

An Bord Pleanala,  
64 Marlborough Street,  
Dublin 1.

**Direct Planning Application to An Bord Pleanala in Respect of a Strategic Infrastructure  
Development**

**Case reference:** PL08 .PA0002 (liquefied natural gas regasification terminal proposed for  
Ralappane and Kilcolgan Lower, Co. Kerry)

**Name of Person (or agent) making submission/observation:** Johnny McElligott (Group  
submission for the ‘Kilcolgan Residents Association’)

**Address to which Correspondence should be sent:** Island View, 5 Convent Street, Listowel,  
Co. Kerry

**Subject matter of submission or observation:** Proposed LNG Terminal: Recommending  
complete Rejection of the Planning application

**Reasons/Considerations/Arguments:**

We are objecting to the submitted planning application due to, among other things, the safety,  
environmental, economic and residential amenity grounds supported in detail in the attached  
letter

**(Please use additional pages if necessary & attach supporting documentation if  
applicable)**

**Fee:** There is no fee applicable in this instance

**Signed:**

**Date:**

Johnny McElligott

<b>Name</b>	<b>Address</b>
<b>Johnny McElligott</b>	<b>Island View, 5 Convent Street, Listowel, Co. Kerry</b>
<b>Morgan Heaphy</b>	<b>Glencullare North, Tarbert, Co. Kerry</b>
<b>Patricia Anglim O’Connor</b>	<b>Saleen, Tarbert, Co. Kerry</b>
<b>Josephine Anglim</b>	<b>Saleen, Tarbert, Co. Kerry</b>
<b>Adam Kearney</b>	<b>Bridge Street, Ballylongford, Co.Kerry (landowner Kilcolgan, Tarbert)</b>
<b>Seamus Leane</b>	<b>Knockenagh, Listowel, Co. Kerry (land-owner Puleen, Tarbert)</b>
<b>Fiona Leane</b>	<b>Knockenagh, Listowel, Co. Kerry (land-owner Puleen, Tarbert)</b>
<b>Michael O’Connor</b>	<b>Upper Kilcolgan, Tarbert, Co. Kerry</b>
<b>Willie Hayes</b>	<b>Puleen, Tarbert, Co.Kerry</b>
<b>Kathleen Hayes</b>	<b>Puleen, Tarbert, Co. Kerry</b>
<b>Richard McElligott</b>	<b>Gunsboro, Knockenagh North, Listowel, Co. Kerry (landowner Kilcolgan)</b>
<b>Shannon O’Mahony (Age 6)</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>

<b>Raymond O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Tim Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Padraig O'Connor</b>	<b>Upper Kilcolgan, Tarbert, Co. Kerry</b>
<b>Margaret O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Margaret Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Kathleen Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Andrew Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Noleen Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Ann Marie Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Catherine Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Seamus Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Sean Heaphy</b>	<b>Lislaughtin Abbey, Ballylongford, Co. Kerry</b>
<b>Michael Heaphy</b>	<b>Lislaughtin Abbey, Ballylongford, Co. Kerry</b>
<b>Ena O'Neill</b>	<b>Puleen, Tarbert, Co. Kerry</b>
<b>Jim O'Neill</b>	<b>Puleen, Tarbert, Co. Kerry</b>
<b>Michael O'Connor</b>	<b>Carhoonakineely, Ardmore, Tarbert, Co. Kerry</b>
<b>Beatrice O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Chris Kelly</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Jayne Kearney</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Kenneth Finnucane</b>	<b>Ballymacassy, Ballylongford, Co. Kerry</b>
<b>Kathleen Kelly</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Frank Kelly</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Esther Flavin</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Mary Kelly-Godley</b>	<b>Glensillagh, Tarbert, Co. Kerry</b>
<b>Sasha Godley</b>	<b>Glensillagh, Tarbert, Co. Kerry</b>
<b>Brian Godley</b>	<b>Glensillagh, Tarbert, Co. Kerry</b>
<b>Noelle Jones</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Ger Buckley</b>	<b>Cockhill, Tarbert, Co. Kerry</b>
<b>Eileen O'Connor</b>	<b>Lislaughtin, Ballylongford, Co. Kerry (landowner Kilcolgan)</b>
<b>Chloe Griffin (age 10)</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Catriona Griffin</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Pat Griffin</b>	<b>Carhoonakilla, Tarbert, Co. Kerry</b>
<b>Patricia O'Connor</b>	<b>Saleen, Tarbert, Co. Kerry</b>
<b>Ger Shanahan</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Donncha Finnucane</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>John O'Connor</b>	<b>Lislaughtin, Ballylongford, Co. Kerry (landowner Kilcolgan)</b>
<b>Bridget Shanahan</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>John J O Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Lily O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>TJ O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Geraldine Carmody</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Cathal Carmody</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Betty Doherty</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>James Doherty</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Anthony O'Mahony</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Jamie O'Mahony (age 5)</b>	<b>Kilcolgan, Tarbert, Co. Kerry</b>
<b>Catherine Heaphy</b>	<b>Glencullare, Tarbert, Co. Kerry</b>
<b>Tom O'Connor</b>	<b>Ardmore, Tarbert, Co. Kerry</b>
<b>Kathleen O'Connor</b>	<b>Ardmore, Tarbert, Co. Kerry.</b>

Kilcolgan Residents Association  
c/o Johnny McElligott  
Island View,  
5 Convent Street,  
Listowel,  
County Kerry  
[johnmcelligott@hotmail.com](mailto:johnmcelligott@hotmail.com)  
Tel: (087) 2804474

14<sup>th</sup> November 2007

An Bord Pleanála,  
64 Marlborough Street,  
Dublin 1.

Submission to An Bord Pleanála regarding the Proposed Liquefied Natural Gas (LNG) regasification terminal located on the Southern shore of the Shannon Estuary in the townlands of Ralappane and Kilcolgan Lower, County Kerry (reference PL08 .PA0002 and PC 08.PC0002).

Dear Sir/Madam,

This submission is being made by nearby residents of the proposed LNG regasification terminal and by people with close family and economic ties to the area. We are totally opposed to the planning application in its present form and ask that An Bord Pleanála refuse planning permission to Shannon LNG.

It must be highlighted that there are serious environmental, safety, economic, residential-amenity and other concerns surrounding the proposed LNG terminal in Tarbert parish, which have not been raised at all to date. These concerns may be overlooked by the general public until it is too late as the decision by An Bord Pleanála on whether or not to grant planning permission will already have been made. This is because the new fast-track planning process allowed for this application means that all environmental, safety and development issues are being examined in parallel and by different government bodies without the right of appeal in the planning process that would exist if the application was first submitted to Kerry County Council. This is unacceptable because it is depriving the public of meaningful or effective participation in the planning process due to information not being disclosed in a timely manner and therefore removing the transparency that must continue to exist in the planning process. This is contrary to both the Planning and Development Act 2000 and the EU EIA directive. For this reason we hereby insist on being allowed to make more submissions once this information has been obtained.

The primary concern is the lack of safety for nearby residents due to the fact that they live too close to the proposed site. Conservative scientific evidence provided below shows that it is unsafe to live within 3 miles of the site. This area covers the villages of Ballylongford, Tarbert and Killimer in County Clare. More seriously, the limited QRA undertaken by Shannon LNG itself admits categorically that a vapour cloud from a leaked tank could travel as far away as **12.4 kilometers** before being ignited (page 32). This will mean that the Kerry towns and districts of Asdee, Moyvane and Beal, the Limerick town of Glin and the Clare towns of Kilrush, Moyasta, Killimer, Knock and Kilmurry McMahan, as well as surrounding countryside, are in the possible fallout zone. This is from Shannon LNG's own research.

This will therefore also prevent further use being made of the rest of the land bank due to the danger posed to people working nearby, if safety standards are in fact implemented.

The most serious environmental concern is that up to 100 million gallons of chlorinated seawater will be pumped into the estuary daily, causing serious environmental damage to the eco-system of this SAC area. The withdrawal and discharge of huge volumes of seawater would affect marine life by killing ichthyoplankton and other micro-organisms forming the base of the marine food chain unable to escape from the intake area. Furthermore, the discharge of cooled and chemically-treated seawater would also affect marine life and water quality.

The most serious economic concern is that the gas-industry's own standard-recommended exclusion zone of 2 miles around an LNG tanker will stop shipping – including the Tarbert-Killimer car ferry - in the estuary every time an LNG tanker is in the area (and Shannon LNG plan up to 125 tankers a year) and prevent marine use of the rest of the land bank – if those safety standards are implemented.

Finally, whereas the developer emphasises that it is in the national strategic interest to have an LNG terminal in Ireland, we are of the opinion that only a strategic interest in LNG as another strategic alternative source of gas in Ireland has been accepted and that there has been no acceptance of the strategic need for an LNG terminal if no suitable site in Ireland is found. This distinction is very important because this need for LNG is already being met with the construction of the LNG terminals in the UK which can then provide LNG to Ireland via the existing gas pipeline from the UK. It must also be noted that the developer, in any case, does not guarantee supply of LNG via Tarbert. What is proposed is no more than a private storage and transshipment facility albeit on a very large scale. It does not purport to offer any strategic benefit to the country, nor in reality does the country gain any strategic benefit from it. On the contrary, it undermines the stated government policy. It does so in a number of respects - in particular by entirely prejudging the outcome of the all-Island study and the strategic goal No. 2 in the government's white paper on delivering a sustainable energy solution for Ireland.(See 17 below). On that basis alone the application is clearly premature and should be refused.

The methodology used in this submission is to support each topic with data from published scientific reports, governmental reports, decisions and strategy documents, statutory regulations (both Irish and European) and from standards produced by the Gas industry itself. Any reference to non-scientific based claims will be clearly stated. Data was collected initially by various members of the association individually. This was then followed on by a visit to the Dragon LNG plant at Milford Haven in Wales on October 13<sup>th</sup> 2007 where the views of concerned residents were noted. Information was raised since then in contacts with Shannon LNG at their office in Listowel on October 15<sup>th</sup>, with other local residents in Tarbert in meetings with Shannon LNG representatives on October 18<sup>th</sup> and October 29<sup>th</sup>, and with various governmental, scientific, academic and voluntary organisations in Ireland and abroad. Our concerns were taken seriously by one and all but many questions were left unanswered. The overwhelming feedback has been that a submission of these concerns needs to be made to An Bord Pleanála,

For the reasons given below we submit that the Bord is obliged to refuse the application. We accept that the Bord may of course take a different view. While we reserve our rights to challenge such a view if necessary we make any comments on conditions that could be applied by the bord if it grants permission to the developer entirely without prejudice to our

over-riding contention that this application should be refused.

**STATUTORY REGULATIONS:**

- Planning and Development Acts 2000 – 2006. This includes the Planning and Development (Strategic Infrastructure) Act 2006
- EU Habitats Directive 92/43/EEC On the conservation of natural habitats and of wild fauna and flora– as 25 acres of the site is in a Special Area of Conservation (SAC)
- EU 1998 Aarhus Convention Directives, Directive 2003/4/EC and Directive 2003/35/EC – on the right of the public to be informed on the environmental impact and being provided with the opportunity to make comments and have access to justice
- EIA directive 87/337/EEC as amended by Directive 97/11/EC - concerning the effects of certain public and private projects on the environment, the precautionary, preventative-action and polluter-pays principles
- Seveso II Directive 96/82/EC as amended by 2003/105/EC – for placements of hazardous sites
- EU Water Framework directive 2000/60/EC
- Kyoto Protocol
- County Clare and County Kerry Development Plans
- European Convention on Human Rights Act 2003
- Planning and Development (Strategic Environmental Assessment) Regulations 2004

**INVALID APPLICATION**

1. The developers in their planning application describe the 10 hectares to be developed offshore as zoned industrial. This is false as it is zoned Special Area of Conservation. We therefore object to this invalid and misleading application and want the whole application to be declared invalid – as would be the case if an individual made such a serious and misleading mistake in a planning application.

**SAFETY ZONE**

2. The evidence obtained from the Dr. Jerry Havens' Report (see. attachment 1), prepared by the Public Utilities Commission of the State of California for the Federal Energy Regulatory Commission, highlights worrying scientific evidence. Dr. Havens, Distinguished Professor of Chemical Engineering at the University of Arkansas and Director of the University's Chemical Hazard's Research Center, concluded that people living within 3 miles of the proposed site would be in harm's way (this radius covers the Kerry villages of Tarbert and Ballylongford and the Clare village of Killimer). "Dr. Havens is extremely qualified and has studied LNG safety issues for more than 30 years. His primary specialisation is in the analysis and quantification of the consequences of releases of hazardous materials into the environment, with emphasis on the consequences that can occur as a result of toxic and/or flammable gas releases into the atmosphere". "He has provided detailed analysis supporting his conclusion that there should be a minimum of 3 miles between an LNG terminal and a densely populated area. Anything closer than 3 miles could put the public in harm's way." This is based on a spillage of 3,000,000 gallons of LNG, which he claims is widely accepted as credible.

However, he also examines the consequences of a vapour cloud fire which could result if the LNG spill vapours were not immediately ignited and a vapour cloud formed. The

cloud thus formed would drift downwind until it reached an ignition source or became diluted below the flammable concentration level - after which time it would not constitute a hazard. In his opinion, the maximum distance downwind to which portions of a cloud (sufficiently large to constitute a severe fire hazard) formed from the rapid spillage onto water of 3,000,000 gallons of LNG could be ignited is approximately **3 miles**. If the vapour cloud were ignited as it drifted downwind, those persons in that area or immediately adjacent (thermal exposure could occur at some distance beyond the edge of the fire) who could not gain protection could be killed or seriously injured.

In any case, he states that such fires cannot be extinguished and would just have to burn themselves out.

Havens also deals with the explosion hazards of confined vapour cloud explosions, unconfined vapour cloud explosions, boiling liquid expanding vapour explosions, Toxicity hazards, Cryogenic (“cold” burn) hazards and Rapid phase transition (flameless explosion) hazards. Their importance in the public safety context lies in the potential for RPT’s to cause secondary damage which could lead to cascading failures and further releases of LNG.

Dr. Havens’ report is based on a spill of **3 million gallons**. The EIS submitted by Shannon LNG proposes (volume 1 page 3) to design a jetty capable of taking ships with a capacity of up to 265,000 m3 of LNG. This is equivalent to **58 million gallons** approximately.

The distance of the proposed site from vulnerable residential areas must therefore be taken into account by An Bord Pleanála.

3. The limited QRA implemented by Shannon LNG goes even further than the Havens’ report when it admits that a vapour cloud could travel up to **12.4 kilometres** before being ignited:  
“A rule-set has been created for the QRA by considering the development of the largest cloud produced by the consequence analysis, that for catastrophic failure of a full tank in F2 weather. This cloud has a maximum downwind distance to LFL [lower flammable limit] of 12.4 km.” (they do not state how far the cloud could travel beyond this distance before it meets the upper flammable limit – the level at which the oxygen mix with the gas is so high that the gas can no longer be ignited).

#### LNG FIRE HAZARDS

4. A report by the IoMosaic Corporation – “Understand LNG Fire Hazards” (see attachment 19 page 15) found that the maximum impact hazard footprint of a 200,000 m3 LNG tanker will result from a pool fire leading to **a fatality limit of 50 percent at a distance of 3.7 kilometres from the leak.**
5. The safety zone of 3 miles conservatively required by the Havens’ report has implications for further residential development in the area surrounding the gas terminal. It will potentially have the effect **of sterilising residential areas (stopping any new houses from being built on safety grounds)** and it will also prevent other areas of **the landbank from being developed as the levels of risk increase with more complex developments side by side.** Shannon LNG proposes in the EIS (volume 1 page 5) that the remainder of the site may be used for a gas-fired power station , but the exclusion

zone of 3 miles will make this proposal untenable. The Bord is asked to take these issues into consideration and issue an opinion on them as they will have serious social and economic long-term consequences on the area. In any case, Article 12 of the EU Seveso II directive states: "Member States shall ensure that their land-use and/or other relevant policies and the procedures for implementing those policies take account of the need, in the long term, to maintain appropriate distances between establishments covered by this Directive and residential areas".

6. SIGTTO (The Society of International Gas Tanker and Terminal Operators Ltd) is a non profit making company, formed to promote high operating standards and best practices in gas tankers and terminals throughout the world. It provides technical advice and support to its members and represents their collective interests in technical and operational matters. To become a full Member of SIGTTO it is necessary for a company to have equity interest in or to operate a gas tanker or terminal. Two of the company's published works are
  - "**LNG Operations in Port Areas : Essential best practices for the industry**" (see. attachment 2) which SIGTTO describe as follows: "This document draws on this collective experience in setting out guidance to best practice for managing gas shipping operations within ports. It also illuminates the profile of risks attaching to gas operations, for the information of those who administer", and
  - "*Site Selection & Design (IP no.14) for LNG Ports & Jetties*" (see. attachment 3) which SIGTTO describe as follows: "Information Paper No.14: Bearing in mind the high consequential risks of a serious accident in the LNG trade, this publication has been prepared for port developers as a guide to the minimum design criteria considered necessary when a port is to be built or altered to accommodate LNG carriers." Although HESS is not a member of SIGTTO, in the absence of direct Irish or EU regulation on the matter, it is only reasonable to expect that HESS would follow the standards set by its own industry.

In the public meeting held at the "Lanterns Hotel" in Tarbert on October 29<sup>th</sup> 2007, Shannon LNG stated that the SIGTTO standards were "a wish list for the ideal site, which was not, in any case, binding on Shannon LNG". We object extremely strongly to this claim because the Gas industry's own standards should be a minimum that the Kilcolgan Residents Association would expect to be applied. The Bord is fully entitled to regard that response from Shannon LNG as an admission that the present application does not match what they accept is "a wish list for an ideal site". There is no objective reason why the Bord should depart from that standard when assessing this application. The Bord has the opportunity, as well as the Statutory obligation to maintain the highest possible standard and the Company's statement eloquently describes exactly what that standard is

### **RISK ASSESSMENT**

7. a) SIGTTO clearly state in "LNG Operations in Port Areas:Essential best practices for the industry" that risk exposures entailed in an LNG port project should be analysed by a Quantitative Risk Assessment (QRA) study which "must involve the operations at the terminal and the transit of tankers through the port" (Section 2 page 5). Shannon LNG have only undertaken a QRA for the storage tanks on the shore, but no QRA has been done on the marine side of the operation. This is not in line with the industry's own best practice guidelines. The QRA includes a tanker on the jetty but it does not consider ship collision between two ocean-going vessels. It should be bourn in

mind that tug boats themselves can also be a cause of collision

b) The SIGTTO standards also clearly state (page 7) that any risk-mitigating factors introduced - such as traffic control, exclusion zones around transiting tankers, tug escorts and specified limiting operating conditions of wind speed and visibility – should also be used in the QRA. This has not been done.

c) No QRA of intrusive risk exposures has been undertaken either. There are two categories of intrusive risk; that arising from intrusions threatening the physical integrity of the terminal and berthed tankers (e.g. heavy displacement ships), and that arising from the introduction of uncontrolled ignition sources.

d) Shannon LNG (in EIS Volume 2, section 3.10.2.3) states that “Shannon LNG understands that a more detailed Quantitative Risk Assessment (QRA) covering all navigational aspects of shipping will be undertaken by Shannon Foynes Port Company during development of the project”. This splitting of risk assessment responsibility is not acceptable and indeed dangerous. Furthermore this is contrary to the EU 1998 Aarhus Convention Directives, Directive 2003/4/EC and Directive 2003/35/EC which declare the right of the public to be informed on environmental impact and to be provided with the opportunity to make comments and have access to justice.

e) The Quantitative Risk Assessment is based on “Land-use Planning Advice for Kilkenny County Council in relation to Grassland Fertilisers (Kilkenny) Ltd at Palmerstown”. This is completely inadequate for a risk assessment of an LNG installation because the chemicals are different and the manner in which they leak is completely unique to LNG because it is at such a low temperature (-160 degrees).

f) One obvious and questionable claim in the QRA undertaken by the developer can be seen where only one of the four LNG storage tanks is covered by the inner zone contour in Figure 6.2 of the QRA on page 59. This means (using the criteria of table 5.1 on page 49) that it would be acceptable to build residential houses up against the remaining 3 LNG storage tanks even if the first tank leaks. This does not make sense and can only lead to the conclusion that the contours have been unrealistically tightened so as not to encompass current residential areas. We therefore object to this QRA which has not been made available to the general public.

h) We request more time from An Bord Pleanála to get our own independent technical assessment of the QRA undertaken by the developer because it has only been made available to us a very short time ago and is still not available to the general public.

i) Misapplication of Risk Assessment: Recently it has become popular on the international front to apply risk assessment to justify otherwise poor decisions not necessarily in the best interest of the public or the country. RA can be a very unwise tool to force the will of a powerful few on the uninformed public. One factor signalling some very poor applications of RA is the comparison to other risks that in a technical reality are not really related, especially as to consequences. Some consequences are so great that no matter what the probability the risks cannot be justified, especially if economic benefit to the decision makers is actually driving the poor application of this tool. A reality test in such poor applications is to ask what the real liability of the organisation is, if their risk call (aka their key technical “facts” assumptions) should prove wrong. Are their liabilities, both economic and criminal, for reckless decisions shall we say, limited by layers of attorneys citing loopholes, are



the real assets moved off shore or to another country? What are the real corporate risks here if the RA is incomplete, inaccurate, or poor?

### **SITE SELECTION**

8. SIGTTO clearly state criteria which must be followed in “Site Selection and Design for LNG Ports and Jetties”. These include (page 12):
- Find a location suitably distant from centres of population
  - Provide a safe position, removed from other traffic and wave action. For an “LNG carrier of about 135,000 m<sup>3</sup> capacity, the waves likely to have such effects are those approaching from directly ahead or astern, having significant heights exceeding 1.5 metres and periods greater than 9 seconds” (page 7). The EIS submitted by Shannon LNG proposes (volume 1 page 3) to design a jetty capable of taking ships with a capacity of up to 265,000 m<sup>3</sup> of LNG so the port criteria must satisfy this capacity of ship

These criteria seem to be unobtainable given the proximity of the villages of Ballylongford, Tarbert and Killimer (all 3 miles from the proposed gas terminal) and the huge amount of ships using the estuary already. Also, windage has to be accounted for because the specific gravity of LNG is a lot lower than oil and so the ship runs a lot higher on the water.

### **MOVING SAFETY ZONE**

9. SIGTTO clearly state in “Site Selection and LNG Operations in Port Areas: Essential best practices for the industry”, that it is sound practice to establish a cordon sanitaire or exclusion zone around a transiting gas tanker. “Where traffic is proceeding in the same direction as the tanker the zone may extend some 1 to 2 miles ahead of the gas carrier, a distance determined by the distance required to bring the following gas carrier safely to a stop. Traffic following the gas carrier should be excluded for a similar distance, allowing scope for the gas carrier to slow down to manoeuvre without it being impeded by the approach of following ships. In general, traffic should not cross closer than 1.5 miles ahead or 0.5 miles astern of a gas carrier” (page 15).

a) These conditions have therefore an effect on the traffic moving through the estuary towards Tarbert, Moneypoint, Foynes, Aughinish and Limerick, especially since Shannon LNG have plans for 125 ships a year coming to the gas terminal

b) This also has an effect on the Tarbert-Killimer car ferry.

c) This also has an effect on all leisure boats using the estuary, including dolphin watchers in this SAC area of the Lower Shannon and the boats from Saleen Pier.

d) Furthermore, the exclusion zone will prevent other sea-based industries setting up in the land bank as they will not be able to access the site when LNG tankers are at port.

### **ENVIRONMENTAL POLLUTION: SEAWATER USE POLLUTING THE SHANNON ESTUARY:**

10. Intermediate Fluid Vaporizer (IFV) technology using the Shannon seawater as a heat

source is the intended method by which Shannon LNG will convert the liquid LNG to gas. The EIS (volume 2 page 63, section 3.6.3.2), notes that up to 5 pumps will be used to circulate up to 20,000 cubic metres of water per hour. This equates to 4.4 million gallons per hour. To prevent marine growth (bio-fouling) within the system, sodium hypochlorite (bleach, an oxidiser) will be added to the seawater on a continual basis. As it exchanges heat with the glycol solution, the seawater will be cooled such that at discharge it is cooler than the ambient seawater.

The withdrawal and discharge of huge volumes of seawater (***over 100 million gallons on a daily basis***) would affect marine life by killing ichthyoplankton unable to escape from the intake area (see attachment 4) . Further, the discharge of cooled and chemically-treated seawater would also affect marine life and water quality. For this reason, open-loop technology (and the Shannon LNG proposal is still an open-loop seawater technology even if it is using a closed-loop glycol system) has been successfully opposed continuously by government bodies due to its negative environmental impact. This is because IFV technology poses the same environmental problems faced by Open Rack Vaporiser (ORV) technology which also relies on huge quantities of seawater (see attachment 7, section 3.5.2.3). It must be remembered that the Lower Shannon waters (including the 25 acres offshore of the proposed LNG site) are in a Special Area of Conservation (SAC) designated area (see attachment 6) – therefore constituting waters that must be protected under the EU habitats directive.

The waters of the Shannon can be protected using an alternative heating solution e.g. a **closed-loop vaporiser** but this will prove more costly for Shannon LNG.

Concern also has to be expressed on the effect of the additional surface water runoff from the site and water supply to and from the proposed new pond (EIS volume 1 page 21) as well as the chemically-modified cooler seawater discharged from the vaporising process on the wetland habitats to the north-west of the site.

#### **THE EU HABITATS DIRECTIVE**

11. The Bord is bound to uphold the provisions of Art. 6 of the Habitats Directive and of the Irish implementing measures. It is plain that the provisions of Art 6(3) apply to this development. It is also plain that the development will by definition have negative implications for the lower Shannon Estuary candidate SAC. The Bord therefore has no basis for finding that the development will in the words of the Directive, “ not adversely affect the integrity of the site”.

The applicant itself does not purport to claim that the development comes within the provisions of Art. 6 (4) of the Directive and in our view they are quite correct not to attempt to make any such claim.

It is therefore not open to the Bord to grant permission.

We also rely on the protection afforded under European and Domestic law to the Ballylongford Bay proposed Natural Heritage Area and the Shannon-Fergus Special Protection Area in submitting to the Bord that the impacts of the development also mandate the Bord to issue a refusal.

12. The ecological sensitivity of the area has been recognised in the Kerry County

Development Plan (see appendix 22) in declaring both Ballylongford Bay and Tarbert Bay as areas of Ecological Importance. For this reason we object to any environmental damage to this area.

13. The Environmental Protection Agency, in its 2006 report on water quality in Ireland (see attachment 23) emphasised the need to have, under the Water Framework Directive (WFD)(2000/60/EC) all waters, both surface and groundwater in good or higher status by 2015. We therefore object that the use of the Shannon waters as proposed in this planning application directly ignore or obligations under the Water Framework Directive.

### **PROJECT SLICING**

14. Shannon LNG is artificially cutting this LNG project into pieces for the purpose of winning legal approval. Through this process, known as “salami-slicing”, sections of this project will be assessed and permitted. The idea is that the less environmentally-questionable parts of the project are authorised and built first, making continued development of the project a virtual fait-accompli, even if the latter sections of the project seriously violate environmental regulations. This is contrary to, among others, article 2.1 of the EIA (Environmental Impact Assessment ) directive, which requires that “projects” likely to have significant effect on the environment – not parts of projects – are subject to the assessment.

Shannon LNG has made only vague reference to the pipeline from the proposed gasification terminal to Foynes ***even though this pipeline could also pose serious environmental and safety risks depending on the pressure of the gas in the pipeline.***

It has only made vague references to its plans for the rest of its site on the land bank. They suggest maybe a gas-fired power station which would, they say, “be the subject of a separate planning application and EIS” (EIS volume 1 page5).

Shannon LNG also states (EIS volume 1 page5) that electricity to be supplied via 110kv lines from the ESB network at Tarbert will also “be the subject of a separate planning application”.

Shannon LNG goes on to state (EIS volume 1 page5) that Kerry County Council will upgrade the coast road from Tarbert which “will also be the subject of a separate planning application”.

It is to be feared that, due to the necessary exclusion zone required for LNG tankers, the land bank will only be fit for other “dirty” projects, which, if assessed along with the LNG gasification terminal, would almost certainly be denied planning permission.

This piecemeal approach to the planning process is extremely questionable as it does not deal with the sustainable development of the area.

### **LIMITED GAS SUPPLY**

15. The justification for the project being that the supply of gas to Ireland is not assured must be questioned and it cannot be assumed that the proposed gas terminal is of overriding national interest. Reference has been made to the threat from the Russian

pipeline. It must be pointed out that

- A gas pipeline also exists from Norway to the UK (see attachment 8). After the start up of the Langeled pipeline from Norway's Sleipner platform to the UK in the autumn of 2006, shockwaves were sent through the market. "History was made when over-the-counter prices fell to negative territory for the first time".
- LNG terminals in the rest of Europe provide an indirect source of gas through the European network.
- Gas has been discovered off the coast of Ireland
- Shannon LNG is giving no guarantees of supply whatsoever. It is assumed that the intention of the gas industry is to make LNG a commodity product where more gasification terminals increases liquidity in the market and the LNG tankers can change routes more easily if the spot price of LNG changes. From the Poten & Partners report (see attachment 8) Ofgem, the UK regulator, had to invoke use-it-or-lose-it provisions to stop BP and Sonatrach from diverting cargoes elsewhere to take advantage of price movements. Shannon LNG do not want the same types of provisions as can clearly be seen from the pre-planning consultation documents from An Bord Pleanála.
- Gas is still a fossil fuel and when the whole supply chain of LNG is considered from the extraction, liquefaction, transport and gasification stages it is thought that LNG is no cleaner than coal. This contradicts our national commitments signed up to in the Kyoto Protocol

#### **LNG: UK Gas Sellers Face Looming Supply Glut**

16. Poten and Partners have issued a report on their website of a looming glut of LNG in the UK market which should guarantee the supply of LNG to Ireland (see attachment 8). They state that a rapidly expanding import infrastructure in the UK threatens to outstrip requirement by a large margin. "In addition to Langeled, operation of the BBL and Tampen pipelines from the Netherlands and Norway will add 100 Bcm/y of new import capacity by 2010, equivalent to half the country's demand." The report also claims that "LNG import capacity will grow ten-fold during the same period". "This is thanks to the new dockside regasification facility at Teesside in northeast England and two grassroots terminals under construction at Milford Haven in Wales, known as Dragon LNG and South Hook", they add.
17. The Government White Paper, "Delivering a Sustainable Energy Solution for Ireland", the Energy Policy Framework from 2007 -2020 (see attachment 9 section 3.3.2), states that in implementing strategic goal 2 (ensuring the security and reliability of gas supplies):

"The UK is now the source of some 87% of our natural gas and the UK's own demand for imports is growing strongly. Norway will remain a significant supplier of gas to UK in the medium term. Ireland's location in Europe from the view-point of gas supply sources is becoming less peripheral. In the last 12 months the UK has achieved a significant increase in gas import capacity through accelerated infrastructure developments with resultant benefits for Ireland. Both pipeline and LNG capacity has increased significantly. These include the Langeled pipeline from Norway, the new pipeline from the Netherlands and new LNG terminals at Milford Haven. Further expansion of LNG capacity and gas interconnection is underway in the UK and Europe which will benefit Ireland in terms of security of wholesale gas supplies within this regional market... the prognosis for gas supplies is relatively secure as a

result”.

The White paper goes on to state:

“We will put in place an all-island strategy by 2008 for gas storage and LNG facilities in light of the outcome of the all-island study”. This would represent an independent strategic view of LNG facilities, rather than depending on the non-independent representation by Shannon LNG. “He who pays the piper, calls the tune”.

Therefore, while awaiting the government’s all-island strategy for LNG facilities and while noting that “the prognosis for gas supplies is relatively secure”, we strongly bring to An Bord Pleanála’s attention that there is no over-riding urgent, strategic imperative or immediate need for an LNG terminal in Tarbert and that therefore, the “National Interest” cannot be used as an excuse to prime over and ignore the dangers being posed to the safety of the nearby populations in Clare and Kerry and the environmental damage that will be suffered on the SAC waters of the Lower Shannon which must be protected under the EU Habitats Directive if the development is given the go-ahead.

#### **ALTERNATIVE LOCATION FOR AN LNG TERMINAL**

18. The Second International Conference of Renewable Energy in Maritime Island Climates held in University College Cork in April 2006 suggested that Cork, close to the Kinsale Gas Field, would be an ideal site for an LNG terminal (see attachment 10):

“In the longer term it is important to fully explore and maximize geographical diversification in gas supply. One potentially promising option is through LNG (liquid natural gas) trade. This would provide give possibility to transfer gas from remote countries (Algeria, Nigeria, Malaysia, Trinidad and Tobago, United Arab Emirates and Qatar), without using pipelines, which are not economically viable. An LNG terminal in Ireland could be constructed near Kinsale Gas Field, connected to the gas platform, thus the existing gas pipeline from the gas field to Inch can be used. In this way, LNG could be used provide at least a quarter of national gas demand or be sufficient entirely for the Cork area. LNG can also be used as seasonable gas storage at the LNG plant (liquefaction and storage during warm season and vaporisation and injection into local pipelines during cold period). This service can increase the volume of storage in Ireland, which is currently limited to what is contained within the pipelines and remaining reserves at the Kinsale Gas Field.”

19. The Second International Conference of Renewable Energy in Maritime Island Climates held in University College Cork in April 2006 also noted (see attachment 10) that:

“Germany has already started the construction of a gas pipeline from St-Petersburg to Germany under the Baltic Sea, avoiding borders. This is expected to provide more reliable supply from Russia to the West by 2010”.

20. In 2006, a natural gas storage licence was granted to Marathon Oil Ireland Limited at parts of the Kinsale facilities (including the Southwest Kinsale Reservoir and wells,

offshore platforms, pipelines, compression, processing plant and the shore terminal) used from time to time to inject, store and withdraw natural gas (see attachment 21, schedule 1 page 19) . This would seem to suggest that the Kinsale Reservoir would be a more ideal site for strategic gas storage than Kilcolgan.

**PUBLIC ACCESS TO INFORMATION, PUBLIC PARTICIPATION AND ENVIRONMENTAL IMPACT ASSESSMENT**

21. Shannon LNG submitted a risk assessment to the Health and Safety Authority on the same day it submitted the planning application to An Bord Pleanála. The HSA will make a recommendation to An Bord Pleanála based on its own examination of the risk assessment.

However, the risk assessment has never been made available to the general public and neither has it been submitted to An Bord Pleanála. This means that the public will not have access to vital environmental information (e.g. the environmental impact of an LNG leak) before the deadline of November 16<sup>th</sup> and people who would make a submission based on the risk assessment are now being illegally deprived of participation in the planning process. This is contrary to Article 6 of the EU EIA directive.

This issue can be solved by an order that the HSA or Shannon LNG produces both the Risk Assessment submitted and the HSA assessment to an Bord Pleanála and that this information be disclosed to the general public. **Further submissions will have to be allowed from the general public – not only oral (for example in an oral hearing) but more importantly in written submissions.** This is to take into consideration people who would be unable to speak at an oral hearing but who would have serious concerns they could put in writing. These written submissions will therefore have to be allowed from all members of the public who have not made a submission before November 16<sup>th</sup> in order to maintain transparency in the planning process.

We object that the division of responsibility for the Environmental Impact Assessment across a number of bodies including, but not limited to, An Bord Pleanála and the EPA is not clearly defined because the general public does not have all the environmental impacts before planning permission is applied for in order to participate fully in the planning process.

We as members of the public concerned have been given 7 weeks to prepare this submission to the bord. In that time we have faced a literally impossible task. We have been denied access to critical documentation including the materials submitted to the HSA and the HSA's own documents and reports on that material. Yet that material and the HSA analysis of it will without doubt form the basis of the HSA's opinion and the Bord in turn will rely on that opinion in the context of the Seveso II Directive. By the time we are eventually able to access the material to examine it further the Bord may have already dealt with the application on an erroneous assumption about the contaminants in the LNG. The Bord will have closed the door to further submissions from us. That is a clear example of one of the ways in which we are being shut out from meaningful participation in the process in flagrant breach of our rights under Irish and European Law. Our rights in this regard are guaranteed by the provision of the European Convention on Human Rights as adopted and as further made binding on An Bord Pleanála by the European Convention on Human Rights Act 2003 as well as by the principles of natural justice and the obligation on the decision makers including

the Bord to apply fair procedures. There are several other aspects which are in breach of our rights including:

- a) The complete inequality of arms between us and the applicant. This is accentuated by the ability of the applicant to engage in pre-application consultations with the Bord so that it can be advised on how to present the application. The Bord has concluded, with no public input, that the application is one fit to be dealt with as Strategic Infrastructure and has literally pre-judged that vital issue. That in turn puts the Bord in a position of objective Bias when it comes to assessing our contention that the application is no such thing and should not be considered as such.
- b) The Applicants have been granted ample time to liaise privately with the Bord, to compile their material, to liaise with other Statutory bodies and to finalise this application. It has done so over a period in excess of 12 months. By contrast the local residents and other members of the public have been given no access to the statutory decision makers and instead are expected to convey our concerns in one fell swoop within 42 days of being granted sight of some, but not all, of the necessary documentation. This is fundamentally unjust.

#### **ORA NOT DOWNLOADABLE**

22. In a public meeting held by Shannon LNG on October 29<sup>th</sup> 2007, it was stated that the QRA would be available to the general public over the Shannon lng website. However, this has never been downloadable and has therefore never been available to the general public. This was reported by Catriona Griffin to An Bord Pleanála and was noted by the Bord.

#### **BUILDINGS TO BE DEMOLISHED**

23. We object to old buildings being demolished as they represent a history of all the people that lived there over the centuries. The old stone buildings also represent our national heritage as they are built in the style of the region. As these houses are also used by bats, we object that the homes of the bats will be destroyed, contrary to the Wildlife Act 1976/2000 and the EU Habitats Directive.

#### **RESIDENTIAL AMENITY**

24. We object to the detrimental affect of the proposed development on the lives of the nearby residents and general public.
- i. The Environmental Impact Statement anticipates (EIS volume 1 page 17) that construction work will take up to 4 years
  - ii. The Environmental Impact Statement anticipates (EIS volume 1 page 17) that construction activities will require 24-hour working at the site.
  - iii. Added to this are the enormous changes to the visual landscape proposed (EIS volume 1 page 11).
  - iv. The noise and vibration impacts from construction traffic and blasting (EIS volume 1 page 17 and 18) are expected to be within the EPA limits. However, this does not take account of the fact that this area currently has hardly any noise whatsoever as it is on a lonely coastal country road and that the changed level of noise over many years is unacceptable.
  - v. In addition, Ballylongford village is not designed to take the huge increase in

- construction traffic expected.
- vi. Trucks will come from Tarbert to the site but workers cannot be prevented from approaching the site from Ballylongford and no upgrade of the road between Kilcolgan and Ballylongford is proposed. This very winding road is therefore going to prove to be a death trap for the many people that currently walk on this road as a leisure activity.
  - vii. We are afraid that children might cut themselves on the barbed wire fencing proposed around the site.
  - viii. We object to the storage tanks proposed at 50 metres height and want them put underground on visual impact and safety grounds
  - ix. We object to the blight on the landscape from the water.
  - x. Tourists visiting the County of Kerry after crossing over the Shannon on the Ferry from Killimer to Shannon will not want to pass a dangerous industrial zone as proposed and this will have a hugely negative impact on the tourism sector in the north Kerry coastal regions beyond Ballylongford (Asdee, Beale, Ballybunnion). Furthermore, the site will not be in keeping with the county's reputation as one of outstanding beauty and will destroy our image.
  - xi. The environmental damage to the water caused by 100 million gallons of cooled, chlorinated water being daily discharged into the estuary will have a negative impact on the oyster farming on Carrig Island at the other side of Ballylongford Bay as well as the reputation of Ballylongford as it hosts the Ballylongford Oyster Festival every year (see attachment 18).
  - xii. The residents in the area surrounding this proposed development will have to live with the constant fear that an accident may happen at any time and this will be a constant source of worry and fear, no matter how long the terminal works without an accident. This is unfair to burden an innocent population with this threat and residual risk.
  - xiii. The EIS does not include the 2.9 metre barbed wire fencing in the photo montages and this is giving a misleading image of the full visual impact of the proposed development
  - xiv. The EIS does not include the proposed gas power station in the photo montage and this is also giving an extremely misleading image of the full visual impact of the proposed development.
  - xv. We object that the photo montages in the EIS do not represent the true size of the tanks and ask that this be confirmed independently.
  - xvi. We object that the huge construction traffic will effect the safety of the children on the school bus routes

#### **RIGHT OF WAY**

25. The EIS (volume 2 section 15.5.2) states that the right-of-way on the farm track at the western boundary of the LNG terminal site used by anglers to access the shore "will not be accessible to anglers when the LNG terminal is operational". We object to this.
26. The EIS (volume 2 section 16.14) claims that there are no registered rights of way or wayleaves on the site. We object to this because the site has always been used to access the shore for swimming, for angling etc by all the Kilcolgan residents, and to access the site owned by Stevie Lynch and John O'Connor of Lislaughtin.

#### **HESS LNG's OTHER LNG TERMINAL REFUSED PERMISSION IN THE USA**

27. The Weaver's Cove site ( see <http://www.weaverscove.com/aboutus.html>)describes



Hess LNG as follows:

“Weaver’s Cove Energy, LLC, is owned by Hess LNG, LLC, which is a joint venture owned equally by Poten & Partners and Amerada Hess Corporation. A team of professionals that are among the most experienced and reputable executives in the global LNG and energy industry manages Weaver’s Cove Energy. The project team members have decades of experience in the design, development and operation of large energy projects around the world, as well as right here in Massachusetts.”

One newspaper article described it as follows:

“The river that runs past a proposed liquefied natural gas terminal in Fall River isn't safe for frequent traffic by massive LNG tankers, the Coast Guard ruled Wednesday in what could be a fatal blow to the controversial project (see attachment 11 )”

And another paper said:

“BOSTON --A proposed liquefied natural gas terminal in Fall River may have been dealt a fatal blow.

The Coast Guard has ruled the river approaching the Weavers Cove Energy project is unsafe for navigation by massive LNG tankers.

The decision affirms concerns the Coast Guard expressed last year. The agency has since done an extensive review of the project.

A major problem is the relatively short distance between two bridges on the Taunton River. The Coast Guard found the safety risks of the 700 foot long, 80 foot wide tankers navigating the 1,100 foot gap were too great.

A Coast Guard spokesman says the ruling "kills the project, as proposed."

Weavers Cove officials did not immediately return calls for comment on the ruling” (see attachment 12 and 13).

The real lesson to be learned from the debacle at Weaver’s Cove is that Hess LNG were stopped from building an LNG terminal on safety grounds even though they claimed that what they were proposing to do was safe. Our interpretation of this is that, no matter what the obstacle, Hess LNG will claim that they can make it work and ignore their own standards of Best Practice and put people’s lives at risk in order to “clinch the deal”. This further proves that Hess LNG is not capable of self-regulation and the independence of their own risk and environmental assessments have now to be seriously questioned. Furthermore, the increase in LNG traffic all over the world will only increase the risk of an accident and this only accentuates the need for the implementation of the strictest safety standards. We therefore implore An Bord Pleanála to refuse planning on safety grounds.

### **ACCOUNTABILITY**

28. Shannon LNG is described as a wholly-owned subsidiary of Hess LNG Limited in the Environmental Impact Statement submitted by Shannon LNG to An Bord Pleanála (Volume 1 page 1). However, it has not been pointed out to An Bord Pleanála that Hess LNG is an offshore company incorporated in the Cayman Islands (see attachments 15 and 16). In the event of an environmental disaster at the plant Shannon LNG would be liable for the costs of any loss to property and human life. However, Shannon LNG has no assets of note. This can lead to problems in litigation where cases can go on for decades as attempts are made in the courts to apportion blame and

liability. Companies can deny liability by creating shell companies in different jurisdictions, where ownership of the land is shared among some companies and ownership of the operations is shared out among other companies – all in different jurisdictions with different litigation laws.

Hess Corporation itself has never proposed that it could accept from the outset all responsibility for any environmental or human losses at the site for which Shannon LNG itself (or any other related companies) could be held liable as if it still owned the site and operations and that this liability would not be given away or sold without the express permission of the local planning authority in Ireland (Kerry County Council). This would have had the added advantage of creating an incentive for Shannon LNG to maintain the highest environmental and safety standards.

However, we object to the fact that an offshore company controls the private company that is applying for planning permission to construct this dangerous LNG terminal in Tarbert.

### **LNG CONTRIBUTING TO GLOBAL WARMING**

29. In its report on LNG (see attachment 17), Greenpeace found that the use of natural gas that has been liquefied and transferred across the Pacific reduces the difference between natural gas power plant CO2 emissions and coal power plant emissions by nearly half. However, it also found that the development of LNG terminals would open up nearly limitless quantities of natural gas to the energy markets and that this shift threatens to turn natural gas, previously viewed as a “transitional” fuel, into a permanent source of global warming gases. This surely goes against the spirit of the Kyoto Protocol and we therefore ask An Bord Pleanála to note this and refuse planning permission for the project. Furthermore, this trend towards an increased dependence on LNG increases reliance on environmentally destructive fossil fuels and significantly delays the possibility of moving towards renewable energy sources by creating a costly infrastructure for LNG.

Furthermore, the idea of building a Gas Power station on the site (EIS volume 1, page 5) will increase the dependency on LNG as a permanent fuel rather than a transitional fuel and we object to this result.

### **DISAGREEMENT AMONG EXPERTS ON THE DANGERS OF LNG**

30. A report for the US Congress was undertaken by the United States Government Accountability Office (see attachment 14) with advice from 19 of the world’s top international LNG experts. The startling findings from this report was that even they seem unable to agree, hence the reports conclusion that the US DOE should carry out further tests on spills of LNG. We therefore also feel that due to the uncertainty in judging the risk to people’s safety, An Bord Pleanála should apply prudence and rule against this planning application.

31. In The GAO Report for Congress (see attachment 14) the section on Cascading Tank failure is illuminating as it states that the worst case scenario is a small hole in an LNG carrier’s containment; this is because the LNG Pool Fire will last longer close to the ship; so giving more time to heat the adjacent tank. A big hole allows the LNG to empty quickly from the tank in question so limiting the time any fire has to heat the adjacent tank. For this danger posed to the nearby residents we ask once again that An

Bord Pleanála should apply prudence and rule against this planning application.

**HOUSES NOT DISPLAYED ON SITE MAP**

32. On the site map made available to the public, there are 6 houses missing – namely those of Raymond O’Mahony, Adam Kearney, Geraldine Carmody, Mrs. Kathleen Finnucane and two other houses belonging to the Finnucane family. We object that this is distorting the number of homes immediately adjacent to the site and question if this is also distorting the QRA.

**NO BENEFIT TO KERRY**

33. There is no plan to send any of the gas imported to Kerry. The only monetary benefit to Kerry shall be the rates that will be charged to the terminal and we object that this should influence the submission from Kerry County Council.

**COMMUNITY ENGAGEMENT IN PLANNING**

34. The final Report from the APaNGO project entitled ‘community engagement in planning exploring the way forward’ (see attachment 20) was launched at the international APaNGO closing conference in Brussels at the end of October 2007. The APaNGO project is one of the first studies of community engagement and involvement at the European level, covering findings from the seven Member States in North West Europe (Belgium, France, Germany, Luxembourg, the Netherlands, the Republic of Ireland, and the UK). It noted that the “legitimacy of any planning decision will vitally depend on the quality of democratic input to the process; without that input, decision-making itself will be discredited.

For this reason, and from the Aarhus Convention Directives on the right of the public to be informed on the environmental impact and being provided with the opportunity to make timely comments and have affordable access to justice, we therefore object that we do not have the financial means to challenge the EIS and QRA presented by the developer who has access to unlimited resources through Hess Corporation. This EIS and QRA are not independent. We need funds to challenge this with our own safety and environmental experts and therefore request that An Bord Pleanála puts those funds at our disposal in order to maintain transparency and equality in the planning process, given that this is for a complex chemical installation in a SEVESO II site.

**QUESTIONABLE REZONING BY KERRY COUNTY COUNCIL**

35. We object that the development is proposed on a green field site – even if it has recently been zoned industrial (EIS volume 2, section 4.6.3). In march 2007, the LNG site was rezoned from “Rural General” to Industrial (see attachment 29)

“The stated purpose of the variation was as follows:

The purpose of the variation is to facilitate consideration of suitable development of these lands in accordance with the provisions of section 5.2.9 of the Kerry County Development Plan 2003-2009 which states: ‘lands have been identified at Ballylongford/Tarbert as suitable for development as a premier deep-water port and for major industrial development and employment creation’. The adoption of this variation gives effect to objective ECO 5-5 of the Kerry County Development Plan 2003-2009 which states: ‘It is an objective of Kerry County Council to identify lands in key strategic locations that are particularly suitable for development that may be required by specific sectors. Land in such locations will form part of a strategic reserve that will be protected from inappropriate development that would prejudice its long-term

development for these uses.”

- a) If the LNG terminal goes ahead then the landbank will not be a deep-water port as all other ships will be forbidden and unable to use the port.
- b) The creation of 50 long-term jobs does not constitute “major employment creation”.
- c) The LNG terminal is in actual fact a hazardous chemicals installation, defined as the most dangerous of sites in EU legislation – a Seveso II site. This does not fall under the type of installation to be considered for the rezoned site because if it was the intention of Kerry County Development Plan to include hazardous sites within the landbank then Kerry County Council would never have given planning permission for the new houses currently being built (such as that of Jayne Kearney) less than 900 metres from the LNG tanks. Any new houses built after the LNG terminal is constructed would constitute “inappropriate development” which means that hazardous sites were never to be considered as appropriate development within the landbank.
- d) This Seveso II site will sterilise the remainder of the site which means that the aim in the Kerry County Development Plan of “major industrial development and employment creation” cannot be fulfilled.
- e) The County Manager stated that sufficient natural amenity lands had been reserved to the west of the site which included a walking route to Carrig Island. However, Carrig Island is at the other side of Ballylongford Bay and takes several miles by car to reach by driving through Ballylongford.
- f) The County Manager went on to state that “the impact of development on the residential amenity of houses in the vicinity of zoned industrial land will be dealt with at the planning stage”. This clearly shows that the site is not intended for a SEVESO II development.
- g) More importantly Clare County Council objected to the rezoning on the grounds that:

*“the proposed rezoning is likely to have a significant impact on the future development of the region, and will have a direct impact on the planned objectives for the Mid West Regional guidelines for the Shannon Estuary and in particular the Planning, Economic and Service Infrastructural development objectives for zone 5 of the plan. Any industrial development including the construction of a deepwater harbour will have a major impact on both the visual and ecological amenities of the area, and potentially on the Lower Shannon Estuarine Environment, including the foreshore of County Clare. Clare County Council would like an appraisal of any SEA investigation which may have been undertaken in respect of the proposed variation”. The Kerry County Manager replied: “Any future application of these lands will be subject to an Environmental Impact Assessment. This process will ensure that any proposals will take into account impacts on the visual and ecological amenities of the area. A copy of the SEA screening report for the proposed variation will be forwarded to Clare County Council.”*

This is reprehensible. **There is no evidence of an SEA having been undertaken** as required for a variation to a development plan under Statutory Instrument No 436 of 2004 Article 7 section 13K and article 12 schedule 2A of the same Statutory Instrument

(<http://www.irishstatutebook.ie/2004/en/si/0436.html#article12> ). Without any information in the public domain regarding the scoping or the actual execution of an SEA (see attachment 32), this rezoning is fundamentally unsound and invalid. Clare County Council does not even know that this is a SEVESO II development. This rezoning process is also being brought to the attention of the relevant authorities as we object that the variation and rezoning of this site has been undertaken in a highly questionable and indeed invalid manner. We therefore object to the planning application because we maintain that this land is not zoned industrial.

These points mean that An Bord Pleanála should rule that the proposed development does not conform to the Kerry County Development Plan for the site, nor to the Planning and Development Act and should therefore be refused planning permission.

### **OTHER ISSUES**

36. We object to any possible movement by road of LNG, due to the dangers and want this to be confirmed by An Bord Pleanála.
37. We need An Bord Pleanála to rule clearly on the use that may be made of the rest of the landbank if planning permission is given to the developer. We object that the rest of the landbank will be sterilised. It must be remembered that if the Bord allows other installations be built on the site near the gas terminal then they will have an influence on the risk of an accident at the regasification terminal. A clear ruling on this matter must be made.
38. We need An Bord Pleanála to rule clearly on how close residential property may be constructed to the site. We object that people will not be allowed to build on their own property close to the site due to the dangers.
39. We need An Bord Pleanála to rule clearly on the exclusion zone it recommends for boat users on the Shannon Estuary and object that use of the Shannon will be hindered by LNG tankers.
40. We object that most of the statutory bodies informed of the planning application will not have time to make detailed submissions to An Bord Pleanála due to the minimum time scale of 6 weeks from the date of planning application. This is such a serious installation that considered opinions cannot be given in this short timescale.
41. Under Seveso II regulations, we insist that An Bord Pleanála, if it decides to accord Planning permission to the developer, gives a detailed ruling on the type of emergency plan to be put in place, both onsite and offsite, and insist on the implementation of an early-warning system to all residents within 12.4 kilometers, including (but not limited to) a form of public siren and information to be given to the same residents on how to react to this siren.
42. The Tarbert Development Association and The Ballylongford Development Association do not speak for the residents surrounding the Kilcolgan site and we object to any attempt to claim anything to the contrary as this does not represent local consultation as far as we are concerned.
43. Morgan Heaphy, Glencullare, asked Shannon LNG to elaborate on the exclusion zone in a written comment on one of the information days (see EIS Volume 4 , Appendix

1F) and this has never been answered in any format (other than the words “limited exclusion zone” (EIS volume 4 appendix 3c) ) and therefore this does not represent consultation with the nearby residents. We object that the developer has always maintained that the site is safe and has kept such a low profile in discussing safety issues that the general public has been completely unaware of the issues in the euphoria of having new industry and jobs coming to the area. This is completely against the spirit of the planning process and we object to this serious misrepresentation of the installation to our detriment and the developer’s economic advantage.

44. We object to the application of the Strategic Infrastructure Act 2006 as it applies to this application as we are extremely worried about the possibility of “agency capture”. By this, we mean that we are extremely worried that An Bord Pleanála may inadvertently become compromised by having too close an interaction with the developer during the decision making process. We expect An Bord Pleanála to maintain a professional distance from the developer and to inform us of all negotiations it has with the developer and to give us a right of reply to all correspondence between the developer and the Board. In the interest of public safety in this Seveso II development we require that all new information be disclosed to the public and that the public be allowed sufficient time to analyse the data and make further submissions, both written and oral.
45. A report on the LNG blast in Algeria (see attachment 24) mentions the contaminant gases that Lng is made up of. Note that when HSE ,Sandia and other regulators do tests with LNG, it is with 100% pure Methane. We object that the level of contaminant gases to be shipped by Shannon LNG have not been disclosed and request that An Bord Pleanála ask the developer to state the level of contaminant gases they expect to have in the LNG shipments and whether they will vary depending on the origin of the LNG in order that a QRA be undertaken and analysed with this information in mind:  
“A 1980 Coast Guard study titled "LNG Research at China Lake," states that LNG imported into this country is often far from pure, and it reveals that vapour clouds made from "impure" LNG actually explode as readily as the highly volatile LPG. When natural gas is super-cooled and turned into a liquid, as much as 14 % of the total cargo shipped as LNG may actually be LPG or other hydrocarbon fuels, according to the Coast Guard report. Natural gas contains these other fuels when it is pumped from the ground. LNG containing these so-called "higher hydrocarbons" is known as "hot gas" and has a higher energy content than pure methane. The Coast Guard report reveals that vapour clouds of LNG containing at least 13.6 % of these other fuels can detonate just like pure propane gas. The agency concluded in its report that this deserves "special consideration, as the commercial LNG being imported into the US East Coast has about 14 % higher hydrocarbons." “
46. Is the limited exclusion zone proposed by Shannon LNG around the LNG tankers taking into account the risk of an ignition source as well as the risk of a collision?
47. Lloyds Casualty Week dated September 16 2005 (see attachment 25, page 11/12) noted an LNG fire from a pipeline leak in Kalakama, Nigeria started a wild fire covering 27 square kilometres. We object that the developer has not included pipeline incidents in the QRA because the pipeline EIS has not even been completed. This shows the dangers in slicing a project into several separate projects for planning

purposes.

48. What is the thermal flux that An Bord Pleanála would determine as acceptable? Is it 1.5 kw/m2.?
49. We object that the State does not determine the most suitable site in Ireland for an LNG terminal, rather than a biased private-sector company applying for planning permission.
50. We ask that An Bord Pleanála take account of the Buncefield Reports (<http://www.buncefieldinvestigation.gov.uk/index.htm>).
51. From speaking to people in Milford Haven it was noted:
  - a) Jobs increased initially but the unemployment rate increased when the jobs finished as some of the workers had settled down in the area
  - b) Rental costs were high during construction which made life more expensive for locals
  - c) Skilled labour (such as welders) were attracted away from local industry so some local business suffered as a result
  - d) There are other construction works on top of one of the tanks equivalent in size to a five-storey building. Will that be the same in Tarbert?
  - e) Dolphins used to be resident in the Haven but left and never came back
52. We object that this LNG terminal would increase or dependency on the Opec nations – contradicting Energy independence objectives (e.g. windfarms where we have best windspeeds in Europe )
53. We object that the permanent jobs to be created will not be for unskilled labour (see attachment 27), which means that it is likely that many will not be filled by locals.
54. We object that since the government is still giving licences for exploration that must mean more gas exists in the country
55. We want all archaeological sites protected (including the one near the jetty)
56. We object that the bird and sea life will be seriously impacted by the lights and the sounds
57. We object that the gas tanks will be visible from county Clare as that county will be expected to get all the disadvantages and none of the advantages (rates) from this development.
58. We object that we do not know if Shannon LNG has options to buy more land but need to know this as it would be an indication of their real intentions.
59. We object to the idea of dumping soil and stone from the site near to Scattery Island.
60. The Climate Protection bill on the 3<sup>rd</sup> October was in the senate and it refers to a 3 % decrease per annum. Facilitating the importation and dependence on more fossil fuels like LNG goes against the spirit of the Climate Protection bill.
61. We object that an offshore location for a terminal would be safer than the onshore one

proposed.

62. We object that the terminal could hit house prices. An article in the Kerryman newspaper dated October 17<sup>th</sup> 2007, page 5 predicts a 29% drop (see attachment 28).
63. No Material Safety Data Sheets (MSDS) have been supplied with the EIS and we object that these have not been provided. We ask that An Bord Pleanála obliges the developer to provide these and allow us sufficient time to analyse them.
64. While all chemistry is dangerous, we agree that it is also feasible if the hazards can be contained. However, we object to the real problem here which is one of scale. 4 tanks of LNG represent 2400 tanks of gas.
65. We object that the HAZOP study is not available to enable us and the general public participate fully in the planning process as required by the EU EIA Directive. We ask that An Bord Pleanála obliges the developer to put it at our disposition.

“A HazOp study identifies hazards and operability problems. The concept involves investigating how the plant might deviate from the design intent. If, in the process of identifying problems during a HazOp study, a solution becomes apparent, it is recorded as part of the HazOp result; however, care must be taken to avoid trying to find solutions which are not so apparent, because the prime objective for the HazOp is problem identification. Although the HazOp study was developed to supplement experience-based practices when a new design or technology is involved, its use has expanded to almost all phases of a plant's life. HazOp is based on the principle that several experts with different backgrounds can interact and identify more problems when working together than when working separately and combining their results. “

The risks we are especially interested in examining in closer detail include (but not limited to);

  - a) Static electricity and how to control it.
  - b) Catastrophic damage in the pressurisation process.
  - c) Catastrophic damage at the stage where odours are added to the gas with mercaptans.
  - d) Catastrophic damage at the stage where the glycol reheats the LNG
66. We object that no trucks should be travelling to or from the site for 5 minutes before and after a ferry boat lands because it has been noticed that the existing road network in Tarbert cannot take ferryboat traffic as it is at the moment.
67. We object that the full height of the storage tanks was lied about. The EIS (volume 1 page 4 ) clearly states: “The tanks will be a low-profile design and will be approximately 96m in diameter and approximately 50.5m high”. This is extremely misleading as this EIS volume 1 – the non-technical summary – was widely distributed to the general public. From the drawings submitted to An Bord Pleanála (see attachment 31) it can be clearly seen that only the top of the concrete is 50.5 metres in height; the top of the tank elevation is 60.5 metres and the top of the pressure relief valve vent stack elevation is 71.5 metres in height. This means that **the tanks are 40% higher than stated** in the non-technical summary. This is highly misleading to the general public and therefore this has surely to lead, on its own, to this application being declared invalid. To add to that, Figure 3.14 (EIS Volume 3 part a) states that the height of the dome of the LNG tank is 10 metres lower at 50.5 metres. Which is it?
68. A clear example of the misrepresentation on the safety and environmental risks of the



proposed LNG terminal that has taken place can be seen in the following wording in the brochure that was distributed by Shannon LNG in May 2006 which lead the general public to trust and believe (and because of no statements to the contrary from any of the statutory bodies) that this project was completely safe until now: (see attachment 26 page 7)

“Could the tankers leak?

In the unlikely event that there is a release from a tanker, the LNG will evaporate. That means the liquid will warm up and change back into a gas. This gas would quickly dissipate because it is lighter than air. Because the LNG is not transported under pressure any leak would evaporate more slowly and cover a much smaller area than a pressurised gas such as propane or butane. Compared to petrol or home heating oil, LNG is far less flammable and will not pollute the environment if it spilled”

Will there be an environmental impact?

Once it is in operation, the plant would have very few impacts – LNG import terminals are quiet, there is no smell, no smoke, no steam, and no noise that can be heard beyond the site boundary”

Such reassurance must be capable of objective verification. That is impossible as matters stand with this application. In addition the public concerned, of which we form part, have a legal and human right to participate effectively in any such verification process. We are being very effectively shut out from that process at present in all but name.

This is one of the first significant applications to come before the Bord under the Strategic Infrastructure Act. How the Bord deals with it can be expected to set a benchmark for the future. We ask the Bord to refuse the application.

69. The Flight path of flights from Shannon Airport and the dangers they pose have not been assessed at all in the risk assessment. We object that this has not been done because of the potential of disasters occurring from plane crashes – accidental or otherwise as was apparent in the tragic 9-11 disaster in New York. It should also be noted that Hess Corporation is an American company and therefore represents a possible future target given the current political situation in the world.

#### FUNDING

70. Finally, we wish once more to flag the issue of requiring funding to be provided for our further participation if the process continues beyond this point. Funding would be essential to enable us to retain the necessary expert assistance in order to defend our personal, family, property, and public participation rights.

#### **SIGTTO MEMBERS**

71. SIGTTO members include (source <http://sigtto.re-invent.net/dnn/Members/tabid/70/Default.aspx>) :ABS Europe Ltd, Abu Dhabi Gas Industries Ltd, Abu Dhabi Gas Liquefaction Co Ltd, Adriatic LNG, Aegis Logistics Ltd, AES Andres, Alloecean Ltd, Anglo-Eastern Ship Management (Singapore) PTE Ltd, Antwerp Gas Terminal N.V., Atlantic LNG Co. of Trinidad & Tobago, Bahia de

Bizkaia Gas, S.L, Barber Ship Management AS, Bergesen Worldwide Gas ASA, BG Lng Services LLC, BGT Limited, BHP Billiton International Inc, Bibby Line Ltd, BP Group, Brunei LNG Sdn Bhd, Bureau Veritas, Calor Gas Limited, Carbofin Energia Trasporti S.p.A., Ceres Hellenic Shipping Enterprises Ltd, Chemikalien Seetransport GmbH, Cheniere LNG INC, Chevron Shipping Company LLC, China LNG Shipping (International) Company Ltd, Chinese Petroleum Corporation, Chubu Electric Power Co Inc, Chugoku Electric Power Co In, CLP Power Hong Kong Limited, Cometco Shipping Co, ConocoPhillips Marine, Depa Gas Corporation of Greece, Det Norske Veritas, Dominion Cove point LNG, Dorchester Maritime Ltd, Dorian (Hellas) S.A., Dragon LNG Ltd, Dynagas Ltd, Eagle Sun Company Ltd, ECO ELECTRICA, Egyptian LNG, Eitzen Gas A/S, El Paso Corporation, Empresa Naviera Elcano S.A., Energy Transportation Corporation, ESKOM Holdings Ltd, Excelerate Energy LP, Exmar N.V., Exxonmobil Development Company, Fleet Management Limited, Freeport LNG Development, L.P, Gaz de France, Gazocean Armement, Germanischer Lloyd AG, Golar LNG Limited, Grain LNG LTD, Guangdong Dapeng LNG Company Ltd, Hazira Port Private Limited, Hyundai Merchant Marine Co. Ltd, IINO Kaiun Kaisha Ltd, International Gas Transportation Co Ltd, Iwatani International Corporation, Kansai Electric Power Co Inc, Kawasaki Kisen Kaisha Ltd, Knutsen Oas Shipping, Korea Gas Corporation, Kuwait Oil Tanker Co S.A.K., Kyushu Electric Power Co Inc, Lauritzen Kosan A/S, Leif Höegh & Co ASA, Liquefied Natural Gas Limited, Lloyds Register, LNG Japan Corporation, Louis Dreyfus Armateurs S.N.C., Malaysia Int Shipping Corp Berhd, Malaysia LNG Sdn Bhd, Maran Gas Maritime Inc, Marine Service GmbH, Marubeni Corporation, Medway Ports, Milford Haven Port Authority, Mitsubishi Corporation, Mitsui & Co Ltd, Mitsui OSK Lines Ltd, Möller, A.P, Naftomar Shipping & Trading Co, National Gas Shipping Co. Ltd, Nigeria LNG Limited, NIPPON Oil Corporation, Norgas Carriers A/S, North Atlantic Pipeline Partners, L.P., Northern Marine Management Ltd, NYK Line (Nippon Yusen Kaisha), Oman Liquefied Natural Gas, Osaka Gas Co Ltd, OSG Ship Management Ltd, Pertamina Transportation LNG-JMG, Petredec Limited, Petrobras Transporte S.A. – Transpetro, Petronas Gas Berhad, Petronet LNG Limited, Phoenix Park Gas Processors LTD, Pronav Ship Management Inc, PT Arun NGL Co, PT Badak NGL Co, Qatar Gas Transport Company Limited, Qatar General Petroleum Corporation, Qatar Shipping Company Q.S.C., Qatargas Operating Company Limited, Ras Laffan Liquefied Gas Co. Ltd, Rompetrol Petrochemicals, Sakhalin Energy Investment Co Ltd, Santos Ltd, Saudi Arabian Oil Co (Saudi Aramco), Seariver Maritime Inc, Sempra Lng, Shell International Trading and Shipping Co Ltd, Shipping Corporation of India, Shizuoka Gas Co Ltd, Single Buoy Moorings Inc, SK Shipping, SNTM-HYPROC, South Hook LNG Terminal Co Ltd, Statoil A/S, Suez Global LNG Limited, Suez LNG NA LLC, Talisman Energy, Tamaaneftegas, Teekay Shipping, Terminal de LNG de Altamira S. de R.L. de C.V., Texaco Angola Natural Gas Inc, The Bahrain Petroleum Co B.S.C., The Egyptian Operating Company (elng), Thome Ship Management Pte. Ltd, Toho Gas Co Ltd, Tohoku Electric Power Co Inc, Tokyo Electric Power Co Inc, Tokyo Gas Co Ltd, Total Indonesie, Total S.A., Trunkline LNG Company, LLC, Unicom Management Services, United Gas Derivatives Company, V. Ships Limited, Varun Shipping Company Ltd, Weavers Cove Energy, Wesfarmers LPG Pty Ltd, Woodside Energy Ltd,

Kilcolgan Residents Association  
c/o Johnny McElligott  
Island View,  
5 Convent Street,  
Listowel,  
County Kerry  
[johnmcelligott@hotmail.com](mailto:johnmcelligott@hotmail.com)  
Tel: (087) 2804474

14<sup>th</sup> November 2007

An Bord Pleanála,  
64 Marlborough Street,  
Dublin 1.

Submission to An Bord Pleanála regarding the Proposed Liquefied Natural Gas (LNG) regasification terminal located on the Southern shore of the Shannon Estuary in the townlands of Ralappane and Kilcolgan Lower, County Kerry (reference PL08 .PA0002 and PC 08.PC0002).

Dear Sir/Madam,

Further to our submission dated 14<sup>th</sup> November we wish to add the following points:

1. The site layout plan submitted by Shannon LNG (drawing C013) it is noted
  - i. “AREA DESIGNAATED FOR GAS EXPORT A.G.I. (to be subject of separate planning application) “
  - ii. “AREA DESIGNATED FOR EIRGRID 110KV SWITCHYARD (to be subject of separate planning application) “

We object that this is not all submitted as part of the main planning application because it is another example of project slicing (raised in point 14 of our submission yesterday) and because of the dangers they pose for creating another source of static electricity, an ignition source, in the QRA.

2. We do not understand why the existing buildings closest to the main road have to be demolished, because there are no other plans for that area disclosed.
3. We urge An Bord Pleanala to view the RTE “Prime Time” program of November 15<sup>th</sup>, 2007 on the RTE website [www.rte.ie/news/primetime/index.html](http://www.rte.ie/news/primetime/index.html), entitled “Safety Concerns over safety gas terminal: : Katie Hannon reports from the North Kerry Village of Kilcolgan where it is proposed to build a liquefied natural gas terminal despite some local opposition” and bring to the Bord’s attention that it was clearly proved that:
  - i. Shannon LNG lied when it told the public that vapours from a leak would harmlessly evaporate – “a myth”, the LNG industry Mr. Cox described it as
  - ii. The barrister clearly raised serious questions about the legitimacy of this fast-track planning process, which are depriving us for fair application of justice and which bring seriously in to question the manner in which this application is being dealt with.

For these reasons we recommend rejection of the planning application.

4. Adam Kearney has uncovered even more serious questions on the rezoning of the

landbank to Industrial from rural general in March of this year as follows in an email to Kerry County Council today:

**From:** Adam Kearney Associates [mailto:info@akassociates.ie]  
**Sent:** 16 November 2007 11:40  
**To:** Kena Felle  
**Cc:** McElligott, John  
**Subject:** SEA Screening Report  
16/11/07

Dear Kena,

I would like to know if a SEA (Strategic Environmental Assessment) screening report was compiled by Kerry County Council for Variation No. 7 of the County Development (To rezone 188.8ha (466.53 acres) of land, comprising 105ha (261.43acres) currently zoned as Rural General and 83ha (205.1 acres) currently zoned as Secondary Special Amenity, in the townlands of Reenturk, Rallappane and Kilcolgan Lower, to Industrial zoning). If so I would like a copy of same It was stated in the County Managers report on Variation No. 7 in response to a submission by Clare County Council that a copy of the SEA screening report would be sent to them. Yesterday I spoke with the Senior Executive Planner John Bradley who made the submission on behalf of Clare County Council, he informed me that they had not received a screening report. I also contacted the EPA who cannot confirm receipt of the report either. As the deadline for public submissions to An Bord Pleanala for the proposed Regasification Terminal in Tarbert is this evening at 5 pm I am extremely restricted on time and need clarification on this issue. If it is the case that an SEA screening report was not conducted for a variation to a development plan then the validity of the rezoning has to be questioned. Under Statutory Instrument No 436 Article 7 section 13K and article 12 Schedule 2A of the same Statutory Instrument 2004 legislation it is quite clear on the procedures required for making a variation to a plan.

Yours Sincerely,  
Adam Kearney

Tom Sheehy, of Kerry County Council sent the report today (see attachment 33).

The copy of the screening report was not sent to any of the statutory bodies as it was felt there was no need for an SEA as there was no environmental impact, in spite of the serious reservations raised by Clare County Council.

We object that since this planning application is going to have a serious effect on the environment an SEA must be undertaken before the land is rezoned and that planning permission should be refused as this will have a huge impact on the strategic development of the region. Furthermore, we intend to raise this question with the Department of the Environment, and both the Ombudsmans Office and the Standards in Public Office because we feel that this land was rezoned solely for Shannon LNG, when it was known that a huge environmental impact was going to happen – all this done in the interests of avoiding an SEA and rushing this Seveso II site through planning.

We request therefore, that until these matters are concluded that planning be refused.

Yours faithfully,

Johnny McElligott

## ATTACHMENTS

1. The Havens Report: From the submission by the “Public Utilities Commission of The State of California” to the “Federal Energy Regulatory Commission” on the proposed LNG facilities at the Port of Long Beach by “Sound Energy Solutions” Docket Nos. CP04-58-000 on October 4, 2005.  
Internet reference:  
[http://files.meetup.com/207586/Rigassificatori%20-%20onshore%20LNG%20California%20\(3%20miglia\).pdf](http://files.meetup.com/207586/Rigassificatori%20-%20onshore%20LNG%20California%20(3%20miglia).pdf)
2. “LNG Operations in Port Areas : Essential best practices for the industry” First Edition 2003, The Society of International Gas Tanker and Terminal Operators Ltd (SIGTTO) ISBN: 1 85609 256 9 Witherbys Publishing [www.witherbys.com](http://www.witherbys.com) . or <http://sigtto.re-invent.net/dnn/Publications/tabid/62/Default.aspx> Price UK£ 45. Hard copy only.
3. “Site selection and Design for LNG Ports and Jetties – Information Paper No. 14. 1997, The Society of International Gas Tanker and Terminal Operators Ltd (SIGTTO) ISBN: 1 85609 129 5 Witherbys Publishing. [www.witherbys.com](http://www.witherbys.com) or <http://sigtto.re-invent.net/dnn/Publications/tabid/62/Default.aspx> Price UK£ 25. Hard copy only.
4. “LNG in the Gulf of Mexico”, presentation by Jeff Rester of the “Gulf States Marine Fisheries Commission”[http://www.seagrantfish.lsu.edu/pdfs/biloxi\\_07/JeffRester.pdf](http://www.seagrantfish.lsu.edu/pdfs/biloxi_07/JeffRester.pdf)  
The Gulf States Marine Fisheries Commission (GSMFC) is an organization of the five states (Texas, Louisiana, Mississippi, Alabama, and Florida), whose coastal waters are the Gulf of Mexico. This compact, authorised under Public Law 81-66, was signed by the representatives of the Governors of the five Gulf States on July 16, 1949, at Mobile, Alabama. It has as its principal objective the conservation, development, and full utilization of the fishery resources of the Gulf of Mexico, to provide food, employment, income, and recreation to the people of these United States.  
To visit their homepage: <http://www.gsmfc.org/gsmfc.html>
5. Newspaper article on Fisheries agency expressing concern over Bienville LNG project, filed from Houston November 11<sup>th</sup> 2007  
<http://www.energycurrent.com/index.php?id=3&storyid=5952>
6. “Lower River Shannon” Special Area of Conservation (SAC) Site Synopsis by the National Parks and Wildlife Service Internet Reference:  
<http://www.npws.ie/en/media/Media,4177,en.pdf>
7. Draft Environmental Impact Statement for Bayou Casotte Energy, LLC's Casotte Landing LNG Project under CP05-420 et al. Accession Number: 20060519-4002 Section 3 Alternatives  
[http://elibrary.ferc.gov/idmws/file\\_list.asp?document\\_id=4405730%20](http://elibrary.ferc.gov/idmws/file_list.asp?document_id=4405730%20)
8. “LNG: UK Gas Sellers Face Looming Supply Glut” March 20, 2007, Poten & Partners Market Opinions. *This article appeared in Poten & Partners monthly publication LNG in World Markets . Reference LNG and natural gas data is available at the LNGAS Data/News Website . Please go to [www.poten.com/lngconsultingproducts.asp](http://www.poten.com/lngconsultingproducts.asp) to sample these reports and order them*

[http://www.poten.com/?URL=show\\_articles.asp?id=593&table=tMarket](http://www.poten.com/?URL=show_articles.asp?id=593&table=tMarket)

9. The Government White Paper, “Delivering a Sustainable Energy Solution for Ireland”, the Energy Policy Framework 2007 -2020, The Department of Communications, Marine and Natural Resources.  
<http://www.dcmnr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf>
10. Proceedings of the 2<sup>nd</sup> International Conference of Renewable Energy in Maritime Island Climates. 26 – 28 April 2006. Security of Energy Supply in Ireland – A Key Driver for Renewable Energy. Kateryna Korneyeva, Brian P. Ó Gallachóir and Eamon J. McKeogh, Sustainable Energy Research Group, Department of Civil and Environmental Engineering, University College Cork, College Road, Cork, Ireland  
<http://www.ucc.ie/serg/pub/SOS-R2.pdf>
11. Newspaper Article on Weaver’s Cove  
[http://biz.yahoo.com/ap/071024/ma\\_lng\\_fall\\_river.html?.v=1](http://biz.yahoo.com/ap/071024/ma_lng_fall_river.html?.v=1)
12. Boston Globe Newspaper article on Weaver’s Cove:  
[http://www.boston.com/news/local/rhode\\_island/articles/2007/10/24/coast\\_guard\\_says\\_lng\\_waterway\\_unsafe\\_for\\_tanker\\_transit/](http://www.boston.com/news/local/rhode_island/articles/2007/10/24/coast_guard_says_lng_waterway_unsafe_for_tanker_transit/)
13. Projo Newspaper article on Weaver’s Cove  
[http://www.projo.com/massachusetts/fallriver/content/BZ\\_COASTGUARD\\_WEAVE\\_RS\\_10-25-07\\_RB7K2NO\\_v20.35aa5a2.html](http://www.projo.com/massachusetts/fallriver/content/BZ_COASTGUARD_WEAVE_RS_10-25-07_RB7K2NO_v20.35aa5a2.html)
14. “Maritime Security, Public Safety Consequences of a Terrorist Attack on a Tanker carrying Liquefied Natural Gas Need Clarification”, United States Government Accountability Office (GAO) Report to Congressional Requestors February 2007.  
<http://www.gao.gov/new.items/d07316.pdf>
15. Shannon LNG Accounts B1 documents lodged at the Companies Registration Office.
16. Shannon LNG Limited – Director’s Report and Financial Statements for the Year Ended 31 December 2006.
17. “Clean Energy Now. Liquid Natural Gas: A roadblock to a clean energy future”. Greenpeace <http://www.greenpeace.org/raw/content/usa/press-center/reports4/liquid-natural-gas-a-roadbloc.pdf>
18. Ballylongford Oyster Festival <http://www.ballylongford.com/ballylongfordoysters.htm>
19. “Undersand LNG Fire Hazards” Iomosaic Corporation, 2007.  
[http://archives1.iomosaic.com/whitepapers/0100ioM02202007WPS\\_Understand%20LNG%20Fire%20Hazards.pdf](http://archives1.iomosaic.com/whitepapers/0100ioM02202007WPS_Understand%20LNG%20Fire%20Hazards.pdf)
20. Final Report of the INTERREG IIIB Advocacy, Participation and NGOs in Planning Project – “community engagement in planning – exploring the way forward”. October 2007  
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21. Natural Gas Storage Licence granted to Marathon Oil Ireland Limited  
<http://www.cer.ie/CERDocs/cer06101.pdf>
22. Kerry County Development Plan – “Appendix G” – “Other Areas of Ecological Importance”. <http://www.kerrycoco.ie/planning/devplan03.asp>
23. “Water Quality in Ireland 2006 – Key indicators of the Aquatic Environment” – Environmental Protection Agency, Ireland.  
<http://www.epa.ie/downloads/pubs/water/indicators/name.23540.en.html>
24. “Report Sheds New Light on LNG Blast in Algeria” – Alexanders Gas and Oil Connections, Volume 9 issue # 9, May 6<sup>th</sup> 2004
25. Lloyd’s Casualty Week, September 16<sup>th</sup> 2005
26. “Major Project to secure Ireland’s natural gas supply” - Shannon LNG booklet May 2006
27. Basic Job Descriptions at DownEast LNG  
<http://www.downeastlng.com/docs/TypicalJobDescriptionsRev4.pdf>
28. “Locals fear terminal could hit house prices” – The Kerryman newspaper October 17<sup>th</sup>, 2007 <http://www.kerryman.ie/news/locals-fear-gas-terminal-could-hit-house-prices-1202905.html>
29. County Manager’s Report on Proposed Variation No 7 to the Kerry County Development Plan 2003 – 2009
30. Minutes of March 12<sup>th</sup> 2007 Meeting of Kerry County Council
31. Typical Arrangement LNG Tanks 1&3 Front Elevation – submitted as part of Planning Application to An Bord Pleanála by Shannon LNG  
<http://www.shannonlngplanning.ie/files/PlanningDrawings/LNGTankAndJettyDrawings/C202.pdf>
32. Notice of proposed variations of the Kerry county development plan 2003 - 2009  
<http://www.kerrycoco.ie/ballylongfordvariation.asp>
33. Ballylongford screening Report

## **ATTACHMENTS**

1. The Havens Report: From the submission by the “Public Utilities Commission of The State of California” to the “Federal Energy Regulatory Commission” on the proposed LNG facilities at the Port of Long Beach by “Sound Energy Solutions” Docket Nos. CP04-58-000 on October 4, 2005.

Internet reference:

[http://files.meetup.com/207586/Rigassificatori%20-%20onshore%20LNG%20California%20\(3%20miglia\).pdf](http://files.meetup.com/207586/Rigassificatori%20-%20onshore%20LNG%20California%20(3%20miglia).pdf)



STATE OF CALIFORNIA

ARNOLD SCHWARZENEGGER, *Governor*

**PUBLIC UTILITIES COMMISSION**

505 VAN NESS AVENUE  
SAN FRANCISCO, CA 94102-3298



October 4, 2005

**Via Electronic Delivery**

Honorable Magalie Roman Salas  
Office of the Secretary  
Docket Room  
Federal Energy Regulatory Commission  
888 First Street, N.E., Room 1A, East  
Washington, D.C. 20002

***Re: Sound Energy Solutions, Docket Nos. CP04-58-000, et al.***

Dear Ms. Salas:

Enclosed for filing in the above-docketed proceeding, please find an electronic filing of the "Motion of the Public Utilities Commission of the State of California to Supplement the Record and for a Hearing," which is accompanied by the "Prepared Direct Testimony of Dr. Jerry Havens (Exhibit PUC-1) and Accompanying Exhibits (Exhibits PUC-2 through PUC-4)."

Thank you for your cooperation in this matter.

Sincerely,

/s/ HARVEY Y. MORRIS

Harvey Y. Morris  
Assistant General Counsel  
415-703-1086 (voice)  
415-703-2262 (fax)  
hym@cpuc.ca.gov

HYM:jgo

Enclosure

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

Sound Energy Solutions

Docket Nos. CP04-58-000, *et al.*

**MOTION OF THE PUBLIC UTILITIES COMMISSION OF THE STATE OF  
CALIFORNIA TO SUPPLEMENT THE RECORD AND FOR A HEARING**

Pursuant to Rule 212 of the Rules of Practice and Procedure (“Rules”) of the Federal Energy Regulatory Commission (“FERC”), 18 C.F.R. § 385.212 (2005), and section 3(e)(2)(A) of the Natural Gas Act , 15 U.S.C. § 717b(e)(2)(A) (2005), the Public Utilities Commission of the State of California (“CPUC”) hereby submits its motion to supplement the record and for a hearing in this matter.

Although the CPUC is filing this motion to supplement the record with evidence that justifies the rejection of the proposed liquefied natural gas (“LNG”) facilities at the Port of Long Beach, the CPUC recognizes the need for new LNG terminals along the West Coast in order to ensure sufficient supplies of natural gas, as well as to help put downward pressure on the price of natural gas. The CPUC is committed to facilitating the construction of new LNG terminals on the West Coast and has already ordered the intrastate pipelines in California to provide firm access to LNG-supplied natural gas.

Nevertheless, the evidence accompanying this motion establishes that approximately 130,000 people living or working within three miles of the proposed site at the Port Long Beach would be in harm's way, and many of them could be killed or incur second-degree burns if there were a terrorist attack, earthquake or human error, which caused the release of LNG. In addition, there is vital infrastructure that could be destroyed at the Port of Long Beach if LNG were released at or near the proposed site. This potential disaster can be and must be prevented.

Fortunately, this is not a Hobson's choice between either insufficient natural gas supplies or siting a hazardous LNG facility in a densely populated area. The evidence accompanying this motion also establishes that there are much safer alternatives to the proposed site for an LNG terminal at the Port of Long Beach. Therefore, the CPUC respectfully submits that the FERC should consider the evidence accompanying this motion as supplemental record evidence, and the FERC should reject SES's application as being contrary to the public interest, or, alternatively, the FERC should set an evidentiary hearing in this matter.

#### **I. THE ENERGY POLICY ACT OF 2005 HAS NECESSITATED THE CPUC'S MOTION**

This motion is a result of the recent enactment of the Energy Policy Act of 2005, Public Law 109-58 ("EPAAct of 2005"). Prior to the enactment of the EPAAct of 2005, the CPUC had maintained that it had jurisdiction over the siting of Sound Energy Solutions' ("SES") proposed LNG facilities at the Port of Long Beach. The CPUC initiated an investigation into the safety of SES's proposal and set this matter for hearing. The CPUC's Consumer Protection and Safety Division ("CPSD") staff was a participant in the CPUC's proceeding, just like FERC's staff participates in FERC proceedings. In this regard, the

CPSD entered into a contract with Dr. Jerry Havens, an expert with more than 30 years of experience in LNG safety issues, to prepare a report and testify on behalf of the CPSD in the CPUC proceedings.

In the CPUC's intervention and protest in the FERC's proceeding, the CPUC raised serious concerns as to the safety of the proposed LNG terminal site at the Port of Long Beach. However, as a decisionmaker in its own proceeding at the time the CPUC filed its intervention and protest with the FERC, the CPUC did not and could not sponsor testimony on the ultimate merits of this particular project.<sup>1</sup> The FERC issued orders herein claiming that it had preempted the CPUC's jurisdiction, which resulted in litigation between the FERC and CPUC in the Ninth Circuit.

With the passage of the EAct of 2005, both the FERC and the CPUC have agreed in very recent pleadings filed with the Ninth Circuit, that the CPUC's jurisdictional issues were rendered moot. Since the CPUC is no longer contesting the FERC's authority to preempt the CPUC's jurisdiction, the CPUC acknowledges that it does not have decisionmaking authority over the siting of SES's proposed project. Because it would be pointless for the CPSD to file Dr. Havens' expert witness report in the CPUC's proceeding on SES's proposed LNG terminal (which has recently been suspended), the CPUC has decided to sponsor Dr. Havens' report in the present FERC proceeding.

The EAct of 2005 also has certain other provisions that pertain to the FERC's authority to decide whether or not to approve an application to site and construct an LNG import terminal at a particular location. Section 311(c)(2) of the EAct of 2005 (as codified in section 3(e)(2) of the Natural Gas Act, 15 U.S.C. §§ 717b(e)(2)) requires that

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<sup>1</sup> Instead, the CPUC previously filed with the FERC uncontroverted evidence as to the distance between the proposed site and various neighborhoods and reports about previous LNG accidents, such as in Cleveland.

the FERC set the matter for hearing. Pursuant to this section, the CPUC requests a hearing and submits the accompanying testimony to support an evidentiary hearing herein.

Section 311(d) of the EAct of 2005 (as codified in section 3A of the Natural Gas Act, 15 U.S.C. §§ 717bA) requires the FERC to respond to the issues raised in a State advisory report on the State and local safety considerations about a proposed LNG terminal. The California Energy Commission (“CEC”) filed herein on September 7, 2005 a comprehensive State advisory report on the State and local safety considerations. Therefore, the FERC must address each of the issues in the State advisory report filed by the CEC.

In addition, section 311(d) of the EAct of 2005 (as codified in section 3A(b) of the Natural Gas Act, 15 U.S.C. §§ 717bA(b)) has explicitly provided six factors for the location of LNG facilities. As stated in the CEC’s State advisory report at 12:

These factors mirror the six factors for the location of LNG facilities in the Pipeline Safety Act of 1979, which amended the Natural Gas Pipeline Safety Act. *See* 49 U.S.C. § 60103(a). The fifth factor in section 311(d), which involves emergency response capabilities, is a shorter paraphrase of the fifth factor in 49 U.S.C. § 60103(a). The other five factors in section 311(d) and 49 U.S.C. § 60103(a) are the exact same wording: “(1) the kind and use of the facility; (2) the existing and projected population and demographic characteristics of the location; (3) the existing and proposed land use near the location; (4) the natural and physical aspects of the location; ... and (6) the need to encourage remote siting.”

Relevant to each of these factors is evidence concerning the extent to which an LNG spill can cause adverse consequences to the nearby population and/or the infrastructure. Indeed, in its analysis of these six factors, the CEC’s State advisory report at 6-35, focuses precisely upon the need to carefully examine whether or not an LNG facility should be located in a densely populated area, such as the Port of Long Beach, based upon a review of these potential consequences. For example, the CEC’s State advisory report points out, among other things, that:

- the area within 3 miles of SES's proposed site includes over 85,000 residents and at least 44,000 workers (CEC's State advisory report at 8);
- a 5 KW/m<sup>2</sup> thermal radiation flux level does not adequately protect the public, and, at a minimum, a 1.5 KW/m<sup>2</sup> thermal radiation flux level should be used (CEC's State advisory report at 15); and
- the petroleum infrastructure within 3 miles of SES's proposed site provides approximately 60% of the imported crude oil and 80% of imported refined petroleum products to California, which are vital to the economy and the U.S. Department of Defense (CEC's State advisory report at 17- 21).

**II. THE TESTIMONY OF THE CPUC'S EXPERT WITNESS, DR. HAVENS, IS VERY RELEVANT TO THE STATE'S SAFETY CONCERNS AND SHOULD BE PART OF THE RECORD**

Dr. Havens' report and sponsoring testimony goes to the crux of the State's safety concerns involving SES's proposed LNG import terminal at the Port of Long Beach, California: whether or not the proposed site would be a safe distance from the people, businesses and infrastructure in or near the Port of Long Beach. Dr. Havens is extremely qualified and has studied LNG safety issues for more than 30 years. His primary specialization is in the analysis and quantification of the consequences of releases of hazardous materials into the environment, with emphasis on the consequences that can occur as a result of toxic and/or flammable gas releases into the atmosphere. His resume and consequence assessment report to the CPUC's CPSD are exhibits accompanying his testimony. He has provided detailed analysis supporting his conclusion that there should be a minimum distance of three (3) miles between an LNG terminal and a densely populated area. Anything closer than 3 miles could put the public in harm's way.

Consistent with the CEC's State advisory report at 15, Dr. Havens has explained in his testimony and report why a 5 KW/m<sup>2</sup> thermal radiation flux level does not adequately protect the public, and, at a minimum, a 1.5 KW/m<sup>2</sup> thermal radiation flux level should be used. He also establishes why this would require an LNG terminal to be at least 3 miles from a densely populated area.

Dr. Havens' testimony and report also address other safety issues unique to SES's proposed LNG facilities at the Port of Long Beach. For example, he has provided evidence associated with the safety risks of LNG fuel trailer trucks and pointed out that SES proposes up to 45 of these trucks leaving the Port of Long Beach each day and driving through the City of Long Beach and the City of Los Angeles, as well as other cities and locations in California. This potential safety hazard was also identified in the CEC's State advisory report at 13-14.

Dr. Havens further provides evidence as to how the natural gas liquids ("NGLs") proposed to be extracted and stored on-site or transported to other locations pose additional risks for this project. This was also a hazard identified in the CEC's State advisory report at 15-16.

In addition, Dr. Havens' testimony addresses the sixth factor, the need to encourage remote siting, which Congress required to be considered in the siting of LNG terminals. *See* section 311(d) of the EPAct of 2005 (as codified in section 3A(b) of the Natural Gas Act, 15 U.S.C. §§ 717bA(b); *See also* 49 U.S.C. § 60103(a). This is also a prominent issue discussed in the CEC's State advisory report at 30-34. Providing a balanced approach to the siting of LNG terminals, Dr. Havens' testimony points to much safer alternatives in more remote siting in federal offshore waters, where LNG terminals can provide the needed supplies of natural gas without putting the public in harm's way.

Dr. Havens' testimony is therefore relevant to the issues that Congress has required the FERC to address herein. For these reasons, the FERC should accept Dr. Havens' testimony and exhibits into the record.

**III. IF DR. HAVENS' TESTIMONY IS DISPUTED, THERE SHOULD BE A HEARING IN THIS MATTER**

Under the above-mentioned six factors provided in section 311(d) of the EPC Act of 2005, SES's proposed LNG project at the Port of Long Beach should be rejected. It is contrary to the public interest to needlessly put approximately 130,000 people, nearby businesses and critical infrastructure in harm's way when there are much safer alternative sites being pursued by others and which SES could have pursued.

To the extent that SES or others contest Dr. Havens' testimony as to why there must be a minimum 3-mile distance from the LNG terminal for the safety of the public, then there is a dispute of material fact warranting a hearing. The same holds true if SES or others contest Dr. Havens' testimony as to the hazards associated with the LNG fuel trucks or NGLs extracted at the site. There is no basis to assume SES's proposed LNG terminal would be safe or is worth the risk, given the evidence offered by the CPUC. At a minimum, a hearing would be necessary on any such disputes of material facts. *See Public Service Co. of New Hampshire v. FERC*, 600 F.2d 944, 955 (D.C. Cir. 1979).

A hearing is particularly warranted herein, because section 311(c)(2) of the EPC Act of 2005 (as codified in section 3(e)(2) of the Natural Gas Act, 15 U.S.C. §§ 717b(e)(2)) requires that the FERC set the matter for hearing. Pursuant to this section and in light of the accompanying proffered testimony, the CPUC requests a hearing in this matter.



**IV. CONCLUSION**

For the above-mentioned reasons, the CPUC respectfully submits that the FERC should accept the accompanying testimony and exhibits into the record, and should set this matter for an evidentiary hearing.

Dated: October 4, 2005

Respectfully submitted,

RANDOLPH L. WU  
HARVEY Y. MORRIS  
PAUL ANGELOPULO

By:           /s/ Harvey Y. Morris            
          HARVEY Y. MORRIS

California Public Utilities Commission  
505 Van Ness Avenue, Room 5138  
San Francisco, California 94102  
(415) 703-1086  
*Attorneys for the Public Utilities  
Commission of the State of California*

**CERTIFICATE OF SERVICE**

I hereby certify that I have this day caused the foregoing “Motion of the Public Utilities Commission of the State of California to Supplement the Record and for a Hearing,” and the “Prepared Direct Testimony of Dr. Jerry Havens (Exhibit PUC-1) and Accompanying Exhibits (Exhibits PUC-2 through PUC-4)” to be served upon all known parties of record in this proceeding by mailing by first-class mail a copy thereof properly addressed to each party.

Executed in San Francisco, California, on October 4, 2005.

/s/ HARVEY Y. MORRIS

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HARVEY Y. MORRIS

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

Sound Energy Solutions

Docket Nos. CP04-58-000, *et al.*

**PREPARED DIRECT TESTIMONY OF DR. JERRY HAVENS  
(Exhibit PUC-1)  
AND ACCOMPANYING EXHIBITS  
(Exhibits PUC-2 through PUC-4)**

**RANDY L. WU  
HARVEY Y. MORRIS  
PAUL ANGELOPULO**

Attorneys for the Public Utilities  
Commission of the State of California

505 Van Ness Avenue, Room 5138  
San Francisco, CA 94102  
Phone: (415) 703-1086

Filed: October 4, 2005

# **EXHIBIT PUC-1**

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

Sound Energy Solutions

Docket Nos. CP04-58-000, *et al.*

**PREPARED DIRECT TESTIMONY OF  
DR. JERRY HAVENS**

1 Q. Please state your name and business address.

2 A. My name is Jerry Havens. I am President of Havens Associates, Inc. My  
3 consulting company's address is 809 Lighton Trail, Fayetteville, AR 72701.

4 Q. By whom are you employed and in what capacity?

5 A. I am a Distinguished Professor of Chemical Engineering at the University  
6 of Arkansas, where I have been a faculty member since 1970. In addition  
7 to my teaching responsibilities, I am the Director of the University's  
8 Chemical Hazards Research Center, where my responsibilities include the  
9 development and verification of mathematical models for prediction of  
10 atmospheric dispersion of hazardous chemicals. I am testifying here in my  
11 consulting capacity as President of Havens Associates, Inc. My remarks  
12 are not to be attributed in any way to the University of Arkansas.

13 Q. Please summarize your educational background.

## Exhibit PUC-1

1 A. I received a BS from the University of Arkansas in 1961; an MS from the  
2 University of Colorado in 1962; and a PhD from the University of  
3 Oklahoma in 1969, all in Chemical Engineering. I spent an additional one-  
4 year period as a post-doctoral fellow studying fire and explosion  
5 phenomena in the Flame Dynamics Laboratory of the University of  
6 Oklahoma before moving to the University of Arkansas in 1970.

7 Q. Do you have a particular area of specialization?

8 A. Yes, my primary specialization is in the analysis and quantification of the  
9 consequences of releases of hazardous materials into the environment, with  
10 emphasis on the consequences that can occur as a result of toxic and/or  
11 flammable gas releases into the atmosphere. Under my direction, the  
12 Chemical Hazards Research Center has been responsible for the  
13 development and validation of the DEGADIS gas dispersion model as well  
14 as for the continuing development and validation of the FEM3A  
15 computational fluid dynamics (CFD) gas dispersion model, both of which  
16 are the only gas dispersion models currently approved for the determination  
17 of vapor cloud exclusion zones as required by the Code of Federal  
18 Regulations (49 CFR 193) and the National Fire Protection Association  
19 (NFPA) 59A which govern siting of liquefied natural gas (LNG) import  
20 terminals in the United States.

21 Q. Do you regularly do research, publish, and speak at professional symposia  
22 on those subjects?

Exhibit PUC-1

1 A. Yes. A listing of my publications, research assignments and symposia  
2 presentations is included in the Resume, which accompanies this testimony  
3 and is marked "Exhibit PUC-2."

4 Q. Are you a registered professional engineer?

5 A. Yes. I am a registered professional engineer in the State of Arkansas.

6 Q. For whom are you appearing in this proceeding?

7 A. I am appearing for the California Public Utilities Commission (CPUC).

8 Q. What were you originally asked to do for the CPUC?

9 A. The Consumer Protection and Safety Division (CPSD) of the CPUC  
10 requested that I prepare a science-based assessment of public safety issues  
11 that should be considered regarding the proposed siting of an LNG import  
12 terminal in the Port of Long Beach, California (POLB). Subsequently, the  
13 CPUC requested that I prepare this testimony and testify as an expert  
14 witness on behalf of the CPUC. A copy of the report that I prepared for the  
15 CPSD accompanies this testimony and is marked "Exhibit PUC-3."

16 Q. What are your conclusions concerning whether or not Sound Energy  
17 Solutions' (SES) proposed LNG import terminal should be sited at the Port  
18 of Long Beach?

19 A. I conclude that it is not in the public's interest to site the proposed terminal  
20 in the Port of Long Beach because of the potential severe threat to public  
21 safety and to the Port and surrounding infrastructure that could result. The  
22 details of my *consequence assessment* are contained in my report to the

## Exhibit PUC-1

1 CPSD, which I briefly summarize here. I specified a minimum distance of  
2 three (3) miles for the extent to which the public could be in harm's way  
3 from the initial release of approximately 3,000,000 gallons of LNG onto  
4 water at the POLB, an event which is widely considered by the scientific  
5 community to be credible. I recommend the 3 mile hazard distance as the  
6 minimum which should be considered credible to occur as a result of a  
7 terrorist attack in the Port, but I remain concerned that the fire which  
8 formed the basis for the 3 mile consequence distance would be of such  
9 severity as to make it highly likely, if not almost certain, that further  
10 failures of flammable fuel containments would occur.

11 Q. What are the current LNG safety regulations?

12 A. The regulation that specifies requirements for siting LNG import terminals  
13 in the United States is 49 CFR 193, entitled *Liquefied natural gas facilities:  
14 Federal standards*. 49 CFR 193 contains two sections that directly address  
15 the public safety issue:

16 *193.2057 Thermal Radiation Protection, and*

17 *193.2059 Flammable vapor dispersion protection.*

18 Q. Are the current LNG safety regulations sufficient to protect the public?

19 A. In my opinion they are not. I describe in detail in my report to the CPSD  
20 the deficiencies in this regard that I believe require attention in order to  
21 provide sufficient consideration of public safety. But the most important  
22 failure in my opinion of the present regulations to provide for protection of



## Exhibit PUC-1

1 public safety stems from the fact that there are currently no requirements to  
2 provide for exclusion zones to protect the public from LNG spills on water.  
3 Since spills onto water cannot be contained, the hazards from the  
4 uncontrolled spreading of spills could extend to greater distances than  
5 would occur from spills on land, which can be contained to minimize their  
6 areal extent.

7 Q. Have you ever served as a consultant either to the government standard-  
8 setting agencies or to government officials working in the areas bearing on  
9 LNG safety?

10 A. Yes. In 1976-77, while I was on sabbatical from the University, I served as  
11 Technical Advisor to the Office of Merchant Marine Safety in U.S. Coast  
12 Guard Headquarters in Washington. I prepared a report for the U.S. Coast  
13 Guard entitled "Predictability of LNG Vapor Dispersion from Catastrophic  
14 Spills onto Water: An Assessment." That report helped to narrow the range  
15 of uncertainty in the calculations that had been made and identified for the  
16 first time the uncertainties that remained in such calculation procedures.  
17 My report was widely distributed worldwide and served, in part I believe,  
18 as the basis for Congressional authorization of \$40,000,000 to initiate an  
19 LNG safety research program directed principally at the determination of  
20 consequences (fire and vapor dispersion) of major LNG spills on water.  
21 Both of the computer models currently required by 49 CFR 193 for  
22 calculating vapor cloud exclusion distances (DEGADIS and FEM3A) were

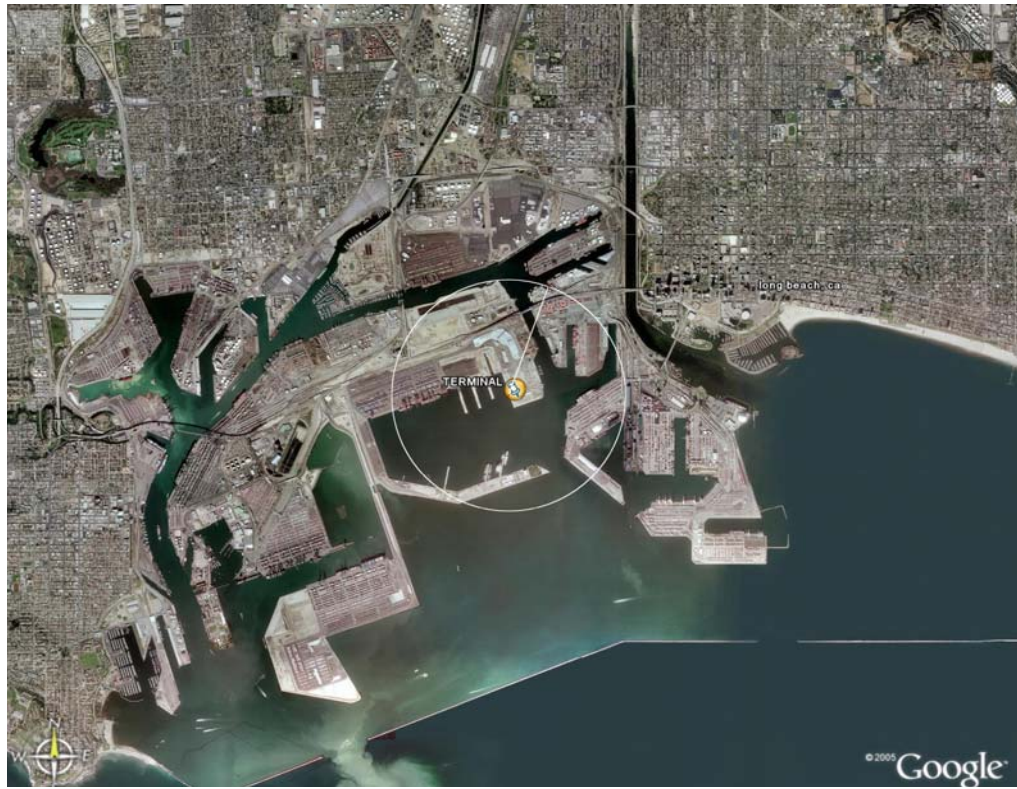
Exhibit PUC-1

1 the result of developments by my Associates and me at the University of  
2 Arkansas. I have also followed closely and have been involved in, if less  
3 directly, the development of the methods required by 49 CFR 193 for  
4 determining pool fire radiation exclusion zones.

5 Q. Please describe the location of the proposed site at the Port of Long Beach,  
6 California.

7 A. The satellite photo below shows the harbors of Los Angeles and Long  
8 Beach, with adjacent cities of Los Angeles to the west and north and Long  
9 Beach to the north and east. The proposed location of the LNG terminal in  
10 the Port of Long Beach is on an approximately twenty-five acre site on the  
11 east side of Pier T. For purposes of scaling, a circle with one mile radius is  
12 centered on the location of the tanker offloading site, which will be on the

1 west side of the land parcel designated "TERMINAL".



2

3 Q. Please describe the principal components of SES's proposed LNG import  
4 terminal.

5 A. The principal components of the LNG terminal are:

- 6 ○ An LNG ship berth with 4 LNG unloading arms;
  - 7 ■ 2 liquid arms designed for a capacity of 24,150 gallons per minute
  - 8 (gpm) each, allowing ship offloading at 48,300 gpm,
  - 9 ■ 1 liquid/vapor hybrid arm, and
  - 10 ■ 1 vapor arm.

## Exhibit PUC-1

- 1           ○ 2 LNG receiving tanks, each with a gross volume of 42.3 million
- 2                   gallons of LNG at a temperature of -260 F and a normal pressure of 1 to
- 3                   3 psig;
- 4           ○ 6 in-tank LNG pumps, each sized for 2,500 gpm;
- 5           ○ Seven LNG primary booster pumps, each sized for 1,830 gpm;
- 6           ○ Seven LNG secondary booster pumps; each sized for 1980 gpm;
- 7           ○ Four shell and tube vaporizers, each sized for 350 million standard
- 8                   cubic feet of gas per day using a primary closed loop water system
- 9                   heated with three direct-fired heaters and circulation pumps;
- 10          ○ Three boiloff gas compressors and associated condensing systems;
- 11          ○ An LNG trailer truck loading facility, including an LNG
- 12                   receiving/storage tank with a capacity of 1,000,000 gallons of vehicle
- 13                   quality LNG for distribution via eight trailer loading bays. An average
- 14                   of 45 trucks will be loaded per day.
- 15          ○ A natural gas liquids (NGL) recovery system, for which the final design
- 16                   appears to remain under consideration, will provide for the recovery and
- 17                   distribution off site of natural gas liquids, principally ethane and
- 18                   propane, via pipeline and/or trailer truck loading. (Information from
- 19                   Sound Energy Solutions Long Beach LNG Import Project Resource
- 20                   Report 1, General Project Description, Jan. 2004)

21    Q.    Did SES's parent, Mitsubishi Corporation, contact you in the Spring of  
22           2005 to request your help in analyzing the consequences of a terrorist attack

## Exhibit PUC-1

1 on an LNG terminal or LNG ship?

2 A. Yes, they requested my technical support for a safety analysis of an LNG  
3 spill on the sea from an LNG ship that could result from a terrorist attack,  
4 including such factors as LNG spread and evaporation, and possibly  
5 FEM3A simulation of LNG vapor dispersion following such a spill. As I  
6 was already under contract with CPSD for the preparation of the report on  
7 which this testimony is based, I declined their offer since such an activity  
8 (consulting for Mitsubishi) would create for me a conflict of interest in the  
9 present matter. Their email request to me accompanies my testimony and  
10 is marked "Exhibit PUC-4."

11 Q. What are the primary hazards that could result from the release of LNG at  
12 the Port of Long Beach?

13 A. It is my opinion that the primary hazards are, in order of prioritization:

- 14 1. LNG pool fires on water
- 15 2. LNG vapor clouds resulting from spills on water
- 16 3. Unconfined vapor cloud explosions of LNG containing "hot" gases
- 17 4. Cascading failures due to the following causes, which could be  
18 combined:
  - 19 a. Confined gas explosions that can cause structural failure.
  - 20 b. Structural failure resulting from contact of cryogenic LNG with  
21 carbon steel.
  - 22 c. Failure of insulation system components resulting from extreme

## Exhibit PUC-1

1 fire exposure.

2 Q. Please explain what would be the consequence of a pool fire.

3 A. It is now widely accepted that spillage from a ship container of  
4 approximately 3,000,000 gallons of LNG is credible. It is highly likely that  
5 ignition sources (such as broken electrical wires, sparks resulting from  
6 friction, or open flames) would cause the LNG vapor evolving from such a  
7 spill, which would mix with air, to catch fire. Such a fire would be so large  
8 as to be completely beyond the capability of any organization to extinguish  
9 or even contain it, and it could seriously burn people to considerable  
10 distances from the fire's edge. There is a scientific consensus that such a  
11 fire could result in heat fluxes of  $5 \text{ KW/m}^2$ , which could cause second-  
12 degree burns to unprotected persons exposed for approximately 30 seconds,  
13 at a distance of approximately one mile from the center of the fire. Even  
14 more serious burns could occur at the one mile distance if exposure times  
15 were longer, and serious burns could occur at greater distances, even with  
16 lower thermal fluxes, with sufficient exposure times. In order to provide  
17 distances of separation which would ensure that unprotected persons would  
18 not be affected, I believe the criteria for safe separation should be based on  
19 a lower thermal flux value of approximately  $1.5 \text{ KW/m}^2$ . If such a criterion  
20 is used, the safe separation distance would increase, for such a spill, to  
21 approximately  $1 \frac{1}{2}$  to 2 miles. Furthermore, there is good reason to believe  
22 that such a large fire could result in further failures of the containment

## Exhibit PUC-1

1 system on the ship. As the Sandia report concludes that as many as three  
2 containers might fail, increasing the safe separation distance by  
3 approximately one third, I believe that the minimum separation distance  
4 should be considered to be approximately 2 ½ to 3 miles.

5 Q. What would happen if there were a vapor cloud fire at the Port of Long  
6 Beach?

7 A. A vapor cloud fire could result if the LNG spill vapors were not  
8 immediately ignited, and a vapor cloud formed. The cloud thus formed  
9 would drift downwind until it reached an ignition source or became diluted  
10 below the flammable concentration level – after which time it would not  
11 constitute a hazard. If the vapor cloud were ignited as it drifted downwind,  
12 the portions of the cloud which were above the lower flammability limit (~  
13 5%) would burn, and those persons in that area or immediately adjacent  
14 (thermal exposure could occur at some distance beyond the edge of the fire)  
15 who could not gain protection could be killed or seriously injured. In my  
16 opinion the maximum distance downwind to which portions of a cloud  
17 (sufficiently large to constitute a severe fire hazard) formed from the rapid  
18 spillage onto water of 3,000,000 gallons of LNG could be ignited is  
19 approximately three miles.

20 Q. To what extent have you relied upon reports by the Sandia Laboratory and  
21 the ABS Group to reach your conclusions?

## Exhibit PUC-1

1 A. Both the ABS Group and Sandia Laboratory reports were commissioned in  
2 2004, following a period when there was significant controversy about the  
3 state of knowledge for making consequence assessments for LNG spills on  
4 water. I welcomed the reports, and I believe that they now provide us an  
5 opportunity to move forward in a rational decision making process to  
6 consider siting of LNG terminals in the United States so as to protect the  
7 public safety. As I have stated earlier, I do believe that some extensions  
8 and modifications of the reports, particularly the Sandia report, are  
9 necessary if the goal is to ensure rational consideration of the potential  
10 consequences to the public of very large releases of LNG which I believe  
11 that we are even more compelled to consider after 9/11.

12 Q. Please explain what thermal radiation flux criterion was used by Sandia  
13 and the ABS Group and what thermal radiation flux criterion should be  
14 used.

15 A. The Sandia Laboratory and ABS Group reports suggest a thermal radiation  
16 flux criterion of  $5 \text{ KW/m}^2$  for use in determining the thermal radiation  
17 hazard zone. There is a scientific consensus that a  $5 \text{ KW/m}^2$  thermal flux,  
18 impinging on unprotected skin, can cause second-degree burns to persons  
19 exposed for approximately 30 seconds. It is important to understand that  
20 even more serious injuries could result from a  $5 \text{ KW/m}^2$  exposure for  
21 longer times ( $> 30$  seconds), and that serious injuries could result from even  
22 lower thermal flux exposures ( $< 5 \text{ KW/m}^2$ ) at larger distances if the



## Exhibit PUC-1

1 exposure time were longer. In order to provide distances of separation  
2 which would ensure that unprotected persons would not be affected, I  
3 believe the criteria for safe separation should be based on a lower thermal  
4 flux value of approximately 1.5 KW/m<sup>2</sup>.

5 Q. Would the NGLs pose any additional hazards at the Port of Long Beach?

6 A. Yes, the introduction of NGLs at the facility, either by receipt in the  
7 imported LNG ("hot gas") or as a result of separation, handling and storage  
8 of NGL, will introduce additional hazards that are not normally considered  
9 in the handling of LNG that is essentially pure methane. First, it is known  
10 from experimental programs performed by the Coast Guard that although  
11 pure methane is very unlikely to undergo damaging explosive reaction  
12 when unconfined, mixtures of methane with heavy components such as  
13 ethane and propane, when contained in concentrations greater than about  
14 12-18%, are subject to high order explosions. Second, the storage of NGLs  
15 portends an additional hazard, the potential for boiling liquid expanding  
16 vapor explosions (BLEVE) of vessels containing NGL. Devastating  
17 failures of NGL containments have occurred repeatedly during the last 4 or  
18 5 decades, and the potential for such explosions in the NGL portion of the  
19 LNG terminal to compromise the much larger LNG containments cannot be  
20 ignored.

21 Q. Your report refers to an LNG road tanker, which had exploded on June 22,  
22 2002 near Tivissa, Catalonia, Spain. Are there any risks posed by the LNG

## Exhibit PUC-1

1 trailer trucks which would be loaded at the Port of Long Beach under  
2 SES's proposal?

3 A.. Yes, as a result of the recent explosion of the LNG road tanker carrying  
4 LNG in Spain, as well as further study of the BLEVE mechanism which  
5 suggests that other LNG containers might also be vulnerable to such  
6 failures, the potential for boiling liquid expanding vapor explosions of  
7 vessels containing LNG can no longer be ignored. This is important to the  
8 POLB terminal consideration because current plans are that up to 45 LNG  
9 trucks carrying approximately 10,000 gallons of LNG will depart the  
10 terminal daily, and because certain types of containment vessels used in the  
11 terminal, or more likely, on the ships that serve the terminal, could be  
12 subject to failure via the BLEVE mechanism. The risk of accident or  
13 terrorist attack that could result in such explosions should not be ignored.

14 Q. Is your 3-mile recommendation based upon a worst case scenario for the  
15 Port of Long Beach?

16 A. No, I am very concerned that such events as provide the basis for the 3 mile  
17 distance I am recommending would be of such severity as to make it highly  
18 likely, if not almost certain, that further failures of LNG containment  
19 vessels would occur. I repeat here my concern that the exposure to the ship  
20 from such a pool fire would have the potential to cause cascading, or even  
21 simultaneous failures of the remaining tanks on the vessel, resulting in total  
22 loss of the vessel and burning of its contents. Furthermore, I believe that

## Exhibit PUC-1

1 insufficient attention has been given to the vulnerability of land storage  
2 tanks to terrorist attack, or even to the vulnerability of land storage tanks to  
3 natural events such as earthquakes and tsunamis, consideration of which is  
4 in order, as recent events remind us.

5 Q. Did you visit the proposed LNG terminal site in the course of preparing  
6 your report to the CPSD?

7 A. Yes, the purpose of my visit to the site was to get a better understanding of  
8 the characteristics of the site that related to the protection of the public and  
9 adjacent infrastructure. In my opinion, the approximately 25 acre site  
10 provides very minimal separation between the LNG spill impoundments  
11 (designated on the facility plans) and the facility's property line; indeed, it  
12 is difficult for me to see how the applicant can meet the exclusion zone  
13 requirements of 49 CFR 193, much less provide a reasonable safety zone  
14 for the public or surrounding infrastructure.

15 Q. Is it your position that there should not be any new LNG import terminals  
16 constructed in or around the United States?

17 A. No, that is not my intention, nor do I believe it is a necessary result. I do  
18 have serious concerns about the adequacy of current regulations,  
19 particularly with the failure to consider the consequences of marine releases  
20 of LNG. I have serious concerns as well about the suitability of selected  
21 sites and of the associated marine transport, and I believe that the process  
22 underway to approve LNG import terminal sites is moving far too hastily

## Exhibit PUC-1

1 and without sufficiently careful deliberation. However, I am also  
2 convinced of the necessity to consider most carefully some expansion of  
3 LNG importation because of the value it can bring. And I am no less  
4 convinced that we have in our grasp sufficient scientific tools to enable us  
5 to provide the public with reasonable assurance of its safety in today's  
6 environment. I believe that proper use of those tools and methods can and  
7 will permit the location, even onshore, of LNG regasification facilities that  
8 present acceptable risks to the public when all of the relevant trade-offs of  
9 risk and benefit are considered.

10 However, I do not believe that to be the case for the proposed LNG  
11 terminal in the Port of Long Beach, because of the very large populations in  
12 the affected zone, and the near certainty that it would be practically  
13 impossible to evacuate those people in sufficient time following an incident  
14 to get them out of harm's way. And while the public safety should be  
15 considered of paramount importance, I also believe that, assuming the  
16 availability of alternative sites that will meet the nations' needs, it just does  
17 not make good sense to place an LNG terminal in the POLB because of the  
18 potential (and the associated attraction) for a terrorist attack to cause  
19 extreme damage and disruption that could well have major national  
20 consequences.

21 Q. Dr. Havens, on the FERC's website and the California Energy  
22 Commission's (CEC) website, there are two proposed LNG import

## Exhibit PUC-1

1 terminals listed in federal waters offshore Southern California: BHP  
2 Billiton at Cabrillo Port and Crystal Energy on the Platform Grace.  
3 According to the CEC's LNG project descriptions, BHP Billiton's proposed  
4 LNG terminal would be approximately 14 miles offshore and Crystal  
5 Energy's proposed LNG terminal would be approximately 10.5 miles  
6 offshore. (See [http://www.energy.ca.gov/lng/documents/2004-02-  
7 24\\_DFG\\_LARSON.PDF](http://www.energy.ca.gov/lng/documents/2004-02-24_DFG_LARSON.PDF)). Do these proposed LNG import terminals pose  
8 the safety risks to the people onshore, which you have testified that SES's  
9 proposed LNG import terminal would pose at the Port of Long Beach?

10 A. No. The distances from shore of either of these projects would obviously  
11 protect the public from events which I have testified could put them in  
12 harm's way approximately three miles from a rapid initial spill of  
13 3,000,000 gallons of LNG onto water, an event that is widely considered by  
14 the scientific community to be credible. Although I have stated that a  
15 3,000,000 gallon rapid spill should not be assumed to be the worst case that  
16 could be realized, because of the possibility that the ensuing fire could  
17 result in further failures of the LNG containment systems, it is my opinion  
18 that the separation distances from shore provided by either the Cabrillo Port  
19 or Platform Grace locations would keep the public onshore out of harm's  
20 way.

21 Q. Does this conclude your testimony?

22 A. Yes. It does.

**UNITED STATES OF AMERICA  
BEFORE THE  
FEDERAL ENERGY REGULATORY COMMISSION**

Sound Energy Solutions

Docket No. CP04-58-000

**DECLARATION OF JERRY HAVENS**

I, Jerry Havens, declare under penalty of perjury that the answers appearing in the foregoing prepared direct testimony are true and correct to the best of my knowledge and belief, and that if asked the questions appearing therein, my answers would, under oath, be the same.

Executed at Fayetteville, Arkansas, this first day of October, 2005.

/s/ JERRY HAVENS

Jerry Havens

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## EXHIBIT PUC-3



**CALIFORNIA PUBLIC UTILITIES COMMISSION**

**CPSD**

*Consumer Protection and Safety Division*

**An Assessment of the Potential Hazards  
to the Public Associated with Siting an  
LNG Import Terminal in the Port of Long Beach**

**Prepared By**

**Dr. Jerry Havens, President  
Havens Associates, Inc.  
809 Lighton Trail  
Fayetteville, AR 72701**

**September 14, 2005**

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## EXECUTIVE SUMMARY

This report was prepared at the request of the Consumer Protection and Safety Division of the CPUC for an assessment of public safety issues that should be considered regarding the proposed siting of an LNG import terminal in the Port of Long Beach.

The history of LNG importation in the United States is reviewed, describing the siting and continuing operation of the present six LNG import terminals, and the proposal for a very large expansion in the country's LNG infrastructure - more than fifty proposals for LNG import terminals to be located in the continental United States, Southern Canada, Mexico, and the Caribbean Islands - is described. As there appear to be many more proposals than for which there is a demonstrated need, it is all the more important to ensure that the siting process involves, to the maximum extent possible, careful consideration of potential hazards to the public and adjacent infrastructure so as to give full consideration to the best alternatives available.

The potential hazards to the public of the proposed POLB terminal are defined as fire and explosion hazards, and an assessment is provided of the adequacy of the present regulation, 49 CFR 193, to protect the public.

Since the regulations were promulgated in the early Eighties, after the terminals now operating had been built and commenced operation, and since there was no rush to build additional LNG import terminals until about the year 2000, the regulations were largely unused for import terminal siting. As a result, the regulations did not, and still do not, give serious consideration to the terrorist threat that began in this country September 11, 2001. The current regulations do not effectively address the many serious questions posed by the present requirement to consider events that could be caused by malicious intent, nor is sufficient attention being paid to the reality that malicious intent changes the whole safety picture - hence the process has outrun the development of the regulations to deal with it, and the present regulations fail to address this most important new paradigm.

Most importantly in consideration of the post 9/11 threat, there is presently no requirement, much less enforcement, of exclusion zones to protect the public from LNG spills which could occur from the ships that serve the import terminal. The failure to provide for the protection of the public and surrounding infrastructure from major releases of LNG that could occur from the ships serving the facility must be considered all the more important now as a result of recent government sponsored reports, for which there is now scientific consensus, that indicate that the danger zones extending from large, but credible, spills on water are likely to pose greater threats than would either accidental or terrorist caused releases from the land part of the terminal.

The regulation does not provide for consideration of boiling liquid expanding vapor explosions (BLEVEs) or unconfined vapor cloud explosion (UVCE) hazards, although the proposed terminal is designed to import LNG containing natural gas liquids (NGL) in amounts sufficient to raise serious questions about the potential for UVCEs following

large LNG spills. The possibility of BLEVEs of LNG ship tanks, particularly the ship tanks which rely on non-fire-resistive insulation to keep the LNG from vaporizing, is not considered, although it is clear that there is a significant potential for occurrence of cascading failures that could jeopardize the ship and all of its content of LNG.

The report then presents an assessment of the consequences to the public that could result from credible accidental or terrorist caused releases of flammable liquefied fuels, either from the land part of the facility or the ships that would serve it.

### **Accidents and Terrorist Actions**

The current regulations, particularly regarding provisions for public safety, focus on the land based part of the terminal. There are specific requirements for liquid containment and impoundment systems that are designed to limit the spreading of LNG that might be released either from the LNG tanks themselves or from transfer lines in the facility. But such control and mitigation measures could not be effectively applied to releases that could occur from an LNG ship, either at the jetty or in transit thereto, because spills onto water could not be effectively contained.

For spills on water, there have been government sponsored studies that provide information sufficient to define the (credible) spills that could occur as well as the consequences that could result.

The ABS Group and Sandia reports agree that the release of LNG in the amount of approximately 3,000,000 gallons (half of one typical LNG ship tank) is credible,

- in that such a release could result from accidental collisions between ships with sufficient momentum (mass and speed) to cause such a breach of containment, or
- that such a release could be caused by terrorists with means that are readily available to them.

Furthermore, the ABS Group and Sandia reports agree that a release of 3,000,000 gallons of LNG onto water could result in:

- Pool fires which would expose persons with unprotected skin to thermal fluxes ( $5 \text{ KW/m}^2$ ) that could cause second degree burn injury in approximately 30 seconds at a distance of approximately 1 mile, and
- Flammable vapor clouds, if the spilled material were not ignited upon release, that could extend downwind to distances between 2 and 3 miles. It is reasonable to assume that persons caught in the fire if the cloud were ignited would be killed or seriously injured.

The author is in essential agreement with these consequence estimates but believes the following modifications are required if they are to be used to ensure public safety:

- Since the thermal radiation flux criterion ( $5 \text{ KW/m}^2$ ) used by Sandia and the ABS Group could cause second degree burns in thirty seconds, it is not sufficiently protective of public safety; a lower value, approximately  $1.5 \text{ KW/m}^2$ , is recommended here. This value is already being used by other segments of the regulatory system, both nationally and internationally, based on its definition as the highest thermal flux to which an unprotected person can be continuously exposed without injury. If the  $1.5 \text{ KW/m}^2$  criterion is used, it is anticipated that the distance of 1 mile (associated with the higher flux level) would be increased to between  $1 \frac{1}{2}$  and 2 miles.
- As the Sandia Report states unequivocally that cascading failures of ship tanks cannot be ruled out and further states that in their opinion failures of as many as 3 tanks could occur, this scenario must be considered credible. As Sandia estimates that the hazard distance from this scenario could be extended by approximately one-third, the distance to the  $1.5 \text{ KW/m}^2$  flux level would then be increased to approximately  $2 \frac{1}{2}$  to 3 miles.
- The ABS Group's high-end estimates for the vapor cloud distance to the 2.5 % gas concentration level (based on releases from a 5 meter diameter hole in the containment) are approximately 3 miles. The Sandia estimates for the credible scenario analyzed are closer to 2 miles, but their calculations reflect the distance to the 5% gas concentration level rather than the 2.5% level which is accepted to represent the better criterion for vapor cloud travel distance that could pose a hazard to the public. Use of the lower flammable gas concentration criteria would be expected to extend the hazard distance to about 3 miles.

Based on this information, which the author believes to be the best available, and which is in general agreement with widely held views in the scientific community, a minimum distance is specified here for the extent to which the public could be put in harm's way from the initial release of approximately 3,000,000 gallons of LNG onto water at the POLB. It is approximately 3 miles.

### **Consideration of Worst Possible Cases**

A minimum 3 mile radius circle around the proposed terminal is proposed to demarcate the area in which events deemed credible could cause serious injury to the public. The minimum distance to demarcate expected damage to infrastructure would be of lesser extent, depending on the criterion selected for damage. Any consideration of the consequences to POLB infrastructure must consider the wide variety of flammable and other hazardous materials routinely handled, as the area in which significant damage to infrastructure could occur (beyond the terminal and the ship) encompasses sections of one of the largest and busiest ports in the country. The POLB receives very large crude oil carriers (VLCC) at a jetty located within several hundred feet of the eastern boundary of the proposed LNG facility, and a major container terminal which almost certainly

receives hazardous cargo lies adjacent to the western side of the proposed site, along which the LNG ship will be berthed.

It must be emphasized that the 3 mile distance recommended here is based primarily on the assumption that approximately 3,000,000 gallons of LNG is spilled onto water, as it appears there is little doubt that either pool fire radiation thermal fluxes or flammable vapor clouds from such a spill could put the public in harm's way out to that distance. However, it is a minimum specification, because it does not address the possibility of more serious events which could occur.

There is very real concern that such events as provide the basis for the 3 mile consequence distance would be of such severity as to make it highly likely, if not almost certain, that further failures of containments would occur. In particular, there is serious concern that the exposure to the ship from such a pool fire would have the potential to cause cascading failures of the remaining tanks on the vessel, resulting in total loss of the vessel and burning of its contents. There can be no doubt that the consequences of such a worst-possible-case event could be more severe.

Finally, the report states that the vulnerability of the land based part of the facility needs to be considered more carefully, as the author believes that insufficient attention has been given to the vulnerability of the land based facility to such natural phenomena as earthquakes and tsunamis, as well as to the facility's vulnerability to terrorist attack.

## CHAPTER 1

### INTRODUCTION

This report was prepared for the Consumer Protection and Safety Division (CPSD) of the California Public Utilities Commission. The CPSD requested that I prepare a science-based assessment of public safety issues that should be considered regarding the proposed siting of an LNG import terminal in the Port of Long Beach, California.

My resume is attached as Exhibit A. I have been researching methods for assessing the potential consequences of major spills of liquefied natural gas (LNG) and natural gas liquids (NGL) for more than thirty years. As the history of LNG import terminal siting in the United States, indeed the world, is largely confined to a similar period, I believe that I have a unique perspective on the issue of the hazards which LNG terminal activities can pose to public safety. I also believe that it is important to consider LNG safety issues in the broader context of increasing usage by society of other liquefied fuel and chemical gases that pose similar hazards. I particularly appreciate this opportunity to put the issues of public safety surrounding the proposed siting of an LNG import terminal in the Port of Long Beach into a scientifically reasoned context - based on my observation and study during the last three decades to understand the consequences that could occur to the public as a result of major spills of liquefied gaseous fuels onto land or water.

In my view, the importance of careful and sober consideration of the potential threat to public safety and to critical infrastructure of the decision to site a large LNG import terminal in the Port of Long Beach cannot be overstated. No liquefied fuel import terminals have been sited in urban areas of the United States since the Distrigas plant began operation in Everett, MA, in Boston Harbor, in 1971. In the interim three decades the world has experienced several catastrophic industrial accidents which were so severe as to importantly influence worldwide regulatory controls intended to lessen the likelihood as well as the potential consequences of accidental releases. Most importantly, no LNG facilities at all have been sited in this country since 9/11, and I believe that 9/11 completely changed, or should and will change, our methods as well as our thinking about the new paradigm in which major hazards complexes must be considered.

It is important for the reader to understand that this assessment is intentionally and solely directed to the realistic definition of the consequences to the public and surrounding infrastructure that could occur from a major release of flammable liquids at the proposed terminal or from the ships that will serve it, with no consideration given to the likelihood of occurrence of the events which are considered. I believe that the first step in determining a rationale for a decision whether or not to site the proposed LNG terminal in the Port of Long Beach is to define the possible (credible) consequences of major releases of hazardous materials, and I believe that such determination should be made independently of any arguments advanced regarding the probability (likelihood) of such events' occurrence.

This approach is all the more appropriate since the tragic events of 9/11, as historical experience regarding LNG accidents (or accidental occurrences of any kind) cannot be used to quantify the probability of a terrorist attack.

### **1.1 LNG Importation in the United States**

Proposals for large scale importation into the United States are not new, importation of LNG into the States having begun in the early Seventies. Although the technology of LNG storage and shipping has advanced in several areas, there are many similarities between the storage and shipping methods utilized in the Seventies and those proposed today. Indeed, all of the import terminals built in the Seventies are still in operation, and are proposed for operation for at least two decades into the future.

By the early Seventies the marine carriage of LNG had been proven technologically, and several ventures were proposed to import LNG into the United States, at the time principally from Algeria to the east and gulf coasts and from far-east gas sources such as Indonesia to the west coast. By the end of the Seventies, four import terminals were operating on the east and gulf coasts of the United States – at Everett, Massachusetts, beginning in 1971; near Savanna (Elba Island), Georgia, beginning in 1978; at Cove Point, Maryland, beginning in 1978; and at Lake Charles, Louisiana, beginning in 1982. A fifth terminal, at Kenai, Alaska, intended for export, principally to Japan, began operation in 1969. The terminal in Everett has been in operation continuously; the terminals at Elba Island, Cove Point, and Lake Charles are currently operating after a period in mothballs (different for each) which resulted from decreased need for LNG importation. The fifth import terminal was constructed and began operating in Penuelas, Puerto Rico, in 2000, and the Gulf Gateway Energy Bridge deepwater port commenced operation this year in the Gulf of Mexico.

To serve the needs of these United States import terminals as well as the needs of even faster growing LNG importation by Japan and Europe, a fleet of LNG carriers was constructed. Currently, there are approximately 165 LNG carriers in service worldwide, several of which were built for the trade that began in the Seventies. Eighteen carriers have been retired from service, and approximately 85 new ones are on order. Typical LNG carriers built in the Seventies, some of which are in use today, carry approximately 125,000 cubic meters of LNG, but the proposed terminals today are planned to receive carriers with capacity up to 250,000 cubic meters (approximately 66 million gallons).

During the period in which the first four terminals (described above) were constructed, there were additional proposals to build and operate LNG import terminals in California, with three specific sites receiving principal consideration – Los Angeles Harbor (Terminal Island), Point Conception, and Oxnard. For all three of these proposed locations, detailed risk assessment studies were prepared to define the hazards to the public that might occur as a result of accidental spills of LNG. None of the proposed California terminals were built, presumably as a result of indications that they would not be profitable in view of a reassessment of the demand for natural gas. It is important to



note that because the terminal project applications were withdrawn for reasons other than consideration of their safety hazards, it is fair to say that the issues of public safety were never effectively resolved, and consideration of the risks to the public of such ventures languished - until about the year 2000.

## **1.2 Proposed Expansion in LNG Importation**

The United States is presently considering a very large expansion of its LNG import infrastructure. As addition to the five land and one offshore import terminals currently operating in this country, as many as fifty new LNG import terminals to be sited in the continental United States, Southern Canada, Mexico, and the Caribbean Islands have been proposed. Additional proposals have been announced during the preparation of this report. All of these plans are said to be based on projections for greatly increased LNG use, both in quantity and as a percentage of total energy use.

Although this report is not intended to address the need for new LNG import terminals, I think that it should be noted that there have been no projections of demand for LNG that suggest our need (before 2025) for more than perhaps as many as a third of this number, and quite likely fewer. Viewed thus, the large number of proposals appears to be in some important part the result of significant competition to "win" in the selection process.

Although the majority of these terminals have been proposed at onshore locations, including some proposed for urban areas, as in Long Beach, a significant number are now planned for installation offshore.

With more proposed terminals than for which there is a justified need, I believe it all the more important to ensure that the siting process involves, to the maximum extent possible, careful consideration of potential hazards to the public and adjacent infrastructure.

## **1.3 Public Safety Concerns about LNG Terminal Siting**

To begin, let me define the terms liquefied natural gas (LNG) and natural gas liquids (NGL).

LNG is natural gas that has been cooled, at normal atmospheric pressure, to approximately -260 °F, its liquefaction temperature varying depending on the composition of the gas. Methane, the principal component of LNG, cannot be liquefied by pressure alone. Although liquefaction by cooling to higher temperatures (> -260 °F) at elevated pressure is possible (combinations of cooling and pressurization are utilized in some LNG applications, such as vehicle fuels), the LNG that would be received at the Long Beach Terminal would be contained in ship tanks designed for nominal atmospheric pressure operation, i.e., with design pressures not exceeding approximately one atmosphere, and stored in land tanks under similar, nominally atmospheric pressure,

conditions. Based largely on historical precedent, most LNG safety and risk assessments have assumed LNG to be principally methane, and present regulatory requirements for determining danger zones around LNG spills allow, at least implicitly, description of its composition as pure methane.

However, the composition of the LNG that would arrive at the proposed Long Beach terminal will depend upon several variable factors, including the location of gas production (the composition of natural gas from different producing fields can vary significantly) and the degree of processing of the natural gas, either during liquefaction at the export terminal or following the receipt of the LNG at the import terminal, to remove heavier molecular weight hydrocarbons such as ethane, propane, and butane. Such heavier molecular weight compounds, mixed in varying concentrations, are commonly referred to as natural gas liquids (NGL). Since the proposed terminal in Long Beach could import LNG containing substantial amounts of natural gas liquids, and since the terminal is designed to process the LNG after receipt to separate the NGL for (separate) distribution, a thorough assessment of the hazards which could be posed to the public should consider both the LNG and NGL components of the facility. Furthermore, since the degrees of hazard to the public depend, beyond the most immediate and compelling factor of the very large quantities of LNG, on important differences that are known to exist in the fire and explosion hazard potentials of LNG and NGL, any assessment of the potential hazards to the public from the proposed terminal should consider the hazards specific to LNG and NGL, as well as any potential for more serious events which could result from the storage and handling of the materials in combination.

The concerns for public safety associated with the current proposals to site new LNG terminals are essentially the same as those identified in the Seventies when LNG terminals were introduced to the United States. I have observed that the degree to which the public raised concerns about public safety varied considerably in the gulf, east, and west coast regions. There appeared to be the least opposition in the gulf coast region, with somewhat greater resistance on the east coast, particularly in New York and New England, and perhaps greatest regarding the siting of the three terminals proposed in California. It is significant, I believe, to the present discussion to note (again) that the Distrigas terminal in Everett, Massachusetts, is the only terminal constructed to date in a major urban area in the United States. There have been voiced far more concerns about the Everett facility than for the other terminals, which by comparison are located more remotely (from the public).

It is also my observation that similar variations exist in these same regions today in their response to LNG terminal siting proposals – least in the gulf region (with the notable exception of Mobile, Alabama, where Exxon Mobil has withdrawn its proposal for a terminal in Mobile Bay), followed by similar responses (both for and against the projects) from the public to proposals on the east and west coasts. So far, the proposals for terminals to be sited in unarguably urban areas, notably Fall River, Massachusetts, on the east coast, and Long Beach on the west coast, appear to be among the most contentious (regarding the public safety issue) of the proposals under active evaluation.

But there are present today (at least) three new and significant factors that require careful consideration before reaching a decision to site a liquefied gas import terminal, particularly if the site is in an urban area.

The first is the aforementioned offshore placement of LNG import terminals. Although at the beginning of the current expansion phase, there were many objections advanced to the offshore alternative, including most prominently issues of economy (it was suggested that offshore installations would be too expensive) and increased vulnerability to scheduling interruptions caused by weather, the offshore option appears to be gaining acceptance, with several terminals proposed for offshore locations off of the west, gulf, and east coasts. At least one offshore LNG facility (The Gulf Gateway Energy Bridge deepwater port, owned by Excelerate Energy Limited Partnership) has commenced operation this year in the Gulf of Mexico. It appears that the viability, of at least this type of offshore importation project (Energy Bridge), is no longer in question.

Second, during the ensuing three decades since the LNG terminals on the east and west coasts commenced operation, the world has experienced several catastrophic industrial accidents, the major consequences of which should be seriously considered before reaching a decision to site a potential major hazard industrial facility, such as the proposed LNG terminal, in a congested area such as the Port of Long Beach. Most importantly to the present in that regard, there have been a substantial number of liquefied gaseous fuel accidents involving containment failures due to boiling liquid expanding vapor explosions (BLEVEs) as well as unconfined vapor cloud explosions (UCVEs), the most severe in this hemisphere (in terms of human casualties) having occurred in an outlying area of Mexico City in 1984. That event resulted in more than 600 deaths, thousands of serious injuries, and the complete devastation of an entire NGL storage and distribution facility.

Third, and perhaps of greatest importance to the present consideration of siting an LNG terminal in the Port of Long Beach, is the terrorist threat, which the public perceives with growing concern. Although sabotage appears to have been given some consideration in the siting of terminals in the Seventies, to my knowledge no organized efforts were undertaken at that time to quantify the consequences that might result from sabotage or to attempt to quantify the likelihood of such occurrences. But, since 9/11, concerns about terrorist attacks that could pose significant threats to public safety are very real, and they are fast growing. The energy infrastructure of our country is of particular concern, because of the potential for terrorist attacks to cause events that could directly endanger the public as well as deprive us of energy that we require.

The Department of Homeland Security has identified LNG infrastructure, one component of the much larger chemical/energy infrastructure, as a potential terrorist target of concern. The Department's concern results, primarily I believe, from the recognition that liquefied gas fuel storage tanks, either on land or on ships, must necessarily concentrate very large amounts of energy (as LNG and NGL) in individual containment systems in order to be economical. The terminal proposed for the POLB will have storage capacity for approximately 86,000,000 gallons of LNG, and the ships that are initially planned to

serve the terminal will carry approximately 38,500,000 gallons of LNG. However, the facility is being constructed so as to enable it to receive ships carrying up to about 53,000,000 gallons of LNG, and possibly more. The potential for terrorist attack to release large quantities of highly flammable fuels from such large storage vessels thus is seen to carry with it the potential for such attacks to endanger the public offsite as well as to effect horrendous damage to infrastructure. In my opinion, these factors demand that LNG infrastructure such as the proposed Long Beach terminal be identified as potential terrorist targets of opportunity.

I believe, and have so testified before Congress, that since 9/11 we no longer have the luxury of considering only means for reducing the probability of accidents (through more effective management strategies) to a level that is considered to justify the attendant risk – we now are forced to consider malicious acts as well. And, I believe that it is imperative that the dangers to the public from possible spills that could occur as a result of terrorist attack, particularly those spills which might occur from a tankship and thus onto water (for which there are few if any control measures), be most carefully considered in the current rush to site additional LNG import terminals in our country. Finally, in this regard, I have notified the Secretary of Homeland Security (Exhibit B) of my concerns about specific features of LNG carriers which I believe may make those ships vulnerable to terrorist attack. The specific issues, which I will address later in order to put them into a proper context, are the use of non-fire-resistive insulation on the containment vessels (LNG tanks) and the potential for major failures of the ship's structure due to direct contact with spilled LNG, which, having temperatures as low as (minus) 260 °F, has been demonstrated repeatedly to cause brittle fracture of carbon steels. Since my appeal to the Department of Homeland Security, there have appeared important reports of studies designed to clarify several outstanding issues, particularly those issues regarding the consequences that can be anticipated from large releases of LNG onto water; I will attempt to summarize the current state of our knowledge regarding these critically important matters in this report.

Finally, I have tried to prepare this report in a form which will be useful to policy makers, whom I believe are not always sufficiently informed on such matters, and to the public, whom I believe are becoming increasingly concerned, as I am, that issues of public safety surrounding the nation's chemical/energy infrastructure are not receiving the attention that is demanded, particularly post 9/11. Quoting from the foreword which I wrote for the chapter on Major Hazard Control, in Lee's Loss Prevention in the Process Industries, "It is my belief that the major hazards problems society faces are less a problem of insufficient information about those hazards and more a problem of insufficient application of the tools that we have in hand." In this regard, I believe it is important to note that the reports on LNG hazards which have been recently prepared and mentioned above, especially the reports by the ABS Group and the Sandia Group, do provide information which provides effective answers to several technical questions concerning large spills of LNG onto water which have been particularly contentious. It is in that vein that I have prepared this report with a view to cutting through the technical details to provide the public with my summary of the information which is now available, along with my candid view of what that information should mean to the public and its policy

makers whom are considering the siting of an LNG import terminal in the POLB. I believe it is absolutely imperative that we get this one right, as it will have the potential for setting extremely important precedents in our attempts to balance the risks and benefits of increased LNG importation, that task having been made immensely more difficult by the threat of terrorist attack.

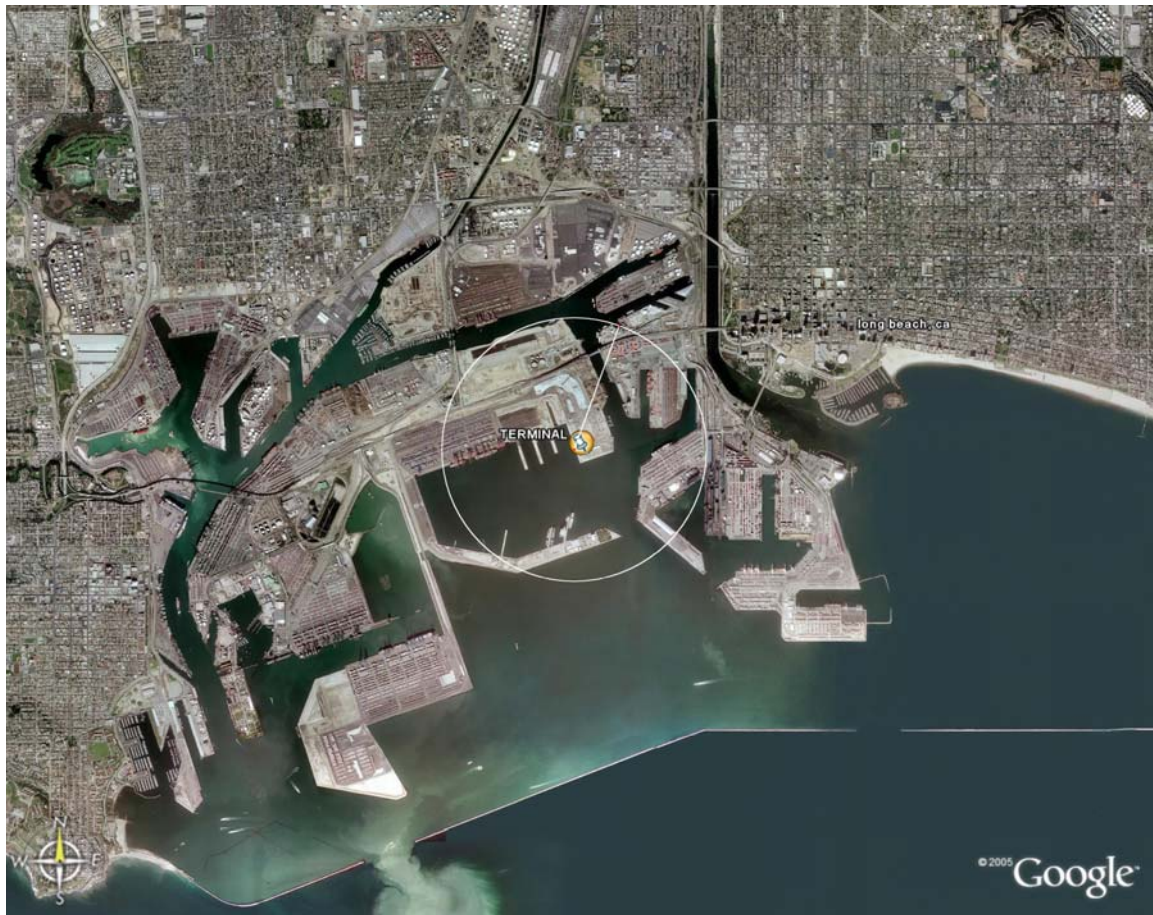
## CHAPTER 2

### POTENTIAL HAZARDS TO THE PUBLIC OF THE PROPOSED LNG TERMINAL IN THE PORT OF LONG BEACH

#### 2.1 Location and Description of the Proposed Terminal

##### Location

The satellite photo below shows the harbors of Los Angeles and Long Beach, with adjacent cities of Los Angeles to the west and north and Long Beach to the north and east. The proposed location of the LNG terminal in the Port of Long Beach is on an approximately twenty-five acre site on the east side of Pier T. For purposes of scaling, a circle with one mile radius is centered on the location of the tanker offloading site, which will be on the west side of the land parcel designated “TERMINAL”.<sup>1</sup>



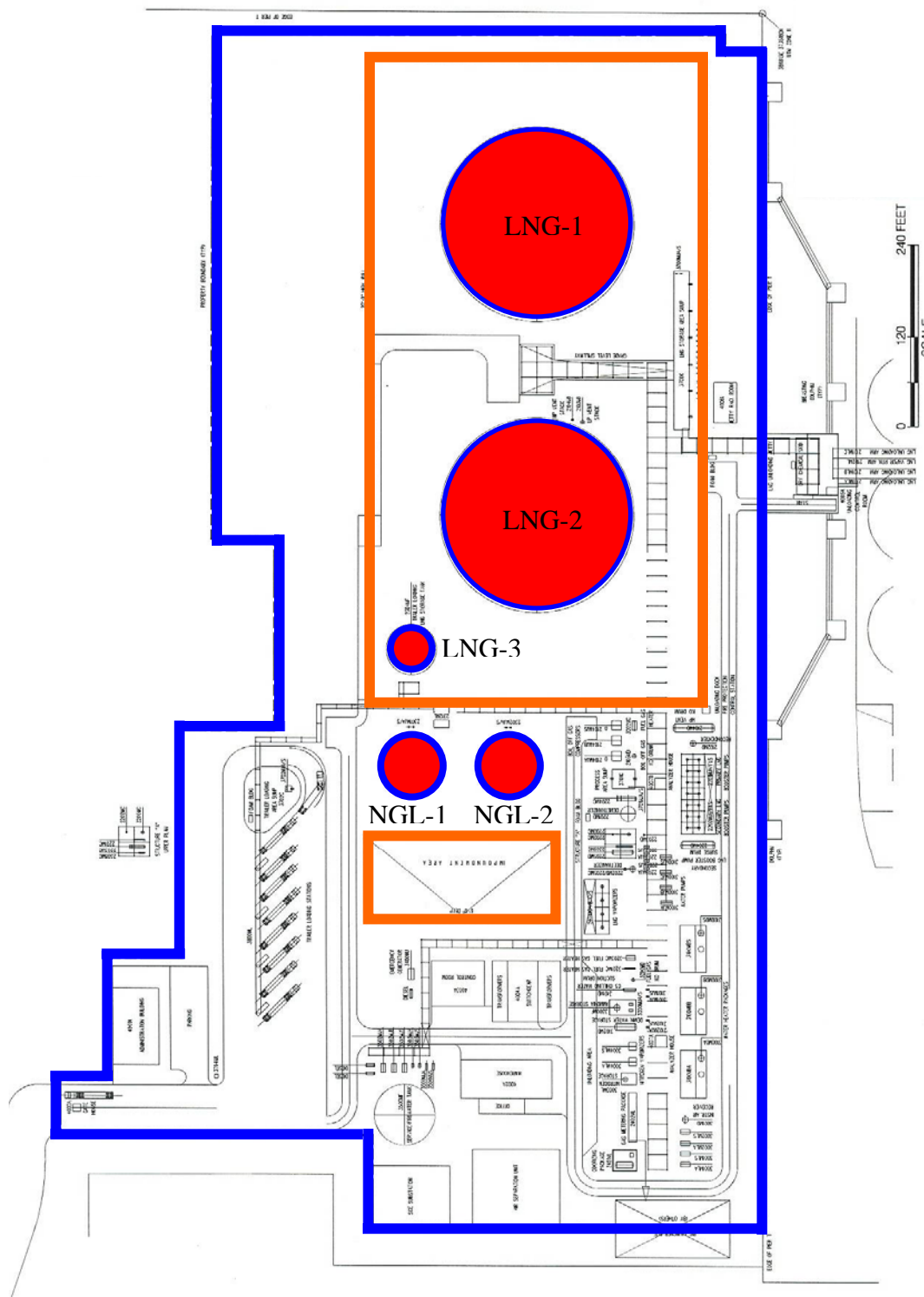
<sup>1</sup> This satellite view, which extends to distances of three to four miles from the proposed terminal, will be used later in this report to delineate the minimum extent of zones in which the public and infrastructure could be endangered by major releases from containment of flammable liquefied gases - for which there is now good scientific agreement that are deemed to be credible.

### **Description**

For purposes of this report, which is primarily directed to consideration of public safety issues, the principal components of the LNG terminal are summarized below.

- An LNG ship berth with 4 LNG unloading arms;
  - 2 liquid arms designed for a capacity of 24,150 gallons per minute (gpm) each, allowing ship offloading at 48,300 gpm,
  - 1 liquid/vapor hybrid arm, and
  - 1 vapor arm.
- 2 LNG receiving tanks, each with a gross volume of 42.3 million gallons of LNG at a temperature of -260 F and a normal pressure of 1 to 3 psig. (LNG-1, LNG-2 on plot plan);
- 6 in-tank LNG pumps, each sized for 2,500 gpm;
- Seven LNG primary booster pumps, each sized for 1,830 gpm;
- Seven LNG secondary booster pumps; each sized for 1980 gpm;
- Four shell and tube vaporizers, each sized for 350 million standard cubic feet of gas per day using a primary closed loop water system heated with three direct-fired heaters and circulation pumps;
- Three boiloff gas compressors and associated condensing systems;
- An LNG trailer truck loading facility, including an LNG receiving/storage tank with a capacity of 1,000,000 gallons of vehicle quality LNG for distribution via eight trailer loading bays (LNG-3 on plot plan). An average of 45 trucks will be loaded per day.
- An NGL recovery system, for which the final design appears to remain under consideration, will provide for the recovery and distribution off site of natural gas liquids, principally ethane and propane, via pipeline and/or trailer truck loading;

The terminal plot plan follows, with designation of the location of the primary storage tanks (in red), spill impoundments (in orange), and site boundary in blue. The total area of the site is approximately 25 acres. (Information from Sound Energy Solutions Long Beach LNG Import Project Resource Report 1, General Project Description, Jan. 2004)



\*\*\*The author is aware that consideration is being given to altering the requirements for NGL storage, perhaps even eliminating it. As the author is not privy to any final decision in this regard, this description is based on the site description from SES' January 2004 report.



## 2.2 LNG (Liquefied Natural Gas) and NGL (Natural Gas Liquids) Hazards

The primary hazards (to the public) that can result from the errant release of liquefied gas fuels such as LNG and NGL from the proposed terminal activities in the POLB are:

- Fire hazard
  - Liquid pool fires
  - Vapor cloud fires
- Explosion hazards
  - Confined vapor cloud explosions
  - Unconfined vapor cloud explosions (UVCE)
  - Boiling liquid expanding vapor explosions (BLEVE)

There are other hazards that require identification and consideration. However it is noted here that they can be of different degrees of concern for LNG and NGL and, in any case, are of less concern than the fire and explosion hazards because, with caveats noted in the specific descriptions that follow, these hazards would not be expected to extend offsite and therefore would not directly affect the public:

- Toxicity hazard
- Cryogenic (“cold” burn) hazard
- Rapid phase transition (flameless explosion) hazard

These last three hazards will be described briefly, for completeness, and then relegated to secondary importance in order to prioritize the main concerns for public safety.

### 2.2.1 Toxicity Hazards

LNG is natural gas that has been cooled to its condensation temperature; its composition can vary significantly depending upon the source of the gas. However, LNG normally contains as its principal component methane, with heavier hydrocarbons such as ethane, propane, butane, etc., comprising the much smaller remainder.

For purposes of assessing the hazards of LNG, it is appropriate to consider the toxicity of LNG vapor to be that of methane, the principal component, with modification as deemed necessary to allow for consideration of the toxicity of the heavier components which may be present.

Since methane is not a toxic material, it normally poses a hazard only if breathed in sufficient quantity to displace necessary quantities of oxygen (asphyxiation). Consequently methane is not expected to pose a toxicity hazard to the public at the proposed terminal since the public would not be expected to be exposed to high enough concentrations to result in severe displacement of oxygen. Furthermore, the toxicity of

the heavier components contained in the LNG, which for our purposes here also can be considered to be simple asphyxiants, is not expected to pose a hazard to the public because of the low concentrations to which the public would be exposed.

Similarly to LNG, which usually contains small amounts of NGL, the components of NGL (ethane and propane are suggested to be the primary natural gas liquids to be stored at the Long Beach Terminal) are not expected to pose a primary hazard to the public, since concentrations of these gases sufficient to asphyxiate people would not be expected to extend off site except in the most extreme conditions, and in such cases the fire and explosion hazards pose much greater hazards.

### **2.2.2 Cryogenic (“Cold Burn”) Hazards**

LNG, as pure methane, has a temperature of approximately -260 F. It is a cryogenic liquid, and exposure of human tissue to such temperatures can cause immediate severe injury. The author investigated an accidental release of LNG that occurred in 1977 in Arzew, Algeria, where a man was killed as a result of being deluged with LNG from a ruptured cryogenic valve. However, injury to the public is not expected to occur by exposure to such extreme temperatures because the region near a release of LNG where contact with either the liquid or cold vapor could cause such “cold” burns would not be expected to extend to distances where the public could be exposed.

Natural gas liquids such as ethane and propane, unlike methane, can be liquefied by pressure alone. Consequently, NGL can be stored either under pressure, refrigerated, or in combination. However, since refrigerated NGL is at a much higher temperature than LNG, and since low gas temperatures that could result due to depressurization of (pressurized) NGL would not be expected to extend to distances where the public could be exposed, NGL is not expected to pose “cold burn” hazards to the public at the POLB.

### **2.2.3 Rapid Phase Transition (Flameless Explosion) Hazards**

If a small volume of LNG is rapidly poured into water, the LNG can be heated by the water to temperatures greater than its normal boiling point while remaining in the liquid state. The (liquid) LNG is then said to be *superheated*. If several degrees of superheat are achieved, the evaporation (boiling) process which follows can be essentially instantaneous, with the result that significant pressure increases (overpressures) can result. Such overpressures can cause damage similar to the overpressures caused by more *conventional explosions* which are normally associated with rapid combustion of a chemical or fuel.

The rapid phase transition (RPT) of LNG added to water was first observed, unexpectedly, in a laboratory experiment performed in the Sixties at the U. S. Bureau of Mines. Subsequent research into the phenomenon has been performed by several organizations, most prominently by inhouse industry research programs. All of the work

of which I am aware is relatively small scale, but there have been calls for additional research to better determine the scaling characteristics of rapid phase transitions.

As in the case of cryogenic (cold burn) hazards, the damaging overpressures that could occur from rapid phase transitions would be local, and the resulting overpressures are not expected to extend to distances which could endanger the public.

However, there is continuing interest in, and a need for, further research to study the scaling characteristics of RPT's. Although dangers to the public are not expected to result directly from RPT overpressures, their importance in the public safety context lies in the potential for RPT's to cause secondary damage which could lead to cascading failures and further releases of LNG.

The author is not aware of damaging rapid phase transitions having occurred for spills of NGL onto water, although the NGL content of LNG, which is much colder, appears to have some relation to RPT occurrence (as it does as well to UVCE occurrence, as we will see). In any case, as large spills onto water at the POLB terminal are expected primarily from the LNG carrier, and since impoundment areas are expected to be provided for any NGL storage tanks, large spills onto water of NGL at the terminal are not expected.

#### **2.2.4 Fire Hazards**

There are two ways that very large fires (that could endanger the public) can result from a major LNG spill – pool fires and vapor cloud fires.

##### **Pool Fires on Land**

Spilled LNG will evaporate rapidly due to high rates of heat transfer from the warm surroundings (primarily the earth's surface) to the cold liquid. The vapor evolving from the liquid pool will mix with air to form a gas-air mixture which will burn in the concentration range of approximately 5% to 15% LNG vapor (the concentration range that is flammable for methane-air mixtures). Such mixtures of LNG vapor and air will inevitably form when LNG is spilled, and if an ignition source such as an open flame or spark is present at a location where the gas mixture is within the flammable range a large pool fire will result. In this instance the fire will immediately burn through the gas mixture from the point of ignition to the liquid pool. The resulting "pool fire" is similar in many ways to any other pool fire where liquid hydrocarbons, such as gasoline, are burning – but it should be noted that because the LNG is so cold, heat transferred from the surroundings will cause the LNG to evaporate much faster, thus effectively "feeding" the fire at much higher rates than would occur from a gasoline spill, and even faster than would occur for a refrigerated NGL spill (because the NGL is not nearly as cold). In any case, the fire results from the combustion of the fuel vapors which have evaporated from the liquid pool and have been mixed with air to result in flammable concentrations. An LNG pool fire, which has the potential to burn significantly "faster" than higher boiling

point hydrocarbons, can seriously endanger the public, either through direct contact with the fire, or through heat radiated by the fire.

It should be noted here that it is in this context that the statement that “LNG does not burn”, or variations thereon, is frequently found in the literature purporting to educate the public regarding LNG safety. While the statement is literally true, it is not helpful, and it can be seriously misleading, as the statement is also (literally) true if applied to any other liquid hydrocarbon fuel such as gasoline or NGL. It can be misleading because the statement that LNG does not burn could imply that there is something different in the combustion mechanism of LNG from other hydrocarbon fuels – in this sense, there is not.

Because very large releases of LNG, attended as they would likely be by violent circumstances which could result in ignition (thus preventing the formation of a flammable vapor cloud that could leave the site), I believe that the potential danger to the public from LNG spills is probably greatest from the very large pool fires that would more likely occur. I emphasize that I am talking about fires resulting from the spillage of several millions of gallons of LNG (each of the two primary storage tanks at the POLB terminal will contain more than 40,000,000 gallons of LNG). We have no experience with such fires, but we do know that they could not be extinguished and would just have to burn themselves out, and the radiant heat extending outward from the fires edge could ignite combustible materials as well as cause serious burns to people at considerable distances from the fire’s edge. The distances from such fires to which harm to the public could extend will be a primary focus of this report.

NGL pool fires on land may be considered similarly with LNG pool fires, with at least two potentially important differences, the implications of which are not completely understood, especially for very large fires:

- NGL, whether it be pressurized or refrigerated, will not evaporate as fast as LNG will due to heat transfer from the ground surface, hence the burning rate (and associated heat flux from the fire) may be somewhat smaller.
- NGL fires have been observed to produce more smoke than LNG fires, with the result that the heat flux radiated out from the fires edge can be significantly changed.

### **Vapor Cloud Fires**

If LNG is spilled and evaporates to form a gas/air mixture in which there are located no sources of ignition (an ignition source is a high temperature “point” source of energy such as a spark or flame), the gas-air mixture (“gas cloud”) which forms, although possibly containing a large amount of gas that is in the flammable concentration range, will not ignite, and the cloud will drift until it either contacts an ignition source or all of the cloud becomes diluted below its *lower flammable limit* (approximately 5% methane in air) - it will then disperse harmlessly. If ignition occurs during the drifting of the cloud the result is a vapor cloud fire.

If the gas cloud formed is not ignited immediately it will be carried downwind, or will spread more or less radially (due to gravity forces on the heavier-than-air gas mixture) in the absence of wind. Both spreading by the wind and gravity spreading are accompanied by gas-air mixing and thus dilution of the cloud.<sup>2</sup>



If, however, an ignition source is encountered at a location where the gas concentration is within the flammable concentration range, ignition will occur (at that location) and the fire will spread throughout the part of the cloud which is in the flammable concentration range. This is the so-called “flash fire” or vapor cloud fire. An LNG vapor cloud fire can endanger the public, either through direct contact with the fire, or through radiated heat from the burning cloud.

I think it important to state here again that my opinion that pool fires pose a greater risk than vapor cloud fires (see above) is based on the potential for high consequences *accompanied by the high probability that ignition will occur* as a result of the violent circumstances that would be expected to effect such a release. However, as I have said above, the consequences of credible events that might occur that could impact public safety require determination *independently* of consideration of the likelihood of the occurrence. Finally, I note here that the current federal regulations for siting LNG facilities require the determination of vapor cloud dispersion exclusion zones to protect the public safety, and no consideration is given to ignition probability in the determination of those exclusion zones. Therefore, it remains critically important to

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<sup>2</sup> Photograph of an LNG spill onto water at Maplin Sands, UK, in the Eighties. The LNG spill volume was of order 10,000 gallons, with a moderate wind from top right to bottom left. White objects are floating instrument platforms. For scaling, radius of circle (dike) is approximately 450 feet. This spill volume is representative of the largest LNG spills that have been conducted on water to study vapor dispersion.

determine the potential consequences of delayed ignition of large flammable vapor clouds.<sup>3</sup>



<sup>3</sup> Sequence of photographs (top to bottom) showing an LNG vapor cloud fire over water – tests conducted at Maplin Sands, UK, in the Eighties. Wind is from right to left with maximum visible cloud extent at the left of the top picture. Ignition occurred near the left side of the gap in the cloud in the top photograph, and the cloud has burned nearly back to the liquid pool in the bottom photograph. Spill volumes are similar to the photograph in footnote 1, and the diameter of the circular dike is approximately 900 feet.

Vapor cloud fires that would result if an NGL vapor cloud were ignited may be also considered similarly to LNG fires, with at least three potentially important differences:

- The flammability range for NGL is significantly different than for methane, the principal component of LNG. Most importantly here, the lower flammable limit for NGL is lower than that for LNG; for ethane it is about 3%, and for propane it is just over 2%. This is significant because it means that NGL vapor clouds will remain flammable at lower concentrations, and therefore will have the potential to remain flammable for greater distances (than for an equivalent volume of methane vapor). As a result, the extent of potential danger to the public is increased.
- NGL vapors may be heavier than air because of their higher molecular weights. For example, propane's molecular weight is 44, causing its density to be about 50% greater than air at the same temperature and pressure. This is important because the density stratification in such a vapor cloud decreases the dispersion rate (by decreased mixing with air) and can result in increased downwind travel before the gas cloud concentration falls below the lower flammable limit, thus increasing the extent of potential danger to the public.
- As will be discussed in more detail below, NGL vapor clouds are known to be susceptible to high-order explosion if ignited, even in the absence of confinement. Therefore, the improbability of explosion due to absence of confinement, a factor which is considered highly important in the assessment of LNG safety, does not apply to NGL vapor clouds. As there have been several catastrophic explosions of NGL vapor clouds, this hazard will be considered prominently in this report.

### **2.2.5 Confined Vapor Cloud Explosion Hazards**

There is no need here to further define the potential for explosions of confined LNG or NGL vapor/air mixtures, of which we are all aware. However, the potential for explosions of confined LNG or NGL vapors are important to this hazard assessment because they have the potential for release of energy and ejection of projectiles that could jeopardize other NGL or LNG containments.

### **2.2.6 Unconfined Vapor Cloud Explosion (UVCE) Hazards**

The term explosion is used here to describe combustion reactions (that we normally call "burning", i.e., reaction of the gas in question with the oxygen in the air) which achieve such rapid rates that significant overpressures (local pressures higher than the atmospheric pressure) develop. Such overpressures can cause severe damage – they constitute the "blast" effect in conventional explosions.

The forces released in conventional explosive materials (such as dynamite) typically result from very rapid *reactions of materials that are totally contained in the explosive*

*material*. In such materials both the “fuel” and the “oxidizer” are already present. In contrast, explosions of fuel gases such as methane or propane cannot occur unless the gas (fuel) is mixed with air (containing oxygen) such that the mixture has a concentration within the flammable range (for methane this is approximately 5% to 15% in air). Such *physical* processes (as mixing with air), which are necessary for the gas to burn (or explode), place gas/air fires and explosions in a lower hazard class than materials like dynamite, which are “ready to go” if ignited, i.e., without the necessity that the material first be mixed with anything else. Furthermore, if the methane concentration is less than 5% (the *lower flammable limit*) concentration, the mixture will not burn, much less explode – it is said to be too *lean*. Similarly, if the methane concentration is higher than 15% (the *upper flammable limit*) concentration, the mixture will not burn (or explode) – it is said to be too *rich*.

If a methane/air mixture within the flammable concentration range is ignited, the rate of reaction (the burning rate, i.e., how fast the flame moves through the gas mixture) varies depending on a number of factors, one of the most important of which is *confinement*. We all know that natural gas (normally principally composed of methane) explodes all of the time – *when it is confined*. We all have read about, and many have experienced, the blast effect that occurs when leaking (flammable) gas is released into a confined volume (say the kitchen) and its ignition (say by a light switch) blows the building apart.

Conventional wisdom, even scientific opinion, held until fairly recently (the Seventies) that unconfined gas/air clouds such as are formed by gases such as methane, propane, and the higher molecular weight hydrocarbon, will not explode if unconfined. This is important to the present discussion because it goes straight to the question of whether the cloud formed by LNG vapors mixing with air following a major LNG spill could explode (develop damaging overpressures) when the cloud is not confined.

Today, damaging explosions of hydrocarbon gas/air mixtures are of very great concern because of accidents which have demonstrated the propensity of some hydrocarbon gases, when mixed to the correct proportions with air, to explode with devastating damage, *even when unconfined*. There is not time or space here to provide the details, but it can be stated that at least three such unconfined vapor cloud explosions (UVCEs) that occurred at Flixborough, England, in 1974; Mexico City in 1984; and in Pasadena, Texas, in 1989, were so devastating that they resulted in extensive changes in the national and international regulatory requirements for dealing with chemical hazards.

What does this have to do with LNG? There is a scientific consensus (supported by experimental data) that methane/air mixtures which are unconfined are very unlikely to explode. The LNG industry and the Government are sufficiently confident of this fact that the explosion of an unconfined LNG vapor/air cloud is not considered credible. As a result, the most severe hazard is considered to be fire. I have studied this question, and I agree with the contention that unconfined methane/air mixtures are very unlikely (but not impossible) to explode.



But the story doesn't end there. It has already been stated that the composition of LNG imported into the United States varies significantly depending on several factors, most prominently the gas source location. LNG is imported from some locations that provide nearly pure methane. LNG is also imported from some other locations with concentrations of heavier hydrocarbons as high as 15-20%. Such gas is termed "hot gas" in the industry because its calorific value (energy content) is higher than an equivalent volume of methane. Typical heavy hydrocarbon gases present in LNG are ethane and propane, but others are present as well.

We know now that even unconfined vapor cloud explosions (UVCEs) cannot be dismissed for LNG spills if the gas contains significant amounts (say greater than about 12 to 18%, based on Coast Guard sponsored tests at China Lake in the Eighties) of gas components heavier than methane. Furthermore, enrichment in higher boiling point components of the liquid remaining as the LNG vaporizes can lead to vapor cloud concentrations that could pose a UVCE hazard, even if the concentration of the heavies in the liquid initially spilled do not. Since the LNG terminal proposed to be located in the POLB is planned to receive "hot gas"<sup>4</sup>, and to engage in the storage and distribution of natural gas liquids (NGL) that are separated from the imported LNG, *questions of whether major releases of LNG at the terminal might pose an unconfined vapor cloud explosion hazard, with the attendant potential to initiate further cascading effects, remain highly relevant.*

There is now no question that GNL vapor clouds can explode with devastating force. Consequently, as the POLB terminal will have some, perhaps yet to be determined, quantities of GNL on the site (primarily ethane and propane), the potential for releases at the terminal to result in high order vapor cloud explosions must be given primary consideration in the assessment of potential hazards to the public and surrounding infrastructure.

Although there are numerous examples of unconfined vapor cloud explosions that have occurred in the chemical manufacturing, storage, and transportation sectors, it is not necessary, nor is there time here, to give a complete list of occurrences. Two events which appear to be highly relevant to this POLB hazard assessment will be highlighted here:

- A fire and explosion occurred in 2004 at the LNG export terminal in Skikda, Algeria. Preliminary reports indicate that damaging unconfined vapor cloud explosions appear to have occurred. If so, this would be the first UVCE which has been reported in an LNG terminal (to the author's knowledge). Final reports have not been released, so there is admittedly some speculation involved here. That said, it appears to the author that damaging explosions did occur both in confined spaces and in unconfined spaces in the export terminal at Skikda. It is important to point out that since the releases are believed to have occurred in parts

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<sup>4</sup> The author is aware of consideration being given to changing the specifications of the LNG that would be accepted by the proposed terminal. As stated earlier, this report has been prepared based on the descriptions made available from the SES Resource Report dated January 2004.

of the facility which would not have been handling LNG, but rather natural gas liquids, that the unconfined vapor cloud explosions experienced probably involved NGL. Nevertheless, particularly since the POLB will handle similar natural gas liquids, the recent experience in Algeria is highly relevant.

- The disaster which occurred on November 19, 1984, in San Juan Ixhuatepec (Mexico City), Mexico, is directly relevant to the consideration of the POLB LNG terminal, because the Mexico City facility provided for storage of quantities of NGL which are very similar to the quantities that could be stored at the NGL component of the POLB terminal. The Mexico City terminal, built for the distribution of LPG which came by pipeline from distant refineries, had an overall storage capacity of approximately 4,200,000 gallons of LPG in 6 large spherical tanks and 48 horizontal cylindrical tanks. The catastrophe started with the rupture, due to pumping overpressure, of an eight inch transfer line. The LPG thus released caught fire, causing fire impingement on one of the spherical tanks. The resulting cascading failure involved multiple unconfined vapor cloud explosions (UCVEs) accompanying the large fires which occurred. 574 people are reported to have been killed and more than 7,000 injured, of whom 144 later died in the hospital. Some 39,000 people were rendered homeless or were evacuated, and the terminal was destroyed.

### **2.2.7 Boiling Liquid Expanding Vapor Explosion (BLEVE) Hazards**

The acronym BLEVE is short for “Boiling Liquid Expanding Vapor Explosion”. There have been a large number of devastating BLEVEs in the chemical process industry and in the transportation sector, including railroad and highway truck incidents. BLEVEs occur when a pressure vessel containing a flammable liquid is exposed to fire so that the metal comprising the containment loses strength and ruptures. When a vessel containing liquid under pressure is exposed to fire, the liquid heats up and the vapor pressure rises, increasing the pressure in the vessel. When this pressure reaches the set pressure of the pressure relief valve (PRV), the valve opens to relieve the pressure. The liquid level in the vessel falls as the vapor is released to the atmosphere. While the liquid is effective in cooling that part of the vessel wall which is in contact with it, those parts of the wall (above the liquid) that are exposed to vapor are not as effectively cooled. After a time, as metal which is not cooled by liquid is exposed to fire, the metal becomes hot and weakens and is subject to rupture. It is important to note that rupture can occur even though the pressure relief valve is operating correctly as designed. This is because a pressure vessel is designed to withstand the relief valve set pressure, but only at the design temperature conditions. If the metal is heated to higher temperature, it may lose strength sufficiently to rupture. Further, and most importantly to the consideration of the failure of LNG tanks to fire exposure, the pressure relief valves must be sized to allow relief of the vapor produced with fire exposure to the tank. I will return to this question when the vulnerability of LNG containments is considered.

Just as the conventional wisdom before about 1970 minimized the potential for explosion of unconfined LNG vapor clouds, that wisdom has also held that boiling liquid expanding vapor explosions of LNG containments are not possible. It appears that the conventional wisdom may have to be updated for BLEVEs of LNG as well.

An LNG road tanker exploded on 22 June 2002 near Tivissa, Catalonia (Spain), after the driver lost control on a downhill section of the C-44 road.<sup>5</sup> The tanker turned over, tipping onto its left side. Witnesses said that flames<sup>6</sup> appeared immediately between the cabin and the trailer, and after approximately 20 minutes, the tank exploded. There was a small explosion, then a strong hiss and then a much larger explosion. Immediately after the small explosion, the fire disappeared and a white cloud appeared. This cloud ignited immediately, giving rise to the larger explosion, a fireball. Assuming that all of the mass initially contained in the tank was involved in the fireball, approximately 12,700 gallons of LNG would have burned. Accepted mathematical modeling techniques suggest that the fireball diameter would have been about 500 feet, the height about 370 feet, and the duration approximately 12 seconds. These model predictions appear to be consistent with the facts that the fireball resulted in serious burns to two persons at a distance of 650 feet from the tanker. Major parts of the truck were projected to significant distances. The rear part of the tank, including the rear undercarriage of the truck, was ejected to a distance of 260 feet. A section of the front of the truck with maximum dimension of approximately 12 feet was projected more than 400 feet, and the motor and cabin covered a distance of more than 840 feet from the explosion.

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<sup>5</sup> Planas-Cuchi, E., et.al, "Explosion of a road tanker containing liquefied natural gas", *Journal of Loss Prevention in the Process Industries*, 17 (2004), pp 315-321.

<sup>6</sup> The photograph shows the jet fire from the tanker 2 minutes after the accident and approximately 18 min before the BLEVE. The author is not aware of any photographs of the fireball (but see footnote 7).



This LNG truck accident has been described in some detail because its occurrence suggests, if not demands, that renewed consideration be given to the potential for BLEVEs of LNG containers to occur. Perhaps most importantly, the road tanker was insulated with polyurethane insulation, and the early failure of the insulation would be expected to allow the container to more quickly reach temperatures giving rise to failure as well as allow heat transfer to the cargo which would significantly elevate the pressure in the tank beyond the ability of the PRV to relieve the greatly increased LNG vaporization. It is this mechanism, failure of the insulation followed by overpressure of the tank leading to rupture, which may have been exemplified in the Spanish road tanker explosion, that I have appealed to the Department of Homeland Security to consider as being applicable to LNG ships whose containers are insulated with foamed plastic insulation materials such as polystyrene and polyurethane<sup>7</sup>.

There have been repeated incidents of BLEVEs of truck and rail containers of NGL, many having occurred in the Seventies and Eighties before the mechanism of the occurrence was understood. And, as was stated earlier, there have been devastating occurrences of BLEVEs in industrial storage and distribution facilities, perhaps most appropriately exemplified here by the disaster of November 19, 1984, in San Juan Ixhuatepec (Mexico City), Mexico. The Mexico City disaster is particularly relevant to the present considerations because the quantity of NGL stored in the Mexico City facility was similar to the quantity that could be stored in the POLB LNG terminal. Although the catastrophe started with the rupture of an eight inch transfer line, the first subsequent

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<sup>7</sup> On July 5, 1973, in Kingman, AZ, a rail car containing approximately 10,000 gallons of propane began leaking during unloading, and the gas ignited. About a half hour later the tank BLEVE'd. The diameter of the fireball was approximately 400 feet, similar, if somewhat smaller, than the size predicted for the LNG BLEVE described in footnote 6. Note telephone poles for scaling and the railcar end being projected.

major failure is thought to have been a BLEVE of one of the NGL storage spheres, and the subsequent cascading failures involved multiple large BLEVEs.



### **2.2.8 Special Hazards of LNG and NGL Spills on Water**

There are special hazards of spills of LNG or NGL that could result from spills of either material on water, because, in addition to the (lesser) hazards of rapid phase transitions that could result from LNG spills considered earlier, it would be impracticable, if not impossible, to contain the spread of either of these liquid fuels on water. Consequently, there would be nothing to limit the size of the liquid pool that would result except the limiting amount of material spilled and the physical constraints which would limit its spread on the water. Since the size of the liquid fuel pool would determine the size (areal extent) of the fire, large spills on water could easily result in fires much larger than those which would be contained in the purpose-designed spill impoundment areas on land.<sup>8</sup>

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<sup>8</sup> The photograph illustrates an LNG pool fire on water. Somewhat less than 10,000 gallons of LNG was spilled; the resulting fire is about 50 feet in diameter and 250 feet high. This test, conducted by the U.S. Coast Guard at China Lake, CA, in the Eighties, is also representative of the largest LNG pool fires that have been studied.



As will be described and justified in more detail subsequently in this report, there is now scientific consensus that rapid spillage of at least one half of a typical single LNG ship container, approximately 3,000,000 gallons, is a “credible event”, as it has been determined that it could be caused by an intentional (terrorist) act with means that are readily available to such groups. The fire from such a spill, particularly if it occurred onto water and was therefore uncontained, would be very large, perhaps up to a half-mile in diameter, or larger if more of the containment system failed. We have no experience with such fires, but we do know that they could not be extinguished and would just have to burn themselves out, and the radiant heat extending outward from the fires edge could ignite combustible materials as well as cause serious burns to people at substantial distances from the fire’s edge. The distances from such fires to which harm to the public, as well as damage to infrastructure, could extend will be a primary focus of this report.

Furthermore, although it is considered highly likely (but we do not know enough to say impossible) that early, if not immediate, ignition of the gas air mixtures above such a spill would occur as a result of the violent circumstances (as in an allision or collision of a ship or a terrorist attack) that would be expected to accompany such a major release, it is imperative that the extents of flammable vapor cloud travel that might result from major spills of LNG onto water (which are most likely to occur from the ship) be considered in the assessment of hazards that could result at the POLB LNG terminal.

### CHAPTER 3

#### ADEQUACY OF CURRENT REGULATIONS TO PROVIDE FOR PUBLIC SAFETY

This part of my report gives my answer to the question: *To what extent do present U.S. regulations that govern LNG terminal siting adequately protect the public from the consequences of LNG releases that could occur?*

Although U.S. Regulations currently require enforcement of some safety exclusion zones intended for the protection of the public (by prohibiting their presence therein), I believe they fall seriously short of achieving the intended objective:

- The regulations were promulgated in the early Eighties largely as a result of concerns for public safety that arose in the Seventies. Since there was no rush to build additional LNG import terminals until about the year 2000, the regulations were largely unused for import terminal siting. As a result, the regulations did not, and still do not, give serious consideration to the terrorist threat that began in this country September 11, 2001. Instead, the regulation method and approach relied on, and still relies on, consideration only of accidental occurrences that could affect the public. Hence, the current regulations do not effectively address the many serious questions posed by the present requirement to consider events that could be caused by malicious intent. Nor is sufficient attention being paid to the reality that malicious intent changes the whole safety picture. We no longer have the option to just “better” manage the risks involved so as to reduce the probability of occurrence of accidents to an acceptable level. The siting in an urban area of an LNG terminal, with its requirements to concentrate immense quantities of hazardous materials, takes on a new dimension. Unfortunately, the process has outrun the development of the regulations to deal with it, and the present regulations fail to address this most important new paradigm.
- Perhaps most importantly, in consideration of the post 9/11 threat, there is presently no requirement, much less enforcement, of exclusion zones to protect the public from LNG spills which could occur from the ships that serve the import terminal. The failure to provide for the protection of the public and surrounding infrastructure from major releases of LNG that could occur from the ships serving the facility must be considered all the more important now as a result of recent government sponsored reports, for which there is now scientific consensus, that indicate that the danger zones extending from large, but credible, spills on water are likely to pose greater threats than would either accidental or terrorist caused releases from the land part of the terminal.

#### **3.1 49 CFR 193 LNG Terminal Siting Provisions for Public Safety**

The regulation that specifies requirements for siting LNG import terminals in the United States is 49 CFR 193, entitled *Liquefied natural gas facilities: Federal standards*.



Part 193 -- *Liquefied natural gas facilities: Federal standards* contains numerous sections describing requirements designed to provide for safe operation of an LNG import terminal. However, most of these sections are directed to the attainment of safe operation of the plant, and therefore they do not directly address the public safety issue. There are two sections of the regulation that directly address requirements to provide for safety of the public (offsite):

193.2057      *Thermal Radiation Protection,*  
and  
193.2059      *Flammable vapor dispersion protection.*

It is noted that the three other LNG hazards described earlier; toxicity, cryogenic (“cold burn”), and rapid phase transition, are not addressed, as these three potential hazards are not expected to affect the public offsite. Explosion hazards (not covered by the regulation) will be considered herein.

Before proceeding to the description of Sections 193.2057 and 193.2059, and to the question of their adequacy to provide protection to the public, I believe it will be helpful to briefly summarize the development of these two sections of the regulation.

During the Seventies, when the four presently operating LNG facilities were constructed in the United States, 49 CFR 193 had not yet been promulgated. The applications for certification of the terminals that were built in Everett, Massachusetts; Cove Point, Maryland; Elba Island, Georgia; and Lake Charles, Louisiana, were decided largely based on guidance contained in industry consensus standards, notably NFPA (National Fire Protection Agency) 59A – *Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)*.

However, as a result of public concerns that arose during the Seventies about LNG terminal siting safety issues, notably those that arose in California regarding the proposals to site terminals at Los Angeles, Oxnard, and Point Conception, Congress mandated a research program on LNG safety, and authorized an expenditure of approximately \$40,000,000 (in 1977 dollars) on LNG safety studies. That research program carried out basic LNG safety research directed to development of methods to define more accurately and realistically the consequences that could result from major spills of LNG. The research effort was directed to three hazards which were considered highest priority;

- liquid pool fires,
- vapor cloud fires, and
- vapor cloud explosions.

Following completion of these research programs, which still constitute much if not most of the research results and data relating to LNG spill consequences that are available in the public domain, 49 CFR 193 was promulgated - in the early Eighties.

I was called upon from time to time for advice by persons in the U.S. Department of Transportation who were preparing the draft regulations that evolved into 49 CFR 193, primarily in the area of my principal expertise, LNG vapor dispersion. My association (with DOT, at that time) was with Mr. Walter Dennis. Walter Dennis was actively involved in the drafting of the sections of 49 CFR 193 identified above (Sections 2057 and 2059), and I had several conversations with him regarding these sections of the regulation, particularly regarding the selection and application of methods for determining vapor dispersion distances. I believe that Walter Dennis was the person primarily responsible for developing Sections 193.2057 and 2059. This is important to the present discussion because Mr. Dennis subsequently advised industry (at their request) regarding the methods to be followed in the determination of exclusion zones required by the regulation. Walter Dennis died (in the late Eighties, I believe) when interest in LNG importation was languishing. I believe that his advice regarding the determination of vapor cloud exclusion zones has been used improperly so as to downplay the severity of the hazards which the regulation is designed to protect against.

(At least partly) as a result, there remains confusion even today about the correct determination of vapor cloud dispersion exclusion zones for spills of LNG which could occur into impoundments on the land terminal. I have prepared reports for the City of Fall River, MA, and I have filed testimony with FERC as well, which describe errors that I believe were made in the preparation of the Draft Environmental Impact Statement for the Weaver's Cove Project proposed to be sited in the Taunton River at Fall River.

With that background, I return to consideration of 49 CFR 193. When 49 CFR 193 was promulgated in the Eighties, it provided for the determination of *exclusion zones* for *vapor dispersion* and *thermal radiation*. The term *exclusion zone* is defined in the current regulation:

*"Exclusion zone means an area surrounding an LNG facility in which an operator or government agency legally controls all activities in accordance with Sec. 193.2057 and Sec. 193.2059 for as long as the facility is in operation."*

This definition is critically important because it follows that the intent of the regulation is that the *consequences* of vapor cloud dispersion and fire radiation scenarios must be specified by determination of the distances to which each of these hazards would extend from the spill, and once those distances are determined, the resulting exclusion zones must be controlled by the owner of the facility or the government. Thus the regulation provides for the prevention of members of the public from occupying the areas included by the exclusion zones, and therefore prevents them from being exposed to the associated hazards. Importantly, no consideration is given to the probability of such hazards being realized (the regulation is *consequence* driven, i.e. it gives no consideration to the probability of the occurrence), it simply defines the extents of the *exclusion zones* which are enforced to ensure that the public is not exposed to danger. *As I have stated earlier, I believe that such a consequence driven requirement for the establishment of exclusion zones to protect the public is all the more appropriate today in view of the potential*

*severity of the terrorist threat, for which historical accident experience, however good, provides little assurance to the public.*

It is noted here that there is no mention in 49 CFR 193 of explosions, either vapor cloud explosions (confined or unconfined) or boiling liquid expanding vapor explosions. I will return to this important omission later.

### **3.1.1 Exclusion Zones for LNG Pool Fires**

Section 193.2057 of the Federal Standard is excerpted below.

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Sec. 193.2057 Thermal radiation protection.

Each LNG container and LNG transfer system must have a thermal exclusion zone in accordance with section 2-2.3.1 of ANSI/NFPA 59A with the following exceptions:

- (a) The thermal radiation distances shall be calculated using Gas Research Institute's (GRI) report GRI-89/0176, which is also available as the "LNGFIRE III" computer model produced by GRI. The use of other alternate models which take into account the same physical factors and have been validated by experimental test data shall be permitted subject to the Administrator's approval.
- (b) In calculating exclusion distances, the wind speed producing the maximum exclusion distances shall be used except for wind speeds that occur less than 5 percent of the time based on recorded data for the area.
- (c) In calculating exclusion distances, the ambient temperature and relative humidity that produce the maximum exclusion distances shall be used except for values that occur less than five percent of the time based on recorded data for the area.

Amdt. 193-17, 65 FR 10958, Mar. 1, 2000]

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It is critically important to note here that the determination of exclusion zones for LNG pool fires requires specification of the criterion to be used to define the extent of the thermal flux hazard, i.e., a criteria for determining how far away from the fire must the public be to be protected. 49 CFR 193 presently requires that thermal exclusion zones be defined by the (mathematical model) prediction of the distance to which a person, at ground level, would be exposed to thermal radiation flux of  $5 \text{ KW/m}^2$  ( $\sim 1600 \text{ Btu/hr/ft}^2$ ). This thermal flux has been determined to have the potential to cause second degree burns to unprotected skin in approximately 30 seconds.

But, as I have previously testified to FERC, I believe that the criterion of a  $5 \text{ KW/m}^2$  flux level merits further consideration, because exposure at this intensity to persons could result in serious burns within time periods which would not be sufficient for evacuation

or escape. Further, although fire fighting personnel equipped with protective gear could work in such an environment for considerable time, they would not be able to provide evacuation or removal of unprotected persons in time to prevent injury. It is known that the flux level would have to be reduced to about 1.5 KW/m<sup>2</sup> before unprotected persons could be exposed continuously without thermal radiation injury. Consequently, I believe that serious consideration should be given to defining exclusion zones to protect the public from thermal radiation hazards using such a lower (~1.5 KW/m<sup>2</sup>) thermal radiation flux criterion. However, whether or not DOT defines the exclusion zone using such a lower thermal radiation flux criterion, I believe that FERC should use the lower thermal flux criteria in order to protect the public from such very large fires. It is very important to recognize that a policy which prevents public presence only where there would be exposure to 5 KW/m<sup>2</sup> or greater is not consistent with the public interest, because the public could receive serious injuries at lower flux levels if exposed for longer time periods (including time periods that would still be insufficient to provide for sheltering or evacuation). That is why I have suggested that serious consideration of the lower value of 1.5 KW/m<sup>2</sup> as the “safety” criterion – as this value is widely recognized as being the highest value of thermal radiation exposure from which the public would not receive serious injury even if exposed for longer time periods.”

For the determination of thermal radiation exclusion zones for the land side of the facility, the credible spill scenario must be defined for input to the LNGFIRE III model. The scenario then is defined by specifying the dimensions of the impoundment area that will contain the spill, and then specifying the rate and total amount of LNG that is spilled. Two types of spill scenarios are possible:

- Spillage from the LNG storage tank
- and
- Spillage from a part of the piping system external to the storage tank.

#### Spillage from the LNG Storage tank

It is my understanding that the storage tank design proposed for the Long Beach Long Beach facility is a Total Containment design, which means essentially that the inner tank in contact with the LNG is surrounded by a prestressed concrete outer tank wall and covered with a similarly constructed roof. To my knowledge, no tanks of the this type have so far been constructed in the continental United States (the Penuelas, Puerto Rico, tank has a prestressed concrete outer tank, but I do not believe it has a concrete roof ), but such tanks are currently being proposed for several other locations. It is my understanding that there remain some questions about the procedures to be followed for such installations, even questions relating to the lack of “definitions” for the various tank systems that are being considered. Nevertheless, 49 CFR 193 appears to have been interpreted by DOT, at least in the case of the DEIS and EIS’s prepared for the Weaver’s Cove terminal in Fall River, MA, in such a manner that the regulation does not require consideration of LNG spills that would penetrate the outer containment wall. It is my understanding, based on DEIS’s that have been produced for terminals with similar tank design proposals, that the thermal radiation zones for fires associated with spills from the

inner tank are (therefore) to be determined by assuming that the spilled LNG would be *contained* by the concrete outer wall. As a result, the fire scenario envisioned is an elevated, or “tank-top”, fire with the diameter (size) of the fire determined by the diameter of the outer concrete tank. For such determinations, I believe that application of the prescribed method (LNGFIRE III) is adequate.

However, there remains a question about the validity of the assumption that failure of the outer concrete wall is incredible. Although I agree that such a failure due to accident would seem to be extremely remote, I cannot agree that such an event is impossible for a terrorist to achieve – witness our tragic experience on 9/11 when two large airliners were hijacked and flown into the World Trade Towers with devastating results. To my knowledge no analyses have been made available to the public which address the possibility of complete failure of a “total containment” LNG storage tank. I will return to the consideration of “worst case” events after consideration of the current requirements for determination of exclusion zones.

#### Spillage from the Piping System

Here, also, the regulations prescribe detail that cannot be adequately described here. However, it is my understanding that the intent of the regulation is to prescribe the credible spill events (for determination of exclusion zones) by identifying the portions of the pipeline systems that carry LNG at the largest rates in the facility, and then to assume a guillotine break in said line with flow at the maximum rate maintained for a period of ten minutes. It appears that negotiations with DOT in the past have in some cases resulted in approval of procedures which will ensure limiting the duration of flow (by automatic shut-off systems) to shorter periods, but I assume here the requirement for a ten-minute spill duration.

In either case, LNGFIRE III application is straightforward, since the fire size is prescribed by the outer boundary of the area (impoundment) into which the spill occurs. In summary, I believe the application of LNGFIRE III, to LNG pool fires contained in liquid impoundment areas, adequately describes the thermal radiation hazard for the purpose of determining exclusion zones to protect the public.

### **3.1.2 Exclusion Zones for Vapor Cloud Dispersion**

Section 193.2059 of the Federal Standard is excerpted below.

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Sec. 193.2059 Flammable vapor-gas dispersion protection.

Each LNG container and LNG transfer system must have a dispersion exclusion zone in accordance with section 2-2.3.2 of ANSI/NFPA 59A with the following exceptions:

- (a) Flammable vapor-gas dispersion distances must be determined in accordance with the model described in the Gas Research Institute report GRI-89/0242, "LNG Vapor Dispersion Prediction with the DEGADIS Dense Gas Dispersion Model." Alternatively, in order to account for additional cloud dilution which may be caused by the complex flow patterns induced by tank and dike structure, dispersion distances may be calculated in accordance with the model described in the Gas Research Institute report GRI 96/0396.5, "Evaluation of Mitigation Methods for Accidental LNG Releases. Volume 5: Using FEM3A for LNG Accident Consequence Analyses". The use of alternate models which take into account the same physical factors and have been validated by experimental test data shall be permitted, subject to the Administrator's approval.
- (b) The following dispersion parameters must be used in computing dispersion distances:
- (1) Average gas concentration in air = 2.5 percent.<sup>9</sup>
  - (2) Dispersion conditions are a combination of those which result in longer predicted downwind dispersion distances than other weather conditions at the site at least 90 percent of the time, based on figures maintained by National Weather Service of the U.S. Department of Commerce, or as an alternative where the model used gives longer distances at lower wind speeds, Atmospheric Stability (Pasquill Class) F, wind speed = 4.5 miles per hour (2.01 meters/sec) at reference height of 10 meters, relative humidity = 50.0 percent, and atmospheric temperature = average in the region.
  - (3) The elevation for contour (receptor) output  $H = 0.5$  meters.
  - (4) A surface roughness factor of 0.03 meters shall be used. Higher values for the roughness factor may be used if it can be shown that the terrain both upwind and downwind of the vapor cloud has dense vegetation and that the vapor cloud height is more than ten times the height of the obstacles encountered by the vapor cloud.
- (c) The design spill shall be determined in accordance with section 2-2.3.3 of ANSI/NFPA 59A.

[Amdt. 193-17, 65 FR 10959, Mar. 1, 2000]

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Again, it is important to note that the DEGADIS and FEM3A model(s) for calculating the exclusion zones for vapor cloud dispersion are *prescribed*. The DEGADIS model was promulgated in the regulation in an amendment dated in the early Nineties, and the

<sup>9</sup>The 2.5 percent concentration represents one half the lower flammable limit concentration of methane (5%). This concentration level is intended to define the cloud average concentration at a point which would prevent the presence of flammable (greater than or equal to 5 %) "pockets" of gas which could be ignited. Hence this concentration level is used as the criterion for delineating the hazard distance.

(alternate) FEM3A model was promulgated in the regulation in the amendment dated Mar. 1, 2000. I am the co-author, with Dr. Tom Spicer, of the DEGADIS model, and Dr. Spicer and I directed the research program sponsored by GRI (since about 1985) to validate a computational fluid dynamics model (FEM3A was ultimately selected, based on consideration of several candidate models) for LNG vapor dispersion application. I support the use of the DEGADIS and FEM3A models. Based on my knowledge of the models and my review of the development of both, I believe that, together, they incorporate reasonably the latest information obtained in the federally sponsored large scale LNG field test programs conducted by the Coast Guard at China Lake, CA, and at the Liquefied Gaseous Fuels Spill Test Facility (LGFSTF) located near Mercury, Nevada, in the Seventies and Eighties, as well as the results of other research programs that have been conducted, principally in the Chemical Hazards Research Center Wind Tunnel at the University of Arkansas.

The DEGADIS model is limited to application to dispersion of vapor clouds (including LNG vapor clouds) resulting from spills onto a flat surface (ground or water) with dispersion over flat, obstacle-free terrain. FEM3A was developed in a followup effort (to DEGADIS) to provide a mathematical model applicable to the determination of the effects on dispersion of manmade obstacles (such as tanks, dikes, or process equipment and structures) and/or significant terrain features. I believe that these two models, correctly applied for the situations for which they are designed, are adequate tools for determining vapor cloud exclusion zones which will ensure public safety. And, similarly to the previous discussion on thermal radiation exclusion zones, I believe that the application of these models, *respecting the limitations of each*, is relatively straightforward for the determination of vapor cloud exclusion zones extending from spills bounded by containment structures (dikes and impoundments) on land.

It is clearly the intent of 49 CFR 193 that enforcement of a vapor cloud dispersion protection exclusion zone implies that the area included be controlled by the facility operator or an agency of the government. It is also clear that the intent of the regulation is to provide for the enforcement of vapor cloud dispersion protection zones as the method for ensuring the safety of the public, since such exclusion zones clearly prohibit the presence of the public therein.

For the determination of vapor cloud dispersion exclusion zones for the land side of the facility, the credible spill scenario must be defined for input to either the DEGADIS model or the FEM3A model. The scenario is defined by specifying the dimensions of the impoundment area that will contain the spill, and then specifying the rate and total amount of LNG that is spilled. Again, two types of spill scenarios are possible:

- Spillage from the LNG storage tank
- and
- Spillage from a part of the piping system external to the storage tank.

### Spillage from the LNG Storage tank

As stated before, it is my understanding that the storage tank design proposed for the Long Beach Long Beach facility is a Total Containment design, which means essentially that the inner tank in contact with the LNG is surrounded by a prestressed concrete outer tank wall.

Further, it is my understanding, based on DEIS's that have been produced for terminals with similar tank design proposals, that the vapor cloud dispersion exclusion zones associated with spills from the inner tank are to be determined by assuming that the spilled LNG would be *contained* by the concrete outer wall. As a result the vapor cloud dispersion scenario envisioned is an elevated, "tank-top" vapor release, with the diameter (size) of the release determined by the diameter of the outer concrete tank. For such determinations, I believe that application of the FEM3A method, although untested for such use, is appropriate. However, the DEGADIS model was designed for applications to *ground level* releases, and I cannot recommend it to describe the tank-top release scenario.

I do note that vapor releases from the top of the tank would be expected to pose significantly less hazard to the public than would equivalent releases at ground level, particularly if accompanied by high wind conditions.

However, as in the case of the determination of fire radiation exclusion zones, there remains a question about the validity of the assumption that failure of the outer concrete wall is incredible, as (to my knowledge) no analyses have been made available to the public which address the possibility of complete failure of a "total containment" LNG storage tank. I will return to the consideration of "worst case" events after consideration of the current requirements for determination of exclusion zones.

### Spillage from the Piping System

Here, also, the regulations prescribe detail that cannot be adequately described here. However I believe that the intent of the regulation was, and remains, to prescribe the credible spill events (for determination of exclusion zones) by identifying the portions of the LNG transfer systems (pipes) that carry LNG at the largest rates in the facility, and then to assume a guillotine break in said (pipe)line with flow at the maximum rate maintained for a period of ten minutes. I do note here that DOT has considered, and approved, procedures which would ensure limiting the duration of flow (by automatic shut-off systems) to shorter periods, but here I assume the requirement for a ten-minute spill duration.

For such spillage into an impounded (or diked) area, the containment afforded limits the liquid (LNG) spreading that can occur, and therefore effectively determines the area extent of the source of vapor (evolving from the spilled LNG).



But, there remain questions even about the requirements for specification of the leak rates that have not been resolved. I have filed testimony with FERC which describes my complaints that the present specification of “accidental leakage rate” design spills by NFPA 59A (which has been incorporated in 49 CFR 193 since the year 2000, effectively replacing the previous requirement for 10 minute full flow spills from the largest transfer line in the facility), have the effect of reducing the requirement for consideration of these (larger spills) that were the intent of the regulation - with the final result that the downwind vapor hazard is downplayed. FERC has not even been consistent in this regard, since they have given approval for submissions from facility applicants that contained transfer line spills with volumes ranging from 28,900 gallons (3-inch line break) all the way to 812,000 gallons (guillotine rupture of ship unloading line).

But, however the spill rate and volume is determined, the vapor cloud dispersion protection exclusion zone determination is not as straightforward as that for the determination of the thermal radiation protection exclusion zone, because:

- DEGADIS was designed to predict dispersion from spills on a flat surface, with dispersion proceeding on a flat surface, *in the absence of significant terrain features or manmade structures that would obstruct the wind or gas cloud flow*. A dike (or the vertical walls of an impoundment) designed to contain the spilled LNG (liquid) causes “holdup” of the gas until the gas overflows the impounded volume. The DEGADIS model does not allow direct accounting for the effect of the vapor “holdup” that occurs within the impounded/diked area. Although provisional methods have been suggested in the past for using DEGADIS under such conditions, such methods have been demonstrated to be in error, as will be discussed subsequently. It is now clear that utilization of certain methods provisionally suggested in the Eighties (for determining gas “holdup”) can lead to serious errors in the determination of vapor cloud dispersion protection exclusion zones.
- Research conducted during the last two decades has resulted in the Department of Transportation’s acceptance and approval of the use of the FEM3A vapor dispersion model. The FEM3A model *provides for prediction of the holdup that occurs in an impoundment area* as well as for other effects of obstacles or terrain features on dispersion of an LNG vapor cloud.

### **3.2 The Potentials for Unconfined Vapor Cloud Explosions and Boiling Liquid Expanding Vapor Explosions are not Addressed**

#### **Unconfined Vapor Cloud Explosion Hazard**

The concern for the potential of unconfined vapor cloud explosion hazards at the proposed LNG terminal in Long Beach is directly related to the composition of the LNG that will be imported to the facility. It is anticipated that significant quantities of “hot gas”, i.e., LNG containing significant quantities of hydrocarbons heavier than methane

will be received at the terminal., and the plant is being designed to remove such heavy components (ethane, propane, etc.) for marketing and distribution from the facility.

Since it does not appear practicable to remove the heavier components of the gas *as it is being unloaded from the tanker into the storage tanks*, it is presumed that the “hot gas” NGL components will have to be stored, at least temporarily, prior to their distribution off site. Consequently, it is presumed that there could be significant quantities of LNG containing heavier hydrocarbons such as ethane, propane, etc., that will be stored and handled in the facility.

The problem of explosion potential of LNG vapor clouds has been studied. I quote directly from U.S. Coast Guard Report CG-M-03-80 entitled *U.S. Coast Guard Liquefied Natural Gas Research at China Lake*, dated January 1, 1980 (pages 12-13):

*“Since unconfined vapor clouds composed of LPG have detonated after tank car and pipeline accidents, the next group of high explosive direct initiator tests involved the system methane-propane stoichiometric in air, always using a 1.35 kg Composition B initiator in a 5 m hemisphere.*

....

*The test series was run in the sequence 90% methane-10% propane, 57.6%-42.4%, 76.8%-23.2%, 81.6%-18.4%, and 86.4%-13.6%. Only methane concentrations above 81.6% failed to produce a vapor cloud detonation. The velocity of the fuel-air detonation wave was 1800 m/s and the maximum pressure was 15.5 bars in the 81.6%-18.4% test. Clearly, for the 1.35 kg initiator, the critical percentage of propane for the methane-propane-air detonation is between 13.6% and 18.4% propane; financial restrictions prevented the determination of critical concentrations for other initiator sizes. Theory suggests that the use of propane as a sensitizer is representative of all hydrocarbons heavier than methane. The 13.6% sensitizer concentration has special consideration as the commercial LNG being imported into the U.S. east coast has about 14% higher hydrocarbons.”*

Based on this report, which to my knowledge has not been called into question, it is clear that there is a potential unconfined vapor cloud explosion (UVCE) hazard associated with the errant release of LNG containing heavier (than methane) hydrocarbons in amounts in the range 13 -18% (and higher).

Furthermore, it is important to note that the explosions described in the Coast Guard Report were gas phase *detonations*, which means that the flame (reaction front) speeds were greater than the speed of sound in the unburned gas mixture. It is now well understood that damaging overpressures can occur in unconfined vapor cloud explosions even when flame speeds are well below those which result in detonations. The bottom line here is that LNG with concentrations above the range 13-18% has been shown to have the potential to *detonate when unconfined*, and there is consequently a very real potential for UVCE's to occur with damaging overpressures when such (unconfined) gas-air mixtures are ignited.

Consequently, although the present regulations do not require consideration of the UVCE hazard associated with vapor clouds that might result from spills of LNG, consideration of the UVCE hazard is relevant for the proposed Sound Energy Solutions terminal *if it is to import "hot gas" that may have concentrations of heavier components in the range above approximately 13-18%*.

Finally, it is noted that enrichment in higher boiling point components of the liquid remaining on the water as the LNG vaporizes can lead to vapor cloud concentrations that pose a UVCE hazard, even if the concentration of the heavies in the liquid initially spilled do not.

### **Boiling Liquid Expanding Vapor Explosions**

If the decision is made to install NGL storage at the facility, consideration must be given to the potential for BLEVEs to occur in the event that the storage tanks are exposed to fire. The potential for NGL BLEVEs to threaten either public safety or infrastructure to distances greater than are already anticipated to be credible for large LNG pool fire or vapor cloud dispersion hazards appears to be low; however there is very real potential for severe mechanical damage (by explosive force or due to ejected missile impact) to the primary LNG storage facilities (or a ship at the jetty) that could cause cascading events that would worsen the situation.

In view of the recent apparent occurrence of a BLEVE of an LNG tank truck in Spain, the potential for BLEVEs of the trucks serving the facility, as well as LNG storage tanks, cannot be ruled out. However, the potential for BLEVE-like explosions appear to be much more likely from the ship containers than from the more heavily constructed and more fire-resistively insulated LNG storage tanks on land.

### **3.3 There is a Critical Need for Exclusion Zones for LNG Spills on Water**

The potential for catastrophic releases from LNG carriers that service an LNG import terminal are acknowledged by FERC in several Draft and Final Environmental Impact Statements, including both for the Weaver's Cove Project in Fall River, MA. FERC has consistently stated that such catastrophic releases would be most likely caused by terrorist attack, and FERC's own analyses have shown that the consequences of such ship-side releases that have been identified tentatively as "credible" are far greater than the hazards posed by the land-side LNG spill scenarios. Nevertheless, the Commission continues to dismiss these hazards on the grounds that the threat of such events (large pool fires on water, or large vapor cloud formation following a spill on water) can be "managed".

I cannot support FERC's statement (from the Weaver's Cove and other Impact Statements) that "While the risks associated with the transportation of any hazardous cargo can never be entirely eliminated, they can be managed". In my opinion, this statement, with no justification provided, does nothing to provide the public confidence in FERC's ability to "manage" these risks. Indeed, I believe that it downplays the

importance of the principal threat to public safety that is associated with the operation of any LNG import terminal – a terrorist attack that could result in catastrophic spills of LNG onto water.

I believe my recent testimony before the Subcommittee on Energy Policy, Natural Resources and Regulatory Affairs, provides adequate explanation of my view on this matter. Although the inclusion here of that testimony is repetitive of my earlier comments, I believe such repetition is warranted:

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***Testimony of Dr. Jerry Havens  
Before the Congressional Subcommittee on Energy Policy,  
Natural Resources and Regulatory Affairs  
Tuesday, June 22, 2004***

*Mr. Chairman and Members of the Committee: My name is Jerry Havens. I am a Distinguished Professor of Chemical Engineering at the University of Arkansas. I appreciate this opportunity to address this hearing on Federal and State Roles in LNG Import Terminal and Deepwater Port Siting. I am speaking here today as a citizen-scientist, and not as an agent of my University.*

*I have for some thirty years been studying methods for assessing the potential consequences of major accidental releases of LNG. My remarks here today are about the estimation of the extents of danger to the public around such spills.*

*I believe that the potential danger to the public from LNG spills is mainly from the very large fires that could occur. I want to emphasize that I am talking about fires resulting from the spillage of several millions of gallons of LNG – a single tank on a typical LNG carrier contains six or more million gallons of liquefied natural gas. The fire from such a spill, if it occurred onto water and was therefore uncontained, would be very large, perhaps up to a half-mile in diameter, or larger if more of the containment system failed. We have no experience with fires this large, but we do know that they could not be extinguished, they would just have to burn themselves out, and the radiant heat extending outward from the fires edge could cause serious burns to people even at larger distances.*

*There are two ways that very large fires can follow a major LNG spill. If LNG is spilled it will rapidly evaporate and the vapors will mix with air to form a mixture which will burn in the concentration range of approximately 5% to 15% LNG vapor. Such mixtures of LNG vapor and air will inevitably form when LNG is spilled, and if an ignition source such as an open flame or spark are present, as would be highly likely to accompany the violent circumstances that would cause a major release, a large pool fire will result. However, if no ignition sources are present in the flammable gas mixture a vapor cloud will result, and the cloud will spread downwind from the spill until it either contacts an ignition source or becomes diluted below its flammable concentration - it will then disperse harmlessly.*

*The maximum distances of the danger zones extending from a pool fire or a flammable vapor cloud determine the zones which would endanger the public. It is the estimation of these distances, which are identified in 49 CFR 193 as pool fire radiation and vapor cloud dispersion exclusion zones, that I want to inform you about, because such exclusion zones are required in order to ensure that people are not exposed to danger if such a fire should occur, and such requirements determine the effectiveness of the LNG siting regulations to provide for public safety.*

*I first began studying the prediction with mathematical models of vapor cloud travel distances in the 1970's, when as this Committee knows, the first wave of interest in LNG importation arrived in the United States. I am privileged to have had an important role in the development of the current regulatory requirements for determining vapor cloud exclusion zones to support requests to FERC for LNG terminal siting. Both of the computer models currently required by 49 CFR 193 for calculating vapor cloud exclusion distances were the result of developments by my Associates and I at the University of Arkansas. I have also followed closely and have been involved in, if less directly, the development of the methods required by 49 CFR 193 for determining pool fire radiation exclusion zones.*

*In my opinion the current requirements in 49 CFR 193 for determining both pool fire radiation and vapor cloud dispersion exclusion zones around LNG terminals are based on good science, and they are adequate for their purpose. Indeed, the present regulations are the result of considerably more research on LNG safety than has been performed for many other hazardous materials that are routinely transported and stored in very large quantity. Furthermore, I believe it is important to emphasize that the hazards associated with LNG, aside from the localized dangers involved with handling any cryogenic fluid, are neither unique nor extreme when compared with other hazardous materials handled in bulk. The potential dangers we are discussing today are brought into the present focus because of the enormous amount of energy that must necessarily be concentrated to enable economical transport of liquefied natural gas across the world's oceans.*

*However, the suitability of the methods required by the regulations for determining exclusion zone distances is not in serious dispute. The problem lies in the specification of the LNG spill scenarios that must be considered.*

*Current U.S. regulations require that exclusion zones be calculated for spills in the land-based portion of an LNG import terminal only – the regulations do not currently apply to spills that might occur from the LNG vessel onto water.*

*Because spills on land are subject to a variety of control measures to limit the area extent of the spill, such as dikes or impoundment systems, exclusion zones in support of requests for siting land-based LNG terminals are typically, in my experience, less than one thousand feet. However, if exclusion zones were required to protect the public from LNG spills onto water from an LNG vessel at the jetty or in route to or from the terminal, there is good scientific consensus that the fire radiation exclusion zones could extend to a mile*

*or more if the entire contents of a single tank were rapidly spilled, and the vapor cloud dispersion zone could extend for a similar spill to several miles. Obviously, if the regulations were applied to the determination of exclusion zones to protect the public from LNG tanker spills onto water, it would have a very important effect on siting decisions. It seems clear to me that such consideration would raise very serious concerns about the siting of LNG terminals where people within the exclusion zone distances would be endangered. It is very sobering to me to realize that the ongoing LNG siting debate regarding public safety comes down to this, and I sincerely hope that those responsible for protecting the public recognize and seriously consider this very important question.*

*Since 911 we no longer have the luxury of considering only means for reducing the probability of accidents to a level that justifies the attendant risk. I believe that it is imperative that the dangers to the public from possible releases from a LNG carrier onto water be considered in the siting of LNG terminals in our country.*

*I must also tell you that I am very concerned that spills from LNG vessels caused by terrorist attack might not be limited to the partial contents of a single tank on the vessel, as is widely assumed. Because of those concerns, I wrote to the Secretary of Homeland Security in late February to urge the Department to consider the vulnerability of LNG carriers to terrorist attacks as part of their deliberations on LNG terminal siting. Because some of the matters that I believed worthy of consideration are sensitive, I do not think it is appropriate to discuss them in detail here, but I will try as best I can to address any questions you may have about this subject. I am very disappointed that I have not received any response from the Department of Homeland Security regarding my concerns.*

*Thank you, that concludes my comments.*

---

I stand by this statement, and I believe it is particularly relevant to the consideration of siting the Sound Energy Solutions LNG Project in Long Beach Harbor.

Today, although the science community has acknowledged the need for additional experimental data that can be used to address some uncertainties which remain in the extrapolation of consequence distances from the approximately 10,000 gallon spill range that has been studied to the approximately 10,000,000 gallon range that has been determined to be credible to result from a terrorist attack on an LNG ship, it is clear that there is scientific (and government) consensus that methods which have recently been evaluated by the ABS Group for FERC and by the Sandia National Laboratory for the Department of Energy are suitable for the estimation of the extent of the thermal radiation or vapor cloud dispersion hazard distances that would extend from major releases of LNG onto water in the Port of Long Beach.

It is not necessary to repeat in detail the findings of either the ABS Group or Sandia Lab reports, both of which are attached as exhibits to this report. I will just summarize my

reading of the conclusions of both reports which I believe are germane to the consideration of the proposed LNG terminal in the POLB.

The ABS Group and Sandia Lab reports, which appear to be now largely accepted by all of the regulatory agencies involved, including the Coast Guard, as being the best current guidance on these matters, emphasize for their extensive analyses of the consequences of marine spills just one (size) spill scenario. That is the spillage onto water of 12,500 cubic meters LNG – this figure being representative of approximately one half of a single tank on a typical LNG ship. The choice of spillage of half a tank (rather than a full tank) appears to be the result of the reports' authors' consideration of the extreme implausibility if not impossibility of the rapid spillage of the entire tank as an initial result of a terrorist attack.

### **Thermal Radiation from LNG Pool Fires on Water**

Setting aside unnecessary precision, I believe that the ABS Group and Sandia Lab reports are in essential agreement that persons exposed to the thermal radiation from a pool fire burning on a 12,500 cubic meter (approximately 3,000,000 gallons) spill on water could receive second degree burns on unprotected skin in about 30 seconds at a distance of approximately one mile from the center of the spill.

I endorse these findings on thermal radiation consequences of LNG pool fires on waters from the ABSG and Sandia Reports, as far as they go.

But, as I have stated before, I do not think these predictions address sufficiently the real requirements to provide for public safety. I am convinced that the use of a thermal flux criterion that would result in second degree burns in 30 seconds is not appropriate for delineating distances necessary to ensure public safety. This (second degree burn criteria) is not sufficient because such exposure essentially ensures that serious burns will occur at that distance to persons who cannot gain shelter within 30 seconds. In addition to the obvious difficulties that would confront any able-bodied individual's attempt to flee from such a threat, there remain very serious questions about the almost certain inability of those less able to do so. As considerably lower thermal flux criteria (~1.5 KW/m<sup>2</sup>) are prescribed in other national and international regulations designed to provide safe separation distances for the public from fires, I believe that FERC should consider such a lower thermal flux criteria, which could increase the distances prescribed in the ABSG and Sandia reports by as much as one and a half to two times, to ensure the public safety from such large LNG fires.

Finally, regarding calls for more research in this area, I have already stated that there are some important needs. It is my understanding that Sandia and others are considering the need for more large scale LNG fire testing. If such tests were conducted with appropriate scientific planning, and if such tests were conducted for the purpose of obtaining experimental data which could be used to verify mathematical modeling methods (as opposed to one-time "demonstration" tests), I would endorse them, as I feel that

additional testing would be worthwhile to provide better means of predicting the consequences of very large fires that could follow massive LNG spillage onto water.

### **LNG Vapor Cloud Dispersion from Spills on Water**

I here also endorse the estimates of LNG vapor cloud dispersion presented in the Sandia and ABS Group reports, which range, considering all of the uncertainties identified in the reports, between approximately two and three miles. I note that while I have reviewed and am in agreement with the methodology used by the ABS Group for making these estimates (they in part used DEGADIS, of which I am a co-author), the Sandia report estimates were reportedly obtained using a CFD model called VULCAN, which I have not had the opportunity to evaluate, and which to my knowledge has not been independently evaluated for such use. I believe that the estimate of two to three miles of flammable vapor cloud travel that could result from an unignited spill of one half of the LNG contained in a single containment is at once reasonable and sufficient for consideration of the consequences of such spills of LNG in the POLB.

### **There is a Real Concern for Cascading Failures to Occur**

But, I believe that limiting our consideration of the potential consequences of a very large LNG release and fire on water to the initial result of a terrorist attack is not sufficient. That would be like ignoring the collapse of the Twin Towers, because their collapse was not the initial result of the attack. Lest I neglect the consideration due of the worst case consequences of large scale tanker spills, it is important to note that the Sandia report states unequivocally that cascading events that could result either from brittle fracture of structural steel on the ship (due to LNG contact with the steel) or failure of the vaporization of the cargo at rates exceeding the capability of the pressure relief valves, cannot be ruled out.

We know that foamed plastic insulation, widely used on LNG carriers, including ships with both of these tank types, would be highly susceptible to failure by melting or decomposition. It is a cardinal safety rule that the pressure limits on tanks carrying flammable or reactive materials not be exceeded, as such exceedance portends catastrophic rupture of the containment. Such a rupture could lead to the release of a full tank of roughly 6,000,000 gallons of LNG, as well as the release from multiple tanks. While, as has been stated, the Sandia report concludes that such cascading events would be very unlikely to involve more than three of the five tanks on a typical LNG carrier – for a total release of 18,000,000 gallons (or more from the larger carriers now proposed) compared to the 3,000,000 gallon release on which all the modeling has been based – the basis for the Sandia report's “optimism” in this regard is unexplained. Once cascading failures begin, I do not know what would stop the process from resulting in the total loss and burning of all of the LNG aboard the carrier.



## CHAPTER 4

### CONCLUSIONS

#### CONSEQUENCES OF CREDIBLE ACCIDENTS AND TERRORIST ACTIONS, AND CONSIDERATION OF WORST POSSIBLE CASES

The objective here is to specify, based on observations of historical and experimental data, and supported by science-based guidance regarding the possibility of occurrence of postulated scenarios, the distances from such credible events to which the public as well as important infrastructure could be in harm's way.

Such a *consequence assessment* is a two step process:

1. The credibility (meaning here, the consistency of the event's occurrence with natural laws which we know to control such processes) of the postulated event must be established. For example, we can respond quickly and certainly to statements that an LNG ship contains the equivalent of fifty or more Hiroshima-size atomic bombs (a literal truth) with a certainty, based on physical laws, that the energy contained in an LNG storage tank cannot be released in a time frame sufficiently short to allow a meaningful comparison with the effects of fifty nuclear weapons each with a nominal 20 kiloton explosive energy release. It just cannot happen. However, we cannot dismiss the hazard on that basis either; instead we must consider the physical limitations which determine the length of time during which that energy could be released (in this case, by fire) in order to objectively define the consequences which could result.
2. Starting with the defined credible event, it is then required to determine the distance to which the hazard would extend. This process typically requires specification of both the total amount (of the hazardous material, measured here as energy content) released and the time frame over which the release occurs. As is true of many of the arguments advanced in this report, this is really just application of common sense - a very small spill rate, even continued for a very long time, would not be expected to pose the fire hazard that would result from the more rapid release of the same amount of material. An objective quantitative determination of the (hazard) distance is also a two step process.
  - a. First a criterion for damage must be selected. For the present case these criteria are; for fires, specification of the permissible level of thermal flux exposure; and for vapor clouds, specification of the concentration level below which the cloud does not pose a flammable hazard because it could not be ignited.
  - b. Finally, as the scenario being considered often involves releases with magnitudes potentially much more damaging than have been experienced, we have to extrapolate our experience to determine an

objective measure of the consequence that can be expected. The best, if not the only, tools we have for such extrapolations are physical (such as wind tunnel) or mathematical models.

Utilizing information summarized in Chapters 2 and 3 of this report, I will summarize what I believe to be the present state of information about the quantities (and rates of release) of liquefied energy fuels that could occur associated with the operation of the proposed LNG terminal in the POLB, as well as the consequences to the public and infrastructure that could result.

### **Accidents and Terrorist Actions**

The current regulations, particularly regarding provisions for public safety, focus on the land based part of the terminal. There are specific requirements for liquid containment and impoundment systems that are designed to limit the spreading of LNG that might be released either from the LNG tanks themselves or from transfer lines in the facility. But such control and mitigation measures could not be effectively applied to releases that could occur from an LNG ship, either at the jetty or in transit thereto, because spills onto water could not be effectively contained, and these concerns appear to have spurred the government's completion of two recent reports that deal with the tanker safety issue.

Before moving to consideration of the potential for, and consequences of, large LNG spills on water, I think it important to state that, in contrast to the attention given to the potential for large spills on water, very little attention is presently given to the vulnerability of land storage tanks to terrorist attack, or even to the vulnerability of land storage tanks to natural events such as earthquakes and tsunamis, consideration of which would appear to be highly relevant for the proposed POLB terminal. I believe that the vulnerability of the land tanks to such accidental or terrorist caused events, as well as to natural events such as earthquakes and tsunamis, needs to be considered carefully in order to provide the public assurance that we understand the potential consequences of releases that could occur on land as well as we now know them for spills on water. Fortunately, we have much more complete information regarding LNG spills onto water.

The ABS Group and Sandia reports agree that the release of LNG in the amount of approximately 3,000,000 gallons (half of one typical LNG ship tank) is credible,

- in that such a release could result from accidental collisions between ships with sufficient momentum (mass and speed) to cause such a breach of containment, or
- that such a release could be caused by terrorists with means that are readily available to them.

Furthermore, the ABS Group and Sandia reports agree, within the precision required here, that a release of 3,000,000 gallons of LNG onto water could result in:

- Pool fires which would expose persons with unprotected skin to thermal fluxes that could cause second degree burn injury in approximately 30 seconds ( $5 \text{ KW/m}^2$ ) at a distance of approximately 1 mile.
- Flammable vapor clouds, if the spilled material were not ignited upon release, that could extend downwind to distances between 2 and 3 miles. It is assumed here that persons that were caught in such a fire as might occur if the flammable cloud were ignited would be seriously injured, if not killed.

The author is in essential agreement with these consequence estimates but believes the following modifications are required if they are to be used to ensure public safety:

- Since the thermal radiation flux criterion ( $5 \text{ KW/m}^2$ ) used by Sandia and the ABS Group could cause second degree burns in thirty seconds, it is not sufficiently protective of public safety; a lower value, approximately  $1.5 \text{ KW/m}^2$ , is recommended here. This value is already being used by other segments of the regulatory system, both nationally and internationally, based on its definition as the highest thermal flux to which an unprotected person can be continuously exposed without injury. If the  $1.5 \text{ KW/m}^2$  criterion is used, it is anticipated that the distance of 1 mile (associated with the higher flux level) would be increased to between  $1 \frac{1}{2}$  and 2 miles.
- As the Sandia Report states unequivocally that cascading failures of ship tanks cannot be ruled out and further states that in their opinion failures of as many as 3 tanks could occur, this scenario must be considered credible. As Sandia estimates that the hazard distance from this scenario could be extended by approximately one-third, the distance to the  $1.5 \text{ KW/m}^2$  flux level would then be increased to approximately  $2 \frac{1}{2}$  to 3 miles.
- The ABS Group's high-end estimates for the vapor cloud distance to the 2.5 % gas concentration level (based on releases from a 5 meter diameter hole in the containment) are approximately 3 miles. The Sandia estimates for the credible scenario analyzed are closer to 2 miles, but their calculations reflect the distance to the 5% gas concentration level rather than the 2.5% level which is accepted to represent the better criterion for vapor cloud travel distance that could pose a hazard to the public. Use of the lower flammable gas concentration criteria would be expected to extend the hazard distance to about 3 miles.

Based on this information, which is believed to be the best that is available - and is in general agreement with widely held views in the scientific community, a minimum distance is specified here for the extent to which the public could be exposed to injury from the initial release of approximately 3,000,000 gallons of LNG onto water at the POLB. It is approximately 3 miles.

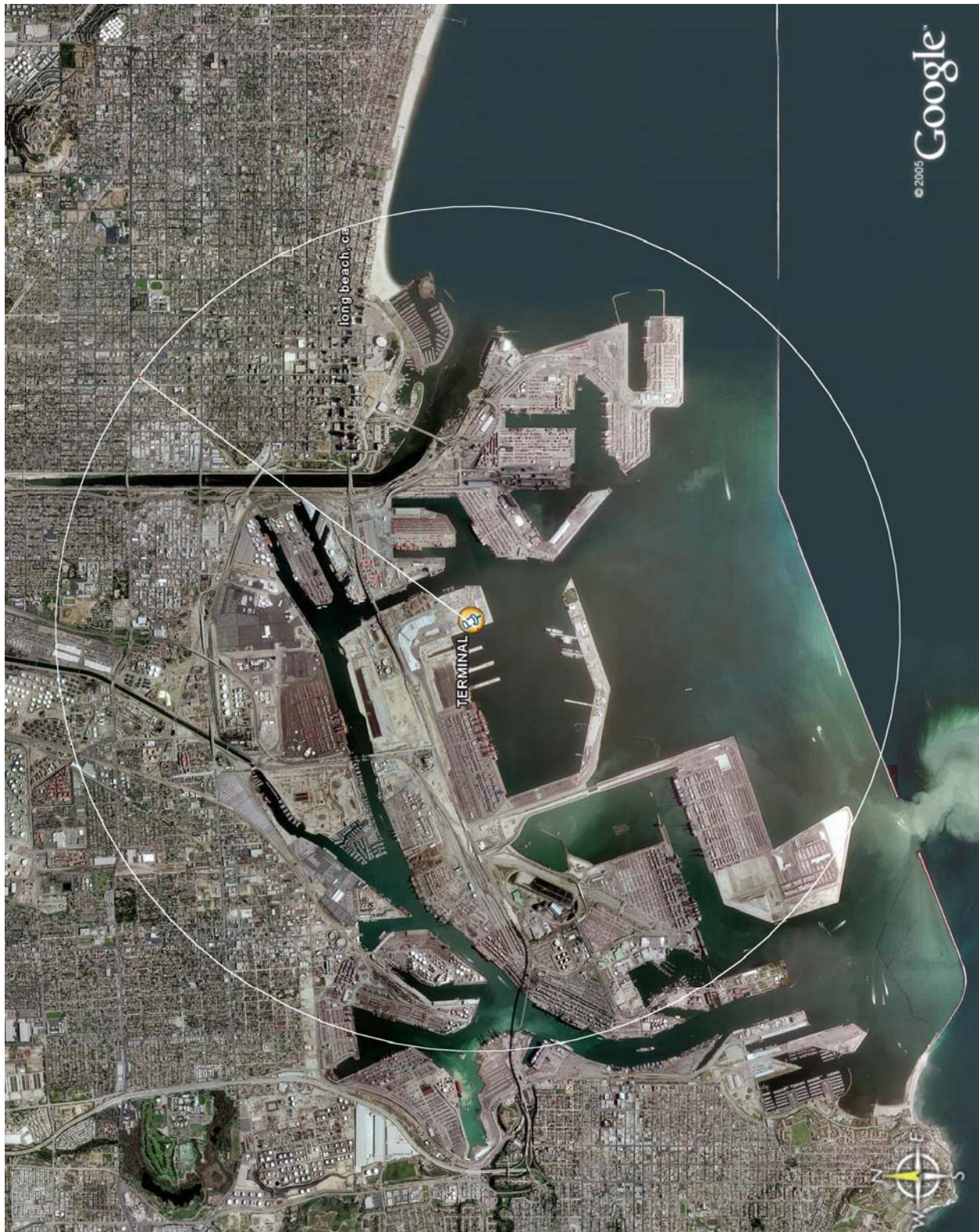
### **Consideration of Worst Possible Cases**

I am recommending a minimum 3 mile radius circle around the proposed terminal to demarcate the area in which events deemed credible could cause serious injury to the public. The minimum distance to demarcate expected damage to infrastructure would be of lesser extent, depending on the criterion selected for damage.

As I have stated that the danger zone around the tanker extends to the route of the tanker approach to the facility, I observe that exposure of the public from incidents of spillage onto the water from the ship appears to be greatest when the ship is at the terminal jetty, rather than during its approach, since the terminal appears to be closer to populated areas than is any segment of its route to the terminal. Exposure of port infrastructure during the approach, based on my observation of the aerial view, would seem to be similarly concentrated at the terminal site, but such a conclusion does not consider any special hazards or vulnerabilities at different locations in the port. Estimation of the consequences to the POLB of a large release of LNG in the port must consider the wide variety of flammable and other hazardous materials routinely handled, as the area in which significant damage to infrastructure could occur (beyond the terminal and the ship) encompasses large sections of one of the largest and busiest ports in the country. The POLB receives very large crude oil carriers (VLCC) at a jetty located within several hundred feet of the eastern boundary of the proposed LNG facility, and a major container terminal which almost certainly receives hazardous cargo lies adjacent to the western side of the proposed site, along which the LNG ship will be berthed. It is noted that the area designated for the terminal's construction, approximately 25 acres, appears to be significantly smaller than the other (existing) terminals in the United States (with the possible exception of the Everett terminal – I do not know at the time of writing what the Everett terminal's area is). In any case, there is very minimal separation between the LNG spill impoundments and the facility's property line in the proposed terminal in the POLB; indeed, it is difficult for me to see how the applicant can meet the exclusion zone requirements of 49 CFR 193, much less provide a reasonable safety zone for the public or surrounding infrastructure.

It must be emphasized that the 3 mile zone is based primarily on the assumption that approximately 3,000,000 gallons of LNG is spilled onto water, as it appears there is little doubt that either pool fire radiation thermal fluxes or flammable vapor clouds from such a spill could put the public in harms way at that distance. However, it is a minimum specification, because it does not address the possibility of even more serious events.

I am very concerned that such events as provide the basis for the 3 mile consequence distance would be of such severity as to make it highly likely, if not almost certain, that further failures of containments, either of LNG or NGL, would occur. In particular, I repeat here my concern that the exposure to the ship of such a pool fire would have the potential to cause cascading failures of the remaining tanks on the vessel, resulting in total loss of the vessel and burning of its contents. There can be no doubt that the consequences of such a worst-possible-case event could be more severe than the rapid release of approximately 3,000,000 gallons of LNG onto water considered in this report.



The radius of the circle extending from the terminal location is three miles.



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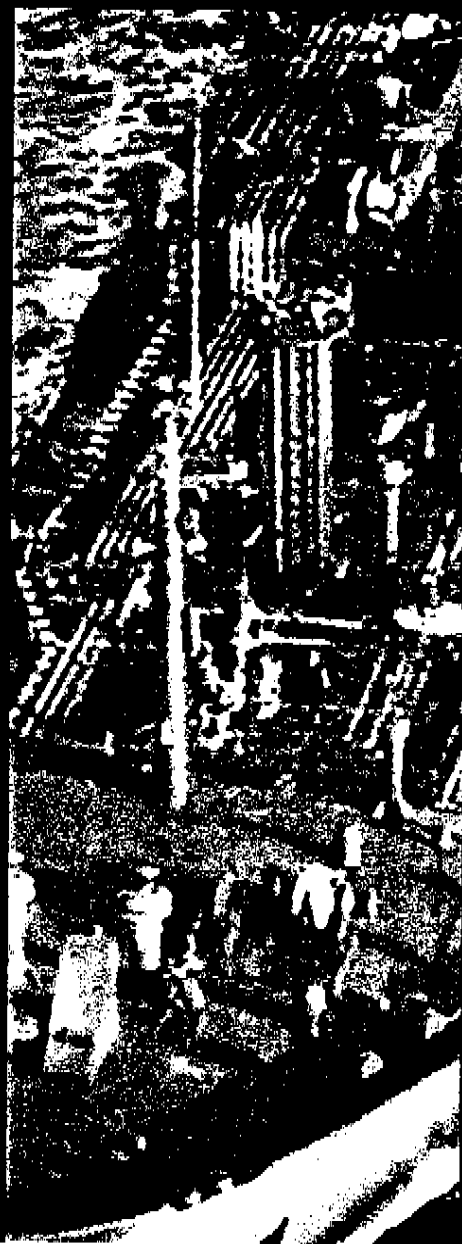
2. “LNG Operations in Port Areas : Essential best practices for the industry” First Edition 2003, The Society of International Gas Tanker and Terminal Operators Ltd (SIGTTO) ISBN: 1 85609 256 9 Witherbys Publishing [www.witherbys.com](http://www.witherbys.com) . or <http://sigtto.re-invent.net/dnn/Publications/tabid/62/Default.aspx> Price UK£ 45. Hard copy only.

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## INTRODUCTION

Gas tanker and terminal operations carry a range of operational risks arising from transport, storage and transfer of liquefied natural gas and petroleum gases. These risks are unique to liquefied gas operations and require specific measures to manage them within tolerable limits.

Many gas terminals are situated within the environs of established ports. Hence their operations and those of the gas tankers serving them, necessarily share a common operational environment with other port users. Such situations have existed for many years. Consequently industry members have acquired valuable experience in conducting gas operations in port environments that also host numerous other port users and other industrial activities.

This document draws on this collective experience in setting out guidance to best practice for managing gas shipping operations within ports. It also illuminates the profile of risks attaching to gas operations, for the information of those who administer ports and provide essential services in port areas.

The document draws heavily on SIGTTO's Information Paper 14 (Site Selection and Design for LNG Ports and Jetties), first published in 1997. Information Paper 14 expounds a doctrine of protective location for gas terminals, arguing for the elimination of major risk elements by locating gas operations in places where they will not be exposed to uncontrolled threats from outside their own operating environments. Under this doctrine operational risks are removed from the operational milieu of gas shipping (by informed selection of locations). Such risks as then remain are assessed and afterwards addressed by the implementation of procedures derived specifically from the risk assessment. Hence gas shipping operations are to be managed within tolerable limits – i.e. residual risk exposures are reduced to manageable proportions.

The guidance offered in this document recognises also the *dynamic nature of operating environments* and the fact that risk profiles change over time. Hence residual risk exposures may also change and therefore require re-assessment,

together with concomitant adjustments to the operational procedures devised to suppress them.

Operators therefore have a need for both a systematic assessment of operating risk and a range of risk reduction measures that can be tailored to be effective in specific situations. The guidance offered in this document aims to satisfy both needs.

Nevertheless change in operational risk profiles may not always be manageable solely by gas businesses adjusting their operating procedures. In many situations the co-operation of port administrations and service providers will be required to achieve the required degree of safety. This will be especially true of risks arising from the movement of gas tankers in port areas and from other activities conducted in the vicinity of gas tankers and terminals, including the movement of other ships. This document therefore addresses also the issue of relations with the providers of port services, other port users and the wider social community of the port.

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## 1 Hazards of LNG Operations

This section describes the salient properties of LNG and the established technologies for its containment and handling. It provides an elementary but essential background of awareness against which a coherent structure of operational disciplines and risk management options can be constructed.

### 1.1 Safety Critical Properties of LNG

Liquefied Natural Gas comprises near pure Methane ( $\text{CH}_4$ ). This is carried in specialist tankers at or very near its boiling point of  $-160^\circ\text{C}$  at atmospheric pressure. Natural gas, otherwise known as methane, firedamp or marsh gas, is non-toxic, lighter than air but flammable under certain conditions.

In its liquid state natural gas is 1/600th of the volume of its equivalent gaseous state, at atmospheric pressure and ambient temperature.

Hence the hazards arising from this material, should it escape to atmosphere are:

- The eventual dispersal of a gas cloud, thereby forming the volume of a flammable mixture with an explosion limiting range of 5.3% to 14%.
- Severe brittle fracture damage to structural and non-ferrous steel structures containing large quantities of material at cryogenic temperatures.
- Severe injury to personnel arising from contact with cryogenic material.

Natural gas is flammable between 5.3% and 14% by volume in air. Outside these limits the gas/air mixture is either too lean or too rich to support combustion.

The energy required for ignition of a flammable mixture of air and all hydrocarbon vapours is typically less than one millijoule – an energy level easily exceeded by any visible flame, by most electrical circuit sparks, even from low voltage sources, and by any electrostatic discharge detectable by human contact.

Release of LNG into the atmosphere of any area having within it low energy ignition agents carries with it a risk of fire or explosion. Such conditions will prevail in any port area where ignition agents are not effectively prohibited, as they are in installations specifically constructed for the handling of hydrocarbons.

Releases of LNG at cryogenic temperatures therefore pose an immediate danger to personnel exposed at the point of the release and to the integrity of steel structures in the immediate vicinity. However subsequent dilution of the gas in air may lead to the formation of a flammable gas cloud, one that could, under eminently feasible conditions, carry flammable vapours into areas where ignition sources are present.

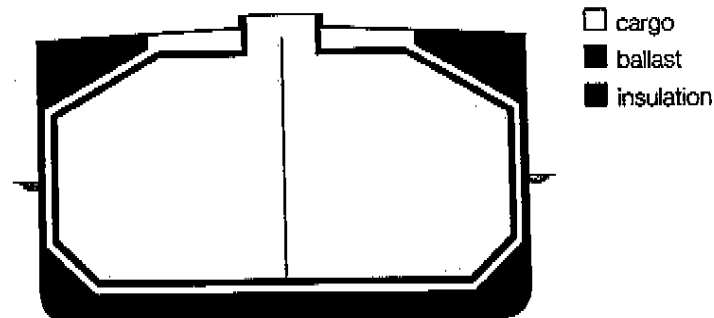
A more detailed exposition of the properties of LNG and other liquefied gasses is provided in "Liquefied Gas Handling Principles on Ships and in Terminals" 3rd Edition, 2000 – SIGTTO. see bibliography.

### 1.2 Containment Systems for LNG

All containment systems for LNG must perform two critical functions: insulation, to inhibit the boil off of the gas and segregation of the liquefied gas from mild steel structures, protecting the latter from exposure to cryogenic temperatures.

Hence the cargo tanks of LNG tankers are constructed as insulated cryogenic holds within the steel structure of the ship's hull. Most of the longitudinal and transverse strength members of the structure are arranged between the inner hull, holding the insulated cryogenic tanks, and the outer skin. In practice this produces a highly robust double-hull configuration.

There are three major designs for ships' LNG tanks: the self supporting Prismatic Tank, or SPB system; the Membrane systems, and the Moss system, that features spherical aluminium tanks. Virtually all LNG tankers in the world are constructed with one or other of these systems.



Representative Cross Section of Self Supporting Prismatic Construction  
Fig.1.1

All LNG tankers are now constructed in accordance with the provisions of the "International Code for the Construction and Equipment of Ships Carrying Liquefied Gasses in Bulk" – more commonly called the IGC Code.

Apart from stipulating standards for containment systems the IGC Code requires all tanks and handling systems to be completely separated from a tanker's accommodation and

SECTION 1

high energy grounding incidents and only one collision incident in the industry since its inception. Neither the grounding incidents nor the collision caused a penetration of the ships' inner hull and gas containment system.

Estimates of the resistance of LNG tankers to grounding and collision impacts have of necessity to be based on mathematical modelling of such incidents. Modern analytical methods, i.e. finite element analysis, now lend greater credence to such estimates. Predictions of hull penetration, for given impact scenarios, can be obtained within tolerances that confer on them a practical utility for use in risk management exercises.

The following table gives indicative speeds for collision impacts, on a stationary LNG carrier of 135,000 m<sup>3</sup>, that are estimated to penetrate the tanker's outer hull but fall short of penetrating the inner hull and the containment tanks located within.

Hull Resistance for a 135,000m<sup>3</sup> LNG Tanker

These values, while indicative only, are considered conservative and therefore reliable for the purposes of managing potentially threatening collision encounters. Even these indicative penetrations would require the tanker to be stationary and the impact to be delivered to the hull at an angle between 30 degrees either side of the perpendicular to the hull of the struck tanker. In practice impacts would often be glancing and less damaging. Nevertheless it would be prudent to assume, for planning purposes, penetration of the inner hull at impact speeds greater than these.

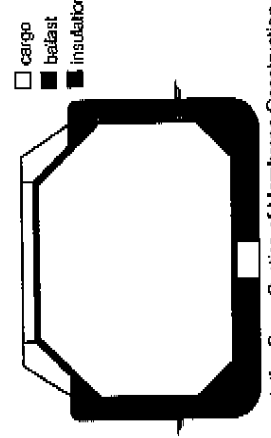
Yet it is clear, their inherently robust constructions notwithstanding, that LNG tankers are vulnerable to penetration by collisions with heavy displacement ships at all but the most moderate of speeds. Such incidents ought to be treated as credible within any port where heavy displacement ships share an operating environment with LNG tankers.

No grounding incident has yet made penetration of the inner hull of an LNG tanker. Yet while such ships are, demonstrably, able to sustain severe damage to their bottom structures without suffering inner hull penetration, such penetration is entirely credible if grounding is associated with impact on hard point obstructions - e.g. rock pinnacles and concrete piles. Such incidents are entirely possible within the environs of some ports.

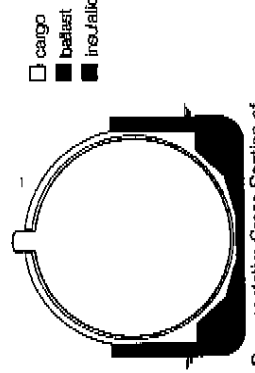
For more extensive treatments of this topic refer to references for this Section.

machinery spaces with gas tight segregation. The Code also prohibits cargo pump rooms being located below the upper deck and stipulates that no cargo pipelines be run under deck. Hence each tank is served by at least one individual submerged pump, discharging to an above deck manifold, with an alternative means of discharging - usually there are two main pumps and a spray pump.

Compressor rooms on LNG tankers are required by the IGC Code to be located in the cargo area and above the weather deck. The Code also contains detailed specifications for the construction and location of accommodation, service and machinery spaces and control stations.



Representative Cross Section of Membrane Construction Fig. 1.2



Representative Cross Section of Spherical Tank Construction Fig. 1.3

Shipboard containment of LNG is thus rendered highly secure by tank arrangements that are physically robust, and by comprehensive control and monitoring systems.

For more detailed descriptions of gas containment and handling systems see references for this Section.

1.3 Resistance of Gas Tankers to Collision and Grounding Impacts

In some thirty years of operations there have been few incidents of serious damage to LNG tankers anywhere in the world. There is scant historical data upon which to base predictions of damage to LNG tankers as a result of collisions and grounding. Indeed, there have been only two

1.4 Characteristics of Gas Releases to the Atmosphere

Since there has never been a catastrophic failure of an LNG tanker's hull and containment system there are no incident data upon which to construct scenarios following the release of large quantities of LNG into the atmosphere. However the behaviour of released LNG has been carefully studied in the light of certain important experiments involving controlled releases. Hence the consequences of such a release are well understood and are predictable, through mathematical modelling, within tolerances that admit reliable interpretation in specific circumstances.

After a release of liquefied gas a cloud will develop and travel horizontally from the spill point under the influence of prevailing winds. The cloud will contain the gaseous components of the LNG, condensed water vapour (giving it the characteristic white-cloud appearance) and air. Mixing with air the cloud will develop flammable properties through much of its volume. Flammable volumes of gas and air mixture will continue to be generated until the release of LNG is stopped.

As it travels away from the spill point the cloud will warm, becoming progressively less dense. As it warms to ambient temperature it will become buoyant in air and disperse vertically. Pure methane is lighter than air at -107°C, but it is the temperature of the entire cloud, not just its gaseous component that determines its behaviour. Other components too must warm to higher temperatures before vertical dispersal ensues. Meanwhile the cloud will continue to disperse in a generally horizontal direction, developing a shape similar to an elongated plume.

In practice the geometry and behaviour of a gas cloud will be determined by the specific circumstances of the release. The single biggest determinant will always be the volume of LNG released. Thereafter the shape and behaviour of the cloud will be determined by the rate at which the liquid gas is released to the atmosphere. Dispersal in specific incidences will also be greatly influenced by wind conditions, atmospheric stability, ambient temperature and relative humidity. The topography and surface roughness of the terrain over which a cloud moves will greatly influence dispersal characteristics. In high air temperatures the gas will disperse vertically more rapidly than in colder conditions. High winds too will encourage a more rapid dispersal of the gas, though they might also hasten the progress of the flammable parts of the gas cloud into areas carrying risks of ignition.

When the gas cloud is no longer fed by fresh volumes of gas it will disperse in the atmosphere until its entire volume is diluted below the lower explosive limit for methane. Its flammable properties will then be extinguished and no further risk will remain. A simple schematic representation of such a cloud is given in figure 1.4.

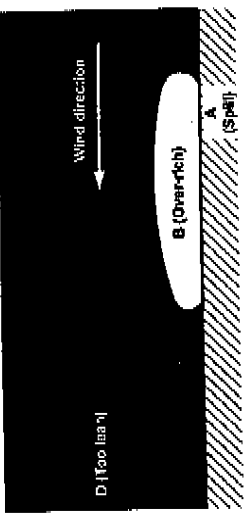


Fig. 1.4

The methodology for gas cloud predictions is well established and comprises two phases of analysis. First there must be established a realistic estimate of the maximum credible release, or spill. Second, the released gas cloud is modelled using realistic values for air temperature, wind forces and atmospheric stability at the location in question. From such analysis it is possible to predict with credible accuracy, the likely scenario following a worst probable gas release into the atmosphere.

1.5 Consequences of Ingress from the Sea

Since there has never been a catastrophic penetration of a tanker's LNG tanks and such an incident has not been replicated by practical experiment, the consequences of a massive and sudden confluence of LNG and sea water are not well understood.

Nevertheless it is indisputable that such an incident would generate a gas cloud in the atmosphere having characteristics similar to those described in section 1.4. It is also widely accepted that a rapid mixing of LNG at cryogenic temperatures with much warmer sea water will induce the phenomenon of 'rapid phase transition', or RPT.

The term RPT describes a process in which the LNG translates from a liquid to gaseous state at a greatly accelerated rate - i.e. a forced rate of phase transition, much more rapid than would otherwise result from a release into the atmosphere, unattended by mixture with water. While there have never been practical experiments on a scale representative of the ingress of the sea to a ship's tank of LNG, tests with small volumes of LNG provide compelling evidence that RPT will indeed occur. These same experiments suggest RPT will be accompanied by a rapid release of energy in the form of violent non-flammable shocks. Such experimentally derived data as does exist suggests such shocks could be energetic enough to threaten the integrity of adjacent structures.

In the absence of historical incident or representative experimental data, determining post-incident scenarios following the ingress of the sea to an LNG tank is necessarily speculative. Nevertheless it would be prudent for planners to recognise the prospective hazards of RPT.



SECTION 2

2 Risk Assessment

The properties of natural gas are well understood and its behaviour, when released to the atmosphere, can be modelled within tolerances that allow for realistic contingency planning and safety management.

An accident causing structural damage to an LNG tanker may lead to a release of LNG. Such events are rare (see Section 1) and there has, to date, never been an accidental release of LNG that has spread beyond the immediate environs of the marine gas terminal. However, accidental release, due to pipe damage and malfunction of cargo handling equipment, have occurred, creating localised hazard situations.

Nevertheless, if very large quantities of LNG were released into the atmosphere the resulting gas cloud could extend beyond the terminal area, or the immediate vicinity of a tanker in transit through a port, to affect adjacent port areas up to several hundred metres from the source of the escape.

Risk exposures entailed in an LNG port project should therefore be analysed by a Quantitative Risk Assessment (QRA) study. Such a study must involve the operations at the terminal and the transit of tankers through the port.

Risk assessments do not of themselves improve safety, but they should be regarded as decision tools in order to satisfy company safety policy and the Authorities that risk is acceptable.

2.1 QRA Methodology

Quantitative Risk Assessments are conducted across a wide spectrum of industrial and other activities. Each application will encounter quite different physical realities with different priorities, different frequencies of hazardous events and varying quality of data for the frequency of such events. Hence actual QRA techniques often will vary from one specific situation to another. In this case (LNG tanker operations in ports) the essential QRA approach will be adapted to the specific risk profile of these operations.

There are many factors influencing the outcome of a QRA which have to be taken into account, such as layout of the port, nearby buildings, population density, traffic etc. Shipowners have little or no control over these important factors.

Quantitative risk assessments cover a probability model of the activity with a wide range of consequence models for determining the risk picture.

In this context Risk is defined as the product of the Frequency of an event and the Consequences arising from it - i.e. R=FxC

Variations in application notwithstanding, the methodology for all QRAs entails the same fundamental elements:

- (a) System Definitions (define what objects and type of operations to be analysed)
  - (b) Establish Risk Acceptance Criteria (what is acceptable risk w.r.t. personnel, assets and environment?)
  - (c) Identification of Hazards (what can go wrong?)
  - (d) Assess the Probability of each Hazardous Event (how often?)
  - (e) Assess the consequences (what is likely to be the result?)
- These elementary processes define the parameters of the risk arising in any particular theatre of operations. From this position it is possible to further refine the process to:
- (f) Assess the potential for consequence escalation (How bad can this get?)
  - (g) Assess the capability for effective response covering design measures and contingency planning (What can be done to limit the consequences?)
- The final steps in the process are:
- (h) Ranking of the Identified Risks in terms of likely severity.
  - (i) Specification of Risk reduction and Risk suppression measures.

SECTION 1

The hazard profile presented by LNG tankers in port areas is narrow. The ships are robustly constructed and well equipped with critical safety systems. Methane is not toxic and presents no pollution risks to the port environment. Hence, provided they are competently managed and maintained, such ships present low exposures across a wide spectrum of operational risk.

Major incidents, involving serious structural damage to LNG tankers, are extremely rare.

There are a number of recorded incidents of LNG escaping during cargo transfer at loading and receiving terminals. In those cases the volumes were relatively small and the effects of the releases were confined to the immediate environs of the terminals concerned.

There has never been an incident involving the penetration or catastrophic failure of an LNG tanker's containment system - indeed, the safety record for this class of ship is exemplary. Nevertheless, this safety record notwithstanding, the risk profile of LNG tankers presents a very serious residual hazard in port areas if the vital structure of the tanker is penetrated.

Thus the paramount objective in managing LNG shipping operations in port areas is the elimination of any credible risk of a tanker's containment system being breached.

The following sections outline procedures that may be used to analyse operational risks in specific locations and the measures available for suppressing them.

Bibliography for Section

1. ...
2. ...
3. ...
4. ...
5. ...
6. ...

There exists today a vast amount of literature on how to perform QRA. This chapter will therefore not go into further detail of the technique as such, but will highlight special areas related to LNG port operations.

(Refer SIGTTO "Guidelines for Hazard Analysis: Aid to Management of Safe Operations in Port", Feb. 1992.)

## 2.2 Special Areas for Performing a QRA of LNG Port Operations

Each port environment will present a unique set of risk exposures for prospective LNG operations and, thus, each will require a specific, detailed study of the operating environment in every case.

Nevertheless, whatever the particular circumstances of specific localities every analysis will encompass two broad areas of risk exposure:-

1. The transit to and from the marine terminal;
2. Operations at and alongside the tanker berth.

In succeeding parts of this section a generalised exposition of how a QRA might be applied is offered, to illustrate use of the technique in the context of LNG operations in port areas.

### 2.2.1 Port Transits

Analysis of the risks inherent in the transit of a tanker to and from its berth must entail an examination of all relevant factors that might lead to the tanker suffering a collision with another ship or a fixed object, or running aground.

In assessing the likelihood of such events the assessor should at least take into account:

- (a) The recorded incident rate for the transit passages concerned. This should cover all vessels, especially since there is unlikely to be any previous recorded incidents involving LNG tankers. In interpreting past incidents in a port, planners should identify the contributing factors (e.g. visibility, passing distances etc.) and consider how these might also affect LNG tankers.
- (b) Traffic density, the extent of navigable water and the incidence of poor visibility. These factors are usually major contributors to the frequency of accidents to ships in confined waters, irrespective of the particular features of specific areas.
- (c) The specific features of the transit passage in question that might contribute to the operational risks entailed. These will include all factors that could conceivably compromise track keeping - i.e. bends in the approach channel, tidal flows that run in

directions other than that of the track, obstructions and isolated dangers that require precise and controlled track alterations.

- (d) Likely encounters with other ships. The geometry of such encounters should be analysed to assess the chances of their precipitating a collision as a consequence of mechanical failure or operational misjudgement, on any of the ships involved at critical points during the encounter.

Through such an analysis - considering the specific risks posed in an operating area, the recorded experience of marine operations in the area, the projected frequency of critical mechanical failures - it is possible to achieve an assessment of the probabilities of a transiting tanker suffering a collision or grounding. It can also provide an indication of the mitigation measures to be adopted.

The accuracy of any formal risk assessment will depend on the availability of past incident data. The value of such data will vary from port to port and in some cases a well defined assessment may not be possible.

Whether or not the resulting assessed risk is acceptable depends on an appreciation of the likely consequences. The analysis must therefore be accompanied by an assessment of the possible consequences arising from the identified hazards (of collision and grounding).

Section 1 describes the resistance of a typical LNG tanker to the impacts of grounding and collision. Both theoretical analysis and the experience of past casualties indicate a robust level of resistance. The tanker's double-hull construction enables it to absorb considerable impact energy before the inner hull and containment of the LNG cargo is breached.

Hence the paramount objective of the analysis is to identify those potential incidents that could lead to the transiting tanker suffering high-energy impacts - impacts that might lead to a penetration of the inner hull.

While this remains the paramount objective, any damage to the tanker will have serious consequences - both commercially and in terms of confidence among the community of port stakeholders in the security of the transit operation.

Hence the results of the QRA process should yield as a minimum:

- (a) A high confidence in there being a low risk of the tanker failing to maintain track during the transit - this might be considered a probability of the order  $10^{-4}$ .
- (b) A high confidence of the tanker not encountering other vessels in situations that present risks of collision - again high confidence might be ascribed a value of  $10^{-4}$ .

- (c) No credible scenario leading to a high energy grounding that holds the prospect for the inner hull being penetrated. This might be ascribed a more remote probability than (say)  $10^{-7}$ .
- (d) No credible scenario that might lead to the tanker encountering a heavy displacement vessel in situations where the resulting collision impact could be sufficient to penetrate the transiting tanker's inner hull.

These criteria are offered as general guidance for what might be recommended in establishing an acceptable level of risk exposure for LNG tanker transits. They MUST NOT be taken as firm recommendations. What is acceptable in any given set of circumstances rests ultimately on local judgements of the consequences of a particular event and an appreciation of the operational circumstances of particular port areas.

Nevertheless other sections of this guide illustrate the measures that may be taken to achieve desired standards of security during tanker transits. These might include: traffic control; exclusion zones around transiting tankers; tug escorts (NB: these will be most useful when it is necessary to limit the tanker's speed, so as to maintain control, while avoiding the risk of high energy grounding) and specified limiting operating conditions of wind speed and visibility. The effect of introducing such risk mitigation factors should be used in the QRA.

### 2.2.2 Terminal Operations

The safety of berthed tankers rests on two sets of defences: those provided to ensure the integrity of LNG transfer at the berth and those aimed at preserving the security of the berth and any ship that might be lying alongside. These are described and illustrated in other sections of this Guide.

There already exists extensive guidance for ensuring the integrity of the ship/shore interface and a QRA of this feature of port operations is implicit in the application of such guidance to the design process for the marine terminal.

Hence the process of site selection, design of the mooring arrangements, specification of the array of transfer arms and specification of maximum operating limits will, effectively, determine what the risks to the integrity of the transfer system are and will specify those measures required to assure its integrity.

However the terminal may remain exposed to risks arising as a consequence of intrusions, accidental or otherwise, into the environs of the berth by other vessels operating in the port.

These risks must first be assessed at the design and site selection stages of a terminal's development. They should

also be reviewed from time to time over the life of a terminal's operation, since conditions in the port might change and with them the pattern of external threat to the terminal and its berthed tankers.

### 2.2.3 QRA of Intrusive Risk Exposure

There are two categories of intrusive risk; that arising from intrusions threatening the physical integrity of the terminal and berthed tankers (e.g. heavy displacement ships), and that arising from the introduction of uncontrolled ignition sources. This latter category will include every type of unauthorised craft, irrespective of its potential for inflicting physical damage at the terminal.

- (a) Intrusions by Heavy Displacement Vessels. The process of site selection (for the terminal) should address a site's exposure to intrusion from other craft using the port - see Section 4.

A QRA analysis should encompass the likelihood of other ships in the vicinity (in transit or berthed at adjacent facilities) presenting a threat of intrusion to the LNG terminal as a result of operational misjudgement or mechanical failure.

The analysis should entail an assessment of what is the worst feasible case, based on the displacement, speed and striking angle of an intruding ship. This should be established, in the first instance, before the initial site selection is made and appropriate defensive actions taken if required.

Thereafter there should be regular reviews of this category of risk exposure to ensure that port developments in the meantime have not introduced intrusion risks that were not prevalent at the time of the terminal's commissioning.

Through this process the probability of a high energy impact, threatening the integrity of the terminal structure and containment systems of berthed tankers should be derived.

The acceptability of such residual exposure is a matter of local judgement, but for general guidance and in recognition of the possibly serious consequences of a high energy impact, such events should be more remote than  $10^{-6}$ . A lower risk threshold might be accepted for intrusions that threaten less severe damage.

- (b) Intrusion of Ignition Risk. The integrity of all defences at the terminal rests on the exclusion of all uncontrolled ignition sources. "Uncontrolled" in this context means any potential source, whether shore or sea based, not under the direct control of the terminal management. Thus tugs,

2.3.1 For Frequency Estimates:

- description of port layout and jetty arrangement.
- the emergency shutdown system. Shut down response time.
- separation distances.
- active and passive fire protection.
- ignition probabilities
- weather data
- traffic data
- other incidents in the port area
- vessel integrity data, collision energy required for penetration
- collision and grounding probabilities
- safety design of a facility – e.g. fail safe systems
- maintenance of a facility

2.3.3 Risk Calculations

- personnel at risk (crew, terminal employees and public)
- other vessels in the vicinity
- damage to material assets
- environmental impact

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2.3.2 For Consequence Estimates (covering both consequence to terminal, LNG vessel and surrounding environs):

- distance to public areas and public densities (population)
- gas dispersion, including cloud dispersion models, size estimates etc.
- gas release models (jet release and dispersion calculations)
- personnel distribution
- fire and explosion calculations
- personnel exposure estimates and fatality calculations

supply boats and bunker barges are deemed to be controlled ignition sources if their entry to the terminal environs is subject to terminal management control and is allowed only when conditions permit – i.e. when cargo transfer is stopped and the custody system is shut down.

Hence, any water craft entering the environs of the terminal presents an ignition risk. This is most potent when transfer operations are under way and there is a heightened risk of an escape of gas at the ship/shore interface.

Assessment of such risk rests on a detailed understanding of traffic flows in the area of the terminal from which the likelihood of an intrusion, by accident or design, might be assessed. Factors to be considered should include:

- The proportion of port traffic in the area not under the control of a licensed pilot.
- The typical trajectories of passing traffic.
- The presence of pleasure craft, particularly those under sail.
- The presence of fishing vessels.
- The presence of barge traffic, its density, typical displacement and factors likely to affect its control and predictable trajectories – e.g. currents.

Such assessment should reveal the probability of an intrusion. The management of such exposure, within acceptable limits, should be addressed primarily in the site selection process with residual risks being reduced to remote contingencies managed by operational procedures – e.g. warnings and the vigilance of security watches. Acceptance of residual risk is a matter for specific determination in particular circumstances, but as a general guide operators should be satisfied that the probability of an uncontrolled ignition source gaining access to the terminal area during LNG transfer is no greater than 10<sup>-6</sup>.

2.3 Summary of General Considerations

Previous sections have addressed the specific operations of port transits and terminal operations. But for all exercises aimed at establishing a QRA for a particular operation the following elements ought always to be addressed and taken into consideration.

### 3 Managing Tanker Transits

During its transit from the open sea to its terminal berth and return to sea, an LNG tanker will be exposed to the same profile of operational risks as any other ship of similar size in the same operational theatre. However the consequences of severe structural damage to the LNG tanker may be far more serious than those of similar incidents involving other types of ship.

Hence every phase of the port transit must be analysed with the express purpose of eliminating any credible probability of the ship sustaining serious hull damage. This approach requires an analysis of the physical features of the transit – e.g. approach channels – and an examination of associated port services, such as pilotage, tugs and VTS.

The security of LNG tanker transit operations rests on two distinct but related sets of activity. First, a systematic analysis and preparation of the operational environment with a view to eliminating all potent threats to the transiting tanker and, second, establishing a set of operational procedures that effectively manage any residual risk still existing in the operational theatre.

#### 3.1 Anchorages

When an LNG tanker is obliged to lie at anchor off a port, waiting to progress to her berth, the circumstances prevailing at the anchorage should be analysed to determine if it is likely to be exposed to unacceptable risk. Above all there should be a careful scrutiny of the possibility of it being struck by other ships passing in and out of the port – particularly high displacement ships moving at speed.

The more dense the port traffic, the higher the risk to the vessel as she lies at anchor. It may seem convenient to locate an anchorage at the end of a channel to a berth, but this merely serves to increase the risk of collision whenever a departing vessel has to pass close to the ship waiting in the anchorage. The risk increases if the departing ship has to manoeuvre around the anchored ship before regaining her intended track, if the area is susceptible to bad visibility or if it is necessary for the manoeuvring ship to maintain a high speed.

**Whatever the specific circumstances, no anchorage should be designated for use by laden LNG tankers if it carries a risk of a threatening encounter with heavy displacement vessels travelling at speed, in the context of normal operations of the port.**

Port Authorities generally recognise a need to keep ships carrying hazardous cargoes segregated from other classes of ship. Hence it is not uncommon for a specific anchorage

area to be designated for such ships, often, but not always, outside port limits away from other port traffic. It is not uncommon therefore to have LNG tankers sharing an anchorage area with oil and chemical tankers.

However the hull shapes and profiles of LNG tankers are quite different from those of other classes of tanker. Their hull forms are more closely akin to those of large container ships and car carriers. Their behaviour, under given conditions of wind and tide, is likewise similar to other high sided ships. They are more often wind-rod than tide/current-rod, whereas a loaded tanker more commonly lies to the current or tidal stream.

Such factors should be taken into consideration when designating an anchorage for LNG ships. Because it presents a large side area to the wind, an LNG ship is prone to drag her anchor more easily than some other classes of ship. A good holding ground is therefore essential and may have to be better than that required by other ships. When an LNG tanker begins to drag anchor it is difficult to arrest the accelerating momentum. Regaining control will take time and meanwhile it is essential that the ship not be exposed to grounding on obstructions with a potential to penetrate its bottom structure.

An anchorage designated for use by LNG tankers should be clearly be indicated, on navigational charts and on site. The area should be prohibited to all other transiting ships. The characteristics of the anchorage should be compatible with the characteristic behaviour of LNG tankers under the prevailing conditions of wind and tide. Above all, it should not expose an LNG tanker to the prospect of a hull penetration – e.g. by grounding on rock pinnacles – in the event that it drags anchor.

### 3.2 Approach Channels

The configuration of an approach channel designated for use by LNG tankers should be determined by the same elementary factors that inform the use of restricted channels by any other class of ship. In broad terms these address the depth of water required, the manoeuvring characteristics of the contemplated ships, within expected operating conditions, while maintaining effective control of the transiting ship. Thus:

- the ship's draught, including any increase in draught caused by the decrease in water density.
- squat, which is related to the speed of the ship, water depth and channel profile.
- reduction of under keel clearance as a result of pitching or rolling.
- the interaction between the sea bed and the ship's bottom as a consequence of the trim of the ship.

The width of the channel too, should be examined throughout its length to confirm that it provides adequate navigable water in all credible operational contingencies.

The principal determinants of channel width are the manoeuvring characteristics of the contemplated ships under the most severe permissible operating conditions, together with the speed needed to sustain directional stability and achieve the required turning momentum on bends in the channel. Thus channel widths might vary, depending upon the expected speed of the vessel in that part of the channel and around bends. If a channel is straight at its sea approach then bends before entering a straight section, prior to approaching the berth, the bend and latter sections might have to be wider than the first section. The speed of the ship in the first section would be expected to be greater than in the final straight section, when the ship would not be so directionally stable.

Similarly the width of bends should be determined by the expected speed of the vessel as it negotiates such sections. If, for example, the bend radius is less than optimal, because of surrounding limitations, the width should increase to allow for the extra space needed for negotiating the bend.

Any channel between the sea approach and the LNG terminal should be clearly defined by navigation marks, particularly the extremities of the channel. In those areas where it is difficult to ascertain the seaward end of the channel, a fairway buoy should be considered, preferably with a Racon fitted. The navigation marks can be in the form of fixed beacons (preferable in locations with strong currents) or buoys of an appropriate size, shape and colour for ease of recognition even in poor visibility. They should have clear markings and distinguishable lights if there are to be shipping movements during darkness.

Leading marks (with lights for night or poor visibility navigation) are very useful in defining the required safe track (usually the centreline) along a channel, especially in areas where high currents or traffic density may periodically result in buoys becoming displaced. Fixed on land they are inherently more reliable than anchored in water. Nevertheless their utility depends upon the distance between the front and back lead, and the distance of the observer from the leads. Leading marks are particularly useful during long passages to a terminal, especially along rivers. The ship's transit along the required track can continuously be monitored when navigating from one set of leads to another, meanwhile the maximum extent of navigable water can be defined using beacons or buoys.

In designing the final approach to the berth it is essential that there is adequate scope to reduce speed, while still retaining directional control over the incoming tanker. It is also essential that the final approach can be made without requiring incoming tankers to be steered directly at the berth while still having to maintain significant headway.

### 3.3 Turning Basins

If LNG tankers are required to be turned around, either prior to berthing at a terminal, or after departure, the size and shape of the turning basin should be consistent with manoeuvring the ship under the maximum specified operating limits for conducting berthing operations. Generally benign weather conditions might predicate a smaller turning basin than would be required if strong winds and significant current effects are anticipated. In general the stronger the weather and current forces the larger the basin should be.

Shallow water in the basin will adversely affect ships' turning characteristics and, if bottom sediments are easily disturbed during manoeuvring (by tugs as well as the ship), mud and silt might enter the ship's condenser and cooling intakes, resulting in loss of power or engine failure.

The utility of a turning basin should also be considered for an emergency anchorage in the event of an approaching tanker suffering some failure or mishap that impedes its safe progress to the berth. Similarly, if the ship has to vacate its berth in an emergency it may be prudent for it to anchor in the turning basin while awaiting assistance before proceeding further, especially if it has to negotiate a channel passage.

The turning basin should be clearly marked by the use of beacon or buoys to enable the ship handlers to be very clear as to the size of the basin and its extremities.

**The paramount concern, in determining what shall be an acceptable geometry of an approach channel for a transiting LNG tanker, must always be to eliminate the possibility of its suffering a high-energy impact at any point during the transit. Hence the chances of its sustaining contact with the bottom or sides of the channel should be suppressed by the application of sound design, coherent with the ships' characteristics and control features. More important is elimination of threats posed by rock outcrops and other obstructions that pose a risk of penetration of a tankers' hull.**

*For further, more detailed expositions of the criteria for establishing safe approach channels see the bibliography for this section.*

### 3.4 Operational Management of Tanker Transits

Having established an inherently non-threatening operating environment for LNG tankers it is also necessary to establish a framework of procedures, derived precisely for application in the specific circumstances of a particular port.

The following sections illustrate a number of possible elements in such a framework. Some will not be appropriate, or necessary, in the actual circumstances of some ports, while others will be applicable to all classes of ships irrespective of their cargoes.

However, established practice and procedures notwithstanding, a distinct framework of operational management for LNG ships must be expressly and deliberately constructed to address the assessed (residual) risks in specific port environments.

#### 3.4.1 Quality Verification Processes

All operational procedures and processes rest on certain assumptions, expressed or implied, of quality, in the human participants involved. Sound risk assessment studies will discount the risks of remotely credible failure events, in even the highest quality participants. But the frequency of such failure events is virtually certain to increase if the assumed quality in participants is not assured.

Operational management procedures therefore must include quality assurance procedures for both the tankers and the port services, employed to support their transits to and from sea.

### 3.4.2 Ship Inspections Prior to Arrival in Port

Pre-arrival inspections are a common feature of bulk oil trading, but not at all common in LNG shipping, where tankers generally have been dedicated to regular trading between a small number of ports. Consequently ports are familiar with the ships and, perhaps more importantly, the ships' crews are familiar with the ports.

However, increasingly LNG tankers are being assigned to less structured trade patterns and crew familiarity with ports and ports' familiarity with ships is set to dilute. Crews used to working in a particular way in one project might overlook specific requirements of another, and different established customs too, may give rise to misunderstandings. Hence transferring a tanker from a dedicated trade pattern to an unfamiliar port might compromise the effectiveness of established safety procedures at that port.

Pre-arrival inspections should form part of a process by which terminal managers and port authorities assure themselves that a tanker, new to the port, is familiar with the critical risk management procedures established for its operations, and that its crew are cognisant of their responsibilities and competent to discharge them.

*Note: Proliferation of vetting inspections in the oil trades has given rise to excessive demands on ships staff in port. The industry seeks to minimise this burden by sharing inspection data through the OCIMF's SIRE system. Shipowners and all parties involved in LNG carrier inspections are urged to take advantage of having reports posted on this system to help prevent a proliferation of repetitive inspections.*

#### 3.4.3 Passage Planning

In well managed ships, irrespective of type, it is accepted best practice to actively plan sea passages berth to berth. Active planning of port transits serves to highlight special dangers, such as shallows and obstructions, and critical control parameters such as approach speeds and critical manoeuvres. The process thus provides for the ship's bridge team a clear picture of what lies ahead of them, how the port transit is to be accomplished and what is required of each of them, in ensuring the plan is executed in a controlled manner.

Active planning is calculated to provide continuous monitoring of a ship's track, early warning of deviation from plan, rapid and effective response to deviations from track and the approach of dangers – e.g. collision risk. Expected speeds also should be marked for each part of the transit. No tanker should be committed to successive stages of the transit unless speed and position in the channel conform to plan and, if meeting tugs, their number and readiness has been confirmed.

### 3.4.4 Abort Procedures

Formal planning of port transits should include contingency plans for aborting the transit and securing the safety of the tanker – e.g. by placing it in a temporary anchorage or returning to sea.

**It is essential that the port transits of LNG tankers be actively planned in the manner outlined above. Without this process there can be no assurance that the transit will be conducted under adequate control, nor can there be any assurance of the ship being able to respond effectively to unforeseen contingencies. Without a well prepared plan, a tanker's safety will rest entirely with the one person directing helm and engine movements. A single error on his part may then go undetected and thus place a tanker in needless jeopardy.**

### 3.4.5 Management of the Port Transit (Bridge Team Management)

Having a plan is essential but it will be ineffective unless progress of the vessel is continuously monitored against the plan. This is the function of the bridge team who should ensure that the guidance given by the pilot is appropriate to the position and intended movements of the vessel, taking into account any dangers to navigation in the vicinity of the vessel and along its intended track.

The aim of bridge team management is to create a proactive culture for managing the navigation, one in which the master and pilot are fed the information they require in advance of an intended manoeuvre and given adequate warning of developing situations that might undermine the integrity of the plan for the passage. Thus all officers on the bridge play active contributory roles in piloting the vessel, with the master in a supervisory or managerial role.

A regime of disciplined bridge management is especially important when a pilot is on board. It ensures that his actions are effectively monitored and challenged where they appear to deviate from the passage plan or the expectations of the bridge team.

*Note: The principles of bridge team management training are set out in a number of industry publications, two of the most comprehensive being the ICS publication "Bridge Procedures Guide" and the Nautical Institute's "Bridge Team Management". Bridge team training is available in a number of establishments throughout the world, drawing on the experience of the aviation industry in fostering a team approach to bridge operations in port.*

### 3.4.6 The Competence of Pilots

For large ships the services of a licensed pilot are mandatory for the conduct of port transits in virtually every port in the world, unless granted an exemption certificate.

Professional standards and experience profiles among pilots vary considerably from port to port, yet it is essential they all be familiar with handling characteristics of the ships they serve. LNG tankers are rare in the world's merchant fleets and it is unlikely, when operations are first introduced in a port, that its pilots will have had experience of them.

This is especially important in the case of LNG tankers since nearly all are still steam turbine driven while the bulk of the world's merchant fleet is powered by diesel engines. Steam turbine propulsion has markedly slower response times than those of the diesel engines common in all other classes of ship. Before committing their ships to the port transit masters must brief pilots on the handling characteristics of their ships, discuss the proposed passage plan from the pilot station to the berth and assure themselves that the plan is coherent with their ships' capabilities.

**Before LNG operations begin at a port with no previous history of the trade, it is prudent for simulator training to be provided for pilots and, perhaps, tug masters. Such training would aim to ensure all involved parties are thoroughly au fait with the proposed operation and are practised in handling emergency procedures and deviations from the plan.**

It may be preferable to designate a specialist team of pilots for LNG operations but even then, periodic refresher training is recommended to assure their continued competence.

### 3.4.7 Limiting Conditions for Operations

Virtually all ports in the world establish limiting criteria for operations when they experience severe weather or bad visibility. The limits applied to LNG operations should also contemplate the high wind areas associated with such ships and the characteristics of their propulsion plant. Operators should also recognise the wind speed limits applied to operation of loading and discharging arms. These will generally be set lower than wind speed thresholds normally applied to restrict vessel movements in a port – hence it may sometimes be prudent to delay port operation until wind speeds are reduced to levels that admit cargo transfer.

As a general principle there should be no impediment to conducting LNG operations at night – though the unique circumstances of particular ports may sometimes

recommend such restrictions. Often there is less traffic movement at night and this could present a transiting tanker with a lower probability for encountering other ships.

## 3.5 Special Defensive Procedures

By adopting the measures outlined in 3.1, 3.2 and 3.3 the operational theatre will be cleared of potential threats and, with procedures in place to assure the quality of operating participants, the security of LNG tanker transits will be substantially established.

Thereafter it is a matter for determination, in the context of particular ports, if additional measures are required. Such additional measures mostly comprise of direct intervention options, by which port authorities exert control over some or all facets of an LNG tanker's progress through the port.

### 3.5.1 Vessel Traffic Systems/Vessel Traffic Information Schemes

These schemes monitor traffic flows within a port and issue advice to transiting ships on the movements of other traffic in the area.

They are shore based with Vessel Traffic System (VTS) operators observing traffic on radar and advising other traffic, by radio, of movements within the area. Recently developed Automatic Information Systems (AIS) may have a growing role in the future – providing the same service.

For transiting gas tankers, who must avoid threatening encounters with other traffic, the advice flowing from such a service can be critical to their security in ports having dense and random traffic patterns.

### 3.5.2. Traffic Separation Schemes

Traffic separation schemes (TSS) are often very effective in organising traffic in a port and in port approaches into an orderly and predictable flow. Properly conceived they will considerably reduce the risks of threatening encounters between transiting ships and will help ensure that these ships remain in safe navigable water. They can be especially effective in preventing the particularly dangerous 'end on' encounters and which can occur frequently in confined waters or areas of high-density traffic.

A VTS in conjunction with a TSS is especially useful in controlling traffic in the vicinity of a transiting gas carrier. VTS operators can contact other traffic and the gas tanker, if a threatening event is perceived to be developing – e.g. a ship not complying with the rules of a TSS. In some ports, authorities have thought it prudent to suspend all other ship movements while a LNG tanker is transiting.

### 3.5.3 "Moving" Safety Zone

It is sound practice to establish a cordon sanitaire or exclusion zone around a transiting gas tanker. In this way an area of sea space is established around the tanker into which no other traffic is permitted to enter. Hence the tanker's progress will never be immediately hindered by encounters with other traffic, nor will it encounter traffic having the potential to penetrate its hull.

The dimensions and shape of an exclusion zone should be determined in the context of the specific conditions of a port.

In a port with a narrow access channel it is sound practice to prevent traffic entering the channel in the opposite direction while a gas carrier is in transit i.e. preventing an 'end on' encounter. In exceptionally long access channels may be acceptable for traffic proceeding in the opposite direction to proceed so far and then stop in a 'passing place' but in all cases the transiting gas carrier must have priority.

Where traffic is proceeding in the same direction as the tanker the zone may extend some 1 to 2 miles ahead of it gas carrier, a distance determined by the distance required to bring the following gas carrier safely to a stop. Traffic following the gas carrier should be excluded for a similar distance, allowing scope for the gas carrier to slow down manoeuvre without it being impeded by the approach of following ships. In general no gas tanker should be overtaken in a channel, regardless of the width of the channel. In general, traffic should not cross closer than 1.5 miles ahead or 0.5 miles astern of a gas carrier.

In some circumstances it may be prudent to deploy a patrol craft to escort a transiting gas tanker. This may be either a small craft that can patrol well ahead of the gas carrier advising other traffic to keep clear, or a tug that can enforce the zone by deliberately putting itself between an approaching vessel and the gas carrier. In some ports a tug of sufficient power to assist a gas carrier to turn in the case of emergency, is preferred. A tug need not necessarily be 'escort tug', capable of assisting the gas carrier at full transit speed, but one of sufficient power enabling it to alter its trajectory at low speeds.

## Bibliography for Section 3

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2. *Marine Structures: Design and Construction - 1981, 1983*
3. *QDS in Vessels (Code) - 1983, 1984*
4. *Oil Tanker Operations - Rules for Design - 1983, 1989*
5. *Guidelines and Dimensions for the Adjustment of Berths of Marine Terminals in Port Areas - Safety and Security - 1983, 1984*
6. *Guidelines for the Design of Marine Terminals with regard to Safety - 1983, 1984*
7. *Bridge Structures Code - 1983, 1984*
8. *Requirements for Vessel Traffic Services - 1983, 1984, 1985, 1986*

## 4 Terminal Site Selection

The most important single determinant of risk attached to LNG operations in port areas is the selection of the site for the marine terminal – the location of the tanker berth(s). The chosen site crucially determines the entire subsequent profile of risk for tanker operations; the approach channel (if any); the berthing and un-berthing manoeuvres; proximity to other port traffic and external ignition sources.

Invariably, and especially for receiving terminals located in developed port areas, the site selection process is formed by many considerations other than the risk implications for tanker operations. Availability of suitable land for the installation and the effects of associated local planning laws, constraints arising from the infrastructure of gas distribution and usage from the terminal and many other factors will weigh heavily in the selection process – not least constraints of acceptable cost.

Therefore, compromising some or all of the principle criteria for site selection is often unavoidable.

Nevertheless, the reality of compromise notwithstanding, no site should be selected for an LNG terminal that produces unavoidable potential threats to the security of its associated tanker operations thereafter, for as long as the terminal will operate. Such risks, accepted as routine at the inception of a terminal, even if they appear remote in the first instance, will inevitably come closer to realisation as the installation operates over its intended life – span.

## 4.1 Elementary Criteria

The specification process for constructing an LNG marine terminal is a well established discipline of civil engineering, similar in many respects to that used for developing marine berths for other classes of ships and other shipping businesses. Essential specification of the layout of the shore terminal – its LNG storage tanks, gas processing plant etc. – will be determined by national and local planning regulations. These will set the parameters, among other things, for the separation of the shore installation from adjacent industrial sites and populated areas in the public domain.

However it is unlikely similar criteria will exist for the marine terminal serving the shore installation. Such criteria that exist are provided by industry sources, and have been developed specifically to secure the safe mooring of tankers and secure transfer of hydrocarbon cargoes in bulk.

These latter criteria are critical for managing operational risk at the terminal during transfers of LNG cargoes and must form part of the basis of design of a marine terminal's structure. However, they do not extend to the port environs beyond the immediate location of the marine terminal itself. Hence what is an acceptable proximity to adjacent shipping berths and other port traffic, for example, is likely to be a matter for local determination in the specific circumstances of a particular port.

The safety and security criteria forming the site selection process therefore fall into two categories; those that address operations at the terminal when a tanker is transferring LNG and those that have a bearing on safety in the wider port environment. This latter category addresses hazards that might arise for LNG tankers transiting the port, threats to them while berthed and hazards that might arise for other port users as a consequence of LNG transfer operations at the terminal.

## 4.2 Terminal Operations (Basis of Design)

Fundamental criteria that effectively set the risk profile for a marine terminal are established in the "basis of design". These are the operating limits for the terminal and the range of ship types for which berths are to be provided.

## 4.2.1 Environmental Conditions

Established civil engineering practice will address the sustainability of the marine terminal structure in the local climate – usually by reference to the severest expected weather (100 year recurring storm).

However, managing tanker operations requires detailed studies of more common weather conditions, to determine what is the likely frequency of 'down time' – that is the frequency of weather conditions that do not permit tankers to berth or operate while alongside. Jetty mounted transfer arms and ships' mooring outfits are both designed to operate within prescribed maximum wind forces. It is necessary to establish beforehand that these limits will not normally be exceeded.

Sea conditions too have an immense impact on the long-term risk profile of a terminal. Certain dynamic forces included in a tankers mooring system can undermine its effectiveness and wave induced movement in a berthed tanker can create excursions in the ship/shore connections of the transfer arms.

Extensive data on climatic and wave conditions are therefore essential for ensuring that tankers can safely berth and remain alongside the terminal without compromising the effectiveness of mooring systems, the design limits of the transfer arms and the maximum designed excursion of the manifold connection of the transfer arms.

The basis of design must therefore be formed by detailed studies, preferably confirmed by simulated testing, that can confidently predict the operability of the planned terminal in the prevailing wind and sea conditions.

For further, more detailed, exposures of the criteria for establishing safe approach channels see the bibliography for this section.

#### 4.2.2 Functionality and Design

Safe tanker operations at a terminal depend crucially on secure moorings for the ships (see section 5). It is therefore critical to the long-term security of operations that, in selecting a site for the terminal, there is sufficient flexibility to accommodate the full range of ships likely to use the facility. The number and arrangement of mooring dolphins and the array of transfer arms must in fact be suitable for all likely sizes of ship. There should never be a need for a ship to have sub-optimal mooring restraint because it is not possible to achieve effective leads for its mooring lines, or provide evenly distributed and adequate load bearing restraint for its flat sides.

Forces transmitted to the jetty structure during berthing manoeuvres should also be discounted in the design. Calculation of the berthing energy should normally conform to established methods (e.g. BSRA or PIANC). The designed absorption capacity of the fender at 50% fender compression (and of berthing angle) should be greater than the envisaged berthing energy. Hence it is recommended that no fenders are directly supported by the structure of the loading platform – the risk of damage to the loading platform in case of a mis-managed berthing manoeuvre, being too high. An approach (speed) meter, to help control berthing speeds is therefore also recommended.

The functions of the breasting dolphins are:

- to absorb the berthing energy of the ship.
- to support the ship alongside a berth.

The energy of an uncontrolled berthing manoeuvre will be translated into deformation of the fenders and, ultimately, damage of the dolphins themselves. One of two (dolphin) failure modes can be considered: plastic deformation of the steel piles, or plastic deformation of the sub-soil. The latter mode is recommended because a more or less inclined fender system is preferred to a system with one or more buckled piles which cannot be refitted upon. The first cannot be re-used after damage, while the second can still support a safe berthing due to the redistribution effect of the sub-soil – provided the resulting inclination is not excessive.

Since the reaction force on the rigid dolphin increases very sharply when the fender is fully compressed, the piles should be designed with enough margin to take the additional load presented. The breasting dolphin calculation will further take into account the combination of loads given on the basis of design (e.g. example loads by the ship alongside in combination with the loads transmitted by mooring lines).

#### 4.3 Port Operations (Manoeuvres)

The process informing the basis of design, described above, is essentially concerned with providing a safe berth for tankers. A berth that can be safely approached and where tankers can be securely moored without compromising the integrity of the ship/shore interface, within the specified operating limits of the terminal.

Such factors inevitably will influence the selection of the terminal site, but other, equally compelling, determinants must also form the selection.

##### 4.3.1 Berthing Manoeuvres

Given the designed load bearing limits of the berth the practicality of conducting safe berthing operations must be established beyond any reasonable doubt. The orientation of a berth in respect of a tanker's approach track must be considered in relation to the approach speed and the concomitant ability to maintain control over the manoeuvre at all stages, up to final contact with the dolphins.

In virtually all credible operating conditions the final approach speed of the tanker will be insufficient to maintain effective directional control – hence tug assistance will be essential. This should be specified in terms of the power required to maintain control over the tanker under maximum permissible operating conditions, assuming loss of the tankers' own main propulsion.

*NB: Maintaining effective control over a tanker of some 130,000 m<sup>3</sup> capacity, in generally prescribed operating limits of wind speed, should be well within the scope of a tug fleet having a total effective bollard pull in the range 130-200 tonnes. However, forces generated by even relatively slow current effects will exceed this range of power. Wave action too can significantly reduce the effectiveness of tugs and inhibit their ability to apply their maximum power to the berthed tanker. Hence it is essential, in circumstances where the berth is exposed to tidal and current influences, that these be accurately determined and that berthing operations are restricted to times when the available tug fleet still can control the tanker.*

The calculation of tug power and the definition of acceptable operating limits notwithstanding, the sizing of the terminal must not compromise the effectiveness of the tug fleet by, for example, restricting their ability to exert the required thrusts to a tanker's hull. An auxiliary issue is the type of propulsion fitted in the tugs. In sheltered harbours a number of smaller tugs may be more appropriate, while exposed locations are better served by a smaller number of larger more powerful tugs.

*Note: The long term practicalities and costs of dredging should be taken into consideration at the outset. Siting progressively reduces water depth and ship manoeuvrability. LNG ships are generally powered by steam turbines. Excessive sediment sucked into the main condenser can cause sudden loss of vacuum, and hence power. Channel silt is therefore a significant risk factor and, if it is a feature of a particular location, must be manageable. Planners must be assured that any anticipated programme of maintenance dredging is both feasible and permitted under prevailing environmental provisions.*

Much of the risk profile, attaching to subsequent LNG operations is thus determined by the initial decision on the siting of the marine terminal. Such risks ought to be explored and assessed through detailed study of the weather and tidal forces impacting on the site and the

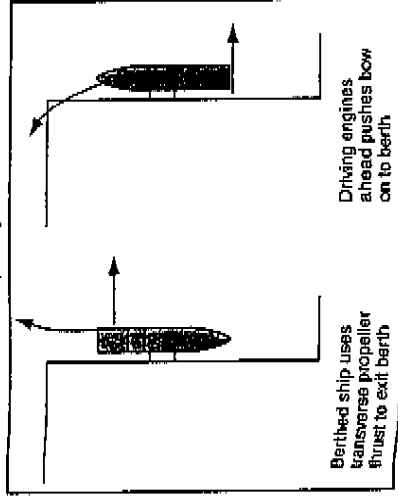


Fig. 4.1

feasibility of conducting routine operations within acceptable operating limits. Dynamic, real time simulations are strongly recommended, particularly to validate computer-aided tanker manoeuvres and the effectiveness of the mooring system.

#### 4.3.2 Departure Manoeuvres

Departure manoeuvres, though generally less problematical than berthing because they do not involve managing contact with the berth, should nevertheless be planned with the same care. It is still essential to maintain complete control over the tanker at all stages of the operation and to have assurance that control will not be compromised by loss of a tanker's main propulsion.

#### 4.3.3 Emergency Evacuation – Use of Tugs

It is common practice for terminals to contemplate emergency departure manoeuvres for tankers – often associated with scenarios involving fire in the terminal. Typically such a contingency will be anticipated by requiring the tanker to be berthed with its bows headed seaward. However, such a procedure, in itself, may not be sufficient to safely evacuate a berth in an emergency, in cases where tankers are not equipped with transverse thrusters and where tugs are not readily available, an emergency departure may be difficult or impossible to achieve. Indeed, where wind and current forces are tending to press a tanker to a berth, or where the transverse thrust of its propeller tends to turn it towards the berth, escape without tug assistance is not a feasible option.

#### 4.4 External Threats (Protective Location)

The operational integrity of a marine terminal notwithstanding, the security of LNG operations can be exposed to external threats, arising from the activities of other port traffic and adjacent industrial sites. Such potential threats must be evaluated in the site selection process for a gas terminal.

##### 4.4.1(a) Passing Ships

Ideally LNG marine terminals should be sited away from po fairways used by other ships. The most effective form of protective location is one where there is no possibility of other ships approaching and threatening the security of moored LNG tankers. Such security will be obtained by locating the terminal in a remote area of a port devoid of other developments, or in an exclusive dock area, not frequented by other port users. Even when protected from the threat of approaching ships, the berth ought also to be free from wave effects generated by passing traffic.



In reality it may be impractical or impossible to achieve this level of security in siting a terminal. Circumstances may dictate that some degree of exposure to other port traffic is unavoidable. In such circumstances the risks attaching to such exposure must be actively managed within tolerable levels - i.e. levels that exclude the possibility of a high-energy impact on the berth, sufficient to threaten the containment of a berthed tanker or the topsides of a jetty. This principle should be rigorously applied.

#### 4.4.1(b) Speed Restrictions for Passing Ships

A large vessel in transit displaces a large volume of water. The resulting surge is proportional to the size and speed of the vessel and the width of the channel. The surge will generate a dynamic loading on moored ships in the vicinity, a loading that could cause their mooring array to fail. Total break outs from berths, with accompanying serious consequences have occurred as a result of this phenomenon.

The effect of passing ships can be especially pronounced at berths recessed into the shoreline as a outway - the dynamics of the pressure wave of a passing ship are magnified when directed into a confined area.

Whatever the circumstances, no terminal should be sited on a bend in a shipping channel such that, inevitably, the trajectories of transiting ships pass through the terminal as they negotiate the bend. (See fig. 4.2).

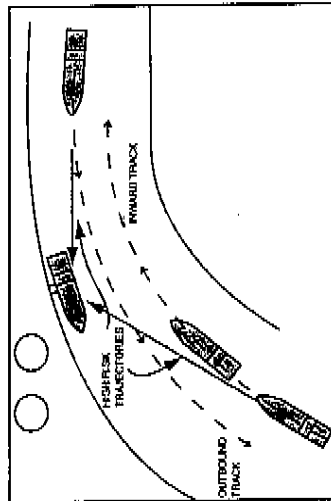


Fig. 4.2

Similarly, whatever the prevailing circumstances, no terminal should be sited in a position that admits the possibility of its being approached by heavy displacement ships, having an inherent capability for penetrating the hull of an LNG tanker.

Where such encounters are possible a protective barrier should be erected to shield the LNG terminal. (See fig. 4.3). If this is not feasible then heavy displacement ships should be conducted through the area with a tug escort sufficient to prevent collision with the terminal. In the event that steering or propulsion is lost on the transiting ship.

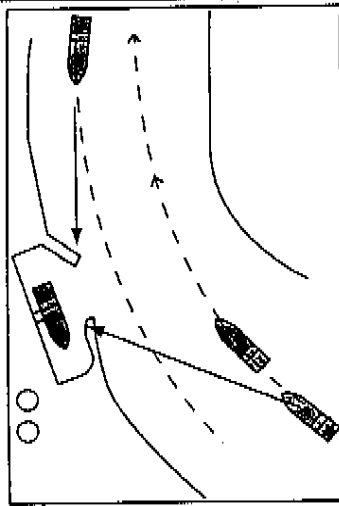


Fig. 4.3

#### 4.4.1(c) Ignition Risk

All port traffic, irrespective of its potential to inflict damage on gas assets, presents an ignition risk.

Hence, the issue of physical protection notwithstanding, all port traffic must be excluded from the environs of an LNG marine terminal. The extent of the exclusion zone established around a terminal is a matter for local determination, in the context of the prevailing conditions. However, an assessment must be made of the size of the maximum credible spill of LNG during transfer operations and the likely pattern of dispersal for the resulting gas cloud. The geometry of the projected cloud, together with a prudent additional margin, should inform the determination of the exclusion zone.

Prudent siting of the terminal will facilitate the effectiveness of an exclusion zone. Locations that already attract other craft, including pleasure craft and fishing vessels, are inherently unsuitable for LNG terminals. In such circumstances enforcement (of the exclusion zone) is highly problematical and, even with strenuous enforcement effort, may ultimately fail.

#### 4.4.2 Adjacent Berths and Operations

Exposures to other traffic and intrusive ignition sources are inherent in a terminal's proximity to other industrial sites and their associated marine terminals.

Hence judicious siting of an LNG terminal, in proximity to an adjacent industrial site, will invite inflated risks of ship encounters and (uncontrolled) ignition sources.

In developed port areas it will often be impossible to eliminate the risks of encounters with shipping serving adjacent industrial sites. The site selection process must therefore examine the patterns of these adjacent operations

to determine precisely what risk will be posed for LNG operations. Of paramount importance is the type of shipping involved and the critical question of whether it has an inherent capability of inflicting catastrophic damage on gas assets.

Assessment of the shipping risk must therefore take into account the displacement of ships manoeuvring in the vicinity of the LNG terminal, the pattern of those manoeuvres and the conditions under which they are conducted. Heavy displacement ships moored at adjacent terminals that are themselves affected by high winds and current effects carry a risk of breakout and uncontrolled drift.

The potential for: damage to the terminal or berthed tanker; failure of control during berthing or un-berthing manoeuvres; and failures at adjacent berths, must be formally assessed.

Such assessments should be formed by an understanding of the operating practices of adjacent terminals and ships. It is entirely possible that operations involving non-toxic and non-flammable materials will be conducted in a manner consistent with a lower risk threshold than LNG or other hydrocarbon based operations. Hence their overall security, in mooring systems, ship/shore cargo handling systems and ship manoeuvring, may be less than those applied to the LNG terminal itself. Thus they could present a generally higher inherent risk than adjacent hydro-carbon facilities.

Special consideration should be given to potential ignition risk from adjacent operations. Certainly where non-flammable materials are being handled, a high level of ignition risk should be assumed.

The proximity of adjacent operations is therefore of critical importance to the security of LNG terminals and tankers - but is, of itself, not the only or even principal determinant for selection of a safe site.

Close proximity to a site handling toxic or flammable materials, on which all ignition sources are rigorously suppressed, may pose a more acceptable risk exposure for the LNG terminal than a site with high ignition risks, located at a more remote distance.

Similarly, ships that are moored with a high degree of security in close proximity may pose a lesser hazard than those insecurely moored at a greater distance.

Indeed, the security of moorings on adjacent berths notwithstanding, their near proximity may be less relevant than the actual trajectory followed by a drifting ship. It is entirely possible, given the particular circumstances of two berths' relative configuration, for a ship breaking out at a more remote distance to pose a greater threat to the LNG terminal than one breaking out close by.

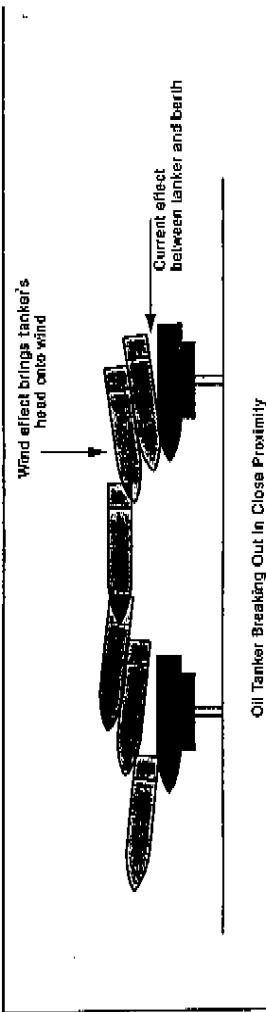


Fig. 4.4

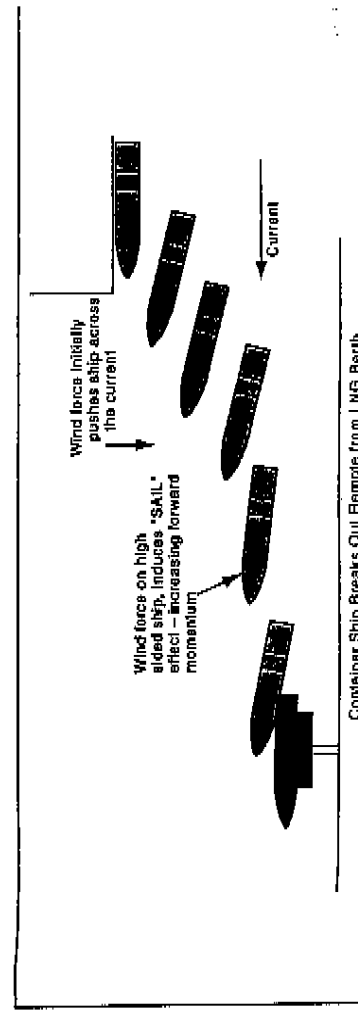


Fig. 4.5

### 5 Managing Gas Transfer Operations

Cargo transfer operations at marine terminals have received more detailed attention in industry circles over the past twenty years than any other aspect of LNG shipping operations. Intense efforts have been made to ensure the ship/shore interface is secured to a degree that renders large scale escape of LNG during transfer operations a non-credible event - provided industry recommended measures are faithfully applied.

Guidance and recommendations for managing liquefied gas transfer operations are well documented and readily available elsewhere (see bibliography for this Section). The elements of this guidance nevertheless are reiterated here to provide for those having responsibility for aspects of port operations an awareness of how secure transfer operations are achieved, and how these measures may be affected by events originating in the wider environs of ports.

This awareness is crucial for effective management of LNG terminal operations since, catastrophic penetration of a tanker's hull excepted, failure of the LNG transfer system presents the biggest single risk of LNG escaping into the atmosphere of a port. It is essential that all terminals designated for the transfer of LNG fully comply with recommended criteria. To do otherwise needlessly increases the risks of interface failure and consequential release of LNG.

#### 5.1 The Elements of Interface Security

Suppression of the risks of LNG escaping at the ship/shore interface is achieved by a series of defences for the tanker arms. These defences are: secure mooring for the tanker, so that movement of the arms is constrained within predetermined limits; emergency shut-down and quick release mechanisms for the transfer arms, and Powered Emergency Release Couplers (PERCS).

Supporting these defences should be ancillary and complementary measures; setting maximum operating limits for LNG transfer and tanker berthing; ship/shore operational controls; personnel training and emergency response procedures.

Finally, the marine terminal and any berthed tankers must be protected from threats to their defences intruding into their immediate environs from without. The most common potential threat being posed by the intrusion of other port traffic.

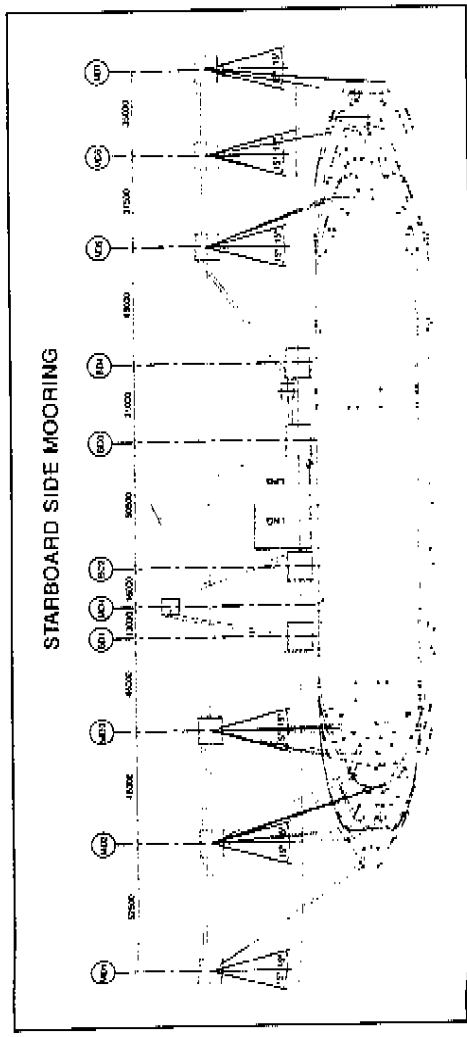


Fig. 5.1

It is therefore not possible to specify general criteria for the separation of LNG operations from adjacent berths and sites. Determination of what is acceptable in specific circumstances must follow from an assessment of the actual risks posed by the operators of adjacent sites, in the particular circumstances of individual ports.

#### 4.5 Port Development

Ports have dynamic environments; the pattern of their operations changes over time and with that the profile of their operational risks also change. Hence a site selection process, conducted with a careful consideration of the risks posed for LNG operations, can later be confounded by subsequent developments, long after the LNG operation is established.

There is a general tendency for ships in all trades to be made bigger. Ports, being competitive commercial undertakings, are committed to attracting users and retaining their businesses. They will therefore be keen to accommodate more traffic and larger ships, if users so desire, and to make the maximum commercial use of available land. Hence the operating environment in which an LNG terminal is constructed may change over time and with it the risks posed for LNG operations may also change.

The site selection process must be conducted with an appreciation of this reality. Ideally the site selected will be one whose operations remain indifferent to subsequent developments within a port. For example, where the terminal site is one that excludes any possibility of unwelcome adjacent developments, or where the marine terminal is located in a position that rules out threats from other shipping, irrespective of size or type. The proximity of passenger ship terminals, for example, would increase social risks by inserting a much higher human risk factor into the port area.

#### Bibliography for Section 4

1. *The International Safety Guide for Oil Tankers & Terminals (ISGOTT) - ICS, OCIMF (IAPH), 4th Ed, 1995*
2. *Safety Guide for Terminals Handling Ships Carrying Liquefied Gases in Bulk - OCIMF 2nd Ed 1993*
3. *Information paper no. 14 "Site Selection and Design for LNG Ports and Jetties". - SIGTTO 1st Ed 1997.*
4. *Information paper no. 15 "A Listing of Design Standards for Liquefied Gas Terminals (referencing Ports and Jetties)" - SIGTTO 1st Ed 1997.*
5. *Safety in Liquefied Gas Marine Transportation and Terminal Operations - A Guide for Self-Assessment - SIGTTO 1999.*
6. *Siting of Terminals (Case Study) - Bertrand LANQUETIN, LNG TECH II Asia 2000, Kuala Lumpur.*
7. *Bontang Future 3rd LNG/LPG Dock: a Design which Achieves Very High Levels of Flexibility, Safety and Reliability - Bertrand LANQUETIN, LNG 12 Conference, Perth 1998.*

Ideal solutions may not, however, appertain. The selection process must therefore consider prospective developments and the possible future consequences for LNG operational risk. Where there is undeveloped land in the vicinity of a prospective terminal, or where access to a terminal is by way of common user shipping channels there must be a possibility for future port developments that could undermine the security of LNG operations.

Such considerations should weigh in the site selection process, as well as consideration of immediately discernible risks. In contemplating possible future changes to risk profiles, planners should also consider the range of risk management options available to them. It may, for example, be entirely possible to manage the risks attaching to the appearance of heavy displacement ships in the vicinity, using the available traffic control mechanisms.

On the other hand it would not be prudent to discount the prospects for later developments that promise improved prosperity for a port, or that are demanded by other users. Such developments will be very hard to resist and should therefore be anticipated at the outset. Hence, the prospects for a changing risk profile must be part of the site selection process and entail an assessment of future capabilities for managing those exposures.

Benefits of a rigorous site selection process notwithstanding the issue of the long-term management of an LNG port operation will remain. The vital needs of security for the operation and the integrity of the procedures developed to manage it must find expression in contingency planning documents and, above all, be expressed in relationships with port authorities and service providers. This latter topic is more fully developed in Section 6.

practical experience confirm the bad practice of deploying mooring lines of different material and elasticity - "mixed moorings". Mooring arrays should comprise lines of similar construction and elasticity. They should have inherently low elasticity, such as wire or advanced synthetic materials. Concurrent deployment of moorings with different characteristics, such as synthetic ropes of high elasticity will introduce disturbing dynamic forces into the entire array when under load and, hence, reduce the restraining power of the system.

It is essential that proposed mooring arrangements for LNG tankers be tested and confirmed by analysis using established computer based programmes developed for the purpose. Such analysis is critical to confirm the operability of the berth envisaged in the basis of design.

### 5.3 Cargo Transfer Systems (Emergency Shut Down - ESD)

LNG is transferred through rigid articulated arms, set in an array on the cargo handling platform with a gas return line. The technical integrity of this system is assured primarily by secure moorings that ensure the arm array is never subjected to deformation or rupture by the tanker moving out the berth while still attached to the arms.

Secondary defence should be provided by two separate supplementary systems of emergency shut-down. One to automatically shut-down the transfer of LNG if the tanker moves outside a predetermined envelope (ESD), and another that will automatically disconnect the arms from the tanker, after the flow of LNG has ceased, if the tanker continues its movement from its permitted envelope. These systems may be operated manually, but are designed to operate automatically, or prompts that indicate a tanker is being disturbed from its berth.

Fig. 5.2 illustrates the principles of ESD operation. A critical feature of such systems is the ship/shore link. Emergency shut-down requires pumps to be stopped and valves closed on both ship and shore in a prescribed safe sequence. This procedure cannot be executed automatically unless ship and shore systems are linked.

An effective ESD system, backing up a sound mooring array, reduces the risk of a large-scale escape of LNG to negligible proportions. Hence it provides a fundamental guard for LNG transfers. No such transfers should routinely be conducted in the absence of a fully effective, linked ESD system.

The integrity of the transfer arms can be further protected by the installation of powered release couplers (PERCS) - devices designed to automatically shut valves close to the ship/shore connection and separate the arms from a tanker's manifold. Such devices represent a secondary ESD system - Emergency Release System (ERS).

The foundation of safe LNG transfer is secure mooring of the berthed tanker. Without this the security of the transfer arms is compromised, rendering all LNG transfers exposed to an inherent risk of LNG escape through rupture - with the dangers of emergency shut down and PERCS remaining to mitigate the consequences.

An understanding of the dynamics of ships' mooring systems has come late to the shipping industry, being investigated first as a necessary accompaniment to the introduction of very large oil tankers in the late 1960s. The high volume cargo transfer rates associated with these ships required hard and relatively inflexible arrays of transfer arms, which in turn required the movement of berthed tankers to be constrained within very limited tolerances.

The then unprecedented size of VLCCs also presented previously unknown forces acting on their moorings as a consequence of tide and wind action on their hulls. The principles of sound mooring practice are now well understood within the oil tanker sector and these have been readily applied to LNG tankers whose needs for secure moorings are identical.

Unfortunately, due to an absence of compelling need, this understanding has not spread widely to other sections of the shipping industry. As a result there may be found among the administrators and service providers of many ports an ignorance of what is needed to properly secure LNG tankers to their berths.

Fig. 5.1 shows the essential components of an effective mooring system. It consists of two complementary components; breasting dolphins to absorb the displacement load of the tanker, and mooring dolphins to provide securing hooks for ships' mooring lines and, thus mooring restraint. The loading/unloading platform, on which are arranged the transfer arms is not a load bearing component of the system.

Contrary to widely held popular opinion head and stern lines contribute very little to the restraint of berthed ships. That head and stern lines still have wide application in ports is due more to the practice of mooring ships to flush dock walls, than to their effective contribution to mooring restraint.

Effective mooring is achieved by arrays of breast lines led to secure points lying within the length of the ship, at angles no more than 15 degrees from the perpendicular to a ship's centre line. The geometry of the mooring array is not the sole determinant of effectiveness. Both theoretical analysis and

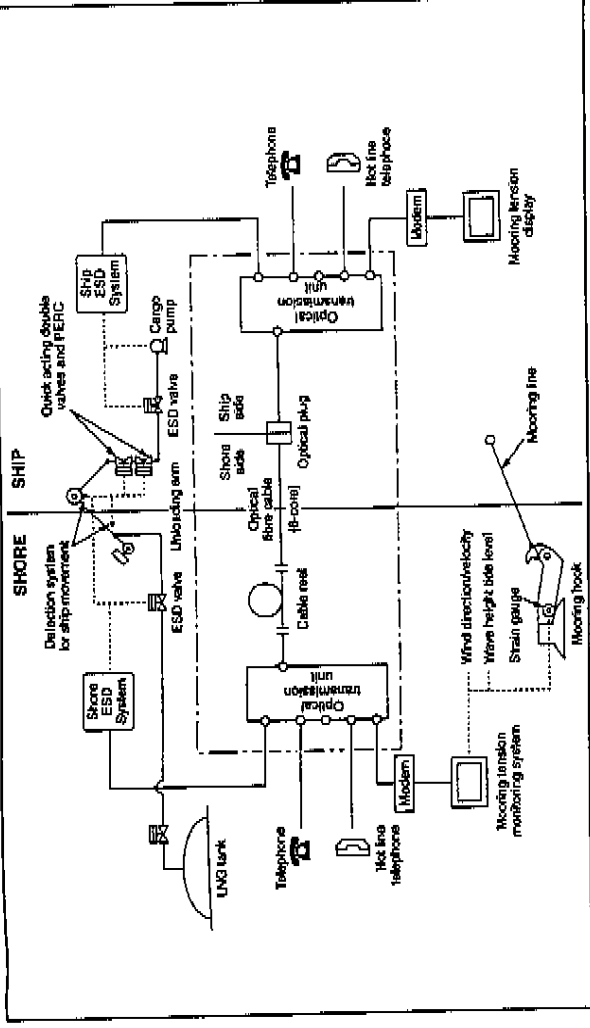


Fig. 5.2

An ERS system contributes significantly in two respects. If, for whatever reason, a tanker is displaced from its moored position the ESD system will automatically shut-down the transfer of LNG. If the tanker continues to be displaced the transfer arms will eventually be ruptured unless their connections to the tanker's manifold are released. Hence failure to execute a timely (manual) release of the connections will result in damage to the arms and the tanker manifolds, with an accompanying release of any residual volumes of LNG remaining in them.

An effective ERS system ensures that arms are automatically released before the tanker's movement is sufficient to damage them. It therefore provides a powerful defence for the structure of transfer arms and tanker manifold connections. It will also obviate the risk of release of residual LNG from the transfer arms - limiting the potential for release to the minimal quantities, if any, remaining in the range area itself.

Hence the combination of secure moorings, ESD and ERS systems produces a ship/shore interface of exceptionally high integrity - one where the risks of an escape of more than a minimal quantity of LNG during transfer operations is negligible.

**It is upon the effective operation, testing and diligent maintenance of these systems that the security of transfer operations chiefly depends.**

### 5.4 Jetty Operations and Control

With the ship/shore interface secured to the maximum possible extent and the risks of all but a minimal spill of LNG thereby excluded, the security package for LNG terminals is completed by a system of monitoring and control. There are no general criteria for specifying precisely what form any such system should take but certain salient features are common to all well managed installations.

Principal features of an effective system are: a human monitoring and intervention capability, located in a secure, protected, location; an effective fire-fighting system; monitoring of the critical elements of interface protection and escape procedures.

#### 5.4.1 Control Building

A jetty control building must be provided, located at some distance from the loading platform, where the probabilities for spillage and subsequent fire are greatest). Its location should nevertheless allow swift and easy intervention by personnel to the jetty by operations personnel at any time. Ideally control buildings should be placed outside the blast zone. If not then they should be constructed to blast proof standards. The control building should incorporate accommodation for mooring teams and have a ready supply of protective clothing and equipment.

Recommendations on the valves to be used can be found in regulations for buildings design (for example the recommendation "Process Plant Hazard and Control Building Design" from the Chemical Industries Association).

5.4.2 Control Systems

Monitoring and control systems for operations on jetties whose design is based on the "unmanned concept" (i.e. operators presence not necessary on the jetty head) are critical for the safety of transfer operations. The principal objective of control systems should be the enhanced safety of operations and personnel - not a reduction in jetty manning.

The overall control of the installation is through a Distributed Control System (DCS).

A schematic representation of a DCS is given in fig. 5.3. Such a system is devoted to the continuous monitoring of

critical data for the transfer of LNG - line pressures, temperatures, position of valves in the transfer system, flow rates and vapour pressures.

However the effectiveness of the principal security systems should be monitored by specific monitoring systems:

- for the loading arms: A Position Monitoring System. This will display the position of the arm flange closest to the alarm first step and trigger the pre-alarm. The alarm first step (ESDY) and the alarm second step (ERS) operate in parallel to proximity switches for alarms detection.
- for marine operations: A Marine Monitoring System to monitor the speed of an approaching ship; distance off and speeds fore and aft; wind and current conditions, with a hand display for the pilot. When the ship is alongside it will monitor tensions in the mooring lines; ship drift (wind/drift-off; wind, current and wave conditions. This latter data can also be displayed by telemetry on a portable computer placed on board the tanker, with alarms provided on the hand display.

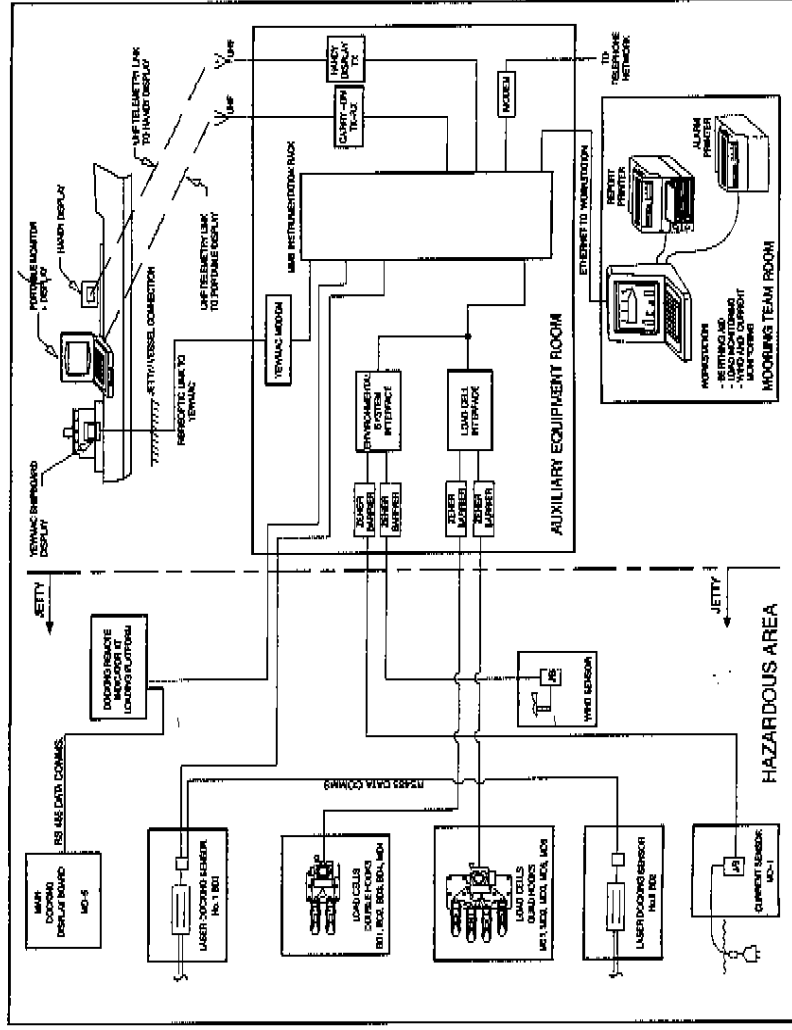


Fig. 5.3

*MS*: When no further operations are being conducted the *MSMS* is useful for collecting weather data in the vicinity of the jetty (i.e. wind and current, and waves in exposed locations).

- *CCTV* system: Typically three remote controlled cameras with pictures displayed on three large colour monitors are provided (one on each side of the loading arms to permanently watch the ships manifold, and one on an elevated tower to permanently watch the gangway). Other remote controlled cameras (lock entrance and each deck of the loading platform) may be provided with, for example, scanned pictures displayed on two other colour monitors (the scanning is in order to reduce the number of monitors in the control room).

5.4.3 Fire Protection

There are no generally applicable criteria for specifying fire protection equipment at LNG terminals (but see bibliography for this Section). Invariably terminals will be subject to independent audit by local authorities, their fire departments and such other agencies having accountability for industrial safety in the locality.

Whatever local regulatory criteria may be applied, the equipment outfit specified for a marine terminal should reflect a clear policy objective, and an accompanying coherent strategy, for managing fire defences.

Policy definition must proceed from what is deemed either necessary or practical in the given circumstances of a terminal's situation.

In all situations the policy should have the safety of human life as a paramount objective. The risks to human life must therefore be assessed in relation to credible scenarios of fire outbreak and feasible response strategies. Such assessments may reveal different imperatives in remote, isolated locations than in more confined situations with closer proximity to adjacent manned sites. Similarly, realistic options for fire response will be determined by a site's accessibility to fire-fighting services and the capabilities of those services.

A realistic policy, for all situations, will acknowledge the virtual impossibility of extinguishing a large volume LNG fire and adopt a strategy of containment, protection of life and other property, and isolation of the fuel supply.

Other elements for fire defence, likely to command themselves in a number of different situations are: early detection and swift extinguishing of small pool fires and jet fires, and protection of gas bearing systems by minimum separation distances set by reference to radiated heat properties.

Typical features of a fire defence inventory will be water curtains to suppress heat radiation to vulnerable containment elements and facilitate human evacuation; rapid detection (*CCTV* and alarm systems) and early response equipment, able to extinguish small fire outbreaks of manageable proportions. Hence some or all of the following equipment might find application in applying a properly devised fire defence system.

- a fixed water curtain on the seaward front of the transfer arms platform to protect arms from excessive heat radiation.
- under deck fixed water curtains on the seaward front to protect deck platforms below the loading arms platform.
- two lower elevated oscillating fire water monitors, controlled from a remote fire station to cool-down of the surfaces exposed to heat radiation.
- a water curtain to protect the gangway tower and its telescopic part from radiated heat.
- two pre-aimed tower elevated dry chemical monitors located on the loading platform in order to help extinguishing a possible fire on a ship manifold or on loading arms.
- fixed dry chemical fire fighting system with hose reels and flooding system for the protection of the curbed areas on main deck platforms.
- hydrants with hoses together with portable and wheeled fire extinguishers provided at different places.
- an international fire connection with hose reel on the loading arms platform.
- *CCTV*, automatic flame, smoke, gas, and spill detection with alarms system.
- foam monitors to blanket spill collection areas.
- passive fire protection measures - e.g. site design and materials selection.

Controls to operate fire defences should be established at a terminals main control room, as well as the jetty operation room, to provide full redundancy for the defence system.

### 5.4.4 Emergency Removal

An essential first step in protecting human life is to minimise the exposure of individuals to potentially hazardous areas. Installations should exclude all but authorised personnel, have appropriate safeguards such as removal of ignition sources on the person. Such a policy should be reinforced by adopting operating practices that allow the monitoring and control of LNG transfer operations to be conducted remotely.

Emergency escape routes for personnel are best provided in the first instance by plotting routine access points outside the fire risk area of the cargo handling platform. Thus a gangway tower should be located on a dedicated dolphin, remote from the closest loading arm. Similarly a tanker's gangway too, should be located some distance from the manifold area. Hence routine access facilities can be used as an emergency escape between ship and shore, without having to cross the loading platform.

Escape routes are needed too, for personnel trapped on dolphins, to reach a safe area without passing over the loading platform. It is also recommended that two ladders be provided on each outer dolphin for access to the water. This would conform to OCIMF recommendations, requiring two separate and remote escape routes from all working and occupied areas.

Emergency removal of the tanker from the berth is an element of emergency response plans for many terminals. The procedures for managing such an operation, if contemplated, must be worked out in detail for each installation. First, its feasibility as an operation must be established. Is it feasible under all conditions of wind and tide? Are tugs required? These are merely examples of several issues that have first to be determined before operational procedures can be established.

If an operation is deemed feasible it may require the tanker's engines to be maintained in a prescribed state of readiness, that tugs are retained in the vicinity during transfer operations and that a minimum number of crew are retained on board.

A critical element of a removal plan will be the operation of the quick release mechanisms for the tanker's moorings. Such devices may be fitted irrespective of whether or not emergency evacuation is contemplated. Control of their operation is essential to guard against the consequences of inadvertent operation, particularly if there is a capability for releasing the entire array simultaneously, as part of a procedure for emergency evacuation.

### 5.5 Protection from External Threats

Potential threats emanating from external sources should be eliminated from the basis of design and in the selection of the terminal site (refer also to Section 4). There should remain only low levels of residual risk to be managed by terminal operating procedures.

Wholly exceptional circumstances apart, these will arise from ignition risks in adjacent sites, from other port traffic in close proximity to the installation, and from the effects of heavy displacement ships generating dynamic loads in the moorings of berthed LNG tankers (Refer Section 4).

#### 5.5.1 Ignition Risk

Ships manoeuvring to and from adjacent berths, especially if accompanied by tugs must be prohibited from straying into a prescribed exclusion zone around a berthed LNG tanker. Indeed all craft not under the control of the terminal must be excluded from this zone during transfer operations, when the possibility for spillage is most likely.

The dimensions of the exclusion zone should be determined by an analysis of the likely spread of a gas cloud generated by the maximum credible spill - it should also be formed by an assessment of the damage threat posed by other vessels approaching to within close quarters of the terminal. Procedures must be established to shut-down transfer operations in the event that the security of the terminal is compromised by the intrusion of craft, not under the direct control of the LNG terminal, into the exclusion zone.

The risks posed by adjacent land sites must be discounted in the site selection process. It would be unusual and very serious if the pattern of these risks were to subsequently change - e.g. by a fundamental change of use, that introduced previously unforeseen hazards.

Nevertheless port environments are dynamic and changing. LNG terminals should be alert to changes in use of adjacent sites that might pose an increased risk of ignition and thereafter render ineffective such protections - e.g. separation distances - that were previously deemed adequate. Under such circumstances resort to local planning enforcement procedures may command itself.

#### 5.5.2 Suppression of Ignition Sources Within Terminal Sites

Terminals handling hydrocarbon materials, whether as oil or gas products, are subject to a range of measures aimed at suppressing the risks of ignition. These measures are detailed in several established industry publications and are referenced here in ISGOTT and Liquefied Gas Handling Principles on Ships and in Terminals, in the bibliography for this Section.

Special attention nevertheless is drawn to the recommended use of insulating flanges on loading arms to achieve electrical discontinuity.

**In this context attention is drawn to the potential dangers of ship/shore bonding cables and the recommended industry practice for discontinuing their use.**

Generally the focus of ignition risk suppression should be on the introduction of sources from without, into the terminal.

#### Bibliography for Section 5

1. Design and Construction Guidelines for Marine Loading Arms - OCIMF (3rd Ed 1998)
2. Recommended Guidelines for Ship/Shore Connections at Marine Terminals Handling Liquefied Gases - SIGTTO (2nd Ed 1996 for SIGTTO Members only)
3. LNG/FCG Vessels Prohibited from Entering the Port of Government: A New Approach For Vessels Serving Land LSO/ERS Operations - Bahrain Liquefied Gas Ltd 2000 (revision (see on SIGTTO web Members Bulletin Board)
4. A Risk Based Approach for the Evaluation of Fire Fighting Equipment on Liquefied Gas Terminals - SIGTTO 1st Ed 1999
5. Liquefied Gas Fire Hazards Management - SIGTTO to be published 2000
6. International Safety Guide for Oil Tankers and Terminals (ISGOTT) - ICS/OCIMF (4th Ed 1996)
7. Working Equipment Guidelines - OCIMF (4th Ed 1997)
8. Standards for the Production, Storage and Handling of Liquefied Natural Gas (LNG) - NFPA 59A NFPA 1996
9. The Ship/Shore Interface - The Communication Necessary for Matching Ship to Berth - SIGTTO 2nd Ed 1997
10. Liquefied Gas Handling Practices on Ships and Terminals - SIGTTO 3rd Ed 2000

area. Visitors and contractors are potential sources of illicit smoking materials, portable electronic devices - particularly mobile telephones - and tools or other materials capable of generating incendiary sparks. Strict controls over access to the terminal area by all personnel, whether approaching from the land or the sea, is therefore critical to the suppression of ignition risk.

**Such controls should also contemplate criminal groups and thus be appropriately supported by rigorous identity vetting and search procedures.**

Safety and security procedures should also guard against unauthorised approaches into the environs of the terminal by water craft of all types. Control and surveillance measures should be adequate for detecting such incursions, while LNG is being transferred, and include procedures for challenging incursions and shutting down transfer operations if they persist.

### 6 Managing Relations with Port Authorisation and Other Stakeholders

Fully effective management of LNG operations in port areas cannot be achieved by the terminal and ship operators working in isolation from other port users, or from regulators and service providers.

Managing the risks entailed in port operations for LNG involves operators in an analysis of the risks attendant to their operations at the terminal and during the port transit of LNG tankers, and adopting the defensive measures described in other sections of this guide. It also requires effective communication of these risks to other port users and an understanding, on the part of port authorities and service providers, of the special needs of LNG operations.

Ports are dynamic environments; their pattern of activities evolves over time and with such evolution the pattern of operational risks may also change. It is therefore essential to establish a set of relationships with other entities within the port that ensures the security of LNG operations is never compromised by changes to port infrastructure and operators lying outside the purview of the LNG business.

Ports often have powerful social and political links with the wider local community. If these are not effectively managed LNG operations may come to be perceived as unwelcome activities and, ultimately, become the target of focused local opposition.

Effective structures for managing all these aspects of port relationships will vary from place to place, depending on specific local conditions. However, they will all share two essential features:

- Detailed Contingency Planning, to manage the response to actual emergencies.
- "Local Partnerships", to educate, explain and gain support for LNG operations in the locality.

#### 6.1 Contingency Planning

The UK's Health and Safety Executive's guidance on emergency planning states:

**"Emergency Plans must be capable of dealing with the largest incident that can reasonably be foreseen, but detailed planning should concentrate on events that are most probable"**

A contingency plan is a document that identifies the hazards of an industrial activity and specifies how each is to be dealt with.

It must specify the chain of command, clearly mark out the boundaries of individual and organisational responsibility, and specify the attendant communications and alarm systems.

Critical procedures for mobilising emergency services, triggering mutual aid arrangements, personnel evacuation, casualty handling and external announcements must be set out in the plan. It should also specify the critical actions to be taken to minimise the impact of an industrial accident in its immediate aftermath, to secure the affected area and to render the environs of the accident as safe as possible. The severity of an emergency may range from an accident which can be dealt with by ship's or site personnel only, to one for which effective response and containment requires assistance from the community's emergency services. The plan must therefore give clear directions for the mobilisation of emergency services support, with concomitant guidance for the operation of communications and the apportionment of responsibilities among the parties in the chain of command and in the communications system.

Yet no plan can give detailed instructions for every conceivable contingency. Rather it should provide clear guidance as to how, when and what to communicate and which responsible party, so that the immediate and

Subsequent decision making processes are effective and opposite to the severity of the emergency being managed. Detailed guidance for the preparation of contingency plans is readily available elsewhere (see bibliography for this Section).

### 6.1.1 Roles of Port Administrations and Service Providers

A port may contain one or more terminals whose activities require them to have a contingency plan. It then becomes essential for each of these to be integrated into the overall plan for the port area and that their respective effectiveness be tested through regular exercises.

For most ports the port authority will be the most appropriate body to co-ordinate the development of contingency planning within the port, ensuring that individual plans are properly prepared, are practical within the context of a particular port and coherent with the available emergency response services.

Plans will be the most effective if developed in close consultation with port users, ship's agencies, adjacent industries, municipal authorities, police, fire and medical services. The Plan, having been developed, must be communicated to all parties that may be involved in responding to an emergency and be understood by them all.

#### 6.1.2 LNG Tankers

A unique feature of contingency planning for marine terminals is the inclusion of berthed ships within the planning and response framework.

All ships must have emergency response plans of their own to address emergencies that might arise on board. Visiting ships must also be familiarised with those elements of the Terminal Contingency Plan that directly, or indirectly, address the situation of a berthed ship during a terminal emergency and the actions expected of it.

#### 6.1.3 Public Relations

In the event of an emergency it is essential that the news media be provided with fast, accurate and focused information and, in particular, reassurance over the risks to affected centres of population.

Modern news reporting allows live pictures of a developing situation to be broadcast very soon after an accident and to continue transmission throughout the duration of the emergency. Port operators will have no direct control over what is shown nor the commentaries that accompany it.

However the prospects for achieving a balanced and responsible treatment by the media will be greatly enhanced by advanced planning of facilities to receive and host journalists, together with a clear protocol governing press briefings - i.e. who should prepare and present briefings and in what areas of responsibility.

**It is strongly recommended that LNG terminal staff, identified as prospective communicators to the news media, be given expert training by media consultants to prepare them for their role. Effective PR is critical for the effective management of an emergency. It is the principal communications route to the public and, as such, will be critical for maintaining the credibility of the operator in public perceptions.**

**Avoidance of hostile (public) perceptions is vital for maintaining an operator's ability to manage an accident, free from politically inspired interference. Positive perceptions will also be critical to re-establishing normal operations after the emergency is past. Saving a site from accidental destruction will avail little if it is subsequently denied permission to re-start operations.**

### 6.2 Local Partnerships

Indeed the management of public perceptions and those of port authorities, other port users and service providers ought to be the subject of routine operational management, not merely an issue to be addressed in the aftermath of an incident. People who are likely to be affected by an accident should be given information about the port and the operations it conducts, including potential hazards and the safety measures that are in place. Port and terminal operators should be pro-active in providing this information, or "risk communication" and not wait until local authorities or community leaders ask for it.

Effective risk communication goes beyond the technical ability to use the best science to assess the risk and to make calculations of the assessed risk, or the ability to demonstrate the effectiveness of state-of-the-art technologies and risk management measures. These things may be viewed as the "Brain" of the Risk Assessment. Risk Communication, Risk Management" triangle. Risk Communication is the "Heart" of the "Risk" triangle.

The ability of the risk communicator to build a relationship that demonstrates respect for and understanding of, the interests of the community or stakeholder(s) will potentially make the difference between strong public support and focused opposition to it at the "heart" of the risk triangle the Risk Communicator understands the audience. Different cultures have different values and methods of understanding; those values and supportive methods must be understood and integrated into the risk triangle.

Research further indicates that four specific factors influence perceptions of trust and credibility:

- perceived caring and empathy,
- perceived competence and expertise,
- perceived honesty and openness,
- perceived dedication and commitment.

These four factors form the criteria that citizens use to evaluate the credibility of an organisation or individual. Risk communication is effective to the degree to which all actions and communications - verbal and non-verbal - convey caring and empathy, competence and expertise, honesty and openness, dedication and commitment.

In 1988 the U.S. Environmental Protection Agency published seven basic rules for effective risk communication. These remain excellent guidelines for effective risk communication. They are:

- accept and involve the public as a legitimate partner.
- plan carefully and evaluate performance.
- listen to your audience.
- be honest, frank, and open.
- co-ordinate and collaborate with other credible sources.
- meet the needs of the media.
- speak clearly and with compassion.

In introducing these rules, the U.S. Environmental Protection Agency noted that the goal of risk communication is not to diffuse public concern or avoid action, but rather to produce an informed public that is involved, interested, reasonable, thoughtful, solution-oriented and collaborative.

### 6.3 APELL

The Awareness and Preparedness for Emergencies at Local Level (APELL) is a significantly similar process, developed by the United Nations Environment Programme, Industry and Environment Office (UNEP IIE) in response to various industrial accidents and naturally occurring disasters, in both developed and developing countries.

It is a process for local co-operative action to improve community awareness and emergency preparedness. Although this process is focused on the environmental issues, it is now acknowledged that every disaster, whatever the cause, has an environmental impact and this should be taken into consideration when preparing contingency plans.

The APELL programme, which involves a partnership between industry, government and the local community, has been developed in co-operation with governments and industry. Its main goal is to "prevent, prepare for and respond to technological accidents and their impacts".

This is achieved by assisting decision-makers and technical personnel to increase community awareness of hazardous installations and to prepare integrated response plans, in case unexpected events at these installations should endanger life, property and the environment. An APELL programme is not a quick process and can typically take two years to implement.

APELL for Port Areas is an adaptation of the UNEP IIE APELL, undertaken in conjunction with the IMO. Local joint plans for port areas developed through the APELL process can be linked with state/provincial, national and international plans and agreements as necessary.

Although port areas are fixed installations, creating joint emergency plans is likely to be a complicated process, for the following reasons:

- the international nature of many port activities means the many standards, conventions and regulations may be involved
- because of the complexity of port operations a large number of potential stakeholders may be involved
- the management structure of the port usually reflects the diversity and scale of its activities, leading to the existence of autonomous facilities having their own management structures, e.g. petroleum, liquefied gas and chemical terminals.

The APELL co-operative approach conforms with that generally adopted in combating maritime accidents, in particular oil, gas and chemical releases. Regional and bilateral agreements on co-operation have been adopted over the world. The most important global instrument in this field is the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC), adopted in 1990, that establishes that contracting parties will co-operate for the purpose of responding to an oil spill. The scope of the OPRC Convention has now been expanded to apply to pollution incidents involving hazardous substances other than oil.

## SECTION 6

Full details of this process are given in "APELL for Port Areas 1996" published by the International Maritime Organization.

### 6.4 Managing the LNG Risk – "Successful" to "Significant"

LNG operations have, historically, an enviable safety record. It is a record that owes much to investment in technical defences and to high quality management that has recognised the crucial importance of preserving a reputation for responsible and safe operation.

It is, therefore, a "Successful" industry – one that has demonstrated an innate ability to confront the challenge of its risks and successfully manage them within acceptable bounds.

Yet historically LNG trading has also been a specialised niche industry, with a restricted international market and relatively few major players. Its reputation for responsible operation, though real enough, will increasingly be tested in the global environment; one in which LNG operations become established in ports with no previous experience or understanding of liquefied gas and where many new industry players are participating.

Managers of LNG operations will therefore have a greater need to reach out to port communities – port authorities, other users and service providers – to communicate the risks of their operations and explain the actions being taken to manage these risks, the defences provided and the protections required of others. Through the process of reaching out, the LNG (terminal) operator moves from the position of being "Successful", within his own industry, to being "Significant" among the wider port community. In a position of significance, the LNG operation is widely understood, others are aware of its particular characteristics and requirements, the actions of its management are appreciated and respected, and it enjoys prestige as a consequence of others understanding the quality, technical excellence and professionalism associated with the LNG operation.

Communication is pivotal to the entire risk management process for the LNG terminal.

- individual perceptions cannot change without knowledge and trust.
- entrenched sectional interests will not change without knowledge of alternatives and consequences, and the motivation, skills, and support systems to do so.
- entrenched working practices and port management systems will not easily change unless a broad consensus for change is first constructed.
- public fear and resistance will not be easily allayed – even by the most stringent laws and regulations – unless there is trust built on knowledge and understanding.
- regulations and prescribed procedures (for port operations) will not function effectively without a consensus of understanding and acceptance among those affected.

Hence building consensus through communication is the central mission of the risk manager. The more complex the problem, the more skilful that communication must be to achieve consensus on the solutions.

When risk management fails it is often because of a lack of public and political acceptability.

Risk assessment and technical uncertainties might sometimes be cited as the reason for failure. Yet if the communication problem is misunderstood, the approach is unlikely to be effective. This error usually results from lack of attention to the formative research necessary to understand the targeted audiences and the leverage points that will be effective with those audiences – both social and professional.

Being "Successful" does not automatically mean an operator is accepted as "Significant," yet being "Significant" is critical for the long-term security of LNG operations in port areas. Only when there is a broad based understanding of the risk profile of these operations among port communities can there be assurance of the required regulatory and procedural framework for safe operations. Similarly, only when there is a favourable public consensus for the continued operation of LNG facilities, based on trust, can operators be confident of obtaining sympathetic support from authorities and governmental agencies.

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## **ATTACHMENTS**

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# *Site Selection and Design for LNG Ports and Jetties*



*Information Paper No. 14*

**SIGTTO**

# ***Site Selection and Design for LNG Ports and Jetties***

*with views on*

***RISK LIMITATION during PORT NAVIGATION  
and CARGO OPERATIONS***

***Information Paper No. 14***

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**The Court House, 15 Glynne Way, Hawarden, Deeside, Flintshire, CH5 3NS, Wales, United Kingdom**

**Tel: +44 (0) 1244 535787 Fax: +44 (0) 1244 538908 E-mail: sales@wmtmarine.com**

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**NOMENCLATURE**

BSI	British Standards Institute
CEN	Comité Européen de Normalisation
ESD	Emergency Shut-Down
ERS	Emergency Release System; a system comprising all ESD and PERC measures
IALA	International Association of Lighthouse Authorities
IAPH	International Association of Ports and Harbors
ICS	International Chamber of Shipping
ISGOTT	International Safety Guide for Oil Tankers and Terminals
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas (butane and propane)
OCIMF	Oil Companies International Marine Forum
PERC	Powered Emergency Release Coupler, with its adjacent quick-acting block valves. This is a device providing a virtual spill-free means of quick disconnection of the hard arm in emergency situations. The block valves are interlocked with the coupler to ensure dual action.
PIANC	Permanent International Association of Navigation Congresses
SIGTTO	Society of International Gas Tankers and Terminal Operators Ltd
TSS	Traffic Separation Scheme
VTS	Vessel Traffic Services

## 1

**SUMMARY**

This paper addresses safety issues for LNG ports. It focuses on the elimination of spillages both at the ship/shore interface and in navigational approach channels. The paper concentrates on issues which can be solved when a port is being designed and is, therefore, of benefit to harbour planners and port authorities. Flowing from these considerations, the paper outlines a way forward for the site selection of LNG terminals, establishes a basis for safe jetty design and considers safety factors in the port approach. In developing its first aim, the paper examines existing industry guidelines covering cargo operations at the ship/shore interface. Indeed, the paper suggests that LNG's excellent safety record owes much to the adoption of existing standards. However, with the industry becoming more widespread, as a second aim, continuing success depends not only on better acceptance of existing standards but also on future improvements. Some of these newer aspects are described and a check list is presented in the Appendix giving an overall package of the items considered most essential for LNG.

Bearing in mind the high commercial exposures within LNG projects, the need to maintain its good safety record is vital to all companies concerned. Furthermore, an incident in one port could have serious knock-on effects in others, and may herald constraints in new projects elsewhere. These concerns, coupled with the dangers perceived during public inquiries into LNG transport, make a very strong case indeed for a continuing high level of safety to be applied.

On ships the good safety record for LNG operations is predicated on an excellent standard of management, high quality crews, the structural robustness of ships' hulls and back-up control systems. On shore, also of importance, are the select number of well managed terminals. At these plants the focus of national agencies, port authorities and terminal managers ensure that safety in operations is always an important element.

However, although LNG has an enviable record it is not risk free. Not only are some hazards difficult to eradicate; an accident, albeit rare, is possible as a result of human error or catastrophic event such as an earthquake. Moreover, technical limitations can have an effect and site location may not always achieve a port design which is entirely risk-free. It can be seen, therefore, that there can remain a very remote chance for some incidents to occur. However, a large release of LNG such as through a damaged hard arm or a ruptured cargo containment system — central themes in this paper — should be specially addressed during port design.

Important matters which should be dealt with when choosing the location of a new terminal are covered in the paper. Apart from general considerations, these emphasise the need for the introduction of risk management techniques. A fact which helps to ease the acceptance of these newer concepts in the LNG trade is its relatively close-knit nature and because most of the trade is held by only a few companies within well-defined limits. Also, investments in LNG projects are such that equipment quality can be planned to a high standard.

This paper proposes the adoption of the recommendations outlined in chapter 2. However, criteria such as that for channel width, should not be understood as absolute values; these recommendations are just basic guides to prompt special enquiry into particular aspects. Furthermore, the actual values quoted together with their risk reduction effect, still depend on local conditions which have to be covered individually, port by port.

## 2 PRINCIPAL RECOMMENDATIONS

### 2.1 PORT DESIGN

**Approach Channels.** Harbour channels should be of uniform cross-sectional depth and have a minimum width, equal to five times the beam of the largest ship.

**Turning Circles.** Turning circles should have a minimum diameter of twice the overall length of the largest ship, where current effect is minimal. Where turning circles are located in areas of current, diameters should be increased by the anticipated drift.

**Tug Power.** Available tug power, expressed in terms of effective bollard pull, should be sufficient to overcome the maximum wind force generated on the largest ship using the terminal, under the maximum wind speed permitted for harbour manoeuvres and with the LNG carrier's engines out of action.

**Traffic Control.** A Vessel Traffic Service (VTS) System should be a port requirement and this should be able to monitor and direct the movement of all ships coming within the operating area of LNG carriers.

**Operating Limits.** Operating criteria, for maximum wind speed, wave height, and current, should be established for each terminal and port approach. Such limits should match LNG carrier size, manoeuvring constraints, and tug power.

**Speed Limits.** Speed limits should be set for areas in the port approach presenting either collision or grounding risks. These limits should apply not only to LNG carriers but also to any surrounding traffic.

### 2.2 THE JETTY

**Exclusion of Ignition Sources.** No uncontrolled ignition source should be within a predetermined safe area centred on the LNG carrier's cargo manifold.

**Mooring Layout.** The terminal should provide mooring points of a strength and in an array which permits all LNG carriers using the terminal to be held alongside in all conditions of wind and current.

**Quick Release Hooks.** All mooring points should be equipped with quick release hooks. Multiple hook assemblies should be provided at those points where multiple moorings lines are deployed so that not more than one mooring line is attached to a single hook.

**Emergency Release System.** At each hard arm the terminal should fit an ERS system, able to be interlinked to the ship's ESD system. This system must operate in two stages: the first stage stops LNG pumping and closes block valves in the pipelines; the second stage entails automatic activation of the dry-break coupling at the PERC together with its quick-acting flanking valves. The ERS System should conform to an accepted industry standard <sup>[15]</sup>.

**Powered Emergency Release Couplers (PERCs).** The terminal should fit a PERC in each hard arm together with quick-acting flanking valves so that a dry-break release can be achieved in emergency situations.

**Terminal Security.** An effective security regime should be in place to enforce the designated ignition exclusion zone and prevent unauthorised entry into the terminal and jetty area, whether by land or by sea.

**Operating Limits.** Operating criteria, expressed in terms of wind speed, wave height, and current, should be established for each jetty. Such limits should be developed according to ship size, mooring restraint, and hard arm limits. Separate sets of limits should be established for (a) berthing, (b) stopping cargo transfer, (c) hard arm disconnection and (d) departure from the berth.

**3****ACKNOWLEDGMENTS**

The content of this paper is based on reports from a company having SIGTTO membership and, in this respect references [1] and [2] were most valuable. The navigational aspects, as detailed in chapters 9 and 10, came about as personnel in that company assessed marine operational risks for new LNG terminals. In one case, the new project was in Europe where the project analysis was carried out in accordance with a European Council Directive for assessing risks and environmental impacts. This is a process which, while being driven by national law, is also of direct concern to the companies involved.

These requirements led the project leaders to consider how the risk of some classes of accident might be better established and, in particular, what the consequences of a large LNG release might be, either in the port approach — due to grounding or collision; or alongside — due to fracture of the hard arm.

The company concluded that such a large release of LNG had never happened. Nevertheless, in some situations such an event was found to be feasible. From a marine viewpoint the scenarios which could lead to a major release were identified and recommendations were prepared to further reduce the chance of any such happening.

This paper also draws on earlier publications from SIGTTO and similar societies which are relevant to the management of port risks.

**4****INTRODUCTION**

At the time of site selection, the level of marine risk is determined by the position chosen for the terminal and this is especially true of terminals handling hazardous cargoes such as LNG. Once the port is in operation, the risks identified during planning should be controlled by suitable equipment and pre-arranged procedures. This should include the on-going need to keep other industry or populations remote from the plant.

As can be seen from much of its earlier work, SIGTTO urge acceptance of a wide range of equipment and procedures for the reduction of operational risk. To supplement past work, this paper recommends that for new sites the LNG terminal, and its port area, should be examined as a unique risk system. This paper focuses, therefore, on accident exposure and risk management not only during cargo operations alongside, but also during the port transits of LNG carriers.

Implicit in site selection is the recognition of risk. As described elsewhere [3], risk consists of a combination of event frequency and consequence. Thus, port designers are often faced with a number of choices when selecting a site, and these choices can arise from a variety of competing pressures. As described in risk assessment theory, operational solutions are found by acceptance, or non-acceptance, of some categories of risk. However, whatever remote frequencies may be tolerated for a smaller release, there is no acceptable frequency for a large release.

In essence, the issue being addressed is how best to minimise port risks by design factors at the start of a project. As can be seen in the paper there are three components in this equation. Initially questions on satisfactory jetty position and design are covered. Operational procedures are then addressed. Thereafter, having questioned the robustness of these procedures with respect to human elements, the consequences of collisions and groundings are studied and methods of limiting the effect of such accidents are considered. By this means, any high risk scenario is identified during design and this then requires special handling to restrict occurrence.

From a navigational standpoint and as alluded to in the above paragraph, the paper suggests that while the human controls called upon during ship manoeuvring deserve high ranking, of themselves, they can never be considered one-hundred per cent secure: this is because questions of human error can prevail. However, back-up is achieved if it is known that, in a grounding or collision, an LNG



carrier's cargo containment system is most unlikely to be breached. To achieve this end, a detailed study of each port approach is needed and, to give this subject greater clarity, examples are given at section 10.3.

To cover the main risks (as identified), the possibility of liquid spillage during cargo operations at the jetty is also discussed. Here, a three stage solution is offered. First, well deployed moorings. Second, well engineered and interlinked ESD systems. Third, the fitting of PERCs, with quick-acting valves included on either side; all controlled by an ERS system.

Having addressed all risks — big and small — alongside and in the port approach, an outcome from the risk analysis which makes an accident virtually impossible is clearly the most satisfactory. If, however, the outcome shows consequences of a serious nature then, clearly, it is necessary to draw up detailed contingency plans. But, in some circumstances, such as a large LNG release close to a populated area, it may be impossible to devise a realistic contingency plan because of the nature of the problem. Herein lies a conundrum which may only be resolved by further reducing the chance of a major release by designing-out the problem.

The precautions, as recommended by SIGTTO in this paper, do not offer a single package that reduces operational risk to some quantifiable and acceptable level; indeed it is suspected that the pattern of operational risk is too complex to be easily handled in this way. However, this cautionary note aside, the industry's objective must be to further reduce risk whenever possible.

Of course, the safety of life is vital, and so also is continuing public confidence in the trade. However, the enormous financial exposures of LNG projects also must be safeguarded. In some circumstances it is found that the protection given to save life also protects the commercial exposure. In other cases, however, personal safety can be assured while unacceptable business risks remain - so suggesting the improved standards, as recommended in this report, are necessary not only due to personnel hazards but also to protect the business risk.

Important factors such as personnel training, contingency planning or matters of a general safety nature are not covered in this paper; the aim has been to focus more on matters of equipment and issues of navigational interest. Nevertheless, these extra factors are fundamental to future safety in the LNG sector and, as a matter of course, should always be taken into account.

## 5 DEVELOPMENT OF LNG STANDARDS

The history of developments in the LNG industry has been marked by two separate but interwoven strands. Firstly there was a continuous effort to design systems to reduce the probability of large escapes of gas. On the other hand extra standards — often oil industry based — were re-specified in light of experience and technological improvement. Indeed; as the LNG industry moves into the 21st century it remains true that future improvements should not be altogether separated from progress in the oil world and, where possible, LNG terminalling standards should continue to grow in parallel with port operations generally.

An example of an LNG standard having developed along technological lines is that covering on-shore storage tanks. For a period, earthen embankments were used for support against the force of sudden release from the inner tank. Subsequently, through adoption of improved inner tank material, the probability of catastrophic crack propagation was much reduced. Now, earthen bunds are no longer needed. Similar changes occurred in the design of LNG carriers, where sophisticated methods for assessing crack propagation now allow the secondary barrier to be omitted in two free-standing cargo containment systems - the Moss Rosenberg spherical design and the IHI prismatic design.

To date, the greatest investment to reduce port risks is the limitation of gas escape at the ship/shore interface and on the jetty. Here the application of industry recommendations for jetty design and mooring systems [4] provides a secure base for LNG transfer. Furthermore, the references mentioned in chapter 6 direct port designers to construct jetties handling hazardous cargoes in remote areas

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where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations. When this advice is combined with that from SIGTTO [5] — as outlined in section 7.2.2 — risks at the jetty are vastly reduced.

It can be seen, therefore, that progress in defining LNG standards have taken a step-by-step pattern which can be summarised as follows:

- a start was made with the existing framework of standards for oil
- these were then adapted for the characteristics of LNG
- changes in shipping and terminaling standards were then addressed, and
- finally the engineering challenges for cryogenic systems were answered

Present day standards for limiting problems are thus the result of sensible evolution rather than a well-focused set of risk related measures. Indeed, experience shows that the process was, simply, one of progressive improvement, the motivation being a desire to make operations safer. However, it is at the time of site selection that the foundations of high quality risk management can be laid and where overall cost/benefit judgements are best formed and it is in these areas where this paper recommends the introduction of risk management techniques.

Although the criteria for site selection may differ between LNG terminals, the majority are common to all. Some, such as the proximity of the plant to centres of population, lie beyond the pure marine interest and outside the main scope of this paper. But others, including the harbour movements of LNG carriers, the density of marine traffic (covering the nautical risks to LNG carriers) and the terminal itself, much influence the overall risk which eventually has to be controlled and these concepts are covered in more detail in the following chapters.

## 6 SITE SELECTION

### 6.1 GENERAL

At its most elementary level, site selection for LNG loading terminals is predicated by the location of production areas and, at receiving terminals, the situation is dependant upon the location of markets. Thereafter, fine tuning within the selection process is influenced by the optimisation of infrastructure costs such as gas transmission systems, access to trunklines and other distribution networks.

Hence, site selection is driven largely by factors aimed at minimising transportation and storage costs. With this in mind, it can be appreciated that marine criteria are only a part of the overall process. Therefore, at the stage of site selection, input from marine experts consists mainly in optimising fleet capacity (numbers and sizes of ships) and checking civil engineering matters at the ship/shore interface, at the terminal and in the terminal/port approach. This latter aspect is achieved by obtaining the required depth of sheltered water, providing good access to the sea and achieving immediate adjacency to the LNG terminal.

From a marine viewpoint there is little prospect to escape from these basic factors. Prices and hence, to a large extent demand, remain linked to the costs of alternative energies and, LNG's unique environmental benefits notwithstanding, the product must retain market competitiveness. Thus, as the future unfolds, continuing efforts to economise on handling costs and freight rates are likely.

In the site selection process the challenge, therefore, is to limit marine risks while positioning the jetty within realistic limits. Already there are generally accepted criteria and regulatory requirements to guide port designers in achieving this synthesis and most are covered in this paper.

### 6.2 JETTY LOCATION

The recommended site selection process removes as many risks as possible by placing LNG terminals in sheltered locations remote from other port users. References [6], [7] and [8] all direct port designers to construct jetties handling hazardous cargoes in remote areas where other ships do not pose a (collision) risk and where any gas escape cannot affect local populations.

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## Design Criteria for Jetties

Furthermore, choosing a jetty position within a sheltered location limits the dynamic forces acting on a ship from sea-waves which, in turn, could break a ship's mooring lines. Considering the standard LNG carrier of about 135,000 m<sup>3</sup> capacity, the waves likely to have such effects are those approaching from directly ahead or astern, having *significant heights* exceeding 1.5 metres and *periods* greater than 9 seconds. Seas approaching the berthed ship from an incidence angle of 90° (to the bow) have much lower cut-off points. It is, therefore, recommended that harbour protection be provided against low frequency waves, either by choice of location or by construction of an effective breakwater. Alternatively, an enhanced mooring system may be designed, suited to dynamic effects (but also taking into account the suitability of gangway access for the moving ship). Without such assurance the mooring system, which is the only defence against ship break-out, could be put at risk.

Jetty location should also be chosen to reduce the risk of passing ships striking a berthed LNG carrier but subjective judgement comes into assessing safety from this standpoint. The acceptability of such positions should be determined only after detailed consideration of local circumstances. However, as far as port design is concerned, some features are clear cut. For example, positioning an LNG terminal on the outside of a river bend raises the risk that a passing ship may strike the berthed carrier if the manoeuvre is not properly executed. This is possible because, at some point on the bend, the manoeuvring ship must head directly at the berthed LNG carrier. In this respect, and following the reasoning in reference [9], ships of over 10,000 tonnes displacement operating at normal harbour speeds — say 10 knots — when striking at 90°, present a hazard to a berthed LNG carrier's containment system. It follows, therefore, that building a jetty in such locations is normally considered unsuitable.

Furthermore, large ships passing near to a berthed LNG carrier can cause surging or ranging along the jetty, with consequential risks to the moorings and this phenomenon should be guarded against. This can occur at jetties located in channels used by large ships and, because of this, these positions are not recommended.

The added risks from increased traffic encounters, and extended shallow-water navigation, when positioning an LNG jetty farther inside a port, must also be considered — but these risks are covered more fully in chapters 9 and 10.

As can be seen, choosing the site for an LNG jetty comprises a mixture of checks, some derived from quantitative analyses, others owing more to subjective judgement. However, when considering an LNG carrier alongside, site selection is directed mainly at minimising the risks of ship strikings, limiting interactive effects from passing ships and reducing the risks of dynamic wave forces within mooring lines.

## 7 DESIGN CRITERIA FOR JETTIES

When the site selection process finally establishes the best position for an LNG terminal, its design is set within two sets of criteria — root criteria and specific criteria. These are categorised as shown below.

### 7.1 ROOT CRITERIA FOR HAZARDOUS LIQUID CARGOES

Basic safety for gas, chemical or oil tankers and their respective terminals is governed by ISGOTT [9]. This book contains an essential list of design and operational practices and is amended from time to time in accordance with new experience. In addition to ISGOTT, in establishing safe designs, the use of other guidelines published by SIGTTO, OCIMF, IAPH, PIANC, IALA, and BSI is encouraged. Some of these documents are referred to in chapter 11 — see references [10], [11] and [12]. However, most of these industry documents are general in nature and seldom discuss event frequency nor, for that matter, specific ship-types. In order to cover the hazards more effectively, reference [13] is of help in the gas trades — although written more from the viewpoint of existing plant.

Until the publication of this paper, within the standard suite of industry publications, the possible consequences of an accident are also left largely unaddressed. Previously, it was only reference [14] which gave some guidance on this subject. However, taken together, these older sources provide a robust framework of root criteria around which jetty designs are established and other standards (specific criteria — see below) are then specially tailored to the needs of LNG.

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Thus, existing recommendations provide the root criteria for jetty design, in terms of:

- strength of mooring systems
- positioning breasting dolphins
- position, size, and spacing, of hard arms
- depth, width, and alignment, of harbour channels

Such recommendations provide terminals with a good set of design standards. They are not, however, exhaustive nor can they be applied without knowledge of local conditions, so they can rarely be used to prepare a complete checklist for LNG — other measures must be adopted (see section 7.2).

It can be seen, therefore, that within the root criteria, a system is established for securing a safe berth; but this is one within which there may remain a significant, albeit remote, probability for an accident to happen. In developing criteria suited to LNG the separation of each risk into its frequency and consequence is crucial. Thus, when considering even the remote possibility of major accidents, the application of existing standards, though relevant, is insufficient to obtain suitable assurance. Accordingly, at LNG jetties, risk related methods should be adopted which address event probabilities, and seek, as far as possible, to quantify the frequency of occurrence.

## 7.2 SPECIFIC CRITERIA FOR LNG

### 7.2.1 General

Although the root criteria, as discussed above, are included in LNG terminal design, risk considerations usually identify the need for yet other equipment or procedures — the site specific criteria. These methods can be more demanding than the root criteria and are often applicable to operational practices and geographical areas for which industry guidance is not yet fully established. However, a new series of standards from CEN, entitled Installations and Equipment for Liquefied Natural Gas, will be appropriate to European usage — perhaps even further afield.

Additional specific criteria are also found from risk factors lying beyond normal operations at the ship/shore interface. These conditions can include hazards from outside influences such as other marine traffic and nearby ignition sources. As an example, some LNG terminals patrol the perimeter of the offshore safety zones with guard boats — see section 7.2.4. A further example is to declare the air-space over an LNG terminal as being a restricted zone where no aircraft is allowed to fly without written permission.

The specific criteria have thus grown through experience in analysing and managing terminals. They have wide application in the reduction of risks at LNG terminals and are therefore included among the recommendations to be applied during terminal design. In the following sections some specific criteria are discussed in greater detail.

### 7.2.2 Mooring

For the LNG trades, site selection includes extensive collection of environmental data, including wave spectra. From this, the oscillations of berthed ships are estimated and the individual loads in each mooring line are pre-calculated for critical conditions. Within the trade, this means that not only mooring standards [4] should apply but also the additional force of dynamic wave action should be taken into account. So, while the root criteria for mooring systems act as the design basis, the behaviour of mooring and cargo handling equipment is made site specific for the prevailing conditions. These analyses establish jetty specifications for:

- mooring bollard strength and position
- mooring load-monitoring equipment, and
- hard arm envelopes and cut-off points for automatic operation of the ERS system

### 7.2.3 Cargo Transfer Operations

All LNG companies ensure that gas carriers can lie safely alongside while transferring cargo. Here, references [14] and [15] are of great value in achieving this aim. By adding the standards for ship's cargo manifolds and detail on surge pressure control [16], which are among the many valuable contributions made

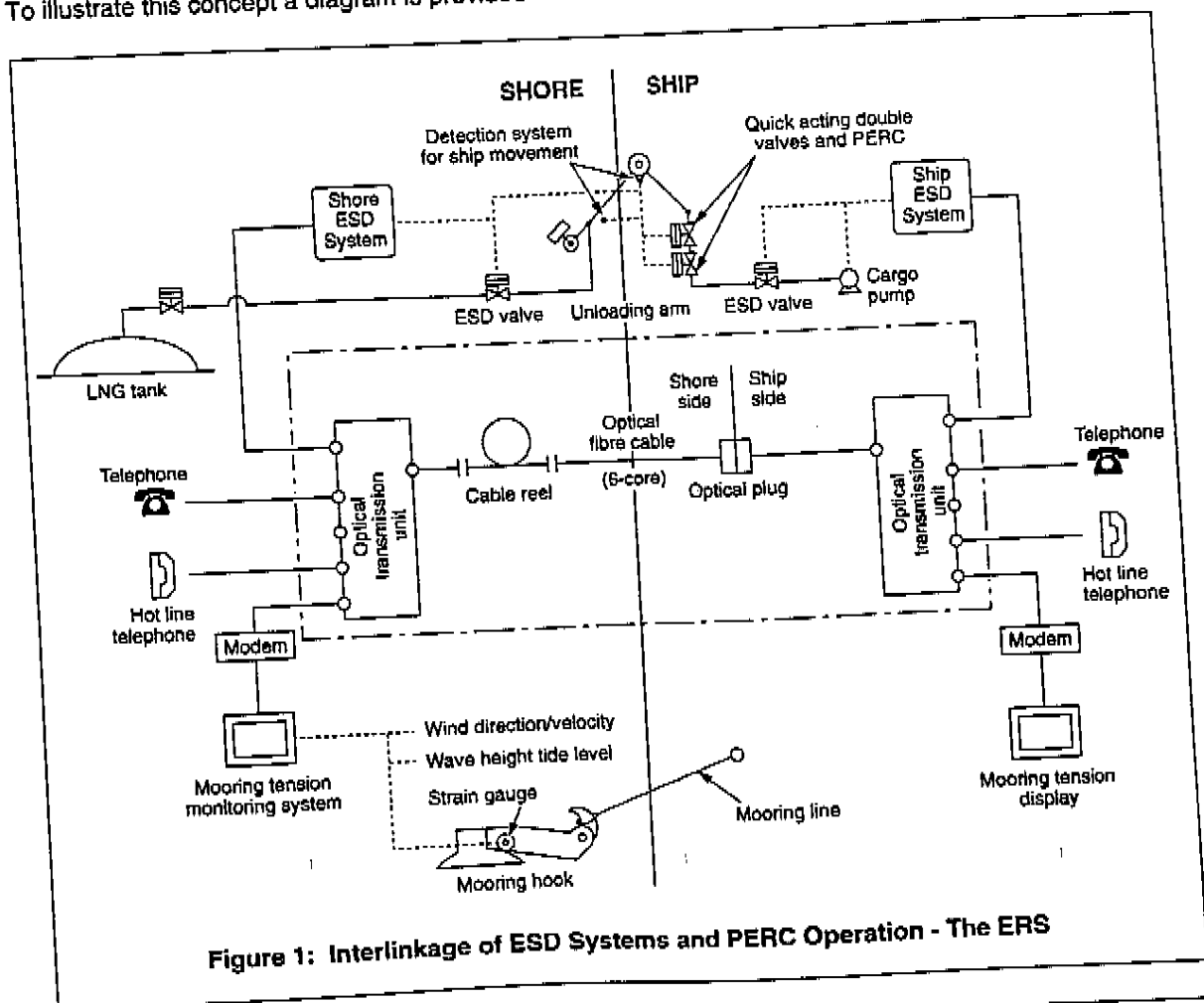
## Design Criteria for Jetties

in recent years, even greater assurance is provided. Yet experience shows that specific criteria should be adopted to adequately control risks over the whole spectrum of port and terminalling operations and these should find a place in the design. In this respect, to guard against the consequences of hard arm failure, specific criteria should limit the possibility of significant LNG spills. This question is addressed in reference [15] where the following equipment is recommended to be fitted at hard arms:

- interlinking of ship and shore ESD systems
- establishing a common standard of linkage for ship/shore ESD control
- fitting PERCs and their quick-acting valves
- linking ESD systems and PERCs into a unified control system called ERS

In addition to other matters, reference [5] takes a fresh look at the operation of Emergency Release Systems (ERSs) where it will be found that many events can cause triggering of the system. For the purposes of this paper it should be noted, however, that the ERS is expected to function in two distinct steps. The first step is cargo pump stoppage and closure of the ESD valves in pipelines, both on-board ship and on shore. The second step is closure of the quick acting valves (at the PERC) and the release of the PERC by automatic means. More detail may help to explain this two-stage operation. Here, it should be appreciated that within the ERS's electronic logic for the hard arm, sensors are installed to detect ship movement. Some movements are within the proscribed limits; others are of significance; and yet others are dangerous. Ship movements to the outer edge of the safe area may trigger an alarm. However, movements into the first ERS area activate valve closure and pump stoppage (ESD) — this is still an intermediate area but one in which automatically initiated controls are considered necessary. Finally, if the ship moves beyond this intermediate zone — into the danger area — automatic release of the PERC is actuated quite independently from human intervention.

To illustrate this concept a diagram is provided below.



In developing these criteria, the underlying rationale is that the mooring lines must provide secure attachment between ship and shore allowing very little relative movement. This means the hard arms also remain secure and the risk of arm rupture, caused by ship break-out, should not occur. However, although this basic framework underpins safety at the ship/shore interface, it provides only a single defence against risk of spillage and the generation of dangerous gas clouds.

Therefore, a second defence comprising an interlinked ESD system is used, this being manually activated by the jetty operator or automatically by ship movement beyond the limits of a predetermined envelope. Automatic activation is triggered (amongst other alarms — see reference [5]) when sensors in the ERS system detect unacceptable ship movement so allowing the ESD controls to stop cargo flow and close pipeline valves — usually within 30 seconds. The progress of activation must be first to stop the pump and then to close the valve nearest to the pump — this restricts the magnitude of surge pressures so limiting any risk of hard arm damage because of high transient over-pressures.

However, and as mentioned above, it is recommended that a third defence be provided to ensure protection for the hard arms against damage from ship break-out and further reduce the maximum quantity of LNG spilled. This is the inclusion of PERCs (fitted within the arms) which allow hard arms to be safely, quickly (about 5 seconds), and automatically disconnected if an LNG carrier should break-out from its jetty. Hence, if all else fails and an LNG carrier breaks away from a jetty the maximum spill is no more than about 15 litres of liquid for the standard 16 inch diameter arm.

Safety issues apart, the PERC (and its accompanying ERS system) is a highly desirable protection of business interests. Often the jetties at LNG installations are but single entities, and if put out of action, total supply can be severely jeopardised. It will be seen, therefore, that in LNG projects, where massive investments are involved and the income of many parties depend on uninterrupted cargo deliveries, any risk of damage to jetties must be eliminated as far as possible. For these reasons, SIGTTO believe that such equipment is an essential risk reduction technique.

Further measures to prevent gas release include surge pressure control systems. Because surge pressures can cause hard arm and pipeline damage, the cargo handling system must be designed by keeping the possibility of surge in mind. This may lead to increased scantlings for pipelines, the fitting of bursting discs with surge pressure drums, or quick-acting relief lines returning surge pressures to the cargo tank.

#### 7.2.4 Ignition Risk

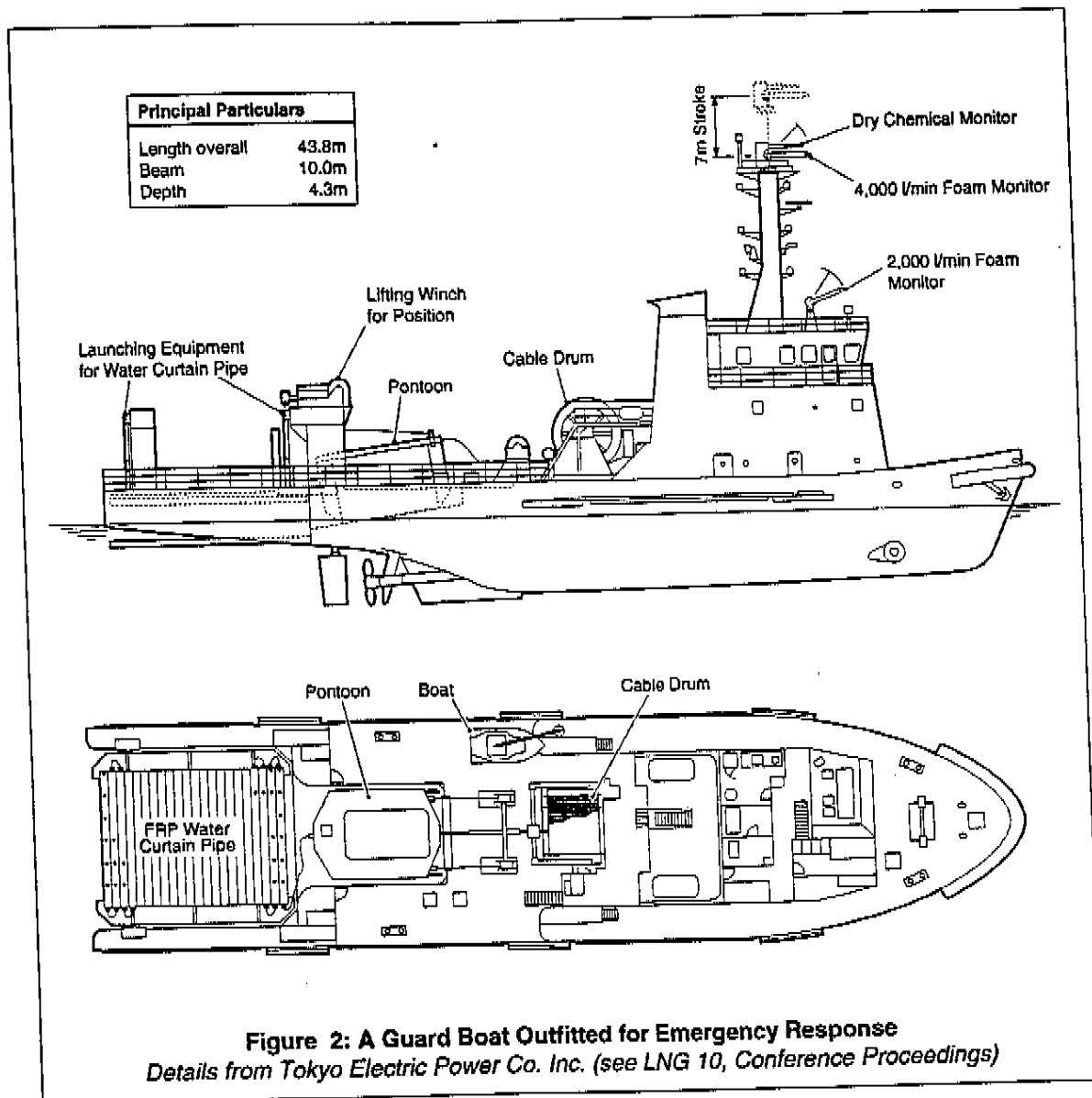
In the event of an LNG spill the possible extent of a gas cloud must be considered. Here it should be appreciated that the risk of ignition from spilled LNG can extend for some considerable distance and, therefore, ignition controls must extend beyond the immediate area and this may be both inside and outside the terminal boundary.

Clearly, it is important to remove all risks of ignition as far as it is practicable to do so. Procedures taken to limit the risk of spills, and minimise their scale, reduce the probability of gas cloud ignition. But even the marginal risks remaining can be unacceptable in a business where a first rate safety record is vital to sustain confidence. Further precautions are therefore adopted to limit ignition sources on the jetty and in its environs.

## Design Criteria for Jetties

SIGTTO

As mentioned in section 7.2.1, in some ports guard boats are used to patrol the offshore safety zones with a view to excluding other traffic. Often these craft are also fitted out for other emergency purposes and feature in contingency plans. Figure 2 below shows the general arrangement for one such craft.



The area over which ignition-free zones should extend is determined by an analysis of the formation and dispersion characteristics of gas clouds resulting from a range of spill scenarios under a variety of weather conditions. The result provides the likelihood and possible extent of gas clouds in the vicinity of the jetty.

The range of a flammable gas cloud generated by a spill is principally dependant on spill rate and duration but inevitably some subjectivity must accompany the assessment of each spill scenario. Other factors such as climatic conditions, wind direction and speed are also of importance. In addition local topography such as harbour structures and the presence of the LNG carrier itself can have an effect.

Thus, determination of the minimum area from which all ignition sources must be excluded will vary from terminal to terminal and such determination should form part of the design considerations. Sometimes quite large zones, free from ignition sources, are considered desirable especially when terminal safety systems such as fire pumps could be engulfed within the gas cloud.

### 7.2.5 Specific Criteria - a Summary

In summary the essentials for a safe LNG berth are as follows:

#### *Essential design for a safe LNG jetty*

- find a location suitably distant from centres of population
- provide a safe position, removed from other traffic and wave action
- construct mooring points in a satisfactory array and of suitable strength
- use hard arms for cargo transfer
- interlink ship and shore ESD systems
- provide a two stage ERS system, linking ESD protocols with PERC operation
- fit hard arms with PERCs, together with quick acting valves
- fit wind speed and direction monitoring equipment
- install load monitoring equipment on mooring line quick release hooks
- determine maximum credible spill, gas cloud range, and ignition-free safety zones

Apart from the essential design factors listed above, the following terminal procedures should be in place.

#### *Terminal procedures for the LNG carrier alongside*

- set limits on the mooring system for wind speed, wave height, and current
- set wind limits for cargo stoppage, hard arm disconnection, and unberthing
- restrict the speed of large ships passing close to berthed LNG carriers
- control visitors and vehicles coming into jetty safety zones
- establish ignition-free offshore zones to stop entry by small craft
- disallow simultaneous LNG operations and ship movements at adjacent jetties
- have available local weather forecasts with suitable warning systems
- have pilots and tugs ready at short notice for emergency departure

Port planning should also ensure that advance procedures are available to control a ship's port entry. In this regard it is most important that each arrival is carefully agreed between the ship and terminal. In particular this should include up-to-the-minute information on berth availability, especially in times of bad-weather forecasts, when last minute changes in berth availability can be anticipated. To safeguard ships in transit from any last-minute change in status on berth availability a contingency plan should be available to include detail on suitable anchorages, lay-by areas or turning circles where the ship can wait or turn round to proceed back to the port entrance.

As a port moves into the operational phase critical revision of existing port procedures is recommended on a frequent basis. By this means, ship operators and terminal managers can be continually assured that cargo planning procedures remain valid, tugs numbers (and power) remain suitable and that matters of contingency planning remain up to date.



## 8 RISK MANAGEMENT IN THE PORT APPROACH

National authorities and LNG companies devote considerable resources to reduce any risk that an LNG terminal may present to the port environs. This is most apparent during design when special emphasis on the security of nearby population centres is obtained by applying Environmental Impact Assessments and application of references [6] and [8]. At this stage, the risks associated with an LNG carrier as it navigates through the port approach are also addressed and, to illustrate these matters, typical safety routines for the offshore areas are listed in the following paragraphs. Reference may also be made to publications from IAPH, PIANC, BSI and IALA on this subject and some of these standards are given in chapter 11.

### 8.1 PORT CONTROLS

Taken globally, the frequency of nautical accidents, such as strikings, collisions and groundings, to any class of ship are greater in port approaches and during berthing when compared to frequency rates at sea. For the whole class of gas carriers (LNG and LPG) such accidents account for over half the total reported and, when time factors are taken into account, this confirms that the opening statement also holds true in the gas trade. However, from historical records, it is good to report that serious incidents of this type are extremely rare for LNG carriers; indeed, only one such incident (a grounding) is known to have occurred at a receiving port, none at a loading port and none at all anywhere in the world since 1980.

This successful management of LNG ports can be explained only by the controls unique to the LNG business which have a significant risk reduction effect. At present these distinguishing features consist of:

- effective VTS (traffic management) and the use of escort craft
- adequate tug power to control LNG carriers, even in dead-ship conditions
- strict operating conditions
- regular ships in each trade, and
- high quality seagoing personnel

Some of these points are further explained below:

#### 8.1.1 Vessel Traffic Systems (VTS)

Establishing safe conditions for the port transit of LNG carriers is always a matter of importance. This is usually a direct responsibility of the port authority. However, operational risk management on a day by day basis is a task shared between port authority, terminal owner and ship operator. In most cases there is agreement over the procedures required to assure low risk levels but, as a minimum, a good VTS system, as specified by the International Maritime Organization (Resolution A.578-14) for marine traffic management is recommended to prevent close encounters between LNG carriers and other ships.

Subordinate specifications concerning traffic management, such as the safe distances for other ships to pass LNG carriers, depend on the risks identified in particular situations. For example, in areas of high traffic density, the shore-based VTS may be supplemented by an escort craft (or guard boat) to attend the LNG carrier; in other situations, the VTS may suspend other traffic movements in the channel during the LNG carrier's approach. Whatever specific arrangements are made, they should aim to much limit collision risks caused by close encounters with other ships.

Other conditions for establishing safe operations in port are similar to those required for the harbour movements of any large ship, such as, adequate navigation marks and lights, limiting ship movements in poor visibility, and a high standard of pilotage service all of which contribute to minimising the risk of grounding.

The quality of pilotage service is particularly important. As part of terminal planning it is vital to secure not only consistent high quality in harbour pilotage operations but also to fix pilot boarding areas at

a suitable distance offshore, beyond which the LNG carrier is not allowed to continue inwards without the pilot being on board. Many port authorities use navigational simulators for training their harbour pilots and, when used wisely, simulator courses can yield valuable results. Not least among the advantages of simulator training are the benefits which can be gained by learning how to build good bridge teamwork and an appreciation of Passage and Voyage Planning routines.

In another context, (see section 6.2) marine traffic management can also be important when the position of the jetty is taken into account. If large ships are allowed to pass close by, interactive effects can cause mooring line failure on the LNG carrier. Although such locations are not recommended, depending on the site chosen for the terminal, it may be necessary to limit the speed of passing ships and this may be achieved by VTS controls.

### 8.1.2 Tugs

Following the same weather which determines port design parameters, the operating limits for LNG carriers should also be specified in terms of wind speed and current drift. These parameters are then used to calculate the maximum wind forces acting on the largest LNG carrier using the port, and thence the number and power of the tugs needed for berthing manoeuvres is specified. There must always be sufficient tug assistance to control LNG carriers in the maximum permitted operating conditions and this should be specified assuming the ship's engines are not available. This method gives different results from one terminal to another. Accordingly, minimum tug power is not an absolute value. Nevertheless, it has been found that for LNG carriers of 135,000 m<sup>3</sup> capacity, acceptable standards are usually in the range of three or four tugs having a combined bollard pull between 120 to 140 tonnes. These tugs should be able to exert approximately half of this total power at each end of the ship. Given that four tugs are provided, in terms of tug propulsion, this suggests that each tug should have engines capable of a minimum of 3,000 horsepower, although this is dependant on propeller configuration.

### 8.1.3 Operating Conditions

When port design is being considered the aim should be to limit navigational risks involving LNG carriers within the port area. The extent of the system developed depends on factors such as:

- number and type of ships and other craft using the port
- port accident records
- navigational distances and difficulty through the port and jetty approach
- the maximum draft of the ships
- the nature of the sea-bed (rock, sand or mud)
- tidal conditions (tidal ranges and tidal currents)
- weather conditions (wind, waves, sea-ice and visibility)
- proximity of the terminal to populated areas and industrial sites

After studying such factors, port designers and port authorities can introduce LNG-related provisions appropriate to the local port. The operational procedures and equipments which follow from these considerations, and already adopted in many LNG ports, are summarised below.

### 8.1.4 Summary of LNG Port Procedures

#### *Port procedural limits for weather*

- establish weather limits for port closure
- draw up procedures to give advance weather warnings to ships
- restrict port manoeuvring of LNG carriers in strong winds
- restrict port manoeuvring of LNG carriers in reduced visibility
- establish safe anchorages at the port entrance and within the harbour

*Port controls for approach channels*

- provide suitable short range navigational aids for approach channels
- provide escape routes in cases where a ship is unable to berth
- establish port suitability for day and night transits
- set safe manoeuvring limits for, visibility, wind, current, and wave height
- relate channel widths to the beam of the largest ship
- relate turning circle diameters to the length of the largest ship
- set speed limits for channels to limit heavy groundings or penetrating collisions

*Port controls for tugs and escort craft*

- set safe weather limits for berthing
- provide tugs farther to seaward; beyond the normal 'assistance' area
- provide escort craft suited to the circumstances
- establish tug power as being sufficient to overcome maximum set wind conditions
- have pilots and tugs available at short notice for emergency departures

*Procedures and systems regarding traffic control*

- establish a VTS control to coordinate the movement of all craft within the port
- limit other traffic movements in the port while LNG carriers are in transit
- set a moving safety zone in approach channels ahead and astern of LNG carriers
- adopt Traffic Separation Schemes (TSS) in appropriate approach channels

In addition to these points other operational factors should be addressed. These can include instructing ships to carry appropriate charts and nautical publications and to implement Voyage Planning routines. Port authorities should also ensure that harbour pilots use the practice of Voyage Planning. However, being more in the realms of ship operation, these issues fall beyond the scope of this paper.

Study of the foregoing lists shows that only rarely are the criteria absolute, or conditions unchanging. Obviously water depth is critical, as are severe weather conditions, but in many other cases either the procedures, or the conditions they are set to control, have flexible application. Indeed, it is suggested in reference [14] that the principal value of listing the criteria is to identify the hazards with a view to setting operational procedures to control them. Similar reasoning is evident in reference [1], and its check list of risk reduction options is used as a basis for the Appendix to this paper. Hence, within many existing navigational controls, it is usual, as a consequence of human factors, for a low level of residual risk to remain. Under present industry guidelines, this is true even after the optimisation process for site selection is complete. Thus, in some existing ports this risk remains to be controlled on a day by day basis.

Of course, for new terminals, present day standards involving Environmental Impact Assessments, and similar procedures, should be even more effective in securing a low risk operation. However, within these systems, expert marine advice is necessary to ensure that, when a large gas release is considered, limited only by human elements, the consequences are controlled by other methods such as those discussed in chapters 9 and 10.

## 9 THE HUMAN ELEMENT

Accident reports show that effective risk management, whether in port or at sea, is often frustrated by an inability to completely obviate human error or uncharacteristic human behaviour. Indeed, the large majority of shipping casualties continue to occur as a result of the human element. But the relationship between operator error and risk assessment remains obscure; this is because human responses are difficult to predict and the process of human reaction is not fully understood.

For these reasons, risk management systems usually take the possibility of human error into account, attempting to control it by other means. Such methods can include alarms, ESD systems, engineered

fail-to-safe equipment, equipment redundancy (back-up), and procedures. As appropriate, these devices include multiple cross-checking features. The positive contribution of all these measures to risk reduction is clear. However, casualty data shows (see sections 8.1 and 10.1), that even for LNG carriers, current techniques involving human controls are less than one-hundred per cent effective. Thus, when limiting the chance of a significant accident — to match a very low risk exposure — the range of industry standards covered in chapter 8 are found to be less than foolproof.

This paper suggests, therefore, that it is necessary in the port approach, to adopt a method of risk management which, as far as possible, discounts the contribution of human judgement. In particular, this chapter not only addresses the need to consider accidents where human judgement has proved helpful in limiting the consequences but also to consider the increased risk in some areas when human controls have failed — perhaps thus endangering the ship's cargo tank containment system.

Drawing on the discussion in chapter 10, the ship's speed which may damage the cargo containment system can be estimated. By this means, for parts of the port approach, speed controls can be established to limit the consequences of collisions, strikings and groundings. In the case of a ship grounding it is possible to assess whether the potential damage might cause cargo containment system rupture. This can be done by:

- reference to the quality of the sea-bed
- assessing the possible courses of the grounding ship
- estimating the ship's speed at the time, and
- applying the criteria given in references [17] and [18]

A similar list of criteria can be developed for collisions but the first item, as listed above, would be omitted and another added; viz, the angle of strike. In addition, references [19] to [26] should be studied.

This paper suggests, therefore, that each port should be investigated for the presence of the dangers which could cause critical impacts during the harbour transit of an LNG carrier and recommends that port designers, when assessing individual hazards, take the possibility of human error into account. This should be done to ensure a satisfactory safety margin is provided — that is, in the event of accident, an assurance ruling out cargo containment system rupture. It can be seen therefore that, when using this method, the following listing of existing safeguards are assumed to fail:

- operational procedures
- back up system warnings, and
- human controls

Evidently (see chapter 10) such high risk events are extremely rare in LNG shipping. Nevertheless, only after the above investigation has been completed can appropriate assurance be secured which protects a ship's cargo containment system against rupture. Because of the unquantifiable nature of the human element, this paper suggests that only by removal of all possibilities for containment system penetration can the correct level of port security be obtained.

## 10 GROUNDING AND COLLISION RISK

With respect to ship navigation, any hazard which may result in a large release of LNG can be identified by assessment of the energy necessary to penetrate the ship's inner and outer hulls. The double-hull arrangement provides LNG carriers' containment systems with protection to all but high impact. This means that, as part of port design there is every prospect for preventing a large gas release without introducing unrealistic port restrictions. However, and following from chapter 9, it should be seen that an important element to avoid, where possible, is any procedure over-dependant on human controls.

In this chapter, therefore, consideration is given to LNG carrier groundings and collisions with a view (through ship operation and port design) to reduce the risk of major gas releases. Clearly, once a terminal is in operation, knowledge that such accidents are virtually impossible, provides valuable input for future operations.

## 10.1 HULL DAMAGE - A HISTORICAL REVIEW

Analysis of SIGTTO and other casualty records give a reliable picture of the accident profile of the LNG shipping industry in the period between 1982 and 1996. However, because some categories of minor incident were considered unreportable, it is probable that the data is incomplete. Nevertheless, it is virtually certain that the data includes every incident, such as grounding and collision, having potential for damaging a ship's cargo containment system.

The data-base shows that the cargo handling and port-related accidents recorded in this period, and with the ships fully operational, numbered only ten. Of these:

- one occurred whilst manoeuvring in a port (propeller struck channel buoy)
- five involved ships breaking out from the jetty with the hard arms connected
- three involved mechanical failure, and
- one records a fire on the engine room switchboard

In none of these cases was the LNG carrier's cargo containment system put at risk.

For the period between 1962 and 1982 the data is less comprehensive, but still it is extremely unlikely that any significant incident, threatening an LNG carrier's cargo containment system, would have gone unreported. In this period there are only six accidents which might be categorised as posing a hazard to the ship's cargo containment system. Within this time frame there are five reported collisions and five reported groundings. One of the collisions involved an LNG carrier being struck whilst berthed, the others were outside port and none resulted in serious damage to the cargo containment system. Of the groundings only two (one in port and the other at sea) involved serious structural damage to the ship's bottom and in neither case was the cargo tank containment system penetrated.

The two serious grounding incidents demonstrate the capacity of LNG carriers to sustain bottom damage without experiencing rupture of the containment system.

Records show that there are no comparable data that would similarly demonstrate the resistance of an LNG carrier's side structures to collisions. Nevertheless, there are tools available for predicting such resistance, giving results which, when used with care, are able to establish the minimum energy required to put a cargo containment system at risk — see section 10.2.2.

So, although it has never happened over some three decades of LNG carriage, an important risk to be considered in port analysis is the possible release of cargo during groundings or collisions. Though open to interpretation, good estimates are available for the energy required to penetrate an LNG carrier's double hull so putting the ship's internal cargo tank containment system at risk. It is therefore possible to identify accident scenarios with potential for such damage and plan to remove them from port areas. Accordingly, when designing a port, the aim should be to limit the probability of high energy impacts on LNG carriers, such that damage to a ship's hull is minimised.

## 10.2 RISK OF STRUCTURAL DAMAGE TO LNG CARRIERS

### 10.2.1 General

The structure of LNG carriers, incorporating double bottom tanks and double sides, gives high resistance to the impact of grounding and collision. This is supported over many years of research (see references [17] to [26]), some of which is described in the following sections.

### 10.2.2 Collision Damage

One method [19], in which collision energy is assumed to be absorbed by the structures of both ships was, for many years, the accepted way for assessing collision resistance. Predictions using this method relied upon empirical resistance factors, mostly derived using data from actual impacts. More recent methods (see chapter 11), which include a better understanding of failure and collapse mechanisms, have led to more accurate predictions and these methods seem to be especially effective for low energy collisions; although the method first mentioned still gives acceptable results in high energy situations.

The results of such analyses are dependant on the impact angle (of the striking ship), the bow shape of the striking ship and the structure of the struck ship. Therefore conservative interpretations must be placed on such analyses, particularly if the results are intended to support the conclusions of a wider risk assessment.

Significant studies on the question of collision damage are included in the references. Based upon published methods, the following table lists examples of the resistance of a stationary 135,000 m<sup>3</sup> LNG carrier, expressed against the critical impact speed required to hole the outer hull but not to rupture the cargo tank containment system.

Hull Resistance for a 135,000 m <sup>3</sup> LNG Carrier	
Displacement of Colliding Ship (tonnes)	Critical Impact Speed (knots)
93,000	3.2
61,000	4.2
20,000	7.3

For the reasons indicated above, the results shown in the table are considered to be realistic and provide conservative estimates — so allowing a satisfactory margin for error.

### 10.2.3 Grounding Damage

Typical publications covering grounding damage are listed in the references — in some cases a reference may dwell on oil tanker topics, however, with respect to the double bottom depths, as present day oil tanker design is similar to that in LNG carriers, the references remain helpful. Indeed the references suggest that the similar structure in LNG carriers gives the same level of protection from low energy grounding and similar assurance in a significant proportion of high energy incidents.

Accurate prediction of damage in grounding incidents is difficult. But, given a smooth sea-bed of sand or mud, impact energy is usually spread over a large area of the ship's bottom and, with this cushioning effect, upward penetration is minimised. Rock bottoms cause more jagged penetrations with the impact being absorbed over a much smaller area.

### 10.2.4 Hazardous Penetration

As can be seen from the foregoing overview, analytical tools are available which can, with reasonable accuracy, predict damage to ship's hulls in collision and grounding situations. This means it is possible to set criteria for accident severity (in terms of ship's speed) below which rupture of the cargo containment system is virtually impossible.

It therefore becomes feasible to consider ways to analyse port approach channels so that any risk of cargo containment rupture can be removed and the remote possibility of an uncontrolled release of LNG reduced to non-credible proportions.

Hence, by removing individual risks in each port such as:

- rock outcrops or reefs
- underwater obstructions, and
- close encounters with other ships

from the main shipping channels and their immediate environs, port risks can be reduced to a level where a large release of LNG becomes too remote to imagine.

### 10.3 EXAMPLES

In this section practical application of the recommendations given in sections 10.1 and 10.2 is illustrated by simplified examples for a hypothetical port. The port in question is shown in Figure 3.

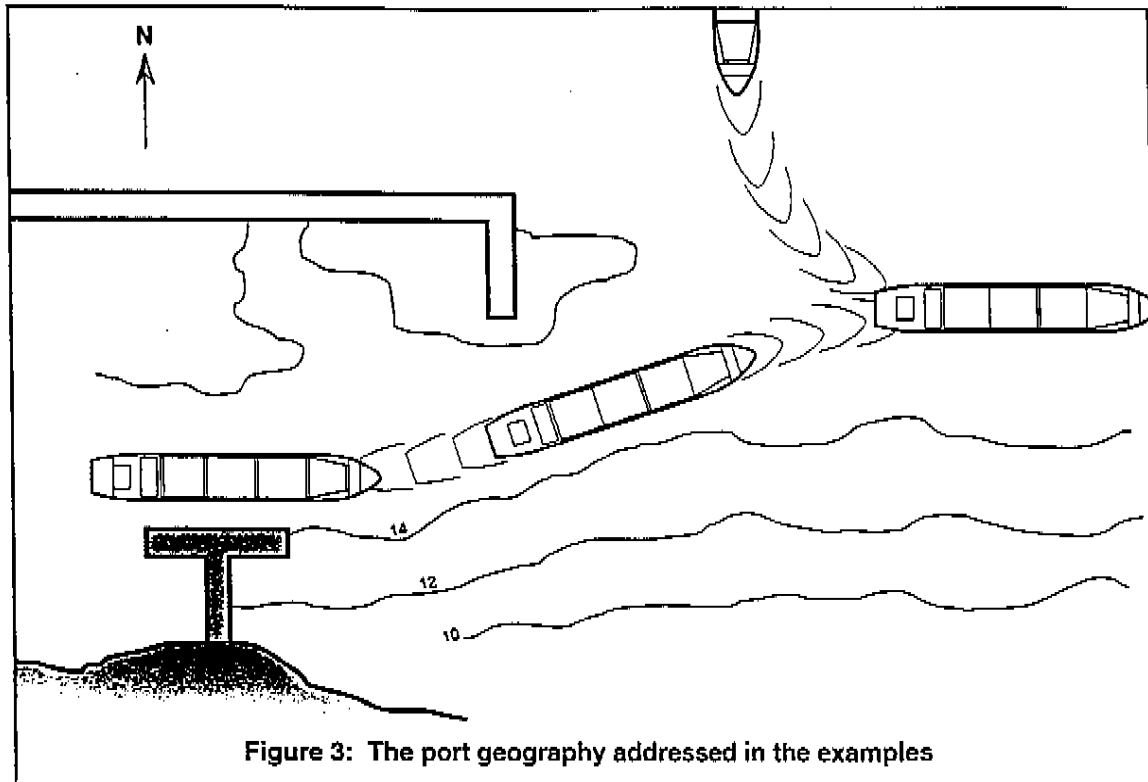


Figure 3: The port geography addressed in the examples

#### 10.3.1 Striking a Fixed Structure - Example 1

Harbour entry is carried out in accordance with the manoeuvre illustrated in Figure 3. This involves moving stern-first through the port entrance under the control of tugs.

The following conditions are assumed to apply:

- Tug numbers, tug power, and operating conditions are specified for the port such that the LNG carrier is fully controlled by tugs alone, even in case of ship engine failure.
- Penetration of the ship's outer hull, through striking the corner of the harbour wall, is calculated to require a side-on speed of 5 knots. Furthermore, the calculations show that this damage will not extend to the cargo tank containment system. (For this scenario, the worst case condition occurs with impact on the ship's parallel body and with the transverse velocity at 90° to the point of impact).
- Misjudgment by those controlling the manoeuvre is assumed.
- At a point on the ship's track (from which impact on the corner of the harbour wall is possible) simultaneous failure of the ship's engines, and sufficient of the tugs for loss of control, is assumed. This is assessed as being possible once in 5 million operations.
- The most likely part of the ship to strike the wall is the ship's stern structure. Collision damage in this area cannot put the cargo containment system immediately at risk.

- The critical speed of 5 knots for a side-on striking cannot be achieved from any point in the manoeuvre since the ship's maximum drift speed in open sea conditions, in wind speeds of 30 knots, is calculated as just 4 knots. This wind produces conditions in which tugs cannot operate; and therefore, under such conditions, the port would be closed. In any case the wind does not contribute sufficient extra speed, to that already given by the tugs, for a 5 knot side-on speed to be achieved from the stern-first manoeuvre.

#### Solution

With the effects of harbour wall fendering discounted and the resistance of the cargo tank containment system ignored, the probabilities of sustaining cargo tank containment system penetration through striking the harbour wall are assessed as non-credible.

#### 10.3.2 Grounding - Example 2

Assuming human error has occurred, the arriving LNG carrier overshoots the initial port-hand turn of the entry manoeuvre with excessive speed and, through technical failure or misjudgment, the tugs fail to stop the ship. As a result the carrier enters shallow water to the east of the jetty and grounds.

- It is assumed that the ship's last course before grounding can result in angles of impact from head-on (bow-on) to beam-on (side-on).
- Head-on grounding is assumed to have a higher speed than from other directions since any other angle of impact implies a change of course — hence speed loss.
- The sea-bed is free of obstructions and smooth, hence point penetrations are not possible. The slope of the sea-bed is two metres in every 100 metres over the ground.
- The maximum possible head-on grounding speed is assessed at 12 knots. Higher speeds are considered impossible because of shallow water effects, which slow the ship, and because the ship should have put its engines into manoeuvring mode (slower than full sea speed) well in advance. For this reason, grounding speeds for all other angles of impact must be less than 12 knots.
- Impact energy for a head-on grounding is mostly absorbed by structural damage forward of the cargo containment area, and the ship's forward speed is reduced to less than 6 knots (half the initial speed) before the ship's bottom under the cargo tanks takes the ground. The residual impact energy is then spread broadly through the bottom structure as the ship runs over a 2:100 gradient and this is calculated to be insufficient (with a smooth sea-bed) to achieve penetration of the cargo containment system.
- Groundings with the LNG carrier at any other angle to the shore, other than head-on, involve progressive combinations of speed reduction and structural deformation of the ship's bottom forward of the cargo tanks - until, with the beam-on grounding, the impact is taken wholly on the ship's side, but with a speed less than 6 knots.

#### Solution

Actual grounding incidents and theoretical calculations together suggest that rupture of the cargo containment system is non-credible in any of the cases.



## 11

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*Some references relating to collision damage*

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- [22] *Studies of the Resistance of LNG Carriers to Collisions* - Greuner H.P., Bockenbauer M., LNG 6 Conference Proceedings - 1980
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- [24] *A Comparison of the Collision Resistance of Membrane Tank-type and Spherical Tank-type LNG Tankers* - Edinberg D.L. et al., Gastech Proceedings, Hamburg - 1981
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## APPENDIX

## LNG PORTS - RISK REDUCTION OPTIONS

<b>General Requirements for LNG Carriers</b> (Where figures are given they refer to LNG carriers of 135,000 m <sup>3</sup> capacity)	
<b>1</b>	<b>The Port</b>
<b>1.1</b>	<b>Port Analysis</b>
	Speed restrictions for LNG carriers should be appropriate to limit grounding and collision damage.
<b>1.2</b>	<b>Approach Channels and Turning Basins</b>
	Navigable depths (for most LNG carriers) should generally not be less than 13 metres below the level of chart datum.
	Under-keel clearances should be established in accordance with the sea-bed quality.
	Channel width should be about five times the beam of the ship (approximately 250 metres).
	Turning areas should have a minimum diameter of two to three times the ship's length (approximately 600 to 900 metres).
	Short approach channels are preferable to long inshore routes which carry more numerous hazards
	Traffic separation schemes should be established in approach routes covering many miles.
	Anchorage should be established at the port entrance and inshore, for the safe segregation of LNG carriers and to provide lay-by facilities in case, at the last moment, the berth proves unavailable.
<b>1.3</b>	<b>Navigational Aids</b>
	Buoys to mark the width of navigable channels should be placed at suitable intervals.
	Leading marks or lit beacons, to mark channel centrelines and to facilitate rounding channel bends, should be appropriately placed.
	Electronic navigational aids, to support navigation under adverse weather conditions, are needed in most ports.
	Lit navigational aids should be provided to allow ship movements at night.
<b>1.4</b>	<b>Port Services</b>
	Tugs should be made available and three to four are normally required giving 140 tonnes total bollard pull. (Tugs may be required to meet LNG carriers farther offshore).
	Mooring services are often required and these services should normally provide a minimum of two boats, each having at least 400 horsepower.
	Escort services comprising fast patrol craft, to clear approach channels, turning areas, jetty, etc. should be provided in busy port areas.
	Firefighting services comprising specially equipped craft, or, one or more suitably equipped tugs should be provided.

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## Appendix

<b>1.5</b>	<b>Port Procedures</b>
	Traffic control or VTS systems should be strictly enforced to ensure safe harbour manoeuvring between the pilot boarding area and the jetty.
	Speed limits should be introduced in appropriate parts of the port approach, not only for the LNG carrier but also for other ships.
	Pilotage services should be required to provide pilots of high quality and experience. Pilot boarding areas should be at a suitable distance offshore.
	Ship movements by nearby ships, when the LNG carrier is pumping cargo, should be disallowed.
	Pilots and tugs should be immediately available in case the LNG carrier has to leave the jetty in an emergency.
<b>1.6</b>	<b>Port Operating Limits</b>
	Environmental limits for wind, waves, and visibility should be set for ship manoeuvres and these should ensure adequate safe margins are available under all operating conditions.
	Weather limits for port closure should be established.
<b>1.7</b>	<b>Weather Warnings</b>
	Forecasting for long range purposes should be provided to give warning of severe storms, such as typhoons and cyclones.
	Forecasting for short range purposes, such as those required for local storms and squalls, should be made available.
<b>2</b>	<b>The Jetty</b>
<b>2.1</b>	<b>Jetty Location</b>
	Jetty location should be remote from populated areas and should also be well removed from other marine traffic and any port activity which may cause a hazard.
	The maximum credible spill and its estimated gas-cloud range should be carefully established for the jetty area.
	River bends and narrow channels should not be considered as appropriate positions for LNG carrier jetties.
	Breakwaters should be constructed for jetty areas exposed to sea action, such as excessive waves and currents.
	Restrictions, such as low bridges, should not feature in the jetty approach.
	Ignition sources should be excluded within a predetermined radius from the jetty manifold.
<b>2.2</b>	<b>Jetty Layout</b>
	Mooring dolphin spacing - between the outermost dolphins - should not be less than the ship's length (approximately 290 metres).
	Mooring dolphins should be situated about 50 metres inshore from the berthing face.
	Mooring points should be suitably positioned, and have suitable strength, for the environmental conditions.
	Quick-release hooks should be provided at all mooring points.

## Appendix

SIGTTO

	Breasting dolphin spacing should be designed to ensure that the parallel body of the ship is properly supported.
	Fendering for the dolphins, and for the berth face, should be to a suitable standard.
<b>2.3</b>	<b>Jetty Equipment</b>
	Pipelines and pumps etc should be designed to provide a rapid port turn-round.
	Emergency Release Systems at the hard arms should be fitted in accordance with industry specifications. The ERS should be suited to both ship and shore by interlinking and a PERC should be fitted to each hard arm for emergency stoppage and quick release purposes.
	Emergency shut-down valves should be fitted to both ship and shore pipelines and should form part of the ERS system.
	Powered emergency release couplings (PERCs) with flanking quick-acting valves should be fitted to the hard arm as part of the ERS system.
	Plugs both on ship and shore to carry all ESD and communication signals should be standardised.
	Surge pressure control should be provided in LNG pipelines.
	Communications equipment (telephone, hot-line and radios) should be provided for ship/shore use.
	Load monitors, to show the mooring force in each mooring line, should be fitted to quick release hooks.
	Gangways should be provided to give safe emergency access to or from the ship.
<b>2.4</b>	<b>Basic Firefighting Facilities</b>
	Water curtain pumps and pipelines should be provided.
	Fixed Dry Powder systems should be provided.
	Gas detection monitors should be fitted at strategic locations.
	Fireproof material should be used for the construction of hard arms (no aluminium).
<b>2.5</b>	<b>Jetty Procedures</b>
	On shore jetty safety zones should be effectively policed while the ship is alongside thus providing control over visitors and vehicles.
	Offshore safety zones should be effectively policed by a guard boat to limit the approach of small craft.
	Passing ships, close to the jetty, should have their speed controlled by the harbour VTS system.
	Communications procedures should be well established and tested.
	Contingency plans should be available in written form.
	Operating procedures should be available in written form.
	A Port Information/Regulation Booklet should be provided for passing operational advice to the ship.

## **ATTACHMENTS**

4. “LNG in the Gulf of Mexico”, presentation by Jeff Rester of the “Gulf States Marine Fisheries Commission”[http://www.seagrantfish.lsu.edu/pdfs/biloxi\\_07/JeffRester.pdf](http://www.seagrantfish.lsu.edu/pdfs/biloxi_07/JeffRester.pdf)  
The Gulf States Marine Fisheries Commission (GSMFC) is an organization of the five states (Texas, Louisiana, Mississippi, Alabama, and Florida), whose coastal waters are the Gulf of Mexico. This compact, authorised under Public Law 81-66, was signed by the representatives of the Governors of the five Gulf States on July 16, 1949, at Mobile, Alabama. It has as its principal objective the conservation, development, and full utilization of the fishery resources of the Gulf of Mexico, to provide food, employment, income, and recreation to the people of these United States.  
To visit their homepage: <http://www.gsmfc.org/gsmfc.html>

# LNG in the Gulf of Mexico

Jeff Rester

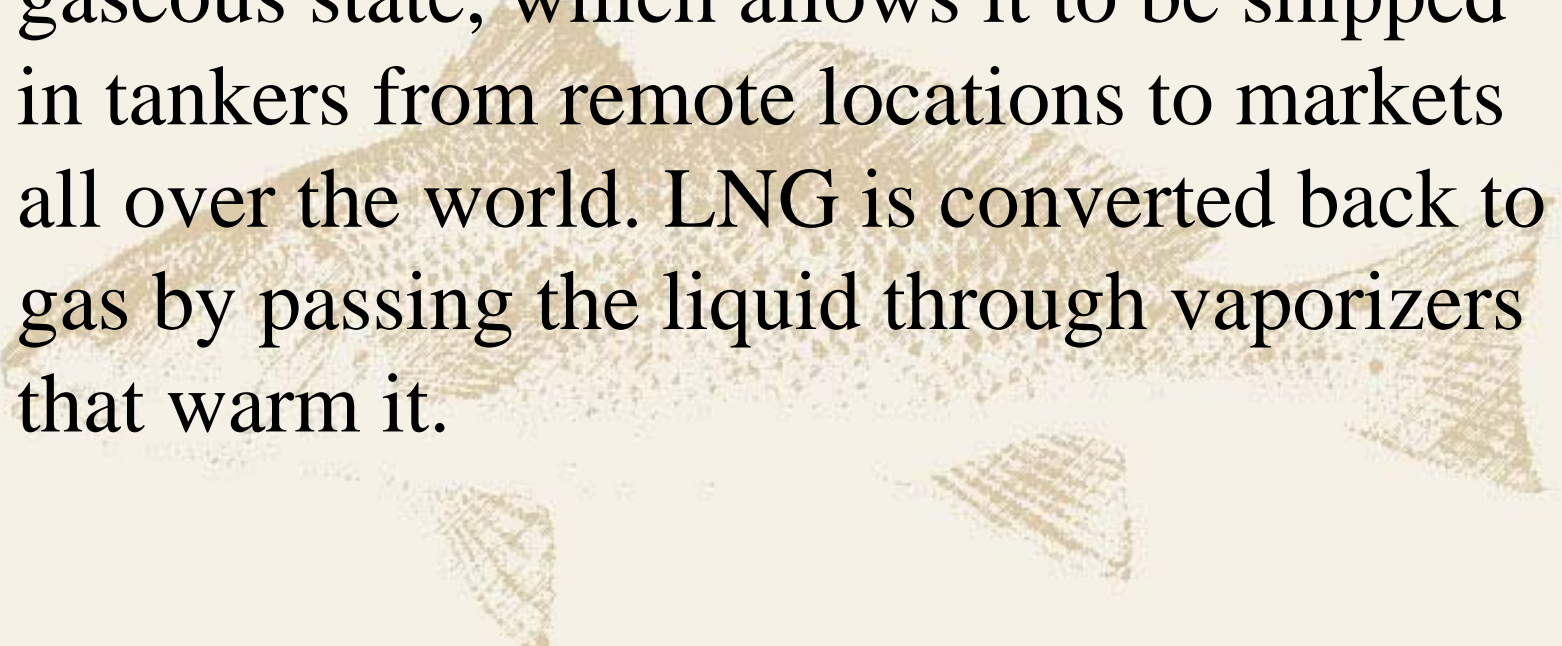
Gulf States Marine Fisheries Commission



# Liquefied Natural Gas

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LNG is natural gas that has been cooled below minus 260 degrees Fahrenheit and condensed into a liquid. LNG occupies 600 times less space than natural gas in its gaseous state, which allows it to be shipped in tankers from remote locations to markets all over the world. LNG is converted back to gas by passing the liquid through vaporizers that warm it.



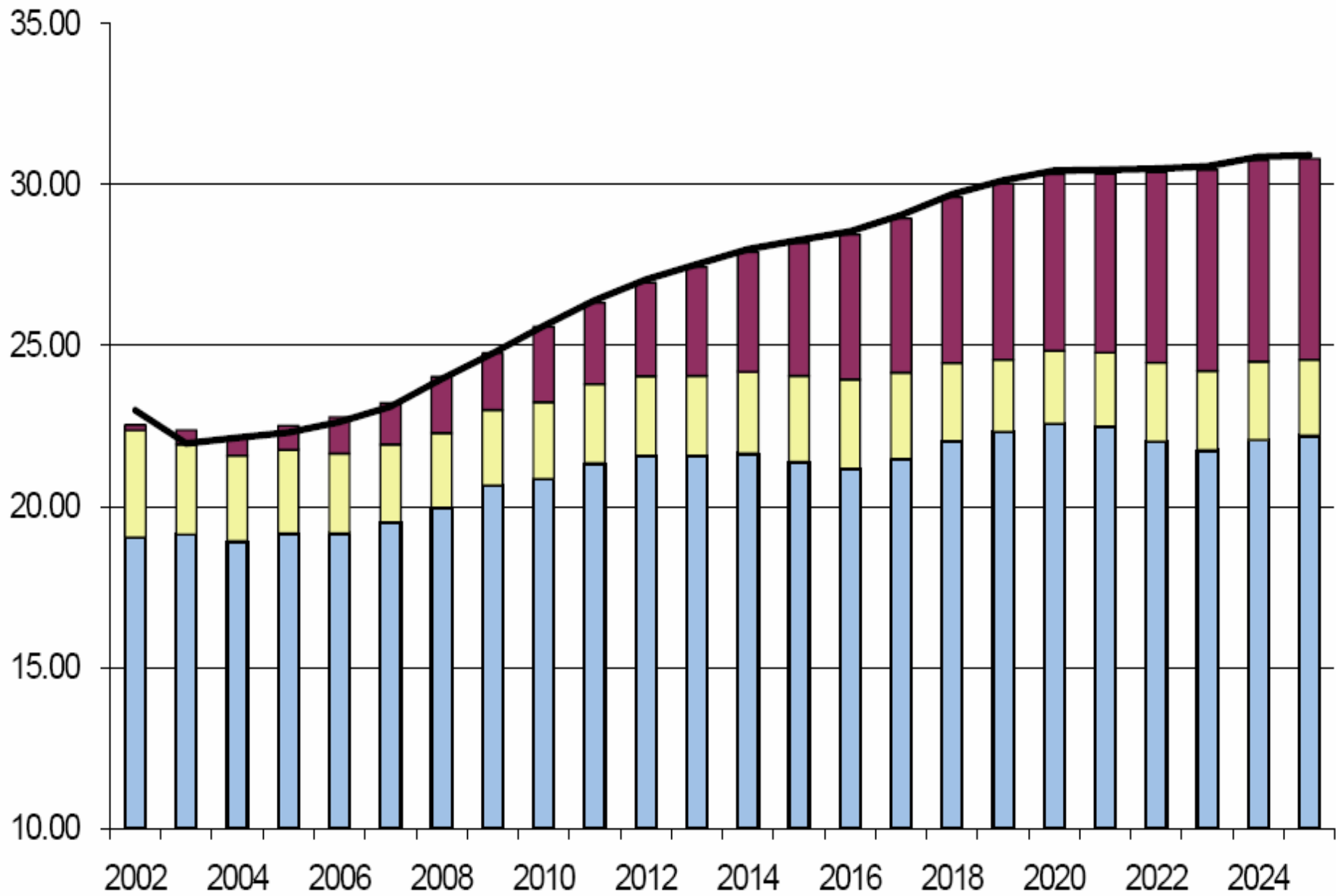


# Liquefied Natural Gas

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Most LNG is imported to the United States from overseas in large tankers to one of five U.S. import terminals in Cove Point, Maryland; Everett, Massachusetts; Elba Island, Georgia; Lake Charles, Louisiana; and the Gulf Gateway Energy Bridge Deepwater Port 116 miles off the coast of Louisiana.





Source: EIA 2005

■ U.S. Production 
 ■ Other Imports 
 ■ LNG Imports 
 — U.S. Demand

# Deepwater Port Act

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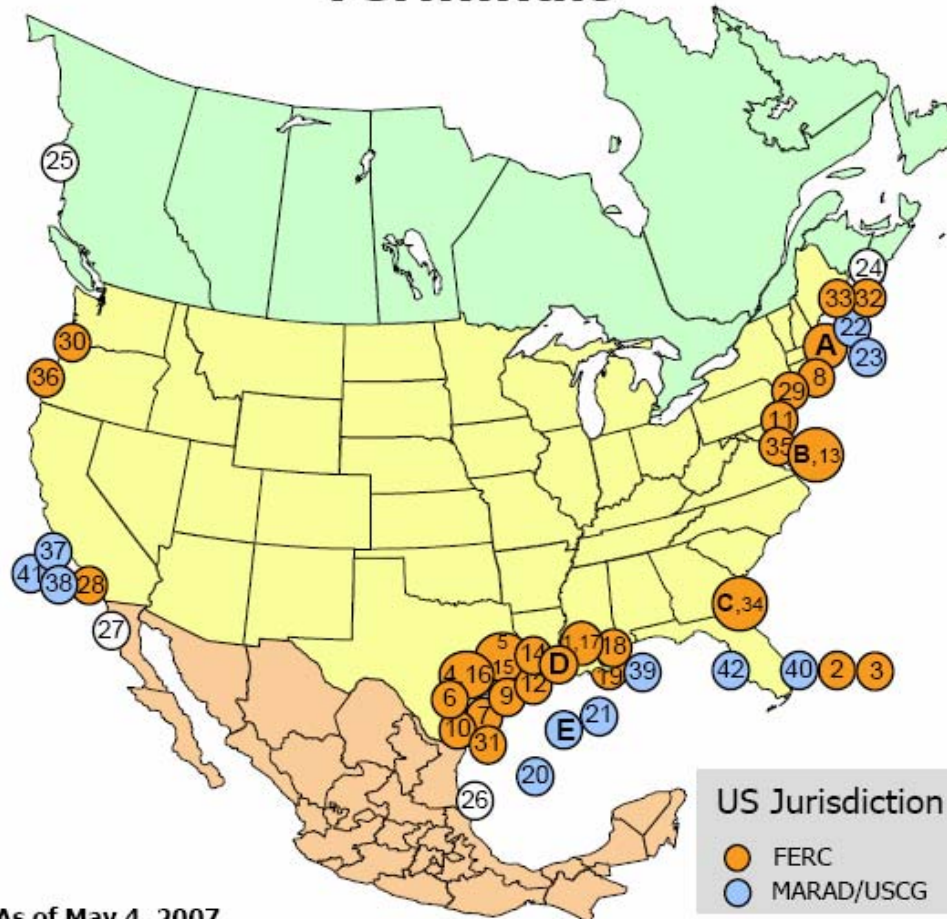
The Deepwater Port Act of 1974 was amended on November 25, 2002 to provide for offshore ports for natural gas. The first application to the U.S. Coast Guard was filed by ChevronTexaco on November 25, 2002 for a LNG deepwater port off the Louisiana coast. The DWPA provides a fast track for approval which is fixed by statute as 356 days after filing. This provision provides a firm statutory timeline for a decision which cannot be extended.

# Deepwater Port Act

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Under the DWPA only a single national federal license is required which is issued by the Department of Transportation. The U.S. Coast Guard is the lead agency that performs the license review, assisted by the Maritime Administration (MARAD). All other federal agencies must coordinate their work with the U.S. Coast Guard. Under the DWPA, the governor of the adjacent state can veto a project. The governor can also ask that the license be conditioned based on the state's interests. The EPA is the only federal agency with similar power.

# Existing and Proposed North American LNG Terminals



As of May 4, 2007

\* US pipeline approved; LNG terminal pending in Bahamas

\*\* Construction suspended

**CONSTRUCTED**

- A. Everett, MA : 1.035 Bcfd (DOMAC - SUEZ LNG)
- B. Cove Point, MD : 1.0 Bcfd (Dominion - Cove Point LNG)
- C. Elba Island, GA : 1.2 Bcfd (El Paso - Southern LNG)
- D. Lake Charles, LA : 2.1 Bcfd (Southern Union - Trunkline LNG)
- E. Gulf of Mexico: 0.5 Bcfd (Gulf Gateway Energy Bridge - Excelerate Energy)

**APPROVED BY FERC**

- 1. Hackberry, LA : 1.5 Bcfd (Cameron LNG - Sempra Energy)
- 2. Bahamas : 0.84 Bcfd (AES Ocean Express)\*
- 3. Bahamas : 0.83 Bcfd (Calypso Tractebel)\*
- 4. Freeport, TX : 1.5 Bcfd (Cheniere/Freeport LNG Dev.)
- 5. Sabine, LA : 2.6 Bcfd (Sabine Pass Cheniere LNG)
- 6. Corpus Christi, TX : 2.6 Bcfd (Cheniere LNG)
- 7. Corpus Christi, TX : 1.1 Bcfd (Vista Del Sol - ExxonMobil)
- 8. Fall River, MA : 0.8 Bcfd (Weaver's Cove Energy/Hess LNG)
- 9. Sabine, TX : 2.0 Bcfd (Golden Pass - ExxonMobil)
- 10. Corpus Christi, TX : 1.0 Bcfd (Ingleside Energy - Occidental Energy Ventures)\*\*
- 11. Logan Township, NJ : 1.2 Bcfd (Crown Landing LNG - BP)
- 12. Port Arthur, TX : 3.0 Bcfd (Sempra Energy)
- 13. Cove Point, MD : 0.8 Bcfd (Dominion)
- 14. Cameron, LA : 3.3 Bcfd (Creole Trail LNG - Cheniere LNG)
- 15. Sabine, LA : 1.4 Bcfd (Sabine Pass Cheniere LNG - Expansion)
- 16. Freeport, TX : 2.5 Bcfd (Cheniere/Freeport LNG Dev. - Expansion)
- 17. Hackberry, LA : 1.15 Bcfd (Cameron LNG - Sempra Energy - Expansion)
- 18. Pascagoula, MS : 1.5 Bcfd (Gulf LNG Energy LLC)
- 19. Pascagoula, MS : 1.3 Bcfd (Bayou Casotte Energy LLC - ChevronTexaco)

**APPROVED BY MARAD/COAST GUARD**

- 20. Port Pelican : 1.6 Bcfd (ChevronTexaco)
- 21. Offshore Louisiana : 1.0 Bcfd (Main Pass McMoran Exp.)
- 22. Offshore Boston : 0.4 Bcfd (Neptune LNG - SUEZ LNG)
- 23. Offshore Boston : 0.8 Bcfd (Northeast Gateway - Excelerate Energy)

**CANADIAN APPROVED TERMINALS**

- 24. St. John, NB : 1.0 Bcfd (Canaport - Irving Oil/Repsol)
- 25. Kitimat, BC : 1.0 Bcfd (Kitimat LNG - Galveston LNG)

**MEXICAN APPROVED TERMINALS**

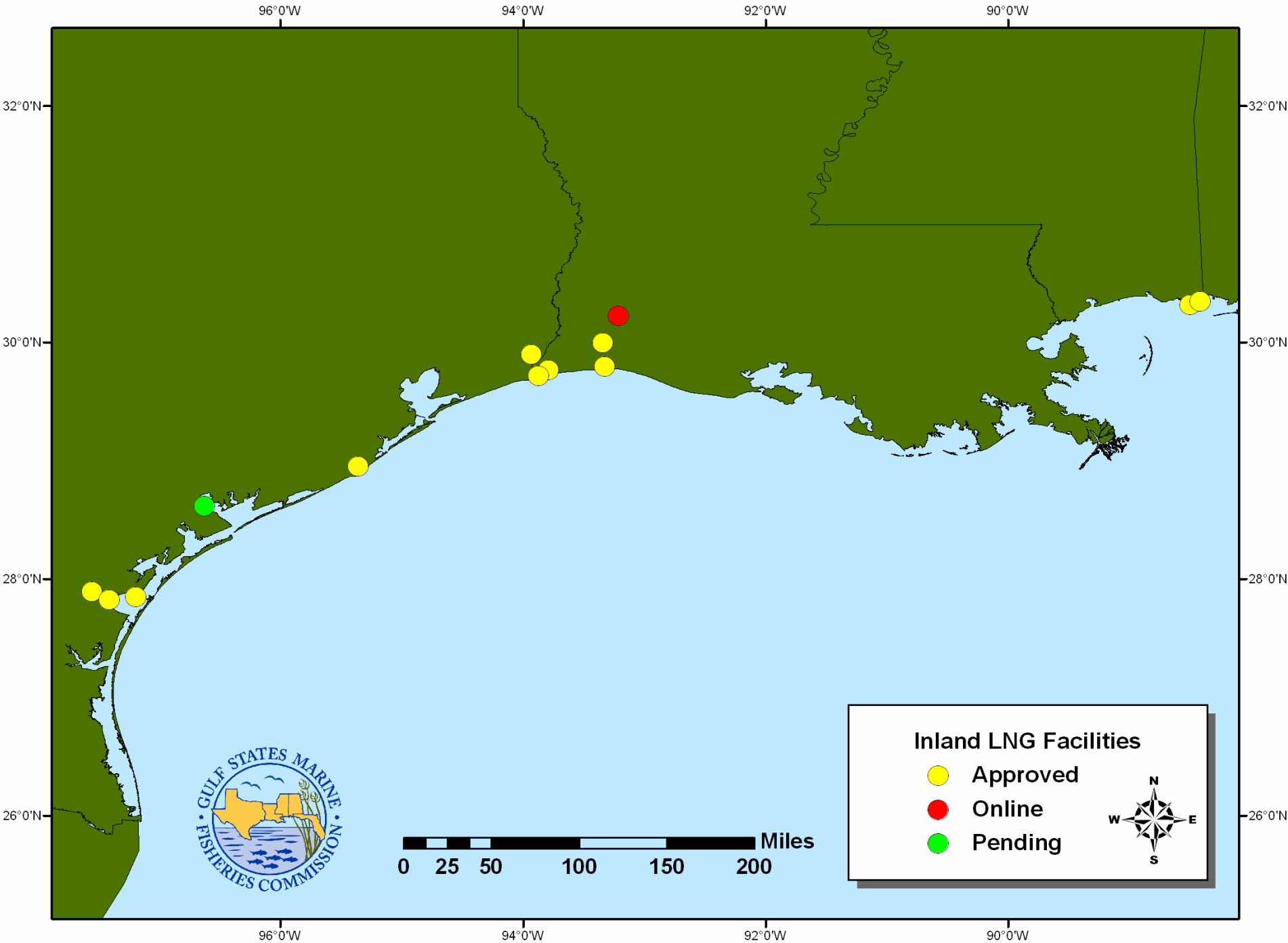
- 26. Altamira, Tamulipas : 0.7 Bcfd (Shell/Total/Mitsui)
- 27. Baja California, MX : 1.0 Bcfd (Energia Costa Azul - Sempra Energy)

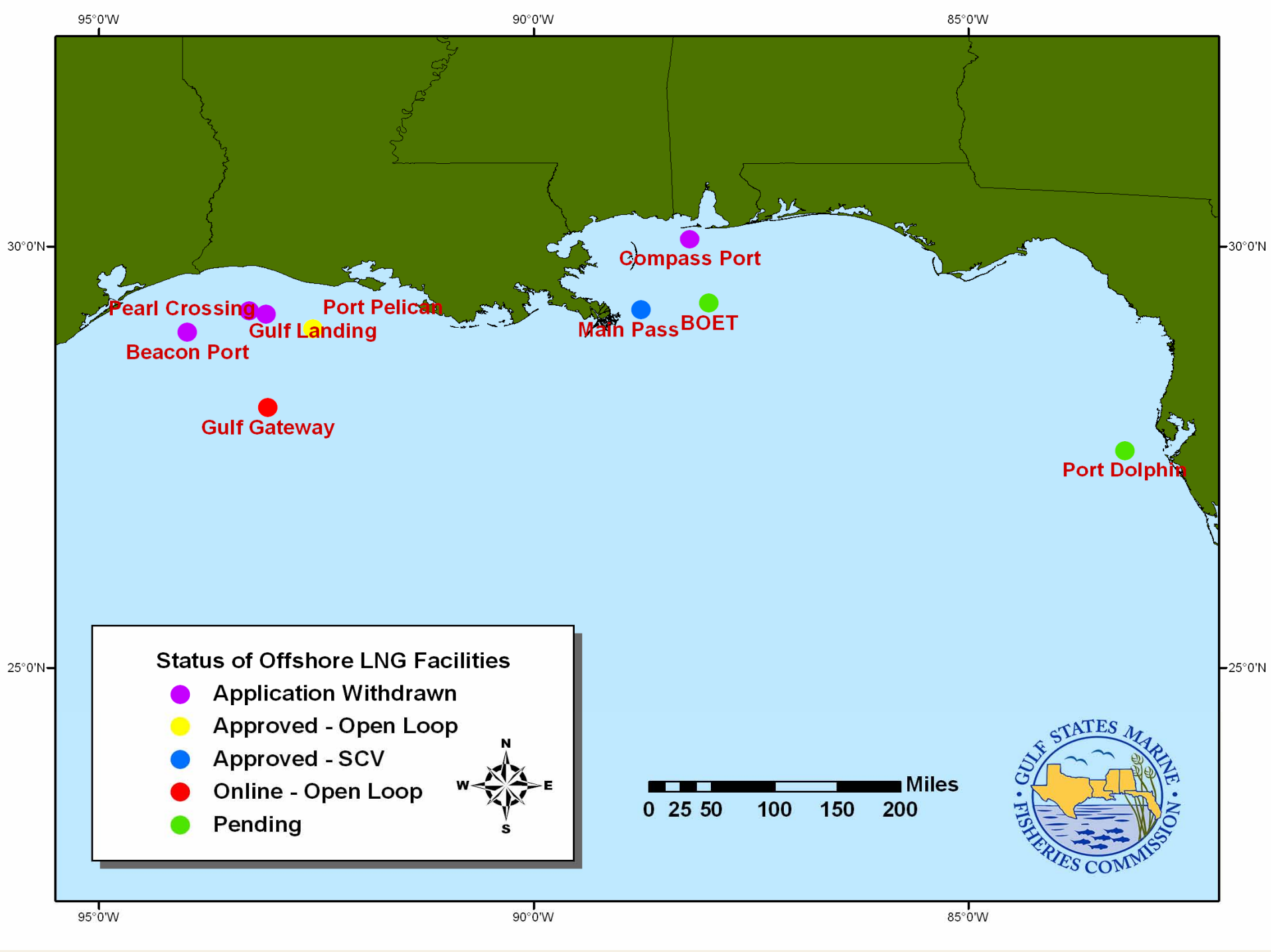
**PROPOSED TO FERC**

- 28. Long Beach, CA : 0.7 Bcfd, (Mitsubishi/ConocoPhillips - Sound Energy Solutions)
- 29. LI Sound, NY : 1.0 Bcfd (Broadwater Energy - TransCanada/Shell)
- 30. Bradwood, OR : 1.0 Bcfd (Northern Star LNG - Northern Star Natural Gas LLC)
- 31. Port Lavaca, TX : 1.0 Bcfd (Calhoun LNG - Gulf Coast LNG Partners)
- 32. Pleasant Point, ME : 2.0 Bcfd (Quoddy Bay, LLC)
- 33. Robbinston, ME : 0.5 Bcfd (Downeast LNG - Kestrel Energy)
- 34. Elba Island, GA : 0.9 Bcfd (El Paso - Southern LNG)
- 35. Baltimore, MD : 1.5 Bcfd (AES Sparrows Point - AES Corp.)
- 36. Coos Bay, OR : 1.0 Bcfd (Jordan Cove Energy Project)

**PROPOSED TO MARAD/COAST GUARD**

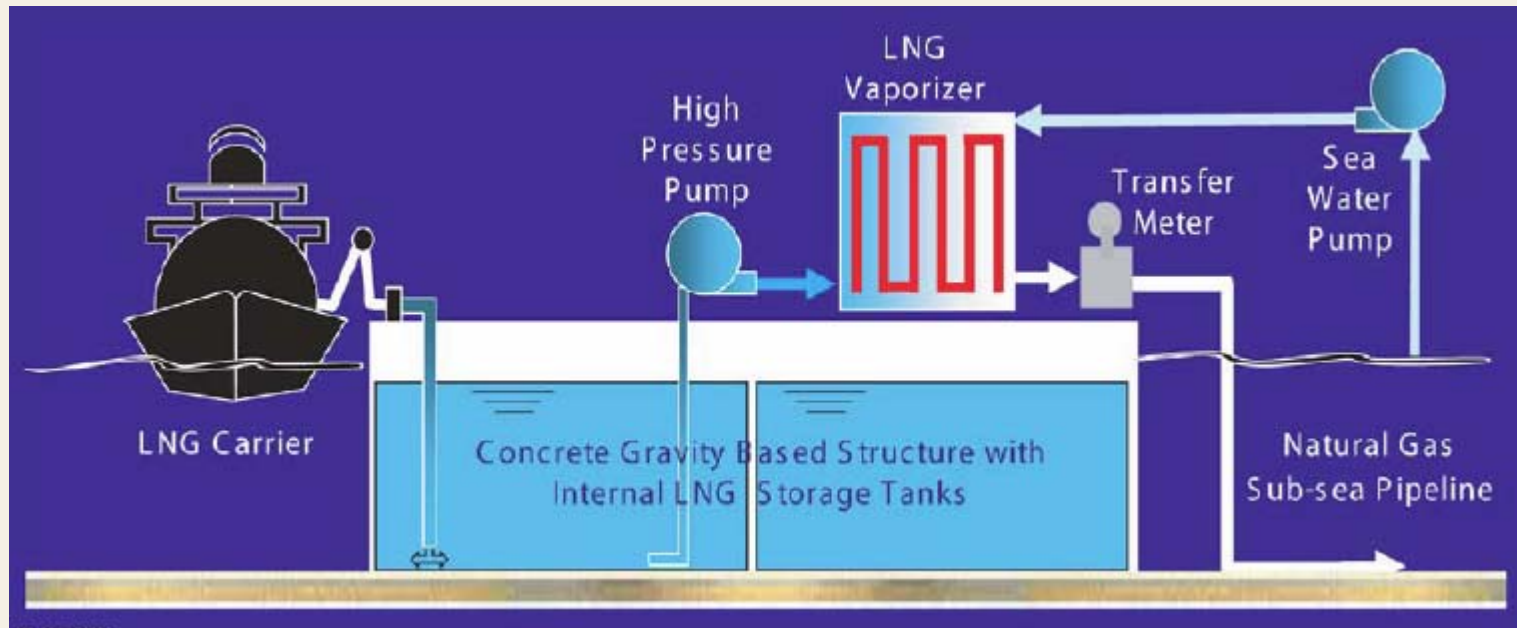
- 37. Offshore California : 1.5 Bcfd (Cabrillo Port - BHP Billiton)
- 38. Offshore California : 0.5 Bcfd, (Clearwater Port LLC - NorthernStar NG LLC)
- 39. Gulf of Mexico: 1.4 Bcfd (Bienville Offshore Energy Terminal - TORP)
- 40. Offshore Florida: 1.9 Bcfd (SUEZ Calypso - SUEZ LNG)
- 41. Offshore California: 1.2 Bcfd (OceanWay - Woodside Natural Gas)
- 42. Offshore Florida: 1.2 Bcfd (Hoegh LNG - Port Dolphin Energy)





# LNG Vaporization

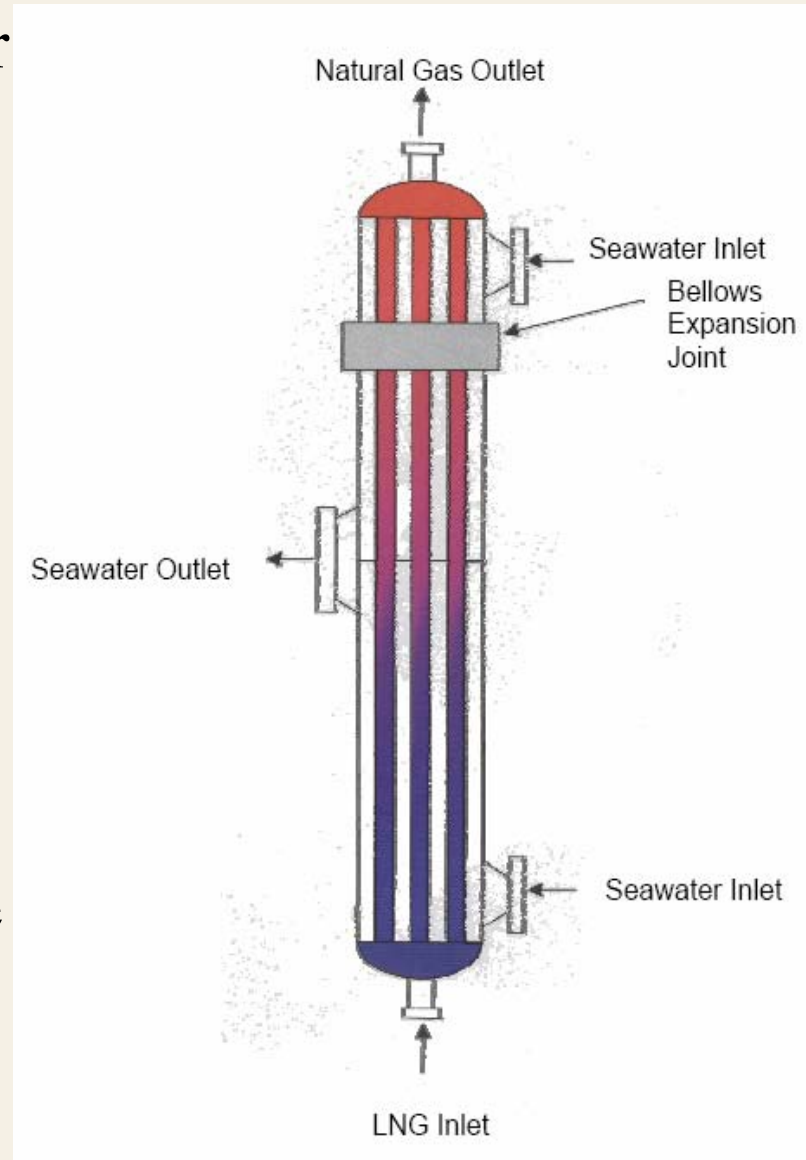
An open rack vaporizer uses sea water as the heat source for vaporizing the LNG into gas using a series of heat-transfer tube panels. Sodium hypochlorite is usually injected at the intake to prevent marine growth inside the warming water system.





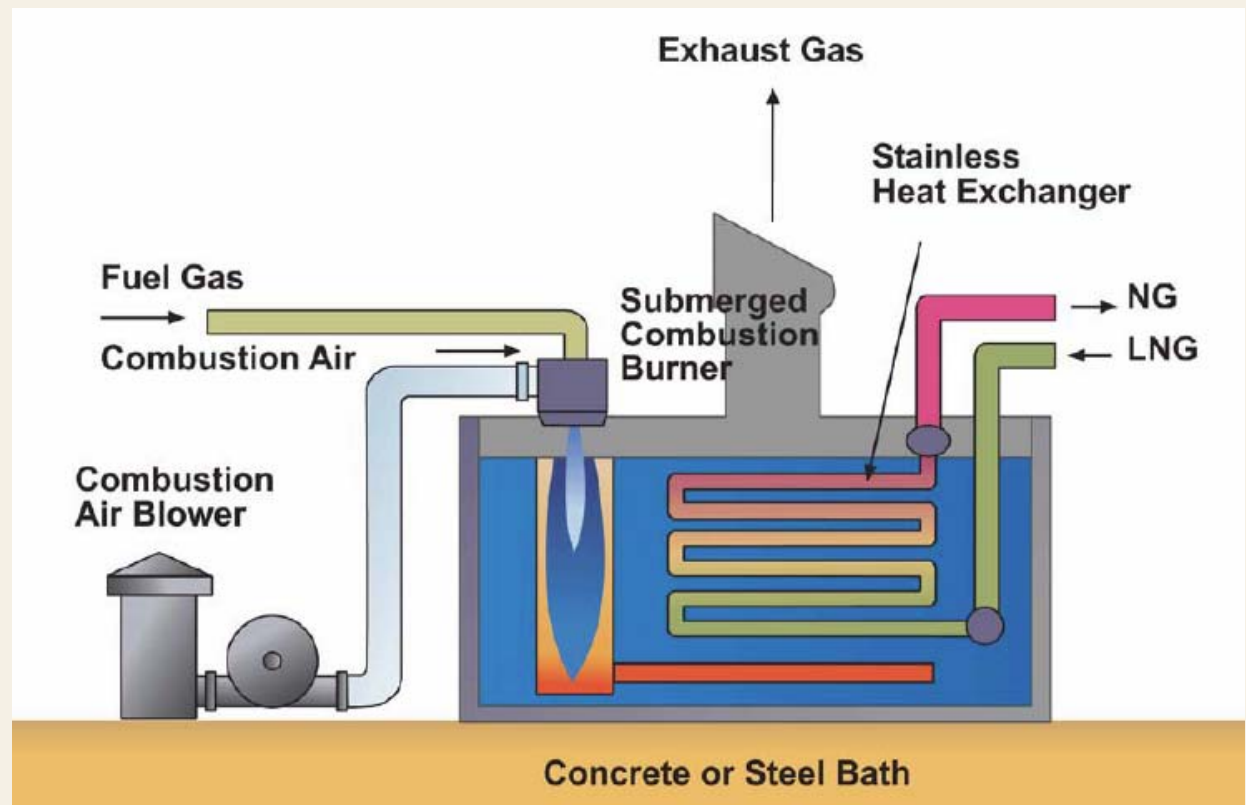
# LNG Vaporization

A shell and tube vaporizer also uses sea water as the heat source. An inlet is located at the bottom, with water running in the same direction as the LNG. The other inlet is located at the top with sea water running counter flow to the LNG. The seawater exits through the center of the STV and is routed to an outfall.



# LNG Vaporization

A submerged combustion vaporizer uses natural gas as a heat source to vaporize LNG back into a gas. A submerged combustion vaporizer consumes 1 to 2 percent of the natural gas produced each year as fuel.



# Concerns

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- Open loop systems will be drawing in 100 to 195 million gallons of seawater per day on average
- Water leaving the system will be 13.5°F to 20°F colder at outfall and will contain anti-biofouling agents
- Billions of fish and crustacean eggs, larvae, and other zooplankton will be destroyed each year through impingement or entrainment



# Problems Estimating Larval Fish Densities

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- Sampling intensity and timing of SEAMAP data are inadequate for estimating densities at one location (1-2 samples per year per station in summer and fall; winter spawners such as grouper and menhaden are not well represented)
- The short duration of larvae in the water column (e.g., about 20 days for snapper) increases sampling error
- Of the fishery species in the Southeast, scientists can only identify about 30% of larval fish to the species level



# Problems Estimating Larval Fish Densities

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- Oblique plankton tows integrate water column; more representative in fall when water column is mixed
- 0.333-mm mesh net misses some larvae
- Estimates for entrainment mortality are between 1.6 and 13.1 billion eggs and larvae each year



# Concerned Fishery Agencies

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- Texas Parks and Wildlife Department
  - Louisiana Department of Wildlife and Fisheries
  - Mississippi Department of Marine Resources
  - Alabama Department of Conservation and Natural Resources
  - NOAA Fisheries
  - Gulf of Mexico Fishery Management Council
  - Gulf States Marine Fisheries Commission
- 

# Concerned Leaders

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On May 17, 2005, Louisiana Governor Kathleen Blanco in a letter to John Jamian, Acting Maritime Administrator, stated that “I will oppose the licensing of offshore LNG terminals that will use the open rack vaporizer system. Until studies demonstrate that the operation of the open rack vaporizer will not have an unacceptable impact on the surrounding ecosystem, I will only support offshore LNG terminals using a closed loop system having negligible impacts to marine life.”

# Concerned Leaders

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On June 15, 2005, Alabama Governor Robert Riley stated in a letter to MARAD that “I cannot support the development of terminals using the open-loop system unless there is proof of negligible impacts on the marine fisheries and marine habitat.”

On June 16, 2005, Mississippi Governor Haley Barbour stated in a letter to MARAD that “due to concerns with the open rack vaporization system proposed for the Compass Port project, as Governor of an adjacent State, I oppose the permitting of this facility unless assurances supported by adequate scientific data are provided to ensure our marine resources will be protected.”



# Port Pelican

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- Deepwater Port license was granted in January 2004
- On July 12 2005, Port Pelican announced its decision to put the project on hold indefinitely



# Energy Bridge

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- 116 miles south of Cameron, Louisiana in 298 feet of water
- Open loop system using 76 million gallons of water per day
- Received their license in May 2004
- Commenced operations on March 17, 2005
- All regasification takes place onboard the vessel
- Excelerate Energy has proposed an additional LNG port off Massachusetts that will use the same vessels, but in a closed loop mode
- Due to concerns over using 56 mgd of seawater at the Massachusetts facility for vessel operations, Excelerate Energy agreed to reduce seawater usage to 11.5 mgd

# Ichthyoplankton Assessment Model

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- Uses SEAMAP Ichthyoplankton Data – Data only available for June through November
- Used to calculate potential entrainment impacts on fish eggs and larvae
- Estimates the density of larvae and eggs that could be entrained and applies those numbers to estimate potential impacts on species of concern
- Species of concern were selected based on economic and ecological importance, availability of life history data and the similarity to representative population types
- Red Drum, Bay Anchovy, Gulf Menhaden, and Red Snapper
- Effort was made to assess king and Spanish mackerel, but the current level of information available for these species is insufficient to generate a realistic assessment

# Gulf Landing

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- 38 miles south of Cameron, Louisiana in a water depth of 55 feet
- Open loop system using 136 million gallons of water per day
- Closed loop system would use 2.2 % of the natural gas produced each year for heating purposes and would cost \$20.7 to 43.3 million per year to operate
- Open loop discharge water would be 18° F colder than surrounding water and contain sodium hypochlorite
- Final EIS examined impacts to
  - Gulf Menhaden
  - Bay Anchovy
  - Red Drum
  - Red Snapper
- Intake screen located 36 feet below the surface

# Gulf Landing

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## Potential Annual Fish Egg Entrainment

Mean	2,331,734,269
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Lower	684,271,697
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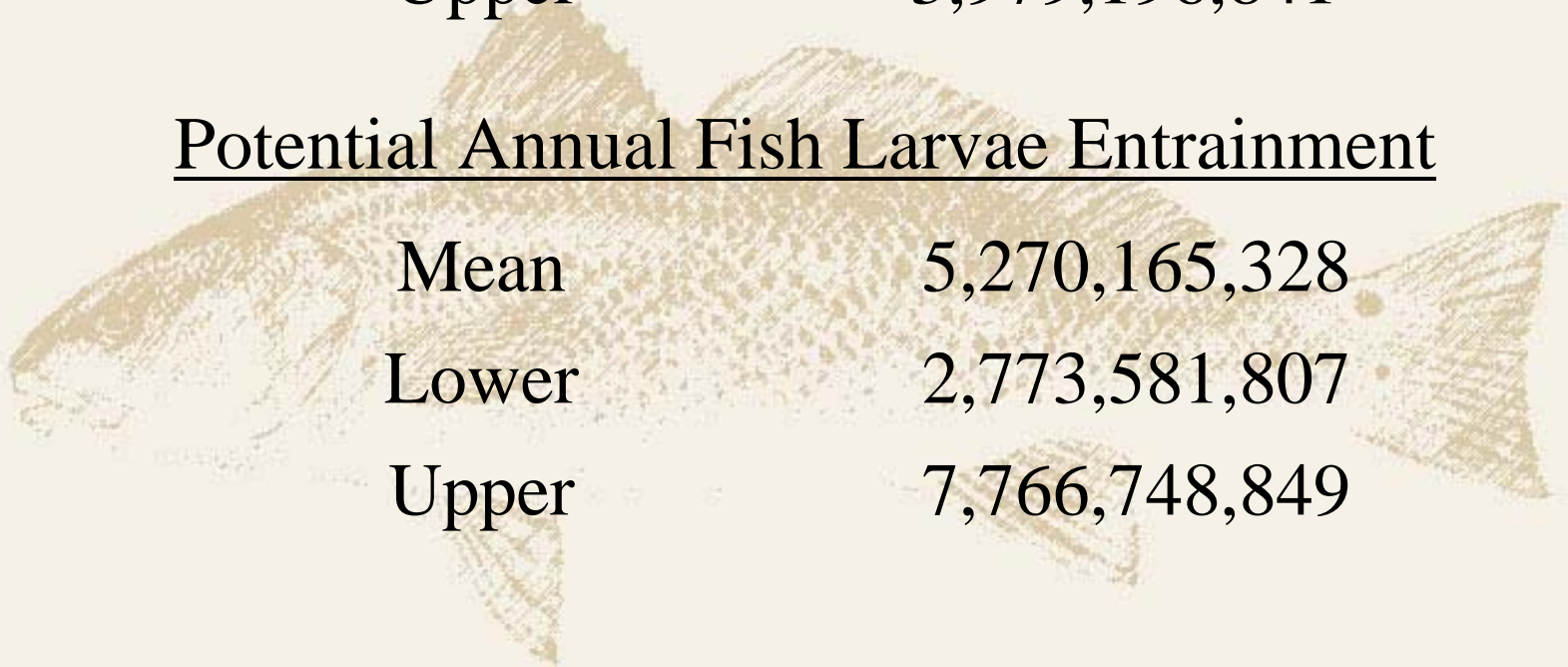
Upper	3,979,196,841
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## Potential Annual Fish Larvae Entrainment

Mean	5,270,165,328
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Lower	2,773,581,807
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Upper	7,766,748,849
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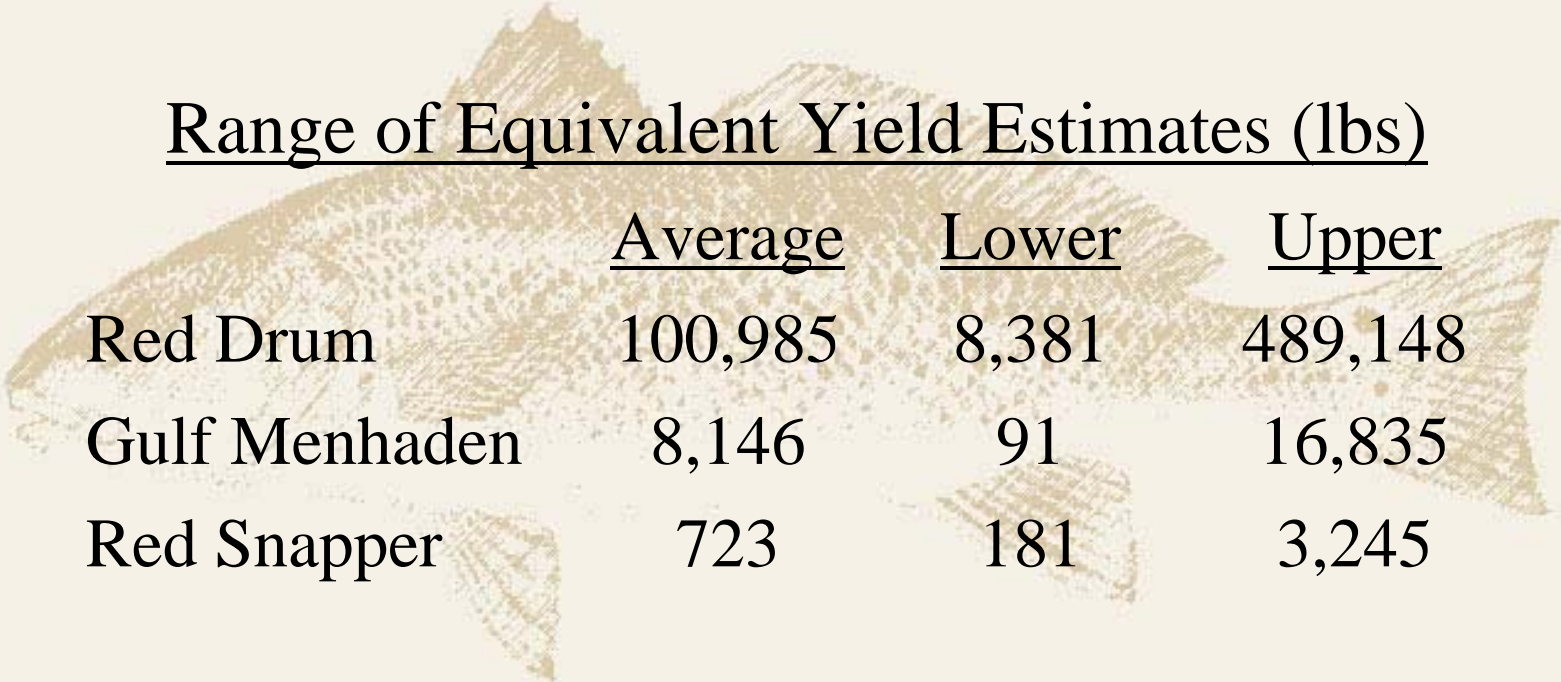


# Gulf Landing

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Equivalent yield estimates adjust the estimated larval impacts forward in time to resemble a fishery yield or harvest. The equivalent yield estimate is used as a base for reasonable comparison to other fisheries to help assess potential stress on the population.

## Range of Equivalent Yield Estimates (lbs)



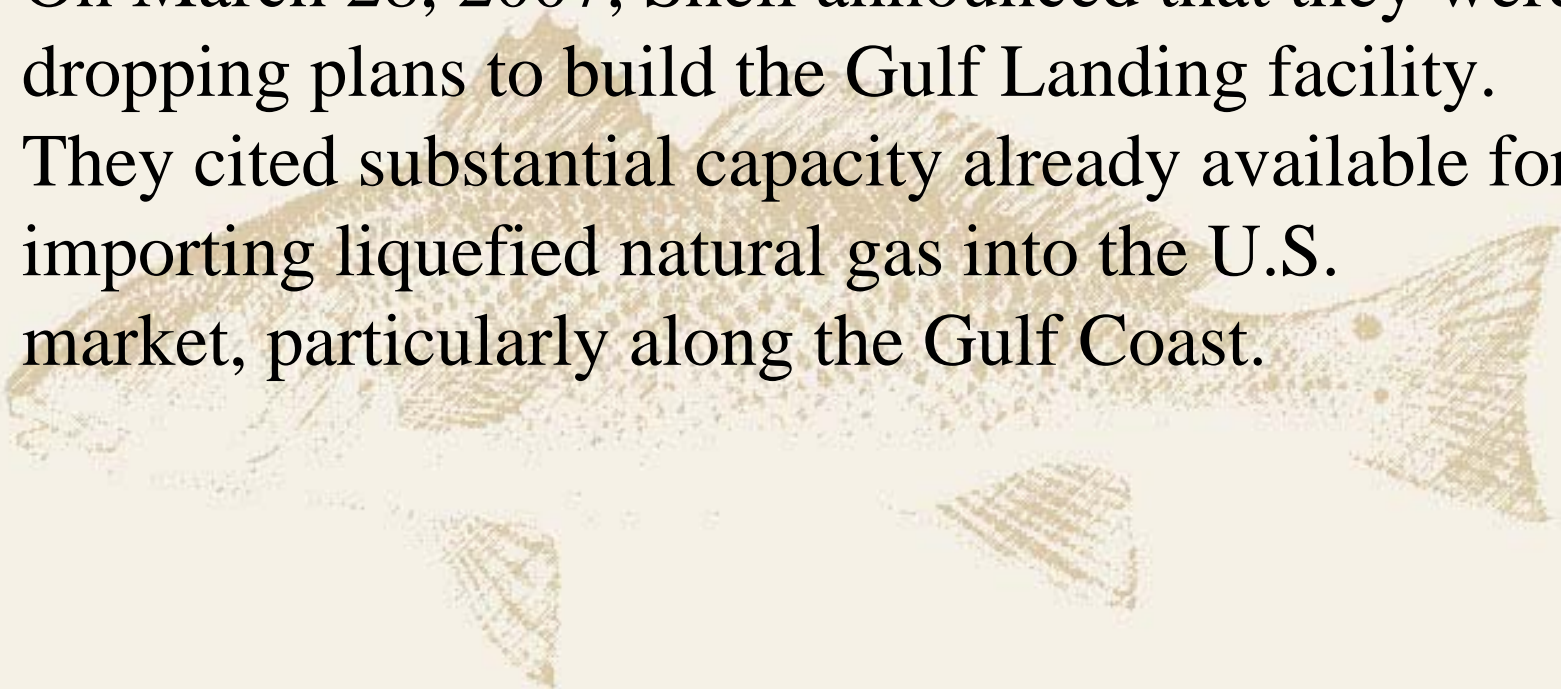
	<u>Average</u>	<u>Lower</u>	<u>Upper</u>
Red Drum	100,985	8,381	489,148
Gulf Menhaden	8,146	91	16,835
Red Snapper	723	181	3,245

# Gulf Landing

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Status – Deepwater Port License Application to operate an open rack vaporizer was approved on February 16, 2005.

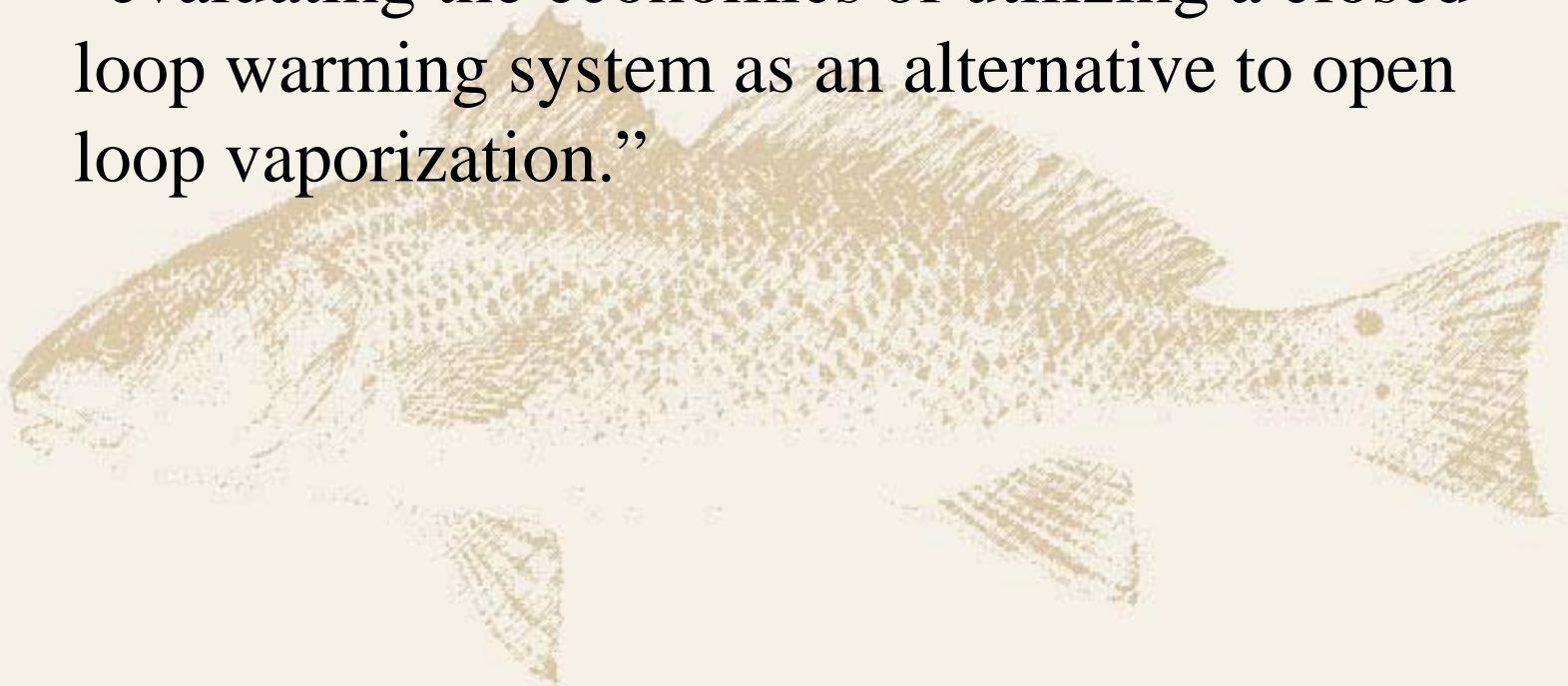
On March 28, 2007, Shell announced that they were dropping plans to build the Gulf Landing facility. They cited substantial capacity already available for importing liquefied natural gas into the U.S. market, particularly along the Gulf Coast.



# Compass Port

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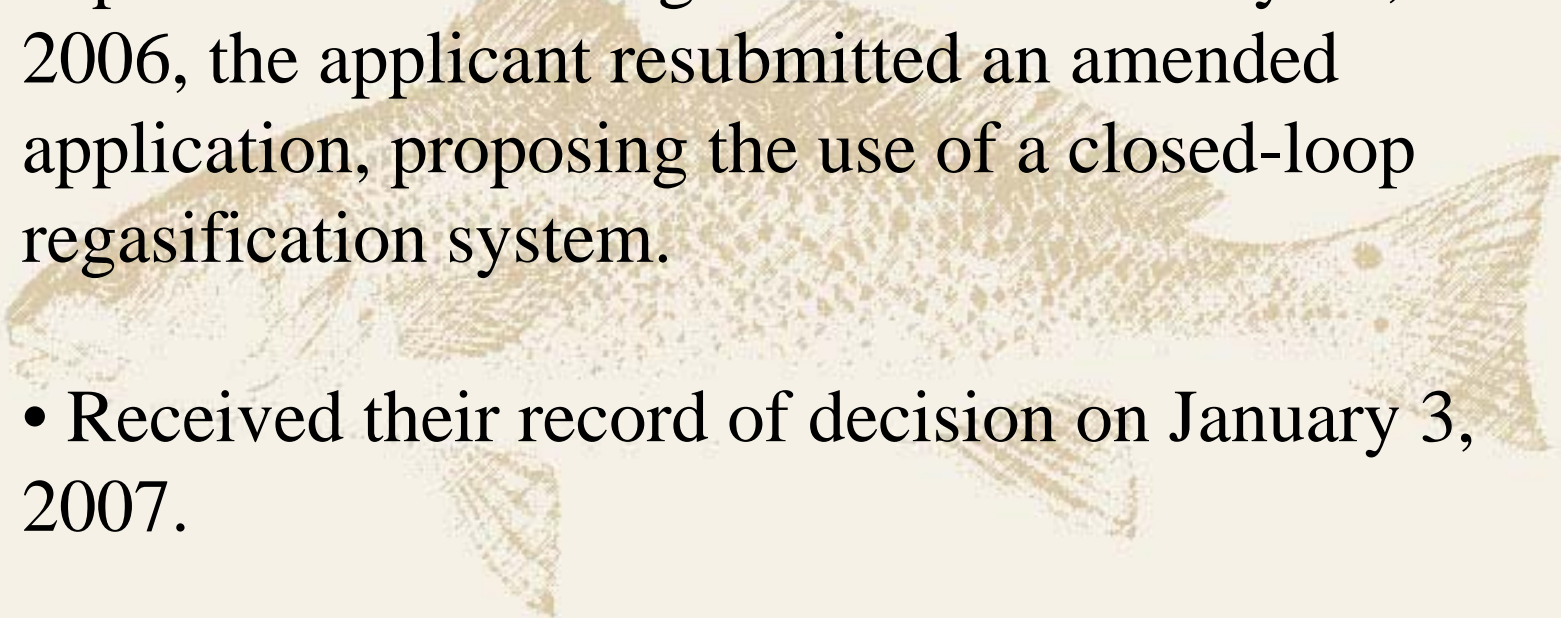
Status – On June 8, 2006, ConocoPhillips advised MARAD of the withdrawal of its Compass Port Deepwater Port application. ConocoPhillips has stated they were currently “evaluating the economics of utilizing a closed loop warming system as an alternative to open loop vaporization.”





# Main Pass

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- Originally proposed to use an open rack vaporizer.
  - On May 5, 2006, the Governor of Louisiana used the adjacent coastal state authority to veto the project based on the proposed use of an open rack vaporizer for LNG regasification. On May 31, 2006, the applicant resubmitted an amended application, proposing the use of a closed-loop regasification system.
  - Received their record of decision on January 3, 2007.
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# Beacon Port

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On November 3, 2006, ConocoPhillips sent a letter to the U.S. Coast Guard stating “Since filing our application for the Beacon Port Deepwater Port project in January 2005, regulatory authorities have approved a number of new LNG import projects and expansions of existing or proposed facilities in the western Gulf of Mexico. With our capacity at Freeport and nearby Golden Pass, ConocoPhillips no longer has a business need for an LNG terminal off the coast of Texas at this time.”

# Pearl Crossing

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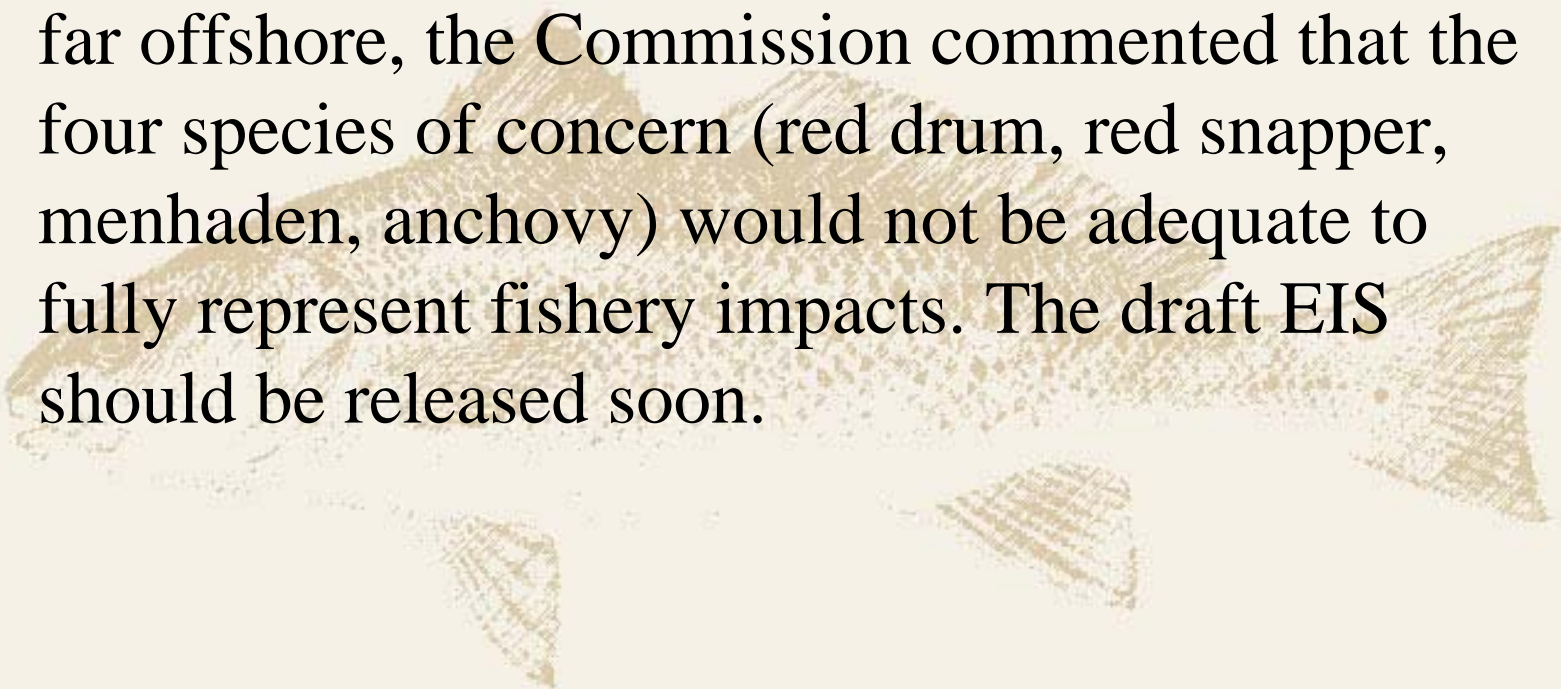
Status – On October 19, 2005, ExxonMobil stated that they “no longer have a current business need for an offshore terminal in the Gulf of Mexico,” and withdrew their deepwater port license application.



# Bienville Offshore Energy Terminal

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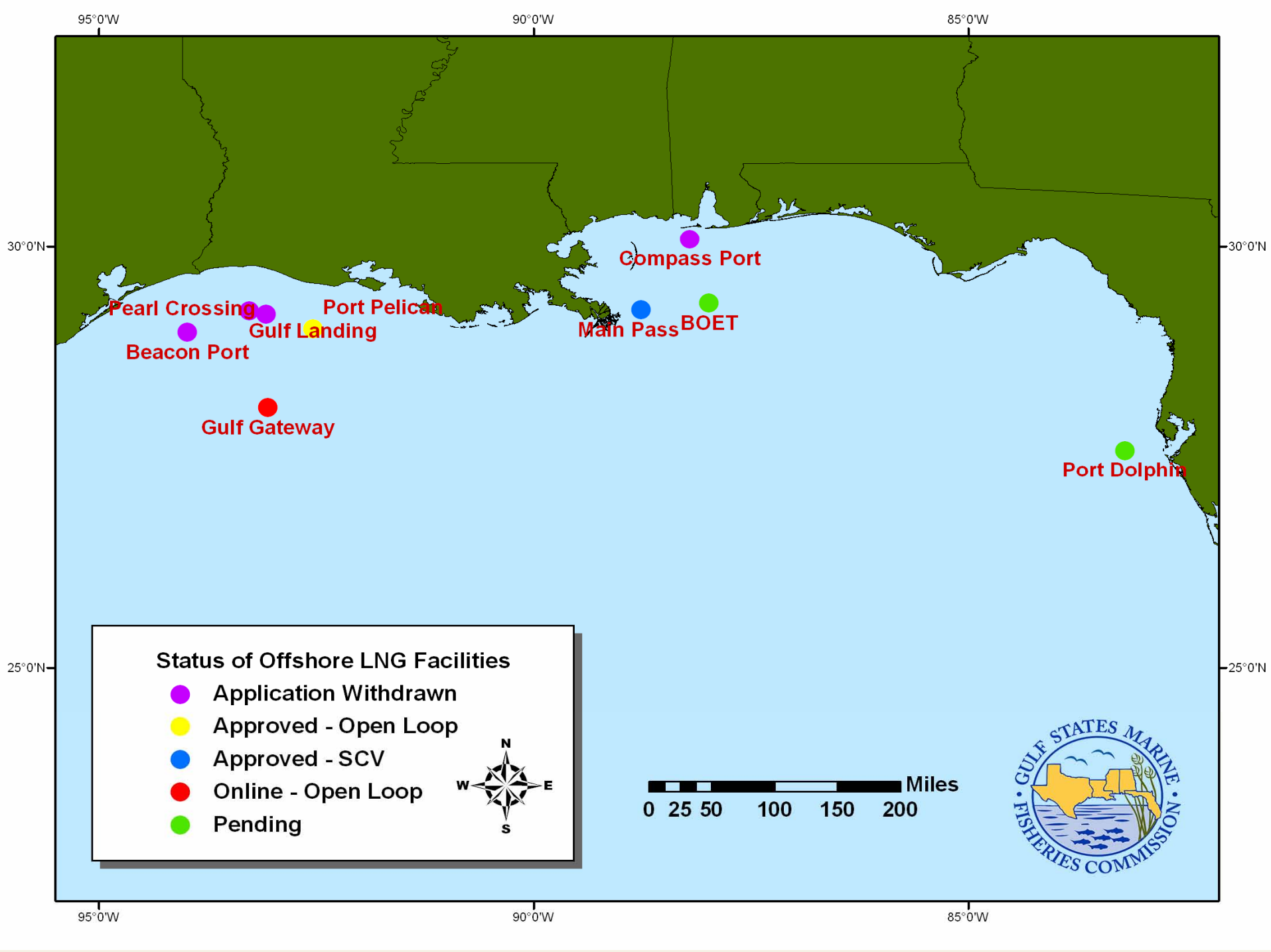
U.S. Coast Guard published a notice of intent to prepare an EIS on June 1, 2006 and requested scoping comments for the facility. The facility is approximately 63 miles south of Mobile Point, Alabama in water depths of 425 feet. Since it is so far offshore, the Commission commented that the four species of concern (red drum, red snapper, menhaden, anchovy) would not be adequate to fully represent fishery impacts. The draft EIS should be released soon.



# Port Dolphin

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Port Dolphin Energy LLC filed its license application on March 29, 2007 for a LNG facility located 28 miles offshore of Tampa, Florida in approximately 100 feet of water. The proposed port would consist of two mooring areas centered on two Submerged Turret Loading Buoys similar to those used in the Gulf Gateway Energy Bridge deepwater port. The proposed port would be capable of mooring up to two Shuttle and Re-gasification Vessels (SRV). The SRVs are vessels designed to regasify the LNG onboard the vessel.



## **ATTACHMENTS**

5. Newspaper article on Fisheries agency expressing concern over Bienville LNG project, filed from Houston November 11<sup>th</sup> 2007  
<http://www.energycurrent.com/index.php?id=3&storyid=5952>

<http://www.energycurrent.com/index.php?id=3&storyid=5952>

## Fisheries agency expresses concern over Bienville LNG project

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Filed from Houston 10/11/2007 8:15:24 PM GMT



**USA/GULF OF MEXICO:** The National Marine Fisheries Service (NMFS) has concluded that the proposed Bienville liquefied natural gas (LNG) project, if approved, could cause "significant direct and cumulative adverse impacts on marine fishery resources" in the U.S. Gulf of Mexico. NMFS released its conclusion in a recent letter sent in response to a request for comments on the project's Draft Environmental Impact Statement (DEIS) dated July 2007.

NMFS said the project's approval without significant design modifications or mitigation requirements, in combination with other similar projects, could impede its ability to rebuild some overfished stocks of marine species in the area surrounding the proposed project site.

NMFS also expressed concern that issues it identified in scoping comments on the project have not received adequate consideration. NMFS previously pointed out that the project, if licensed as currently proposed, would allow the construction and operation of an LNG terminal that could have significant adverse impacts on NMFS trust resources.

The agency acknowledges that the DEIS correctly states that one of the proposed technologies for the project, an open-loop, shell and tube vaporizer heating system (STV), will require an average 126.7 million gallons of seawater per day and subject early life stages of marine species to entrainment, impingement, thermal shock, and water chemistry changes.

The DEIS estimates that entrainment impacts could equal the harvest of more than 11,000 pounds of red snapper, a federally managed species under a rebuilding plan, and 600,000 pounds of Gulf menhaden, an important commercial and forage species. Entrainment and mortality estimates for ichthyoplankton should include ship cooling water and ballast operations and be scaled to evaluate impacts resulting from an ambient cycling rate of 151.7 million gallons/day.

However, NMFS believes the impact could be greater than originally estimated. "While the USCG/MARAD [U.S. Coast Guard/Maritime Administration] used an improved impact assessment methodology developed in conjunction with NMFS, the limitations



of the data used create problems in adequately assessing species that are more likely to be impacted at the site by the operation of the project," NMFS noted.

"Considering the close proximity of the [Bienville Offshore Energy Terminal] site to very productive marine fishery habitats, we believe that fishery impact estimates could reflect more significant losses if detailed, site specific data and improved life history tables of more representative species, such as the groupers, snappers, amberjacks and triggerfish, were acquired and incorporated into the ichthyoplankton assessment methodology."

Given that many Gulf of Mexico fisheries already are stressed and have experienced reductions in their populations and require stringent harvest regulation to enable population recovery, NMFS recommends that the project not use the proposed STV system, but choose an alternative that would not cause the likely mortality of all fish larvae and eggs contained in the 46 billion gallons of seawater the system would take in annually.

The fishery impacts also should extend to highly migratory species managed by NMFS, in particular bluefin tuna, swordfish and billfish such as blue and white marlin and sailfish, which are overfished and subject to overfishing.

The DEIS notes that the four species on which detailed analysis of ichthyoplankton impacts were studied - red snapper, red drum, menhaden, and bay anchovy - were not necessarily representative of the marine fisheries expected to be present at the proposed LNG location.

"Because of the economic importance of the group, billfish, tuna, and other fisheries associated with the Gulf of Mexico deepwater habitats, Pinnacle Trend, and the frontal zone of the Mississippi River plume, it is critical that additional life table (e.g., stage-duration and mortality) information be sought or developed to allow an ichthyoplankton impact assessment based on species more representative of the project area."

NMFS also noted that the project as proposed could negatively impact the recreational fishing industry off Alabama and Mississippi, which is estimated to provide about 5,500 jobs and have a total economic impact of approximately US\$562 million/year in 2001 dollars. "NMFS finds such a transfer of LNG facility operating costs to the public, through an uncompensated reduction in fishery resources, to be inappropriate."

TORP Terminal LP has proposed to construct and operate the LNG receiving and regasification facilities and associated pipelines in the U.S. approximately 62.6 miles (100 km) south of Fort Morgan, Ala. Components of the terminal include a support platform, HiLoad units and parking systems, flexible risers, terminal pipeline, and subsea gas export pipeline.

Technologies considered for the revaporization process include the STV system, submerged combustion vaporizer with low nitrogen oxide burners, and submerged combustion vaporizer with selective catalytic reduction.

## **ATTACHMENTS**

6. “Lower River Shannon” Special Area of Conservation (SAC) Site Synopsis by the National Parks and Wildlife Service Internet Reference:  
<http://www.npws.ie/en/media/Media,4177,en.pdf>

## SITE SYNOPSIS

**SITE NAME : LOWER RIVER SHANNON**

**SITE CODE : 002165**

This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarne. Rivers within the sub-catchment of the Mulkear include the Killeenagarrieff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigne River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary.

Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (*Zostera* spp.) and patches of green

algae (e.g. *Ulva* sp. and *Enteromorpha* sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a *Macoma-Scrobicularia-Nereis* community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and Club-rushes (*Scirpus maritimus*, *S. tabernaemontani* and *S. triquetrus*). In addition to the nationally rare Triangular Club-rush (*Scirpus triquetrus*), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (*Typha angustifolia*) and Summer Snowflake (*Leucojum aestivum*).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Long-bracted Sedge (*Carex extensa*), Lesser Sea-spurrey (*Spergularia marina*) and Sea Arrowgrass (*Triglochin maritima*). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the compass of Common Saltmarsh-grass (*Puccinellia maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Cloonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland. Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (*Ruppia maritima*) and green algae (*Cladophora* sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (*Hydrobia ventrosa*, *Cerastoderma glaucum*, *Lekanesphaera hookeri*, *Palaemonetes varians*, *Sigara stagnalis* and *Enochrus bicolor*). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluiced outlet. However, it supports two Red Data Book species of Stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris*), Sea Champion (*Silene maritima*), Thrift and Plantains (*Plantago* spp.). A rare endemic Sea Lavender (*Limonium recurvum* subsp.

*pseudotranswallinum*) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Bird's-foot Trefoil (*Lotus corniculatus*).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the pcSAC.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of *Paracentrotus lividus* are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

- stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (*Fucus* spp., *Ascophyllum nodosum* and kelps).
- shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (*Matricaria maritima*), Sea Campion and Curled Dock (*Rumex crispus*).
- Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.
- sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (*Ammophila arenaria*).

Flowing into the estuaries are a number of tidal rivers.

Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of particular

conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*Carex pallescens*).

Floating river vegetation characterised by species of Water-crowfoot (*Ranunculus* spp.), Pondweeds (*Potamogeton* spp.) and the moss *Fontinalis antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to county Limerick.

Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (*Salix alba*) dominates the tree layer with occasional Alder (*Alnus glutinosa*). The shrub layer consists of various willow species with sally (*Salix cinerea* ssp. *oleifolia*) and what appear to be hybrids of *S. alba* x *S. viminalis*. The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (*Typha* sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (*Quercus robur*), Elm (*Ulmus glabra*, *U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (*Quercus petraea*) forms the canopy, with an understorey of Hazel and Holly (*Ilex aquifolium*). Great Wood-rush (*Luzula sylvatica*) dominates the ground flora. Less common species present include Great Horsetail (*Equisetum telmateia*) and Pendulous Sedge (*Carex pendula*).

In the low hills to the south of the Slievefelim mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (*Betula* spp.), Hazel, Oak, Rowan (*Sorbus aucuparia*), some Ash (*Fraxinus excelsior*) and Willow (*Salix* spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (*Vaccinium myrtillus*) with a typical range of woodland herbs. Where there is more light available, Bracken (*Pteridium aquilinum*) features.

The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (*Prunus spinosa*) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.

There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (*Sphagnum*) cover. Species of particular interest include the Cranberry (*Vaccinium oxycoccos*) and the White Sedge (*Carex curta*) along with two other regionally rare mosses including *S. fimbriatum*. The site is being invaded by Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site.

A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- Triangular Club-rush (*Scirpus triquetrus*) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.
- Opposite-leaved Pondweed (*Groenlandia densa*) - this protected pondweed is found in the Shannon where it passes through Limerick City.
- Meadow Barley (*Hordeum secalinum*) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.
- Hairy Violet (*Viola hirta*) - this protected violet occurs in the Askeaton/Foynes area.
- Golden Dock (*Rumex maritimus*) - noted as occurring in the River Fergus Estuary.
- Bearded Stonewort (*Chara canescens*) - a brackish water specialist found in Shannon Airport lagoon.
- Convergent Stonewort (*Chara connivens*) - presence in Shannon Airport Lagoon to be confirmed.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit ( 476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94.

Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528; 1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregrine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987)

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo salar*). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey.

Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (*Osmerus eperlanus*) and Pollan (*Coregonus autumnalis pollan*). Only the former has been observed spawning in the Shannon.

Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River.

There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, Cord-grass (*Spartina* sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the



E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

## **ATTACHMENTS**

7. Draft Environmental Impact Statement for Bayou Casotte Energy, LLC's Casotte Landing LNG Project under CP05-420 et al. Accession Number: 20060519-4002 Section 3 Alternatives  
[http://elibrary.ferc.gov/idmws/file\\_list.asp?document\\_id=4405730%20](http://elibrary.ferc.gov/idmws/file_list.asp?document_id=4405730%20)

## 3.0 ALTERNATIVES

### 3.1 INTRODUCTION

This EIS addresses alternatives to the proposed actions before both the FERC and the Coast Guard. The proposed action before the FERC is to consider issuing Section 3 authorization for the LNG import facilities proposed by Bayou Casotte Energy. The proposed action before the Coast Guard is to consider issuing an LOR finding the waterway suitable for LNG marine traffic associated with the proposed Casotte Landing Project.

In accordance with NEPA and the FERC policy, we evaluated a number of alternatives to the proposed Casotte Landing Project, to determine whether they would be reasonable and environmentally preferable to the proposed action. These alternatives included the no action or postponed action alternatives, system alternatives, LNG terminal site alternatives, LNG terminal design alternatives, pipeline interconnect alternatives, and dredge material placement alternatives. Identification of alternatives to the proposed Project incorporated public comments and input received from federal and state regulatory agencies and other interested parties.

As described in Section 1.1, the primary purpose of the Casotte Landing Project is to provide an additional source of firm, long-term, and competitively priced natural gas to the southeast and the broader United States markets by accessing natural gas reserves throughout the world. More specifically, Bayou Casotte Energy indicates that its specific objectives for the proposed Project are to construct and operate an LNG terminal and associated pipeline facilities with the capability to:

- access gas markets primarily in the southeastern United States, as well as the Mid-Atlantic and New England regions, through interconnects with existing intra- and interstate pipeline infrastructure;
- provide vaporization facilities to accommodate the send-out of natural gas all year at a nominal rate of approximately 1.3 Bcfd;
- provide LNG storage facilities with a combined capacity of at least 480,000 m<sup>3</sup>;
- provide facilities needed to receive and unload a range of LNG carriers from approximately 125,000 m<sup>3</sup> to 200,000 m<sup>3</sup> capacity<sup>5</sup>, while making use of an existing 42-foot-deep shipping channel;
- start-up terminal operations by 2010;
- be located proximal to existing NGL infrastructure and markets for the sale of associated liquids;
- provide synergies with other existing Chevron owned businesses; and
- provide Bayou Casotte Energy sufficient control and proprietary rights of operation to ensure operability for a 25- to 30-year project life.

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<sup>5</sup> Bayou Casotte Energy indicates that the existing Bayou Casotte channel and associated navigational aids are currently only sufficient to accept LNG carriers up to approximately 160,000 m<sup>3</sup> capacity, but the Casotte Landing Project as proposed has been designed with the flexibility to accommodate larger LNG carriers should the channel be modified at a future date to enable their passage.

The identified potential alternatives were evaluated and compared to the proposed Casotte Landing Project to determine whether they would be technically and economically feasible and practical; offer significant environmental advantage over the proposed Project; and meet the objectives of the proposed Project, as listed above. With respect to the first criteria, it is important to recognize that not all conceivable alternatives are technically and economically feasible and practical. Some alternatives may be unfeasible because they are unavailable and/or incapable of being implemented after taking into consideration costs, existing technologies, and logistics in light of the overall project purpose. In conducting a reasonable analysis, it is also important to consider the environmental advantages and disadvantages of the proposed action and to focus the analysis on those alternatives that may reduce impacts and/or offer a significant environmental advantage.

By consistently applying evaluation criteria and comparing potential environmental affects, each alternative was considered until it was clear that the alternative was not reasonable or would result in significantly greater environmental impacts that would not be readily mitigated. Those alternatives that appeared to be the most reasonable with less than or similar levels of environmental impact are reviewed in the greatest detail.

### **3.2 NO ACTION OR POSTPONED ACTION ALTERNATIVE**

The FERC has three alternative courses of action in processing an application for a Certificate. It may: 1) deny the Certificate; 2) postpone action pending further study; or 3) grant the Certificate with or without conditions. Similarly, alternative courses of action to the Coast Guard proposed action include: 1) issuance of a Coast Guard LOR finding the waterway not suitable for LNG marine traffic (no action alternative); 2) postponing the issuance of a Coast Guard LOR pending further analysis and study; and 3) issuance of a Coast Guard LOR finding the waterway suitable for LNG marine traffic with conditions.

As previously described in Section 1.1, projected natural gas demands in the United States markets are expected to exceed the currently available supply. The growth in natural gas demand is driven primarily by increased use of natural gas for electricity generation and industrial applications, which together account for 62 percent of the projected demand growth from 2004 to 2025 (EIA 2006). Bayou Casotte Energy believes that an additional supply of natural gas is necessary to satisfy this increasing demand. To maintain pace with growing energy demands, the EIA (2006) anticipates that consumption of natural gas in the United States will grow from 22.4 trillion cubic feet (Tcf) per year in 2004 to 27.0 TCF in 2025. Similarly, current gas consumption in the southeastern United States (Alabama, Florida, Louisiana, Mississippi, and Georgia) is projected to increase from 4.0 Tcf per year in 2003 to 4.7 Tcf per year by 2025, an annualized increase of 2.4 percent (EIA 2005). The proposed Project would supply up to 1.3 Bcfd of natural gas directly to the southeast and broader United States markets through interconnects with the existing interstate pipeline system. Bayou Casotte Energy believes that the addition of incremental supply at the proposed interconnect locations would help meet growing energy demands, enhance reliability, and result in supply diversification by accessing natural gas reserves from a variety of sources around the world, possibly including Angola, Nigeria, and Venezuela.

If the FERC denies the application, the short- and long-term environmental impacts identified in this EIS would not occur. If the Commission postpones action on the application, the environmental impacts identified in this EIS would be delayed, or if the Applicant decided not to pursue the Project, the impacts would not occur at all. However, if the FERC were to select the no action or postponed action alternatives, the objectives of the proposed Project would not be met, and Bayou Casotte Energy would not be able to provide a new source of natural gas to markets that can be accessed through the proposed pipeline interconnects.

Although it would be purely speculative and beyond the scope of this analysis to attempt to predict what actions might be taken by policymakers or end users in response to the no action or postponed action alternatives, it is likely that potential end users would make other arrangements to obtain natural gas service (e.g., traditional, non-LNG derived natural gas, or LNG-derived gas from another project), or make use of alternative fossil-fuel energy sources (e.g., fuel oil or coal), other traditional long-term fuel source alternatives (e.g., nuclear power or hydropower), and/or renewable energy sources, such as wind power, to compensate for the reduced availability of natural gas that would be supplied by the proposed Project. It is also possible that energy conservation practices would be used to offset the demand for natural gas in markets that would be supplied by the proposed Project.

### **3.2.1 Alternatives to the Coast Guard Action**

For the Coast Guard's proposed action, the no action alternative would be issuance of an LOR that finds the waterway not suitable for LNG marine traffic. Similar to the no action alternative of the FERC, the no action alternative for the Coast Guard would avoid any Project-related environmental effects in the waterway. However, the no action alternative would also prevent LNG carriers from delivering LNG to the proposed import terminal, and the objectives of the proposed Project would not be met.

If the Coast Guard postpones issuance of an LOR pending further analysis and study, the effect would likely be similar to the FERC postponing its action. That is, although it is speculative to predict the resulting effects, postponing issuance of an LOR would lead Bayou Casotte Energy to delay the Project.

A reasonable alternative to the Coast Guard action of issuing a LOR that finds the waterway suitable for LNG marine traffic is to issue an LOR that includes certain conditions. Under this alternative, if a waterway were found unsuitable for LNG marine traffic, which would occur for any number of reasons (e.g., inadequate hydrographic characteristics, lack of existing resources to implement appropriate risk management measures, etc.), the Coast Guard LOR would identify specific additional resources and actions that would be needed to provide a safe and secure environment for LNG marine traffic. As described in its letter to the FERC dated April 1, 2006, the Coast Guard has already reached the preliminary determination that the waterway can accommodate the proposed LNG marine traffic and that there is sufficient capability within the port community to responsibly manage the safety and security risks associated with the proposed Project (see Section 4.12.5). Therefore, issuance of a conditional LOR is not anticipated. Additionally, we are unable to quantify the impacts associated with issuance of a conditional LOR at this time due to uncertainty in the actions (scope and extent of resources) that might be required in association with such an issuance. However, the Coast Guard would ensure the appropriate NEPA environmental documentation for any such actions is completed prior to the commencement of those activities, if required. Also, the Coast Guard would cooperate in any NEPA environmental analysis initiated by another agency for projects related to the introduction of LNG carriers to the waterway, such as any prerequisite channel deepening or dredging by the COE.

### **3.2.2 Energy Source and Conservation Alternatives**

While traditional, non-LNG derived natural gas production is important to the overall supply of energy nationally, LNG imports will become increasingly important sources of natural gas for the United States (EIA 2006). Although domestic natural gas production, primarily from unconventional sources (e.g., shale, tight sands, and coal bed methane) and the Arctic, is expected to rise through about 2019, forecasts continue to indicate that domestic production will provide a decreasing share of total natural gas supply (EIA 2006). Likewise, net pipeline imports of natural gas from Canada and Mexico are also expected to continue to decline as a function of depletion and growth in Canada's domestic consumption

(EIA 2006). Failure to provide additional sources of natural gas to the domestic market would result in increased natural gas prices or shortages for industrial use and electricity generation. Alternative arrangements to obtain natural gas service would require the construction of modified or new LNG import or natural gas pipeline facilities in other locations. If such facilities were approved and constructed, each would result in its own set of specific impacts. The ability of other existing or proposed natural gas facilities to meet the objectives of the proposed Project are addressed in Section 3.3.

Denying or postponing a decision on the Casotte Landing Project would result in reduced natural gas availability in the targeted market regions. Such shortages would in turn lead to an increased reliance on fuel oil and other non-renewable fuel supply sources for power generating facilities. However because petroleum product consumption is also projected to increase (EIA 2006), it is unlikely that fuel oil would provide a readily available or cost-effective alternative to natural gas. Further, natural gas is the cleanest burning of the fossil fuels. Relative to natural gas, reliance on coal or fuel oil to power electric generation would likely result in greatly increased emissions of pollutants, such as NO<sub>x</sub>, SO<sub>2</sub>, and CO<sub>2</sub>, and associated reductions in air quality. In addition, increased reliance on other fossil fuels would also result in secondary impacts associated with their production (e.g., coal mining and oil drilling), transportation (e.g., oil tankers, rail cars, and pipelines), and refinement.

Other long-term fuel source alternatives to natural gas include nuclear power, hydropower, and the development of renewable energy sources. Although there has recently been renewed interest in nuclear power production, growth in nuclear generating capacity will only account for about 10 percent of total United States generating capacity by 2019, and is expected to remain at that level through 2030 (EIA 2006). Additionally, regulatory requirements, cost considerations, and public concerns make it unlikely that new nuclear power plants would be sited and developed to serve the markets targeted by the proposed Project within a timeframe that would meet the objectives of the proposed Project. The EIA (2006) does not anticipate that any new nuclear power plants will begin operation before 2014.

Renewable energy projects and energy conservation measures will likely play an increasingly prominent role in meeting the United States' energy demands in the coming years. Though efficiency upgrades at existing hydropower facilities are expected to produce incremental additions of power production in the coming years, it is unlikely that new and/or significant sources of hydropower would be permitted and brought online as reliable, energy source alternatives to the proposed Project. Federal, state, and local initiatives will likely contribute to an increase in the availability and cost-effectiveness of non-hydropower renewable energy sources such as wind, solar, tidal, geothermal, and biomass. Even so, the percentage of national electricity generated from non-hydropower renewable energy sources is only projected to increase to 3.2 percent by 2025 (EIA 2005), which would offset only a small part of the projected energy demands.

Similarly, energy conservation would help alleviate some of the growing demand for energy and, therefore, offset some of the need for LNG supplies. The EIA (2006) expects that energy conservation will be induced by higher energy prices in the future. However, projections indicate that energy demand, primarily for natural gas, will continue to outpace programs designed to stimulate energy conservation. Although both renewable energy sources and energy conservation measures will be important elements in addressing future energy demands, they would not be able to meet more than a small fraction of that demand within the foreseeable future. Thus, renewable energy sources and energy conservation would not preclude the need for natural gas infrastructure projects like that proposed by Bayou Casotte Energy.

In light of the preceding analysis, we do not recommend the no action or the postponed action alternative.

### **3.3 SYSTEM ALTERNATIVES**

System alternatives would make use of other existing or proposed LNG or natural gas facilities to meet the objectives of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to the existing or proposed facilities would be required to increase capacity. Although these modifications or additions would result in environmental impacts, the impacts would be less than, similar to, or greater than those associated with construction of the proposed Project. The purpose of identifying and evaluating system alternatives is to determine whether potential environmental impacts associated with the construction and operation of the proposed facilities would be avoided or reduced while still meeting the Project objectives.

The analysis below examines the existing and proposed LNG and other natural gas systems that currently or would eventually serve the markets targeted by the Casotte Landing Project, and considers whether those systems would meet the proposed Project objectives while offering an environmental advantage over the proposed Project. Specifically, the system alternatives considered in our analysis include:

- use of existing or planned onshore LNG terminals (Onshore LNG Terminal System Alternatives);
- use of existing or planned offshore LNG terminals (Offshore LNG Terminal System Alternatives); and
- use of existing or planned natural gas pipeline systems (Pipeline System Alternatives).

To be considered viable, any system alternative to the proposed Project would need to provide LNG carrier unloading, storage, and sendout capacities similar to that proposed by Bayou Casotte Energy. Additionally, the system alternatives would need to provide access to the existing interstate pipeline infrastructure to serve the gas markets targeted by the Casotte Landing Project.

#### **3.3.1 Onshore LNG Terminal System Alternatives**

##### **3.3.1.1 Existing Onshore LNG Terminals**

There are 16 existing LNG facilities currently under THE FERC jurisdiction in the continental United States. Of these, 12 are peak-shaving plants that liquefy natural gas and store LNG during periods of low natural gas demand (summer months) for later vaporization and sendout during higher demand periods (winter months). The remaining four facilities are baseload LNG import terminals that provide unloading, storage, and delivery services in the United States. These facilities are operated by Distrigas of Massachusetts LLC (Distrigas) in Middlesex County, Massachusetts; Dominion Cove Point LNG, LP (Cove Point) in Calvert County, Maryland; Southern LNG Inc. (Southern) in Chatham County, Georgia; and Trunkline LNG Company, LLC (Trunkline) at Lake Charles in Calcasieu Parish, Louisiana.

Neither the Distrigas nor Cove Point terminals are viable alternatives to the Casotte Landing Project. Their location in the New England and Mid-Atlantic regions, respectively, in combination with the existing interstate pipeline infrastructure would not provide reasonable access to southeastern markets, which are the primary target market of the proposed Project. Thus, any additional LNG delivered to these terminals would serve their respective regional markets and would not meet the primary objective of the proposed Project.

The Southern terminal, which is located on Elba Island in the Savannah River, approximately 5 miles downstream of Savannah, Georgia, recently completed an expansion project that included the

addition of a second and third docking berth, a fourth storage tank, and associated support facilities. The expansion project, which was approved by the FERC in April 2003, nearly doubled the terminal's maximum sendout capacity to 1.2 Bcfd. Southern has also announced plans for an additional expansion project that would add additional storage, modify the docking facilities to accommodate larger LNG carriers, and nearly double the terminal's sendout capacity. Further, two proposed and/or planned pipeline projects (Cypress and Elba Express) would increase the takeaway capacity at the terminal and enhance the Southern terminal's connectivity to the interstate pipeline system. Due to its location, as well as existing and planned access to the interstate pipeline system, the Southern terminal would serve the same markets targeted by the proposed Project. However, all of the existing terminal capacity, including that associated with the recently completed expansion, is fully subscribed under long-term agreements.

The Trunkline terminal, which is located in Lake Charles, Louisiana, is the largest operating LNG import terminal in the United States. This terminal has also recently received the FERC authorization for several expansion projects. The most recent such approvals authorized the addition of a fourth storage tank and a second marine unloading dock, as well as the addition of pumps and vaporizers that would increase the sustained daily sendout capacity of the terminal to 1.2 Bcfd. The Trunkline terminal provides access to multiple intra- and interstate pipelines. Given this factor and the terminal's location along the Gulf of Mexico, the Trunkline terminal would potentially serve the same markets targeted by the proposed Project.

### **3.3.1.2 Approved and Proposed Onshore LNG Terminals**

Over 25 onshore LNG terminals have recently been proposed for the United States. A number of these have been proposed along the West Coast or in the Mid-Atlantic and New England regions. As discussed previously, relative to existing LNG terminals, the existing interstate pipeline infrastructure in the Mid-Atlantic and New England regions would not provide reasonable access to the southeastern markets. Likewise, existing pipeline infrastructure along the West Coast is designed to provide local and regional distribution, such that an LNG terminal sited there would not have access to the markets targeted by the proposed Project. Because they would not satisfy one of the main objectives of the proposed Project, to access gas markets primarily in the southeastern United States, approved and proposed LNG import terminals located along the West Coast or in the Mid-Atlantic and New England regions are not considered to represent viable alternatives.

As a historic source of domestic natural gas production, many interstate pipelines serving national markets, including those targeted by the proposed Project, originate along the central Gulf of Mexico. Consequently, most of the recently approved and proposed onshore LNG import terminals would be located in this region. Table 3.3.1-1 identifies these facilities and summarizes the status of each terminal project.

#### **Authorized Projects**

As described in Table 3.3.1-1, the FERC has recently authorized the construction and operation of seven onshore LNG import terminals along the Gulf of Mexico. Currently, construction has commenced at only two of those terminals, the Sabine Pass terminal in Sabine Pass, Louisiana and the Freeport terminal in Freeport, Texas. Construction is pending at the remaining five terminals.

As proposed and approved, the Freeport terminal, which would be located on Quintana Island outside the City of Freeport, Texas, is only designed to serve the Texas intrastate market and would not provide access to the interstate pipeline system. Further, the proposed terminal capacity is already fully subscribed. The Freeport terminal would not satisfy the objectives of the Casotte Landing Project, and is therefore not considered a viable alternative to the proposed Project. Each of the remaining onshore LNG



terminal projects would interconnect with the existing interstate pipeline systems, and would potentially serve the same markets targeted by the Casotte Landing Project.

**TABLE 3.3.1-1  
Approved and Proposed Onshore LNG Terminals Along the Gulf of Mexico**

<b>Operator/Applicant</b>	<b>Project Name</b>	<b>FERC Docket Number</b>	<b>Location</b>	<b>Sendout Capacity (Bcfd)</b>	<b>Total Storage Capacity (m<sup>3</sup>)</b>	<b>Status<sup>a</sup></b>
<b>Approved Terminals</b>						
Cameron LNG LLC	Cameron LNG Terminal Project	CP02-374	Hackberry, LA	1.5	480,000	FERC approval issued September 2003.
		PF06-10		2.7	640,000	Expansion project pre-filing process request approved December 2005; environmental review in progress.
Freeport LNG Development, LP	Freeport LNG Project	CP03-75	Freeport, TX	1.5	320,000	FERC approval issued June 2004; construction underway.
		CP05-361		2.5	480,000	Phase 2 application filed May 2005; environmental review in progress.
Sabine Pass LNG, LP	Sabine Pass LNG Project	CP04-47	Sabine Pass, LA	2.6	480,000	FERC approval issued December 2004; construction underway.
		CP05-396		4.0		Phase 2 application filed July 2005; environmental review in progress.
Corpus Christi LNG LP	Cheniere Corpus Christi LNG Project	CP04-37	Corpus Christi, TX	2.6	480,000	FERC approval issued April 2005.
Vista Del Sol LNG Terminal LP	Vista del Sol LNG Terminal Project	CP04-395	Corpus Christi, TX	1.4	465,000	FERC approval issued July 2005.
Golden Pass LNG Terminal, LP	Golden Pass LNG Project	CP04-386	Sabine Pass, TX	2.0	775,000	FERC approval issued July 2005.
Ingleside Energy Center LLC	Ingleside Energy Center LNG Project	CP05-13	Corpus Christi, TX	1.0	320,000	FERC approval issued July 2005.
<b>Proposed Terminals</b>						
Port Arthur LNG LP	Port Arthur LNG Project	CP05-83	Port Arthur, TX	3.0	480,000	FERC application filed February 2005; environmental review in progress.

**TABLE 3.3.1-1 (continued)**  
**Approved and Proposed Onshore LNG Terminals Along the Gulf of Mexico**

Operator/Applicant	Project Name	FERC Docket Number	Location	Sendout Capacity (Bcfd)	Total Storage Capacity (m <sup>3</sup> )	Status <sup>a</sup>
<b>Proposed Terminals (continued)</b>						
Creole Trail LNG, LP	Creole Trail LNG Project	CP05-360	Cameron, LA	3.3	640,000	FERC application filed May 2005; environmental review in progress.
Calhoun LNG, LP	Calhoun LNG Project	CP05-91	Port Lavaca, TX	1.0	320,000	FERC application filed March 2005; environmental review in progress.
Gulf LNG Energy, LLC	LNG Clean Energy Project	CP06-12	Pascagoula, MS	1.0	320,000	FERC application filed October 2005; environmental review in progress.
Bayou Casotte Energy LLC	Casotte Landing Project	CP05-420	Pascagoula, MS	1.3	480,000	FERC application filed September 2005; environmental review in progress.

<sup>a</sup> Project status as of April 2006. More specific information for many of these projects can be obtained from the FERC document management system (<http://www.ferc.gov/docs-filing/elibrary.asp>).

Bcfd billion cubic feet per day  
m<sup>3</sup> cubic meters

### Proposed Projects

In addition to the Casotte Landing Project, we have received and are currently reviewing applications for four other proposed onshore LNG terminals along the Gulf of Mexico, as described in Table 3.3.1-1. Additionally, BP LNG has announced plans for its Bay Crossing terminal, which would be located on Pelican Island near Galveston, Texas. However, we have not received a formal application for the Bay Crossing terminal. Consequently, limited information is available about that project at this time.

Several of the formally proposed terminal projects would be sited a considerable distance from the proposed Project. The Port Arthur and Creole Trail terminals would be sited about 300 miles west of the proposed Casotte Landing Project site, and the Calhoun terminal would be sited in Port Lavaca, Texas, about 500 miles from the proposed Project site. Even so, each of these proposed LNG terminal projects would interconnect with the existing interstate pipeline systems. Therefore, each terminal project would potentially serve the same markets targeted by the Casotte Landing Project.

In contrast, the proposed LNG Clean Energy Project would be sited along Bayou Casotte in Pascagoula, Mississippi, just south of the proposed Casotte Landing Project terminal site. The LNG Clean Energy Project would consist of ship berthing and unloading facilities capable of accommodating one LNG carrier, two 160,000 m<sup>3</sup> storage tanks, 10 high pressure submerged combustion vaporizers, a

5.0-mile-long, 36-inch-diameter sendout pipeline, and various support facilities. Gulf LNG Energy, LLC (Gulf LNG) anticipates that up to 150 LNG carriers would unload LNG at the proposed facility on an annual basis. The LNG Clean Energy Project would sendout up to 1.5 Bcfd of natural gas to national markets that can be accessed through interconnects with the Gulfstream and Destin pipeline systems, as well as an existing gas processing plant. Due to its proximity to the proposed Casotte Landing Project and its proposed interconnect with the interstate pipeline system, the LNG Clean Energy Project would potentially serve the same markets targeted by the Casotte Landing Project.

### **3.3.1.3 Conclusions Regarding Onshore LNG Terminal System Alternatives**

As described above, the existing and proposed LNG import terminals along the West Coast or in the Mid-Atlantic and New England regions would not provide reasonable access to the markets targeted by the proposed Project. Likewise, the Freeport terminal would not interconnect with the interstate pipeline system. These terminal projects would therefore not meet the objectives of the proposed Project, and they have been eliminated from further consideration in our analysis.

Two of the existing onshore LNG import terminals, the Southern and Trunkline terminals, and seven of the eight approved and proposed onshore LNG import terminals along the Gulf of Mexico would provide access to the interstate pipeline system. With the exception of the LNG Clean Energy Project, all of the other terminal projects would be located more remotely from the southeastern markets that are the primary target of the proposed Project, which would be less attractive commercially and/or require development of additional pipeline infrastructure. Likewise, the capacity of many of these terminal projects has already been committed to customers through long-term agreements. Relative to the proposed Project, it is therefore unclear how efficiently or effectively, the other existing, approved, and proposed LNG terminal projects would satisfy the objectives of the proposed Casotte Landing Project. Additionally, we are unsure whether those LNG terminal projects that have been proposed, but not yet constructed, will advance beyond the planning stages. Ultimately, the FERC does not consider these projects as true alternatives to one another. Rather we view each of the existing, approved, and proposed onshore LNG terminal projects to be potentially complementary for the purpose of meeting the United States' projected energy demands. Each terminal project has been designed to satisfy a unique purpose and need (i.e., the projects are not readily interchangeable), and each has undergone, or would undergo, an independent environmental review process designed to ensure that potential environmental impacts resulting from their development are avoided, minimized, and/or mitigated. Although each LNG terminal would interconnect with existing interstate pipeline systems and would serve broader national markets, most would also target local and/or regional markets. As a result, it is likely that market forces, which include considerations for environmental impacts and associated permitting time and mitigation costs, will ensure that the LNG terminal projects that would ultimately be developed offer the optimal combination of environmental and financial benefits while being consistent with sustainable development in the regions for which they are proposed.

Because the proposed Casotte Landing and LNG Clean Energy Project terminal sites are in close proximity to one another and both would interconnect with the existing Gulfstream and Destin pipeline systems, the FERC considered the alternative of combining them into a single LNG terminal system. In general, there are two avenues by which the goals of multiple LNG terminal projects would be satisfied by developing a single system alternative. First, a single company would build facilities that would satisfy the objectives of multiple terminal projects. However, the authorized and proposed LNG import terminals along the Gulf of Mexico, including the Casotte Landing and LNG Clean Energy Projects, are proposed by separate applicants and/or are designed to achieve unique objectives. Combining two or more of the projects into a single system would likely involve either the elimination of one or more of the proposals or a comprehensive synchronization of the respective LNG chains (source development to market).

Second, two companies would build LNG facilities that would satisfy the objectives of their respective projects at a single property. However, in the case of the LNG Clean Energy Project, property at the proposed Casotte Landing Project terminal site is not available to Gulf LNG. Conversely, the Casotte Landing Project terminal site facilitates significant synergies with the Chevron Pascagoula Refinery (e.g., waste heat delivery and cool water return system, enhanced marine operability, and security and safety systems) that would be lost or reduced if sited at Gulf LNG's proposed terminal site. Furthermore, we do not believe that there are significant advantages to combining or collocating two or more different LNG project facilities on a single property. If the LNG projects were built on a single site, additional space would be required to accommodate the construction of additional ship berths, storage tanks, vaporization equipment, and combined pipeline facilities, which would likely result in environmental impacts similar to that associated with the two individual projects. Further, construction of two LNG facilities at a single property would not lessen the effects to local ship traffic, and increased congestion in the immediate vicinity of a single marine terminal would pose significant logistical difficulties.

In considering either of these approaches, we would first need to establish that unacceptable impacts exist at a proposed LNG terminal site. At this time, our environmental review of each terminal project has not revealed any unacceptable impacts. The FERC will evaluate each project individually based on its merits, and at the time of its decision will be fully apprised of the individual as well as the cumulative environmental impacts. To ensure that our analysis was complete and included local and regional issues, we conferred with appropriate agencies and held public scoping meetings. Section 4.13 addresses the potential combined environmental impacts of construction and operation of multiple LNG import terminal projects in the Pascagoula area, should both the Casotte Landing and LNG Clean Energy Projects proceed forward.

### **3.3.2 Offshore LNG Terminal System Alternatives**

To avoid many of the environmental issues and safety concerns associated with locating an LNG terminal onshore, many companies have considered locating LNG import terminal facilities in offshore areas. As defined in the Deepwater Port Act of 1974 (as amended by the Maritime Transportation Security Act of 2002 to include natural gas facilities), deepwater ports include a fixed or floating structure (other than a vessel) or a group of structures that are located off the coast of the U.S. and that are used as a port or terminal for the transportation, storage, and further handling of oil or natural gas. This legislation requires that the DOT (U.S. Maritime Administration [MARAD]) and the Coast Guard regulate the licensing, siting, construction, and operation of deepwater ports for natural gas. Like onshore LNG terminals, offshore LNG terminal facilities located in state waters fall under the jurisdiction of the FERC.

There is currently only one existing offshore LNG terminal in operation in the United States. However, more than a dozen offshore LNG terminals that would be located in United States waters have been formally proposed or are in the planning stages. The four main offshore technologies currently under development include:

- shuttle regasification vessels (SRV);
- gravity-based structures (GBS);
- reuse of existing offshore platforms; and
- floating regasification units (FRU).

Many of the proposed offshore LNG terminal facilities would be located along the West Coast or in the New England region. As with the onshore LNG terminal system alternatives, offshore LNG terminals located in those regions would not satisfy one of the main objectives of the proposed Project, to access gas markets primarily in the southeastern United States. Therefore, our analysis of approved and proposed offshore LNG terminals was constrained to those facilities that would be located in United States waters along the Gulf of Mexico or South Atlantic coasts. Table 3.3.2-1 identifies these facilities and summarizes the status of each project.

### **3.3.2.1 Shuttle Regasification Vessel**

An SRV is a specially designed LNG carrier that uses onboard vaporization equipment similar to that used at onshore LNG terminals to transfer regasified LNG to subsea pipelines via a floating buoy and riser system. The floating buoy is permanently attached to the seafloor using a 6- or 8-point mooring system, and a flexible pipeline riser is used to transfer regasified LNG received from the SRV into a subsea pipeline.

The Gulf Gateway Energy Bridge (Gulf Gateway) terminal, owned by Exceleerate Energy LP, uses SRV technology and is currently the only operational offshore LNG import terminal in the United States. The facility is located in the Gulf of Mexico, approximately 116 miles off the Louisiana coast. The Gulf Gateway terminal consists of a submerged turret loading buoy and associated flexible riser pipe and subsea manifold, a gas metering platform, and about 7 miles of subsea pipeline that provides interconnects with two offshore pipeline systems. The Gulf Gateway terminal has a sendout capacity of approximately 0.5 Bcfd during the 6 to 10 day period required for a berthed SRV to offload its cargo at the terminal. Although as planned the Exceleerate shipping fleet would include up to four SRVs, the Gulf Gateway terminal is currently only served by one SRV.

SUEZ Energy North America, Inc. (SUEZ) recently filed an application with the Coast Guard for its proposed Calypso LNG Deepwater Port Project (Calypso), which would also make use of SRV technology. As proposed, the Calypso terminal would consist of two submerged turret loading buoys, which would allow at least one SRV to be moored at all times, yielding the flexibility to provide for continuous sendout of natural gas from the terminal. The Calypso Project would be located approximately 10 miles offshore of Port Everglades in south Florida, and would provide a peak sendout capacity of up to 1.0 Bcfd through an interconnect with the planned Tractebel Calypso Pipeline Project, which was previously evaluated by the FERC under Docket No. CP01-409-000.

Though the Gulf Gateway and Calypso terminals would satisfy an objective of the proposed Project by providing natural gas service to southeastern markets through interconnects with existing interstate pipeline infrastructure, neither facility would provide any storage component. To ensure a continuous supply of gas, an SRV-based terminal would need to provide multiple unloading buoys serviced by a fleet of purpose-built SRVs or retrofit LNG carriers. Even though the Calypso terminal would provide multiple unloading buoys, the sendout capacity of that project would not achieve that of the proposed Project. Additionally, the location of the Calypso terminal was selected to meet the specific natural gas demands of the south Florida market, and substantial upgrades of the existing interstate pipeline infrastructure would be required to backhaul natural gas to the broader southeastern markets targeted by the proposed Project. For these reasons, we do not consider the Gulf Gateway terminal, the Calypso terminal, or SRV technology in general, to represent a viable alternative to the proposed Casotte Landing Project.

**TABLE 3.3.2-1  
Approved and Proposed Offshore LNG Terminals Located along the  
Gulf of Mexico or South Atlantic Coasts**

<b>Operator/Applicant</b>	<b>Project Name</b>	<b>Coast Guard Docket Number</b>	<b>Location</b>	<b>Sendout Capacity (Bcf/d)</b>	<b>Total Storage Capacity (m<sup>3</sup>)</b>	<b>Status<sup>a</sup></b>
<b>Existing Terminals</b>						
Excelerate Energy LP	Gulf Gateway Energy Bridge	14294/21111	Gulf of Mexico, offshore LA	0.5	None	Began operation in April 2005.
<b>Approved Terminals</b>						
ChevronTexaco – Port Pelican LLC	Port Pelican Offshore Deepwater Port Project	14134	Gulf of Mexico, offshore LA	2.0	330,000	Coast Guard and MARAD approvals issued November 2003; project placed on hold indefinitely by applicant.
Shell US Oil and Gas – Gulf Landing LLC	Gulf Landing Project	16877	Gulf of Mexico, offshore LA	1.0	200,000	Coast Guard and MARAD approvals issued February 2005; NEPA environmental review of graving dock in progress.
<b>Proposed Terminals</b>						
Freeport - McMoRan Energy, LLC	Main Pass Energy Hub	17696	Gulf of Mexico, offshore LA	2.5	300,000	Application filed February 2004; Coast Guard issued final EIS in March 2006; ROD anticipated by June 2006.
ConocoPhillips – Compass Port LLC	Compass Port Project	17659	Gulf of Mexico, offshore AL	1.0	300,000	Application filed March 2004; Coast Guard issued final EIS in April 2006; ROD anticipated by July 2006.
ConocoPhillips – Beacon Port LLC	Beacon Port Project	21232	Gulf of Mexico, offshore LA	1.5	300,000	Application filed January 2005; Coast Guard issued draft EIS in March 2006; NEPA environmental review in progress.
TORP Terminal LP	Bienville Offshore Energy Terminal	N/A	Gulf of Mexico, offshore AL	1.4	None	Application filed January 2006; Coast Guard is currently assessing the completeness of the application.
SUEZ Energy North America, Inc.	Calypso LNG Deepwater Port Project	N/A	South Atlantic, offshore FL	1.0	None	Application filed March 2006; Coast Guard is currently assessing the completeness of the application.

<sup>a</sup> Project status as of April 2006. More specific information for many of these projects can be obtained from the Coast Guard document management system (<http://dms.dot.gov/>).

Bcf/d billion cubic feet per day

m<sup>3</sup> cubic meters

N/A not applicable

### **3.3.2.2 Gravity Based Structures**

A GBS offshore LNG terminal would consist of LNG storage tanks, offloading, and vaporization facilities placed on large concrete structures attached directly to the seafloor. LNG carriers would moor at the terminal and offload LNG, similar to an onshore LNG terminal. The LNG would then be regasified and sent out through interconnects with existing interstate pipeline systems using vaporizers and pumps housed at the terminal. Because the GBS must extend above the water surface but still enable access by deep-draft LNG carriers, GBS terminals are constrained to relatively shallow waters with a depth range of approximately 45 to 100 feet. The GBS itself would be constructed at a graving dock, which is a specialized onshore construction facility with adjacent channel depths sufficient to float the completed structure. Graving dock land requirements and associated environmental impacts would vary from site to site, but would typically range from 50 to 100 acres in size and require the dredging of between 2 and 3 mcy of material.

As described in Table 3.3.1-1, several offshore LNG terminals that incorporate GBS technology in their design has been proposed along the Gulf of Mexico. Both the Port Pelican and Gulf Landing terminals have received preliminary authorizations from the Coast Guard, and the Compass Port and Beacon Port terminals are currently under review. As proposed, these LNG terminal projects would provide storage capacities ranging from 200,000 m<sup>3</sup> to 300,000 m<sup>3</sup>, with sendout capacities of 1 to 2 Bcfd, both of which are similar to that of the proposed Casotte Landing Project. The locations of these terminals in the Gulf of Mexico would also satisfy another objective of the proposed Project, providing natural gas service to southeastern markets through interconnects with the existing interstate pipeline infrastructure.

### **3.3.2.3 Reuse of Existing Offshore Platforms**

Abandoned platforms and associated infrastructure that exist in the Gulf of Mexico would also be converted for reuse as LNG import, storage, and vaporization terminals. Reuse of an existing platform would first require decommissioning of the existing production facilities. The platform would then be outfitted with LNG carrier berthing, LNG storage, and vaporization facilities, but depending on the specific design, reuse of an offshore platform may not include significant offshore storage facilities. Like with a GBS, LNG would be regasified and sent out through subsea pipelines to interconnects with existing interstate pipeline systems. Currently, there is one such project proposed in the Gulf of Mexico.

The Main Pass Energy Hub (Main Pass) terminal would utilize an existing offshore platform to provide LNG carrier berthing, unloading, and vaporization facilities. The project would provide an LNG surface storage capacity of approximately 145,000 m<sup>3</sup>, but would also make use of a nearby salt dome to provide underground storage of up to 28 bcf of natural gas. As proposed, the Main Pass terminal would provide sendout capacities of up to 3.1 Bcfd, and construction of approximately 192 miles of offshore pipeline and 5 miles of onshore pipeline would interconnect the project with the existing interstate pipeline infrastructure. As such, the Main Pass terminal would satisfy several objectives of the proposed Casotte Landing Project.

### **3.3.2.4 Floating Regasification Units**

An FRU represents a new technological approach to providing LNG import terminal services. Under this approach, LNG offloading and vaporization equipment is housed on a floating, L-shaped structure equipped with positioning thrusters. LNG carriers of any design arriving at the terminal are moored using a single anchor leg mooring buoy. The FRU then docks onto the LNG carrier using a suction cup-like attachment system, and offloads, vaporizes, and sends out the vessel's cargo via a flexible riser connected to a subsea pipeline, similar to the SRV technological approach.

TORP Terminal LP recently filed an application with the Coast Guard for its proposed Bienville Offshore Energy (Bienville) project, which would be the first offshore LNG terminal to use FRU technology. As proposed, the Bienville terminal would consist of two FRUs and mooring buoys, as well as a support platform housing a control room, metering, and support facilities. Provision of two FRUs operating in tandem would allow at least one LNG carrier to be moored at all times, yielding the flexibility to provide for continuous sendout of natural gas from the terminal. The Bienville terminal would be located approximately 63 miles off of Dauphin Island, Alabama, less than 80 miles from the proposed Project, and each FRU would provide a sendout capacity of up to 1.4 Bcfd through interconnects with existing interstate pipeline infrastructure.

The Bienville terminal would satisfy an objective of the proposed Casotte Landing Project by providing natural gas service to southeastern markets, and unlike the Gulf Gateway terminal, the tandem design of the project would facilitate continuous sendout of natural gas at a capacity similar to that of the proposed Project. Further, the design of the floating regasification unit would not result in the need for a fleet of specialized LNG carriers. However, the Bienville terminal would not provide for storage of LNG, which is one of the primary objectives of the proposed Project. For this reason, we do not consider the Bienville terminal, or FRU technology in general, to represent a viable alternative to the proposed Casotte Landing Project.

The floating, storage and regasification unit (FSRU) represents a similar approach to FRU technology that is being considered by some companies to provide for LNG imports into the United States. Unlike an FRU, an FSRU would provide for onboard storage of LNG in addition to offloading and vaporization facilities. An FSRU would resemble an oversized LNG carrier and provide storage capacities between 250,000 and 350,000 m<sup>3</sup> of LNG, over twice the capacity of most typical LNG carriers. An FSRU would be permanently moored to an offshore platform or floating buoy, and LNG carriers would berth alongside it to accomplish offloading of their LNG cargoes. After offloading, LNG stored in the FSRU would be vaporized and sent out at capacities up to about 1 Bcfd through subsea pipelines and interconnects with existing interstate pipeline infrastructure. Though several companies have proposed the use of FSRU technology off the West Coast and in the Long Island Sound area, no projects of this type have yet been proposed for the Gulf of Mexico.

### **3.3.2.5 Conclusions Regarding Offshore LNG Terminal System Alternatives**

We have considered existing, approved, and proposed offshore LNG terminals and technologies to determine if they would meet the proposed Project objectives while avoiding or reducing impacts to environmentally sensitive resources. Though an offshore LNG terminal would avoid or minimize some of the environmental impacts associated with the proposed Project (e.g., permanent fill of coastal wetlands, dredging and dredge material placement impacts, public safety concerns raised by local residents), there are operational and environmental tradeoffs associated with offshore LNG terminal technology.

Though an offshore LNG terminal might reduce some onshore public safety concerns, it would not entirely eliminate concerns for potential conflicts with recreational or commercial navigation. Though the siting process for an offshore LNG terminal includes considerations for locating a terminal in areas removed from shipping fairways and operational oil or gas platforms, a permanent, safety zone would be established at an offshore LNG terminal. The safety zone would entirely preclude commercial or recreational navigation and fishing within a 1,640-foot (500-m) radius around the terminal. Additionally, any anchoring of vessels would be precluded in an area up to 1 nautical mile in diameter around an offshore terminal.



Relative to an onshore terminal, an offshore LNG terminal would be more exposed to metocean (weather and marine related) conditions. Unsuitable metocean conditions would result in significant periods when LNG carriers would be unable to unload their cargo due to excessive relative motion between the LNG carrier and the offshore terminal berth, reducing the long-term reliability of such a facility. This factor would be particularly exacerbated for those offshore terminal technologies that do not provide LNG storage capabilities (i.e., SRV and FRU). For facilities employing those technologies, any disruption of the shipping supply chain would result in an inability to deliver a reliable supply.

Each of the offshore LNG terminal facilities proposed to date in the Gulf of Mexico would use seawater as the primary heat source for vaporization of LNG. As described in Section 3.5.2, this requires the intake and discharge of large volumes of seawater, which would adversely affect marine life by entraining ichthyoplankton and lead to localized water quality concerns. For these reasons, NOAA Fisheries and various non-governmental organizations have opposed the use of seawater warmed vaporization technology at other LNG projects in the Gulf of Mexico.

Use of an offshore facility would not preclude potential impacts too onshore or nearshore facilities and resources. As described previously, a GBS must be constructed at a graving dock, which can range in size from 50 to 100 acres and require the dredging of material volumes similar to that of the proposed Project. Permanent onshore facilities would also be required to support an offshore terminal. Likewise, an offshore LNG terminal would likely require a longer sendout pipeline to provide an interconnect with existing pipeline infrastructure. Construction of a longer pipeline would result in additional environmental concerns, especially if a pipeline crossing of sensitive coastal resources (e.g., submerged aquatic vegetation beds, coastal marsh, Gulf sturgeon critical habitat, etc.) were required.

In addition to the operational and environmental tradeoffs described above, economic feasibility must also be considered. Some estimates have placed the capital cost for constructing an offshore terminal that includes significant LNG storage component at approximately twice that of a comparable onshore terminal. We note that ExxonMobil withdrew its application with the Coast Guard for the Pearl Crossing Project, a deepwater port LNG terminal that was proposed for construction off the coast of Louisiana. Additionally, though the Port Pelican terminal received approval from the Coast Guard, ChevronTexaco Corporation, and the parent company of Port Pelican, LLC, announced in July 2005 that it has placed that project on hold indefinitely. These factors do not provide reasonable assurances that an offshore LNG terminal would represent an economically viable or practicable alternative to the proposed Project.

In summary, many of the existing, approved, and proposed offshore LNG terminals and technologies evaluated in our analysis would satisfy some objectives of the proposed Casotte Landing Project, as described above. Though we acknowledge that the existing, approved, and proposed offshore LNG terminal projects and technologies would provide an alternative means for the import of LNG, we do not consider that any of them would provide the capabilities of the proposed Project. Further, we do not consider that any of the offshore LNG terminal technologies represent an environmentally preferable or technically and economically feasible and practical alternative to the proposed Project. Additionally, we are unsure whether those offshore LNG terminal projects that have been proposed, but not yet constructed, will advance beyond the planning stages. As with our analysis of existing, approved, and proposed onshore LNG terminals (see Section 3.3.1.3), the FERC does not ultimately view any of the existing, approved, or proposed offshore LNG terminal projects as true alternatives to the proposed Project. Rather we view each of the existing, approved, and proposed offshore LNG terminal projects to be potentially complementary for the purpose of meeting the United States' projected energy demands.

### **3.3.3 Pipeline System Alternatives**

As an alternative to constructing a new LNG import terminal, we considered the feasibility of utilizing or expanding existing pipeline systems to provide an equivalent amount of natural gas to the markets that would be served by the proposed Casotte Landing Project. Expansion of existing pipeline systems alone would not supply these markets with new, non-domestic sources of natural gas, as the proposed Project would. As described in Section 1.1, demand for natural gas is outpacing domestic supplies. Pipeline system alternatives would therefore be unable to meet the objectives of the proposed Project and were not considered further in our analysis.

## **3.4 LNG TERMINAL SITE ALTERNATIVES**

In evaluating a potential location for the proposed Casotte Landing Project, Bayou Casotte Energy considered its specific objectives for the proposed Project, with primary focus given to the following factors:

- proximity to existing natural gas and NGL infrastructure and associated markets;
- marine operability and port capabilities to accommodate LNG carriers from approximately 125,000 m<sup>3</sup> to 200,000 m<sup>3</sup> capacity;
- ability to provide synergies with other existing Chevron owned businesses; and
- minimization of environmental impact from construction and operation.

A location in proximity to the Chevron owned and operated Pascagoula Refinery on Bayou Casotte in Pascagoula, Mississippi, would satisfy all of these factors. A primary objective of the proposed Project is to provide direct access to southeastern natural gas markets, as well as broader United States markets, through interconnects with the existing pipeline infrastructure. Existing pipeline infrastructure in the immediate vicinity of the Refinery provides over 4.0 Bcfd of takeaway capacity that provides direct and indirect access (through interconnects with other pipeline systems) to markets in the southeastern United States, as well as the Mid-Atlantic and New England regions. NGL pipeline infrastructure in the vicinity of the Refinery is also well developed. Additionally, a site along Bayou Casotte provides ready access to an existing deepwater shipping channel. Bayou Casotte Energy also reports that a site in proximity to the Refinery would provide numerous synergies and benefits including use of existing Refinery services for security and safety, access to lands owned and controlled by Chevron to minimize impacts to other property owners, and use of waste heat from the Chevron Pascagoula Refinery to accomplish LNG vaporization. As described in Section 3.5.2.3, utilization of heated wastewater from the Refinery's cooling towers as a heat source for LNG vaporization would provide numerous environmental benefits over other alternative vaporization technologies.

For these reasons, we consider that other potential locations would be unlikely to satisfy the proposed Project objectives, and we did not conduct a detailed regional screening analysis to identify alternative terminal locations. Additionally, we note that the regional screening analysis performed for the LNG Clean Energy Project, which did not include an objective for providing synergies with other existing Chevron owned businesses, resulted in convergent selection of a proposed terminal site in Pascagoula, Mississippi.

### **3.4.1 Local Siting Alternatives**

Based on the above analysis, proximity to the Chevron Pascagoula Refinery was identified as a critical component in siting an LNG terminal that would meet the specific project objectives of Bayou

Casotte Energy. We therefore considered other local siting alternatives in the vicinity of the Refinery to determine whether other alternative sites would meet the proposed Project objectives while avoiding or reducing impacts to environmentally sensitive resources and representing a technically and economically feasible and practical solution. The proposed LNG terminal site and associated facilities are described in Section 2.1.1. Two alternative terminal sites, the South and Point aux Chenes Site Alternatives, were evaluated in our analysis. These alternative terminal sites are depicted in Figure 3.4.1-1, and the various criteria used in our analysis are provided in Table 3.4.1-1.

**TABLE 3.4.1-1.  
Comparison of Local Siting Alternatives for the Proposed Casotte Landing Project**

<b>Comparative Category</b>	<b>Unit</b>	<b>Proposed Site</b>	<b>South Alternative</b>	<b>Point aux Chenes Alternative</b>
LNG carrier berth design	N/A	Off-channel slip	Jetty	Jetty
Primary land use	N/A	Former industrial site	BCDMMS	BCDMMS
Excavation/dredged material volume	mcy	4.5	1.8	12.0
Total wetlands affected <sup>a</sup>	Acres	118	136	187
Estuarine emergent	Acres	54	129	167
Palustrine emergent	Acres	59	0	0
Palustrine scrub shrub	Acres	5	0	0
Palustrine forested	Acres	0	7	17
Waterbodies affected <sup>a,b</sup>	Number	2	2	3 <sup>b</sup>
Essential Fish Habitat affected <sup>c</sup>	Acres	21	41	71

<sup>a</sup> All wetland and waterbody impacts estimated from National Wetlands Inventory data, and therefore reported values for the proposed terminal site may differ from actual numbers provided elsewhere in this document.

<sup>b</sup> All potentially affected waterbodies consist of man-made canals or ponds, except for the South Site Alternative, which would affect one tidal creek.

<sup>c</sup> All affected open water areas were assumed to represent Essential Fish Habitat.

N/A Not applicable  
BCDMMS Bayou Casotte Dredged Material Management Site  
mcy million cubic yards

The berthing facility design contemplated by Bayou Casotte Energy at both the South and Point aux Chenes Site Alternatives would consist of a berth located at the end of a new jetty and would not provide for creation of an off-channel slip, as would the proposed terminal site. As such the dredge material volume associated with the South Site Alternative would represent that material removed to expand the existing Bayou Casotte turning basin and access the existing channel. The dredge material volumes associated with the Point aux Chenes Site Alternative would represent that required to provide a dedicated channel east of the existing Bayou Casotte channel, as well as a new turning basin. In the case of the South Site Alternative, adoption of a jetty berthing facility design would reduce the amount of material that would need to be excavated, dredged, and/or disposed of relative to the proposed terminal site. However, berthing of LNG carriers in an off-channel slip would be optimal from a safety and security perspective, as it would reduce potential conflicts with existing commercial and recreational marine traffic and minimize the chances of allision by passing vessels.

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Figure 3.4.1-1 Proposed Casotte Landing Project  
Local Siting Alternatives

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As described in Table 3.4.1-1, adoption of either the South or Point aux Chenes Site Alternatives would not reduce potential Project impacts to wetlands, waterbodies, or EFH. Additionally, Bayou Casotte Energy has identified several technical concerns with both site alternatives. The berthing design of both alternatives would also increase the separation between the LNG carrier berth and the LNG storage tanks relative to the proposed terminal site design, and would result in cryogenic transfer lines 5,000 to 7,000 feet longer than that proposed, which represents a technical and economic constraint. While the proposed terminal site would occupy a former industrial site, the South and Point aux Chenes Site Alternatives would conflict with the Bayou Casotte Dredged Material Management Site (BCDMMS), which is an active dredged material placement area. Reduction in size of either the South or Point aux Chenes sites to avoid conflict with the BCDMMS would require that LNG storage tanks and associated facilities be located remote from the LNG carrier berthing. As the most likely candidate site for siting of the LNG storage tanks would be at the proposed terminal site, adoption of either the South or Point aux Chenes Site Alternatives might not preclude use of the proposed terminal site. For these reasons, we eliminated both of the local terminal siting alternatives from further consideration.

### **3.5 LNG TERMINAL DESIGN ALTERNATIVES**

#### **3.5.1 Terminal Slip Configuration Alternatives**

The proposed Project would include the construction of a vessel berthing and unloading slip off of the Bayou Casotte shipping channel. The proposed slip design would require the excavation, dredging, and removal of approximately 4.5 mcy of material, approximately 3.5 mcy of which would be disposed of at the Pascagoula ODMDS, as proposed. We evaluated alternative slip configurations to determine whether they would reduce the required volumes of dredged material while still being technically feasible and practical.

Consistent with the proposed Project objectives, the proposed terminal slip would accommodate LNG carriers up to 200,000 m<sup>3</sup> capacity by providing a dredge elevation of 46 feet below MLLW. This dredge elevation would encompass a 42 foot design depth, 2 feet of advanced maintenance dredging, and an additional 2 feet of over depth dredging allowance. Each of the alternative slip configurations evaluated would provide the same dredge design depth. As described in Section 3.4.1, berthing of LNG carriers in an off-channel slip would be optimal from a safety and security perspective. Construction of a parallel berth alongside the existing Bayou Casotte channel was therefore not evaluated in detail. The following terminal slip configuration alternatives were evaluated in our analysis:

- Option 1 - Angled Slip with LNG and Crude Berths (the proposed action);
- Option 2 - Long Slip with LNG and Crude Berths;
- Option 3 - Short Slip with LNG and Crude Berths; and
- Option 4 - Angled Slip with LNG Berth Only.

The alternative terminal slip configurations evaluated are depicted in Figure 3.5.1-1, and the various criteria used in our analysis are provided in Table 3.5.1-1.

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Figure 3.5.1-1 Proposed Casotte Landing Project  
Terminal Slip Configuration Alternatives

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**TABLE 3.5.1-1.  
Terminal Slip Configuration Alternatives for the Proposed Casotte Landing Project.**

<b>Slip Configuration Alternative</b>	<b>Dredged material volume (mcy)</b>	<b>Achieves marine synergies<sup>a</sup></b>	<b>Marine operability considerations</b>
Option 1	4.5	Yes	Marine navigation enhanced by the approximate 30° slip angle and slip width.
Option 2	9.1 <sup>b</sup>	Yes	LNG carrier berth further removed from channel, enhancing safety and security considerations. Relative to Option 1, marine navigation more difficult due to the higher degree of complexity and tighter turns in and out of the narrower slip.
Option 3	4.6 <sup>b</sup>	Yes	Relative to Option 1, marine navigation more difficult due to the higher degree of complexity and tighter turns in and out of the narrower slip.
Option 4	4.0	No	Marine navigation enhanced by the approximate 30° slip angle, but the narrower channel lane and slip entrance would result in higher degree of complexity relative to Option 1.

Notes:

<sup>a</sup> This metric evaluates whether the alternative would accommodate relocation of Chevron Pascagoula Refinery Berth 7.

<sup>b</sup> An additional 1.4 mcy of material would be dredged in association with these alternatives to expand the existing Bayou Casotte turning basin.

As described in Section 2.2, construction of an off-channel slip at the proposed terminal site would require relocation of the Refinery’s existing Berth 7, which is used to receive deliveries of crude oil and export refined products. Bayou Casotte Energy’s proposed action, Option 1, would accommodate relocation of Berth 7. The angled design of the slip would also enhance marine maneuverability and navigation and avoid the need for expansion of the existing Bayou Casotte turning basin, which Bayou Casotte Energy has estimated would require dredging and disposal of an additional 1.4 mcy of dredge material. Further the width of the proposed terminal slip would provide sufficient room for operation of LNG carriers, crude tankers, and tugs.

As described in Table 3.5.1-1, both Options 2 and 3 would both accommodate relocation of Berth 7. However, both of these alternatives would require dredging of greater volumes of material than Option 1, including additional dredging of the Bayou Casotte turning basin. Relative to Option 1, the approximate 90° orientation of the slip to the existing Bayou Casotte channel under Options 2 and 3 would also complicate marine navigation for vessels entering and departing the slip. For these reasons, Options 2 and 3 were eliminated from further consideration.

Option 4 would result in the smallest amount of dredge material volumes of any alternative evaluated, and the angled slip design of Option 4 would provide marine navigation benefits for LNG carriers similar to that of Option 1. However, the narrower slip channel and entrance would result in a higher degree of marine maneuverability complexity than Option 1. Further, Option 4 would not accommodate relocation of the Refinery’s existing Berth 7. Failure to relocate Berth 7 would interfere with the Refinery’s existing operations and would not achieve one of Bayou Casotte Energy’s Project

objectives, to provide synergies with other existing Chevron owned businesses. For this reason, Option 4 was eliminated from further consideration.

In summary, we do not consider any of the alternative slip configurations evaluated to represent a technically or environmentally preferable alternative to Bayou Casotte Energy's proposed terminal slip design.

### **3.5.2 Vaporization Technology Alternatives**

As described in Section 2.1.1.4, LNG must be warmed from a liquid to a gaseous state (vaporized) before it can be transported as natural gas in the sendout pipeline. This section describes the vaporization technology alternatives considered for the Casotte Landing Project and the associated environmental impacts. The following vaporization technologies were evaluated:

- submerged combustion vaporization (SCV);
- shell and tube vaporization (STV) with gas fired heaters;
- intermediate fluid vaporization (IFV);
- open rack vaporization (ORV); and
- ambient air heated vaporization.

#### **3.5.2.1 Submerged Combustion Vaporization**

SCV technology uses water heated by combustion exhaust to warm and vaporize LNG. An SCV system typically consists of a water bath containing stainless steel tubes (vaporization coils) and a submerged combustion chamber. LNG would be pumped through the vaporization coils submerged in the heated water bath, where it would be warmed and vaporized. The water bath would be cooled during this process as it transfers heat to the LNG. Cooled water would then be reheated in the submerged combustion chamber. The hot exhaust from the combustion chamber would be sparged into the water bath (i.e., the exhaust would be introduced into the liquid), thus transferring the heat necessary to vaporize the LNG. The combustion units would use vaporized LNG (natural gas) as a fuel source, and SCVs typically consume about 1.5 percent of the sendout natural gas from an LNG terminal.

The primary byproducts from burning natural gas for the SCV process would be carbon dioxide (CO<sub>2</sub>) and water. Though water generated by the combustion process would be used as the water bath, excess combustion water would also result. CO<sub>2</sub> absorbed into the water bath would create a low (acidic) pH, necessitating chemical treatment to neutralize excess combustion water prior to discharge. A SCV system capable of providing the sendout capacity proposed by Bayou Casotte Energy would likely result in a daily discharge of more than 200,000 gallons of treated wastewater. Furthermore, since SCVs rely on combustion of natural gas, this technology would also produce air emissions, including CO<sub>2</sub>, CO, and NO<sub>x</sub>.

SCV is a widely used and proven technology, and it is generally considered to represent a viable and safe vaporization technology alternative. SCV technology is currently in use at the Southern terminal at Elba Island, Georgia, and the Trunkline terminal at Lake Charles, Louisiana, and has also been approved for use at the Cameron and Sabine terminals located near Hackberry and Sabine Pass, Louisiana, respectively.



### **3.5.2.2 Shell and Tube Vaporization with Gas Fired Heaters**

STV technology uses a heat exchange medium, typically a glycol/water solution, that is circulated in a closed loop to warm and vaporize LNG, which is conveyed through the heat exchange medium in tubes. Though multiple heat sources can be used to warm the heat exchange medium, under the gas-fired approach, conventional gas-fired heaters are used, typically resulting in consumption of approximately 1.6 percent of the sendout natural gas from an LNG terminal. Like SCVs, gas-fired STVs also produce air emissions, particularly NO<sub>x</sub>. However, since conventional gas-fired heaters are used, they can be constructed with effective emission control devices (e.g., selective catalytic reduction technology) that can't be used with SCV systems.

Gas-fired STV is also a widely used and proven technology. It is currently in use at the DISTRIGAS and Cove Point terminals, as well as the Guayanilla Bay terminal in Puerto Rico, and has also been approved for use at the Vista del Sol terminal in San Patricio County, Texas.

### **3.5.2.3 Intermediate Fluid Vaporization**

IFV technology uses a glycol/water solution that is circulated in a closed loop as the heat medium to vaporize LNG via a shell and tube heat exchanger. Depending on the heat source used to warm the glycol mixture, several configurations of IFVs are possible. Gas-fired heaters may be used as a heat source, but the use of gas-fired heaters results in air emissions, as described above (see Section 3.5.2.2). Seawater may also be used as a heat source. Under this approach, heat transferred from the seawater to the glycol mixture through a series of plate and frame exchangers would then be transferred to the LNG via a shell and tube heat exchanger. However, this approach would share many of the disadvantages noted for an open-loop ORV system (see Section 3.5.2.4). Heated wastewater generated by industrial operations may also be used as a heat source to warm the glycol mixture.

For the proposed Project, Bayou Casotte Energy has proposed the use of waste heat from the adjacent Chevron Pascagoula Refinery to accomplish vaporization, as described in Section 2.1.1.4. Specifically, heated wastewater from the Refinery's cooling towers would be transferred to the LNG terminal site via a nonjurisdictional water circulation system using one set of pumps. A second set of pumps would circulate a 25 percent polypropylene glycol/water solution in a closed loop at the proposed terminal site. The glycol solution would transfer heat received from the heated wastewater to the LNG via a shell and tube heat exchanger, where vaporization would occur. Cooled water resulting from the transfer of heat to the glycol solution would subsequently be returned to the Refinery through the water circulation system, and would assist in meeting the cool water needs of that facility's operations.

Though the use and storage of propylene glycol represents a potential environmental impact in the event of an accidental release of the compound, propylene glycol is generally considered a relatively benign chemical. Further, mixture with water would improve the safety of the system as diluted propylene glycol has no measurable flash point. A similar system has been approved for use at the Ingleside terminal in San Patricio County, Texas.

### **3.5.2.4 Open Rack Vaporization**

ORV typically utilizes seawater as the LNG warming medium. Under this approach, LNG is pumped through a series of aluminum heat transfer tubes arranged in a rack. Seawater is drawn in through screened water intakes and passed over the heat transfer rack to warm the LNG before being discharged back to the ocean in an open-loop. To prevent marine growth (biofouling) on the water intakes and inside the warming water system, sodium hypochlorite (bleach, an oxidizer) is typically added to the seawater in the system on a continuous basis. As it exchanges heat with the LNG, the seawater is

cooled such that the discharge is typically 13 to 22 °F cooler than the ambient seawater (Exponent 2005). ORV is only effective as the sole source of vaporization when seawater temperatures exceed 63 °F. At seawater temperatures of 50 to 63 °F, supplemental methods of LNG warming are needed to maintain sendout capacity. Supplemental heating would typically be provided using gas-fired heaters similar to those used for SCV or STV systems.

ORV technology is widely used for LNG vaporization at LNG terminals in warm water areas, including Japan, Korea and portions of Europe (Yang and Huang 2004), and it has been approved for use at the Port Pelican and Gulf Landing terminals in the Gulf of Mexico. However, open-loop ORV technology requires the use of large volumes of seawater. To provide the sendout capacity proposed by Bayou Casotte Energy would require the withdrawal and discharge of well over 100 million gallons of seawater on a daily basis, which would affect marine life by killing ichthyoplankton unable to escape from the intake area. Further, the discharge of cooled and chemically treated seawater would also affect marine life and water quality, although the effects would be localized. For these reasons, NOAA Fisheries has opposed the use of open-loop ORV technology at other LNG projects in the Gulf of Mexico.

Bayou Casotte Energy initially considered an ORV system that would make use of a closed-loop of heated wastewater from the Refinery as a heating medium rather than seawater. This closed-loop ORV alternative would avoid the withdrawal and discharge of large amounts of seawater, as well as the use of an intermediate, glycol/water heating medium. However, Bayou Casotte Energy indicated that copper concentrations in the Refinery wastewater stream would corrode the aluminum components of an ORV system, resulting in reduced system reliability and higher maintenance costs.

### **3.5.2.5 Ambient Air Heated Vaporization**

Ambient air heated vaporizers, operating in either a natural or forced draft mode, use heat from surrounding air to warm and vaporize LNG. Ambient air temperature and the amount of supplemental heating available affect the size and performance of these units. If proposed as the sole means of vaporization, ambient air must be warm enough to vaporize LNG year round, and this approach is only suited for LNG terminals in very warm climates, such as the Petronet LNG terminal in Dahej, India (Yang and Huang 2004). As with ORV technology, LNG terminals in more temperate climates would require supplemental heat from SCVs or STVs during cooler weather. Additionally, condensation that results from the cooling of air associated with these systems can result in the production of significant amounts of freshwater, which must be disposed of. Further, water that is condensed on the heat exchange surfaces may freeze. Periodic downtime to facilitate melting of built-up ice greatly reduces the performance and efficiency of these systems.

### **3.5.2.6 Vaporization Technology Alternatives Conclusions**

After reviewing the alternative vaporization technologies described above, none are considered environmentally preferable to Bayou Casotte Energy's proposed approach, IFV technology using a heated wastewater stream as the heating medium. This conclusion was reached using the following rationale:

- Though SCV and gas-fired STV represent widely used and proven technology, both technologies would result in air emissions, as well as consumption of sendout gas.
- Open-loop ORV technology does not have regulatory agency support due to potential impacts on aquatic biota, and a closed-loop ORV system would reduce system reliability and increase maintenance costs. Both systems would also likely require supplemental or back-up vaporization capacity using SCV or gas-fired STV technology.

- Ambient air-heated vaporization would require up to 100 percent supplemental vaporization capacity using SCV or gas-fired STV technology, which would offset the environmental advantages of this system. Further, the efficiency and performance of these systems is uncertain.
- The proposed IFV system would use a readily available heat source, heated industrial wastewater, to avoid the potential impacts (e.g., air emissions, large water withdrawals and/or discharges, etc.) associated with other technologies. Additionally, this alternative would achieve synergies with other existing, Chevron owned businesses, thereby meeting one of Bayou Casotte Energy's objectives.

Although gas-fired STVs were not selected as an environmentally preferred vaporization technology for the Casotte Landing Project, this technology is considered to represent a widely used and proven technology, with minimal environmental affects. To enhance the long-term reliability of the proposed Project, Bayou Casotte Energy has proposed the use of a similar system to provide a back-up or supplemental vaporization capacity, in the event the Refinery cooling water system is unavailable or inadequate (e.g., full or partial Refinery outage or periods of colder supply water). The back-up vaporization system proposed by Bayou Casotte Energy would provide enough heat to maintain a sendout rate of 0.9 Bcfd, by using two, gas-fired process heaters associated with the nonjurisdictional NGL plant to directly heat the glycol/water solution used in the closed-loop IFV system.

The proposed back-up vaporization system would make use of existing facilities and systems, thereby eliminating the need for construction of an altogether separate back-up system. Additionally, the process heaters employed in the back-up vaporization system would be fitted with emission controls and would not significantly affect air quality, as described in Section 4.11.1. For these reasons, we did not consider alternatives to the proposed back-up vaporization technology in further detail.

### **3.5.3 Electrical Power System Alternatives**

During operation, the proposed LNG terminal would require about 27 megawatts of electrical power. This power demand would be supplied in one of two ways, on-site generation through construction of a new, gas-fired electric generation facility or by purchase from an existing public utility.

Bayou Casotte Energy considered on-site generation at the proposed LNG terminal, but determined that an on-site electric generation facility would increase site air emissions (primarily NO<sub>x</sub>) and require substantial capital costs. Bayou Casotte also considered obtaining power for the proposed Project from an existing Mississippi Power Company (MPC) substation located at the Refinery, but this alternative was eliminated due to a lack of sufficient, available power. Bayou Casotte Energy has proposed to provide electric power to the Casotte Landing Project terminal through construction of one main electrical substation and four smaller substations within the footprint of the LNG terminal site. Approximately 2 circuit miles of new, 115 kV transmission line constructed by MPC would link the substations to the existing electric transmission grid.

The most probable route for the electric transmission line would parallel Highway 611, an existing industrial and transportation corridor. Further, permits required for the installation of the transmission line would minimize any potential environmental impacts associated with its construction. For these reasons, we do not consider on-site power generation to represent an environmentally preferable alternative and have eliminated it from further consideration.

## **3.6 PIPELINE INTERCONNECT ALTERNATIVES**

### **3.6.1 Pipeline Route Alternatives**

We considered route alternatives for the proposed Gulfstream pipeline interconnect spur to determine if alternative pipeline alignments would avoid or reduce impacts to environmentally sensitive resources that would be crossed by the proposed pipeline. In conducting our analysis, we gave primary consideration to the use, enlargement, or extension of existing rights-of-way over developing a new right-of-way in order to reduce potential impacts on sensitive resources, consistent with the FERC regulations (18 CFR, Section 380.15[d][1]). In general, installation of new pipeline along existing, cleared rights-of-way (e.g., pipeline, powerline, road, or railroad) may be environmentally preferable to construction along new rights-of-way. Construction effects and cumulative impacts can normally be reduced by use of previously cleared rights-of-way.

In addition to the alternatives identified below, it is anticipated that minor alignment shifts would be required prior to and during construction to accommodate currently unforeseeable site-specific constraints related to engineering, landowner, and environmental concerns. All such alignment shifts would first be subject to post-certificate review and approval by the FERC.

As proposed, the Project pipeline facilities would consist of a 36-inch-diameter pipeline interconnect spur that would exit the terminal site traversing north along Ranson Road, then east to a terminus at an interconnect with the existing 36-inch-diameter Gulfstream pipeline (see Figure 2.1.3-1). Along its route and near the northeastern corner of the proposed LNG terminal site, the pipeline interconnect spur would pass adjacent to the existing 12-inch-diameter Gulf South, 36-inch-diameter Destin, 16-inch-diameter Chandeleur, and 12-inch-diameter Chandeleur pipelines, and short laterals would facilitate interconnections with those pipeline systems, as described in Section 2.1.3. Each of the latter pipeline interconnect laterals would be short (less than 0.1 mile in length) and constructed within existing pipeline rights-of-way adjacent to the proposed terminal site. Further, any modification of the proposed route for the 36-inch-diameter pipeline interconnect spur would not appreciably affect the location and route of the pipeline interconnect laterals. Consequently, only route alternatives for the 36-inch-diameter pipeline interconnect spur were evaluated in our analysis.

Three alternatives for the proposed 36-inch-diameter pipeline interconnect spur were evaluated. These alternatives are depicted in Figure 3.6.1-1, and Table 3.6.1-1 provides a detailed comparison of each route alternative with the proposed Project route.

Route Alternative A would generally follow the proposed route, and would only differ from the proposed route in that it would tie-in to the existing Gulfstream pipeline slightly farther north than the proposed route. As indicated in Table 3.6.1-1, Route Alternative A would not provide any reduction in affected environmental resources, but would be longer than the proposed route and encumber more land within construction and permanent rights-of-way. For these reasons, Route Alternative A was eliminated from further consideration.

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Figure 3.6.1-1 Proposed Casotte Landing Project  
Route Alternatives to the Proposed Pipeline  
Interconnect Spur

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through the Public Reference Room, or by e-mail at  
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**TABLE 3.6.1-1  
Comparison of Route Alternatives to the Proposed Pipeline Interconnect Spur  
for the Casotte Landing Project**

Comparative Category	Unit	Proposed Route	Alternative A	Alternative B	Alternative C
Total pipeline length	Miles	1.5	1.6	2.4	2.4
Construction right-of-way <sup>a</sup>	Acres	15.5	16.5	24.7	24.7
Permanent right-of-way <sup>a</sup>	Acres	9.1	9.7	14.5	14.5
Wetland crossings <sup>b</sup>	Number	3	3	2	3
Wetlands affected <sup>a, b</sup>					
Estuarine emergent	Acres	12.9	13.9	2.6	2.6
Palustrine emergent	Acres	2.6	2.6	2.6	7.9
Waterbody crossings <sup>c</sup>	Number	2	2	1	1
Collocation potential <sup>d</sup>	Percent	0	0	79	79

<sup>a</sup> Acreages reported assume an 85-foot-wide construction right-of-way and a 50-foot-wide permanent right-of-way.  
<sup>b</sup> Estimated from National Wetlands Inventory data.  
<sup>c</sup> All potentially affected waterbodies are man-made canals.  
<sup>d</sup> This metric evaluates the percentage of the route that would be parallel or adjacent to existing rights-of-way.

Both Route Alternatives B and C would differ from the proposed route in that they would parallel Ranson Road (Highway 611) and existing utility rights-of-way to an interconnect with the Gulfstream pipeline on the north of the Chevron Pascagoula Refinery. As described in Table 3.6.1-1, both of these route alternatives would result in one less waterbody crossing and impact less acres of wetlands than the proposed route. Though Route Alternatives B and C would also be collocated with an existing utility and transportation rights-of-way along Ranson Road, both would be approximately 1 mile longer than the proposed route, which would result in greater total land encumbrances than the proposed route during construction and operation.

Reduction of wetland and waterbody impacts, as well collocation and expansion of an existing right-of-way along Ranson Road, would make Route Alternatives B and C environmentally preferable to the proposed pipeline interconnect spur route. However, Route Alternatives B and C would also be approximately 1 mile longer than the proposed route, which would result in greater total land encumbrances during construction and operation, as described in Table 3.6.1-1. Bayou Casotte Energy has also indicated that from a constructability perspective, the density of existing natural gas pipelines and other infrastructure along Ranson Road would pose technical and safety constraints. In addition, the majority of the wetland impacts associated with construction of the proposed interconnect spur would be only temporary, as wetlands would be restored following construction (see Section 4.4). Further, the land along the proposed interconnect route is already owned or controlled by Chevron, which would avoid potential effects to other landowners. For these reasons, Route Alternatives B and C were eliminated from further consideration.

The nonjurisdictional NGL pipeline route proposed by Bayou Casotte Energy would parallel the proposed pipeline interconnect spur route before turning north to parallel the existing Gulfstream pipeline and MPC transmission line rights-of-way in route to a tie-in with the existing Tri-States NGL pipeline on the north side of the Refinery (Figure 3.6.1-1). Because the proposed NGL pipeline would be nonjurisdictional, we did not evaluate alternatives for that facility in detail. However, that facility

represents an interdependent action to the proposed Project, and Bayou Casotte Energy has indicated that construction of the NGL pipeline along the proposed route would affect over 25 acres of wetlands and require the crossing of five waterbodies. The only other logical route alternative for proposed NGL pipeline would parallel Ranson Road to an interconnect on the north of the Chevron Pascagoula Refinery. However, for the reasons identified above under our evaluation of Route Alternatives B and C, we do not consider that such a route would be technically feasible or preferable to the proposed route. Furthermore, the proposed NGL pipeline route would collocate with the proposed interconnect spur, the existing Gulfstream pipeline, and an existing transmission line right-of-way for its entire length, thereby minimizing the potential for significant environmental consequences and cumulative effects.

### **3.6.2 Aboveground Facility Siting Alternatives**

We evaluated the proposed locations of the aboveground facilities associated with the proposed pipeline interconnects to determine whether environmental impacts would be reduced or mitigated by use of alternative facility sites. The aboveground facilities associated with the proposed pipeline interconnects include two meter stations associated with each of the five proposed interconnects with existing pipeline systems. Our evaluation involved inspection of aerial photographs and maps and a site visit along the proposed pipeline interconnect corridor. One meter station would be associated with the four interconnect laterals, and the other meter station would be located at the tie-in between the proposed interconnect spur and the Gulfstream pipeline.

Because the location of the aboveground facilities would be linked to the location of the pipeline interconnects, the search for alternatives was constrained to sites located adjacent to the proposed pipeline interconnect route. As described in Section 3.7, each meter station would be located at an interconnection with an existing pipeline, and both stations would be contained entirely within existing pipeline rights-of-way. Consequently, construction and operation of the proposed aboveground facilities in those areas would represent only a minor change to the existing environmental setting. We did not identify any alternative sites for aboveground facilities that would offer a significant advantage to the proposed sites.

## **3.7 DREDGED MATERIAL PLACEMENT ALTERNATIVES**

### **3.7.1 Construction Dredging Placement Alternatives**

As described in Section 2.4.1, construction of the proposed LNG terminal slip would require excavation and dredging of about 4.5 mcy of material. Of this total, Bayou Casotte Energy has indicated that approximately 1.0 mcy would be excavated above the water table using conventional earth moving equipment and used for fill, site leveling, and construction of the hurricane levee at the proposed terminal site. As proposed, the remaining 3.5 mcy of material would be dredged from the slip.

Since late 2005, Bayou Casotte Energy has been working with the regulatory and resource agencies to identify a site where it would place this material. Based on these consultations, Bayou Casotte Energy has developed a draft Dredged Materials Management Plan (DMMP). The DMMP provides an analysis of the dredging methods and dredge material placement alternatives that Bayou Casotte Energy has considered, but modifications to the draft DMMP are anticipated as a result of continuing agency consultations and permitting efforts. In Section 4.2.2 we have included a recommendation that Bayou Casotte Energy finalize the DMMP and provide that for our review prior to issuance of the final EIS.

Based on information provided to date, Bayou Casotte Energy has evaluated four general alternatives for placement of dredge material:

- confined aquatic disposal;
- upland confined disposal;
- beneficial use; and
- offshore disposal.

Each of these alternatives is discussed below and depicted in Figure 3.7.1-1. Because dredging methods (i.e., mechanical or hydraulic) are largely dependent on the dredge material placement option selected, alternative dredging methods were not evaluated independently.

### **3.7.1.1 Confined Aquatic Disposal**

Confined aquatic disposal typically involves construction of an earthen or rock berm within an open water environment. Dredge material is then placed within the confines of the berm, most often using a hydraulic dredge to pump dredge material from the dredge site to the placement site via a temporary slurry pipeline. Other options for confinement of materials in aquatic environments do not require construction of a containment facility. Containment can sometimes be accomplished by excavation and capping of a disposal pit to confine the material. Dredge materials can also be isolated in geotextile bags, with the resulting cache of bags capped with suitable material.

Bayou Casotte Energy indicates that it considered in-channel confined aquatic disposal, but that it was not determined to be a practicable application in Bayou Casotte.

### **3.7.1.2 Upland Confined Disposal**

As the name implies, upland confined disposal would involve placement of dredge material in an upland area that typically consists of an excavated depression that is surrounded by a containment berm or dike. If the upland confined disposal site is located in proximity to the dredge site (e.g., within approximately 2 miles), dredging would be accomplished with a hydraulic dredge and transported to the placement site via a temporary slurry pipeline. If more remotely located, mechanical dredging would be used to remove material and load it onto haul trucks for transport to the placement site. Overland hauling of dredge material is generally less cost-effective as it results in double handling of material, once at the dredge site and again at the placement site.

Two permitted upland confined disposal sites are located within the vicinity of the proposed terminal site. The COE maintains the 136-acre BCDMMS, which is located just south of the proposed terminal site. The BCDMMS is an active, dredge material placement site, but it is reserved for disposal of maintenance dredge derived materials only, and the COE has confirmed that the BCDMMS would not be used for placement of construction dredge material originating from the proposed Project. The Chevron Pascagoula Refinery also operates an existing dredge material disposal site, but Bayou Casotte Energy has indicated that site is dedicated and permitted solely for the use of maintenance dredging of the Refinery's vessel berths in Bayou Casotte.



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Figure 3.7.1-1 Proposed Casotte Landing Project  
Dredged Material Placement Alternatives

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through the Public Reference Room, or by e-mail at  
[public.referenceroom@ferc.gov](mailto:public.referenceroom@ferc.gov).

Bayou Casotte Energy also evaluated creation of a new upland confined disposal site. Two options were considered. The “North Woods” option would entail construction of a new confined disposal site on property within the Refinery complex. The second option would involve construction of a new confined disposal site at a location outside the existing Refinery complex. Bayou Casotte Energy indicates that both of these options would conceivably be developed within a timeframe compatible with the proposed Project and accept the anticipated dredge material volumes. However, both of these options would require acquisition or purchase of property, would result in potential traffic related effects due to overland hauling of material on public roads, and might result in additional wetland impacts.

Bayou Casotte Energy also considered placement of dredge materials at existing permitted landfills. Such an alternative would also result in potential traffic related effects due to overland hauling of material on public roads. Placement at a landfill might also require drying of the dredge materials before they would be transported to a landfill, which would result in additional land requirements and logistical considerations.

### **3.7.1.3 Beneficial Use**

Beneficial use of dredged material allows for recycling of dredged material, particularly that material which is not contaminated. If identified as suitable, dredged material may be used for a variety of uses including wetland restoration, shore protection, beach nourishment, and land improvement. Two studies prepared by the COE Mobile District identified numerous opportunities for beneficial use of dredged material along coastal Mississippi (COE 2002b and COE 2003b), and Bayou Casotte Energy, in consultation with the COE and MDMR, is exploring the potential for beneficial use of dredge material from the proposed Project. Based on consultations to date, Bayou Casotte Energy has identified three beneficial use projects that have reasonable capacity, are located within a reasonable distance of the proposed Project, and have the potential to use the types of dredged material that would be generated by construction activities. These projects include the Round Island Restoration, the Greenwood Island Restoration, and the South Wetland Restoration.

Bayou Casotte Energy has developed a Sampling and Analysis Protocol (SAP) in consultation with the resource agencies, which will be used to conduct suitability testing of the slip dredge material and assess its suitability for various material placement alternatives, including the identified beneficial use projects. In Section 4.2.2, we have included a recommendation for Bayou Casotte Energy to complete all sampling and analyses of dredge materials to characterize its suitability for the placement options under consideration and submit a report of its findings prior to issuance of the final EIS. However, even if determined suitable, the identified beneficial use projects may be unavailable to receive the proposed Project’s construction dredged materials as each site is located within and would affect Gulf sturgeon critical habitat.

### **3.7.1.4 Offshore Disposal**

As described in Section 2.4.1, Bayou Casotte Energy proposes to accomplish dredging of the terminal slip using a mechanical dredge and place the material in barges or scows for transport to the EPA’s permitted Pascagoula ODMDS, which is located in the Gulf of Mexico south of Horn Island. The placement of dredged sediments at the ODMDS was evaluated in an EIS prepared by the EPA (1991), in coordination with the U.S. Navy and COE. At that time, the COE required a placement site for spoils resulting from maintenance dredging within the federal shipping channel extending from the Gulf of Mexico to Mississippi Sound, the Pascagoula River, and Bayou Casotte. The EPA concluded that impacts associated with placement of dredged materials in the ODMDS would be localized to the vicinity of the placement site and would not result in significant adverse effects to the environment. Additionally, the ODMDS is located outside of Gulf sturgeon critical habitat.

Projects involving the transport of material from the United States for the purpose of final placement in ocean waters must be evaluated pursuant to Section 103 of the MPRSA to determine whether discharge of those materials would unreasonably degrade or endanger human health, welfare, or the marine environment. Per Section 103 of the MPRSA, the COE is the permitting authority for dredged material placement, subject to EPA concurrence. Based on consultations completed to date, Bayou Casotte Energy indicates that its construction dredge material would qualify for placement at the ODMDS and has identified this as its preferred alternative for construction dredge material placement. However, Bayou Casotte Energy has not yet completed all necessary agency consultation and permitting requirements with the COE and EPA to obtain final approval for this plan. Further, the suitability of the slip dredge material for placement at the ODMDS has not yet been assessed, although sediment sampling and analysis is ongoing. Consequently, we have included recommendations in Section 4.2.2 for Bayou Casotte Energy to complete all sediment suitability sampling and analyses, agency consultations, and permitting required by Section 103 of the MPRSA prior to issuance of the final EIS.

### **3.7.2 Maintenance Dredging Placement Alternatives**

According to preliminary modeling, Bayou Casotte Energy estimates that maintenance dredging of the proposed terminal slip would generate up to about 250,000 yd<sup>3</sup> of material per year during operations, as described in Section 2.7.1. The maintenance dredge material placement alternatives that would be considered would be the same as those identified in the above analysis of construction dredging placement alternatives, though additional or different beneficial use projects would be identified in the future.

Bayou Casotte Energy indicates that it would consider use of one or more beneficial use sites for placement of maintenance dredge materials, based on availability of suitable sites and timing considerations (i.e., whether needs for beneficial use materials and maintenance dredging schedules aligned). However, there are currently no beneficial use sites that would reasonably be relied on for long-term periodic placement of maintenance dredged material. Consequently, Bayou Casotte Energy has identified placement of maintenance dredge materials at the Pascagoula ODMDS as its preferred alternative.

### **3.7.3 Conclusions Regarding Dredged Material Placement Alternatives**

Bayou Casotte Energy indicates that its preferred alternative for placement of both construction and maintenance dredge materials is placement at the ODMDS, with contribution to beneficial use sites as available. While we encourage contribution of dredge materials from the proposed Casotte Landing Project, should the dredge materials be deemed suitable, we also recognize that availability of compatible beneficial use projects and alignment of schedules would not be entirely within the control of Bayou Casotte Energy.

As described in Section 3.7.1.4, the ODMDS was initially designated for receipt of maintenance dredge materials from Bayou Casotte. Additionally, the environmental effects of dredge material placement at the ODMDS have already been determined to be less than significant (EPA 1991). Therefore, pending receipt of the required approvals under Section 103 of the MPRSA noted previously, we do not consider any of the dredge material placement alternatives evaluated to represent a technically or environmentally preferable alternative to Bayou Casotte Energy's preferred dredged material placement plan.

## ATTACHMENTS

8. “LNG: UK Gas Sellers Face Looming Supply Glut” March 20, 2007, Poten & Partners Market Opinions. *This article appeared in Poten & Partners monthly publication **LNG in World Markets** . Reference LNG and natural gas data is available at the **LNGAS Data/News Website** . Please go to [www.poten.com/lngconsultingproducts.asp](http://www.poten.com/lngconsultingproducts.asp) to sample these reports and order them [http://www.poten.com/?URL=show\\_articles.asp?id=593&table=tMarket](http://www.poten.com/?URL=show_articles.asp?id=593&table=tMarket)*

## **LNG: UK Gas Sellers Face Looming Supply Glut** 3/20/07

Sellers of LNG and pipeline gas into the United Kingdom have pinned their hopes on filling the gap between growing demand and declining production in the country's North Sea sector. But rapidly expanding import infrastructure threatens to outstrip this requirement by a large margin, potentially forcing capacity holders at new regasification terminals and pipelines to opt between selling gas into a depressed market or idling expensive investments. This promises to be a particularly thorny problem during the summer months when demand in the UK typically falls to a seasonal low approaching 4 Bcm per month compared with a much more robust monthly consumption rate of about 10 to 11 Bcm in the winter. Earlier this month, Centrica reversed six years of upward price momentum by announcing a 17% reduction in gas prices effective March 12. In unveiling the cuts, the UK's largest gas marketer said new supplies had directly led to a fall in wholesale prices that it could now pass on to its customers. Centrica also cut power prices by 11%.

Last fall, startup of the Langed pipeline from Norway's Sleipner platform to Easington in the UK sent shockwaves through the market. History was made when over-the-counter prices fell to negative territory for the first time. The collapse came after month-long tests of the new link's southern leg. At that point, the line was delivering 46.6 MMcm/d, equivalent to 17% of total supplies into the National Transmission System for the day (see LNGWM, Oct '06). But export flows from the UK to the continent via the bi-directional Interconnector pipeline failed to compensate for this influx and the resulting price crash shook the market. While traders subsequently adjusted to the new supply source, prices at the National Balancing Point are still well below what they were a year ago (see related article above). The NBP is currently trading under \$4.00/MMBtu, down from double-digits last winter.

<b>UK Pipeline Import Capacity (Bcm/y)</b>					
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Interconnector	18.3	24.0	25.5	25.5	25.5
Vesterled	13.0	13.0	13.0	13.0	13.0
Langed	6.3	25.0	25.0	25.0	25.0
BBL	1.3	16.0	16.0	16.0	16.0
Tampen	-	1.8	7.3	8.0	8.3
<b>Subtotal</b>	<b>38.8</b>	<b>79.8</b>	<b>86.8</b>	<b>87.5</b>	<b>87.8</b>
<b>UK LNG Terminal Capacity (Bcm/y)</b>					
	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Grain	4.4	4.4	9.0	13.5	15.2
Teesside	-	6.9	7.2	7.2	7.2
Dragon	-	1.5	6.0	6.0	6.0
S. Hook	-	-	13.1	21.0	21.0
<b>Subtotal</b>	<b>4.40</b>	<b>12.80</b>	<b>35.28</b>	<b>47.70</b>	<b>49.42</b>

*Source: Project Sponsors, Poten & Partners*

In addition to Langed, operation of the BBL and Tampen pipelines from the Netherlands and Norway will add 49 Bcm/y of new import capacity by 2010, equivalent to half the country's demand of 100 Bcm/y (see table). The Interconnector is also expanding and potential flows from the continent will soon reach 25.5 Bcm/y. LNG import capacity will grow ten-fold during the same period to nearly 50 Bcm/y. This includes a massive expansion of the existing Grain LNG terminal near London, Excelerate Energy's new dockside regasification facility at Teesside in northeast England, and two grassroots terminals under construction at Milford Haven in Wales known as Dragon LNG and South Hook.

Potential supplies in the import queue dwarf demand. According to the latest forecast from the UK's National Grid, domestic production is expected to fall by 16 Bcm/y by 2010 while UK demand is tipped to increase only marginally. The trend in gas utilization over the past five years has been slightly negative, as high prices have discouraged power sector use. Demand is only expected to begin to grow again in 2008, with annual increases averaging 2% over the next decade. Firms with import plans point to the Interconnector UK as an outlet for correcting temporary supply and demand imbalances on the transmission system, as gas can flow in either direction between the UK and the continent. But this pipeline link is not the only flexible delivery point in the country's supply portfolio.

As the seventh Norwegian pipeline to Europe, Langeled puts Statoil in a unique position to take advantage of price movements in the various markets it serves. Because there is spare capacity above contracted volumes on these lines, Statoil can maximize opportunities for geographical arbitrage by rerouting deliveries from East Sleipner. It can also exercise so-called time arbitrage by reducing flows through Langeled when prices in the volatile UK market are low, buying cheaper replacement gas to meet existing sales commitments. Norwegian gas can then be preferentially directed into the country when prices are higher. LNG offers flexibility as well, although sellers with access at Grain have yet to take advantage of price movements this winter. Both BP and Sonatrach could earn more money by diverting cargoes elsewhere, but they have opted to utilize their slots to avoid running afoul of UK regulator Ofgem. When capacity was underutilized last winter, Ofgem threatened to invoke use-it-or-lose-it provisions.

Excelerate Energy's new terminal at Teesside received its first cargo on February 12, marking the opening of the UK's second import facility. But the firm will only utilize Teesside GasPort when the economics are favorable, and it remains to be seen how much use the terminal will get. Indeed, the Excelsior may only regasify enough LNG to commission GasPort before setting sail for Maryland's Cove Point facility or Excelerate's own Gulf Gateway facility off Louisiana after Teesside is formally inaugurated on February 20. Capacity holders BG and Petronas are also unlikely to fill Milford Haven's Dragon LNG all year round, and utilization could be particularly low during the summer when demand is slack and NBP is at a seasonal low. Similarly, South Hook capacity user Qatargas 2 plans to divert a significant amount of volume to Asia for the first five years after startup. Spare capacity at the terminal will therefore be offered out to third parties via an electronic bulletin board to be formally announced later this year.

*This article appeared in Poten & Partners monthly publication **LNG in World Markets** . Reference LNG and natural gas data is available at the **LNGAS Data/News Website** . Please go to [www.poten.com/lngconsultingproducts.asp](http://www.poten.com/lngconsultingproducts.asp) to sample these reports and order them.*

## **ATTACHMENTS**

9. The Government White Paper, “Delivering a Sustainable Energy Solution for Ireland”, the Energy Policy Framework 2007 -2020, The Department of Communications, Marine and Natural Resources.  
<http://www.dcmnr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/27356/EnergyWhitePaper12March2007.pdf>

**GOVERNMENT  
WHITE PAPER**



Department of Communications,  
Marine and Natural Resources

*An Roinn Cumarsáide,  
Mara agus Acmhainní Náúrtha*

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# DELIVERING A SUSTAINABLE ENERGY FUTURE FOR IRELAND

**THE ENERGY POLICY FRAMEWORK 2007 – 2020**



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## Foreword by Taoiseach, Bertie Ahern T.D.

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Ireland has enjoyed record economic growth in recent years, growing by over 150% since 1992. Never in our history has our energy policy been so important, not only due to its role in fuelling the engine of the economy, but also given its centrality in how we manage and protect our environment and respond to climate change. In this context, energy policy and environmental policy are seen as two sides of the same coin.

The Government is committed to ensuring that sustainable development underpins future policy formation, right across the policy spectrum. This is neatly captured in the recently published National Development Plan 2007-2013: *Transforming Ireland: Delivering a better quality of life for all*. This means that we will take account of the needs and well-being of all of our citizens: not only today but also into future generations.

Those needs include providing modern infrastructure, sustaining our economic progress and supporting meaningful employment opportunities. They also include ensuring that we have certainty of energy supply at competitive costs. And above all it means ensuring that we take the steps necessary today to protect and preserve our environment for tomorrow.

Getting the balance right is not always easy. But there are strong linkages and clear areas of overlap between our energy needs and looking after our citizens. Improved energy efficiency is good for consumers, good for the economy and good for the environment. Similarly, alternative energy sources help to broaden the supply base, underpinning security of supply whilst reducing harmful emission levels.

Consequently, we have embedded clear synergies between this White Paper and our forthcoming National Climate Change Strategy. The expansion in our economy and population has contributed to the 25% increase in Ireland's greenhouse gas emissions over the past 15 years. Climate change due to increased greenhouse gas emissions is now recognised as perhaps the most significant policy issue internationally. While in Ireland we have made significant progress in decoupling economic growth from emission levels, we can and must do more to ensure that our economic development is environmentally sustainable while remaining internationally competitive. How we generate and use energy is a key element in that process.

Recognising these challenges, the primary objectives of our energy policy as set out in this White Paper are: security of supply, environmental sustainability and economic competitiveness. The White Paper sets out clear actions, targets and timeframes to meet these interlinked objectives.

This, in turn, requires a systematic "*whole of Government*" approach to all decisions in the area of wider energy policy. This White Paper copperfastens the Government's commitment to sustainable development as set out in *Towards 2016* and the National Development Plan 2007-2013, and details a comprehensive range of actions and targets to fulfil that commitment.

Taken together, the White Paper, the recently launched Bioenergy Strategy, the forthcoming Climate Change Strategy and the imminent National Energy Efficiency Action Plan provide a comprehensive suite of policy initiatives which will contribute to environmental sustainability whilst at the same time delivering reliable, competitively priced energy to businesses and consumers. In addition, the measures in the White Paper will further assist the development of the Single Electricity Market on this island.

We owe it to the next generation to be challenging, ambitious and farsighted in the goals we set today. Building on the foundation of continued social partnership and our sound economic and social policy platform as evidenced in the National Development Plan, the White Paper provides a central contribution to ensuring that Ireland's current success can be sustained and built on into the future, and that we constantly strive for a better quality of life for all.

**Bertie Ahern T.D.,**  
Taoiseach

# Foreword by the Minister for Communications, Marine and Natural Resources, Noel Dempsey T.D.

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This White Paper sets out the roadmap by which we will steer Ireland to a new and sustainable energy future.

My vision for the Ireland of 2020 in energy terms is ambitious, challenging and optimistic.

It sees Ireland as a fully sustainable, secure, efficient, affordable and competitive all-island energy market. This will have been achieved by energy policy directions over the next decade and beyond which delivers for people, for a better society, for the environment and for the economy.

The hall marks of the Irish energy market by 2020 will be reliable supply, highly efficient use of energy, competitive prices and sustainable, diverse energy sources. It will be securely underpinned by robust infrastructure and cutting edge technology.

The Irish energy enterprise sector itself will be, by 2020, a market-led, knowledge based sector characterised by innovation and driven by research and technology developments. It will be highly competitive, serving Ireland's energy needs and actively pursuing international opportunities.

The challenges for energy policy are complex and urgent. We live in a world of high energy demand, volatile fossil fuel prices and uncertainty about security of supply. Environmental threats and the challenge of climate change require urgent global action.

New directions for energy policy must be set by Ireland, Europe and globally.

The Energy Policy Framework which we set out in this White Paper articulates the challenges and sets very ambitious objectives and targets by which we will overcome those challenges. We will deliver on these objectives and targets through the practical policy actions set out under the Strategic Goals.

The cumulative impact of these actions will be change for the better starting now and a solid, safe, sustainable energy future for us all.

The policy actions underway and planned in this White Paper will result in a transformed landscape for the Irish energy sector. Our energy sources will be more sustainable and more diverse. The energy market will have more players and more competition and will operate in a lightly regulated environment. The availability of reliable, secure and competitively priced energy supply will be assured.

This White Paper is about delivering change. We will work in partnership with all stakeholders to achieve that change. Individually and collectively, everyone has to step up to the mark. Energy efficiency goals require us all to scrap the habits of a lifetime – at home and at work. Structural change in the energy sector itself will require leadership, pragmatism and firm purpose by all the stakeholders involved. The environmental and climate change challenge requires a profound new sense of personal and collective responsibility by individuals and by all sectors of the economy.

By delivering the necessary changes, we will become a society and an economy which fully values energy and cherishes the environment.

In the final analysis therefore, this White Paper requires us all to work together to deliver on the energy road map to 2020. The new directions for energy policy are much more than a Government enterprise. This is a collective national enterprise. Ireland's sustainable, secure and competitive energy future demands no less.

**Noel Dempsey T.D.**

*Minister for Communications, Marine and Natural Resources.*

## Executive Summary

This White Paper sets out the Government's Energy Policy Framework 2007-2020 to deliver a sustainable energy future for Ireland. It is set firmly in the global and European context which has put energy security and climate change among the most urgent international challenges. In charting the course for Irish energy policy, the Government is taking full account of global and EU developments.

Ireland faces similar energy challenges to those being confronted worldwide. Our situation is made more acute by our small energy market, peripherality and limited indigenous fuel resources. Sustained economic growth and population growth also add to the challenges for Irish energy policy. We have however major opportunities to be realised in harnessing the full potential of our renewable and bioenergy resources.

As committed members of the European Union, with specific energy policy objectives, Ireland supports the development of a European Energy Policy which delivers a sustainable energy future for Europe through measures to tackle climate change ensure energy security and enhance competitiveness.

The Framework Social Partnership Agreement 'Towards 2016' has set agreed priorities and outcomes for Irish Energy Policy and these are fully reflected in this White Paper. The National Development Plan 2007-2013 fully reflects the strategic role of energy in underpinning our overall social and economic objectives. Over the period of the Plan, the Energy Programme will see some €8.5bn in investment in energy, funded in part by the Exchequer, by the Semi-State Energy Bodies and from other non-public sources.

The Government's energy policy and climate change goals are closely aligned and will be fully reflected in the Climate Change Strategy. Our plans for reducing energy demand and energy related emissions through ambitious renewable energy targets (including co-firing biomass with peat), new state-of-the-art power generation plant and interconnection to wider markets will contribute in a major way to national climate change targets.

The joint commitment by both Governments to the All-Island Energy Framework is demonstrated by the strengthening and deepening of all-island cooperation across energy matters. The immediate priority is delivery of the Single Electricity market in 2007 while continuing to enhance the all-island approach to gas, renewable energy, energy efficiency and energy research.

This White Paper has been informed by the outcome of the consultation process on the Government's Green Paper on Energy Policy. Over 100 submissions were received and discussions held with a number of key stakeholders. The outcomes of the consultation process are set out in Section 2 of this White Paper.

Section 3 of this White Paper sets out the Government's comprehensive action-oriented Energy Policy Framework to 2020 under each of our Strategic Goals for Security of Supply, Sustainability of Energy and Competitiveness of Energy Supply.

### Actions to Ensure Security of Energy Supply

Security of energy supply is crucial for the economy and society. We need reliable access to oil and gas supplies and the infrastructure in place to import, distribute and store gas and oil. We also need robust networks and electricity generating capacity to ensure consistent supply to consumers and all sectors of the economy.

The Government's overriding policy objective is to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption.

The underpinning Strategic Goals are:

- Ensuring that electricity supply consistently meets demand
- Ensuring the physical security and reliability of gas supplies to Ireland
- Enhancing the diversity of fuels used for power generation
- Delivering electricity and gas to homes and businesses over efficient, reliable and secure networks
- Creating a stable attractive environment for hydrocarbon exploration and production
- Being prepared for energy supply disruptions

The range of actions underway and planned under each Strategic Goal for Security of Supply are set out in Sections 3.2 to 3.7 of this White Paper.

## **Actions to Promote the Sustainability of Energy Supply and Use**

Sustainability is at the heart of the Government's energy policy objectives. The challenge of creating a sustainable energy future for Ireland is being met through a range of strategies, targets and actions to deliver environmentally sustainable energy supply and use.

The underpinning Strategic Goals are:

- Addressing climate change by reducing energy related greenhouse gas emissions
- Accelerating the growth of renewable energy sources
- Promoting the sustainable use of energy in transport
- Delivering an integrated approach to the sustainable development and use of bioenergy resources
- Maximising Energy Efficiency and energy savings across the economy
- Accelerating Energy Research Development and Innovation Programmes in support of sustainable energy goals

The range of actions underway and planned under each Strategic Goal for Sustainable Energy Supply and Use are set out in Sections 3.8 to 3.14 of this White Paper.

## **Actions to Enhance the Competitiveness of Energy Supply**

The Government's key policy objective is to ensure a reliable and competitively priced energy supply and competition in energy markets in support of economic growth and national competitiveness. Ensuring the relative competitiveness of Irish energy prices is a key concern, reflecting the needs of the enterprise sector and all consumers. We also need structural change in the energy market which enables competition and delivers consumer choice. We are taking measures to address, where we can, the impact of high and volatile global energy costs and to address domestically controllable costs.

Structural change will reinforce the benefits which will accrue from the Single Electricity Market. The Government endorses the case for a process of structural change in the electricity sector and will deliver change, starting now and progressively working with all stakeholders. The competitiveness of energy costs, the interests of consumers and the economy as well as the effective working of the all-island market require it. The Government intends to create a new impetus for choice and innovation in a lighter regulated environment and delivering a responsive and stable energy market.

The underpinning Strategic Goals are:

- Delivering competition and consumer choice in the energy market
- Delivering the All-Island Energy Market Framework
- Ensuring that the regulatory framework meets the evolving energy policy challenges
- Ensuring a sustainable future for Semi-State Energy Enterprises
- Ensuring affordable energy for everyone
- Creating jobs, growth and innovation in the energy sector

The range of actions underway and planned under each Strategic Goal for competitive energy supply and competition in the market are set out in Sections 3.16-3.21 of this White Paper.

## Integrated Approach to Delivery

The Government will work in partnership with all stakeholders to achieve our goals for a sustainable energy future. Section 4 of this White Paper sets out our commitments to delivering the energy policy framework in close cooperation and regular engagement with all players. The Government will also ensure a whole of Government approach to energy policy given its close interrelationship with other policy areas. This work cuts across traditional departmental and Agency lines. The Government will ensure a fully integrated and cohesive approach to energy policy priorities, supported by comprehensive and regular stakeholder engagement and backed up by full accountability for performance and delivery.

The Government intends to carry out interim reviews of the Energy Policy Framework every two years, reporting on progress and adjusting targets and policy actions as necessary. There will also be a fundamental review, informed by public and stakeholder consultation, every five years. This will ensure that we take account of developments at national, European and international level together with technological and macro-economic trends.

The Strategic Goals for integrated delivery of energy policy objectives are:

- Strengthening our national capabilities in the energy policy field
- Ensuring a whole of Government approach to energy policy
- Reaching out to stakeholders in implementing our strategic goals for energy
- Ensuring accountability and transparency through regular progress reporting and review

The range of actions underway and planned under each Strategic Goal are set out in Sections 4.2 to 4.5 of this White Paper.





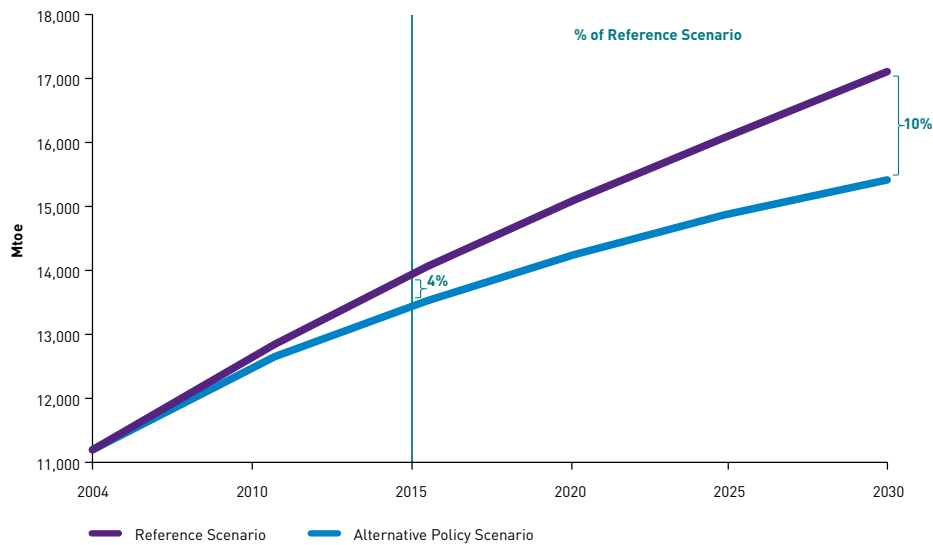
# Section 1 Background

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## 1.1. Global and IEA Developments

- 1.1.1. Irish energy policy is set firmly in the global and EU context which has put energy security and climate change among the most urgent international challenges. The White Paper sets out the actions to be taken in response to the energy challenges facing Ireland. The objective is to deliver a sustainable energy future, starting now, with a time horizon of 2020 but also looking beyond that. We take full account of global and EU developments in charting the course for Irish energy policy.
- 1.1.2. The world's economies need to get on a sustainable energy path if we are to tackle climate change and ensure economic and social growth based on secure diverse and affordable energy supply.
- 1.1.3. Ireland faces similar energy challenges to those being confronted worldwide and by the European Union. Our situation is made more acute by our small energy market, peripherality and limited indigenous fuel supplies. Success plays its part too: our sustained economic growth and population growth also add to the specific energy challenges for Ireland.
- 1.1.4. Ireland, as part of the international community will continue to play a proactive role in the work of the International Energy Agency (IEA) and other international fora, including the UN Sustainable Development Commission, to overcome global energy challenges including those for developing countries.
- 1.1.5. The IEA's latest World Energy Outlook (November 2006) sets out a fully comprehensive Alternative Policy Scenario for Governments to consider. The IEA Alternative Scenario assumes, in particular, exponential growth in renewable energy technologies and energy efficiency strategies. It provides in depth analysis, including cost-benefit analysis, and details of policies and measures which, if implemented by Governments, would significantly reduce the rate of increase in energy demand and in emissions through to 2030. The policy measures range across supply and demand side energy efficiency in generation, transport and building, increased use of renewable energy sources, the nuclear power option, together with investment in energy infrastructure.

## World Primary Energy Demand in the Reference and Alternative Scenarios



Source: IEA World Energy Outlook 2006

- 1.1.6.** Without policy change, global energy demand is projected to increase by over 50% between now and 2030. Fossil energy remains the dominant source of energy to 2030 in both scenarios, but significantly slower growth in fossil fuel demand can be achieved under the Alternative scenario. Under IEA's Alternative Scenario, World Primary Energy Demand in 2030 is about 10% lower than under no-change scenarios.
- 1.1.7.** Policies to encourage the most efficient supply and use of energy can, according to the IEA, contribute to almost 80% of avoided CO<sub>2</sub> emissions by 2030. In that context technological breakthrough, which changes the way we use energy, is essential for a sustainable energy future. The IEA also offers a Beyond Alternative Policy Scenario which sees even more ambitious goals for 2030 and which would take radical technology breakthrough.
- 1.1.8.** The IEA Outlook offers practical guidance to policy makers about the potential impacts of the very many energy policy options being considered worldwide and the costs and benefits associated with them. We welcome the Alternative Policy Scenario findings as drivers for change for Ireland and for all countries. Irish energy policy is also being informed by the important work of the IEA (2006) on energy technology scenarios and strategies to 2050. We will, under the new policy framework, develop Ireland's own energy forecasting and analysis capability taking account of the implications of global trends and IEA scenarios. This will be a key part of the planned review of energy policy goals and targets every two years from 2007 onwards.

## **1.2. European Union Developments**

- 1.2.1.** Ireland's energy policy priorities are framed in the context of the European Union. As committed members of the Union with specific energy concerns, Ireland is fully supportive of a coherent and focused European Energy Policy which delivers sustainability, security of supply and competitiveness. The need for concerted EU action on all of the energy challenges is critical for the EU's objectives for growth and jobs under the Lisbon Strategy. Boosting investment, in particular in energy efficiency and renewable energy, can create jobs, promote innovation and the knowledge-based economy. Ireland also endorses the need for an international energy policy which actively promotes Europe's interests. The climate change challenge cannot be overcome by the EU or individual Member States. The EU and Member States must also collectively forge effective energy partnerships with both developed and developing countries, and energy consumer and producing countries.
- 1.2.2.** The Government has welcomed the EU Commission's Strategic Energy Review and supporting Action Plan published in January 2007. The strategy is a comprehensive set of proposals on the future shape of "Energy Policy for Europe" which the European Council has endorsed as the blueprint for the way forward. We are committed to playing our part in creating a sustainable energy future for Europe which tackles climate change, energy security and competitiveness through sustainable solutions. The European Strategy sets a daunting but necessary agenda over the next number of years.
- 1.2.3.** We will work to maximise Ireland's energy interests in the European Strategy debates, ensuring that our specific national needs, our concerns and energy policy goals are fully reflected in EU energy policy actions both internal and external. We will continue to support, in the interest of the EU and of Ireland, a fully cohesive European approach to external energy policy. We will also work intensively to enhance key strategic relationships with the UK and other Member States on specific energy matters of bilateral interest, shared experiences and technology transfer. We will also work to foster close bilateral relations on energy with Norway as an EEA Member and a key oil and gas producer.
- 1.2.4.** The Commission's Report on prospects for the internal gas and electricity market, published in conjunction with the European Energy Strategy, and in tandem with the Sectoral Inquiry Report, makes it clear that there is still much to be done in terms of delivering a meaningful internal energy market. Ireland welcomes the Commission's analysis of the challenges and will work with the Commission and the Member States in the creation of a competitive integrated energy market through the Commission's forthcoming proposals.

## 1.3. National Developments

- 1.3.1.** There have been a number of relevant developments since the preparation of the Green Paper on Energy Policy in 2006. These have informed, and set the context for, the Government's approach to setting the energy policy framework 2007-2020.
- 1.3.2.** The ten-year Framework Social Partnership Agreement "*Towards 2016*" provides an important and strategic framework for meeting the economic and social challenges ahead. The Government is working closely with the Social Partnership to realise the ambitions of the Agreement. Energy policy has a key role to play in enhancing Ireland's competitive advantage and building sustainable social and economic development. *Towards 2016* has set the agreed priorities and outcomes for Irish Energy Policy and these are fully reflected in this White Paper.
- 1.3.3.** The Government has published the National Development Plan 2007-2013 which sets out the economic and social investment priorities for the next seven years to deliver on the overall vision of a better quality of life for all. The Plan fully reflects the strategic role of energy in underpinning the overall economic and social objectives.
- 1.3.4.** Over the period of the National Development Plan the Energy Programme will entail some €8.5 billion in investment in energy, funded in part by the Exchequer, by the Energy Semi-State Bodies and from other non-public sources. The investment will underpin the overall strategic objective to ensure security of energy supply at the most competitive cost together with environmental sustainability. It will underpin the strategic goals set out in this White Paper. It will also contribute to all-island economic and social cooperation.
- 1.3.5.** The Energy Programme comprises three elements.

### Strategic Energy Infrastructure Programme

Over €1.25 billion will be invested in key strategic energy infrastructure projects including new electricity interconnection, improved gas interconnection and strategic reserve capacity.

Because of the scale, strategic importance and immediacy of our energy needs, the Government will consider the possibility of an Exchequer contribution to the cost of this investment over the period of the NDP. We will leverage non-public sources of funding also where suitable and appropriate, having regard to the overall goals of energy policy. The investment in energy infrastructure will strategically underpin the All-Island Energy Framework and enhanced links with the UK energy market.

### Sustainable Energy Sub-Programme

At least €276 million will be invested in the sustainable energy sector over the period of the NDP in support of the targets for sustainable energy including renewable energy, energy efficiency and innovation. This investment will underpin the strategic goals for sustainable energy.

### **Semi-State Energy Companies Sub Programme**

The Semi-State Energy Companies (BGE, ESB, Bord na Móna and EirGrid) will build on the progress made under the last NDP by investing over €7bn, mainly in the electricity and gas transmission and distribution networks, in new and modernised power generation and in wind energy projects. This major investment programme will enhance security of energy supply, and will support regional development and competitiveness, and all-island cooperation.

- 1.3.6.** The National Development Plan will also see direct investment of just under €150 million in energy research and innovation which will also enable the leveraging of additional funding under EU Programmes including the Seventh Framework Programme. All-Island cooperation will be a key feature of Energy Research, Technological Development and Innovation (RTDI) over the period. The research investment will underpin the Strategic Goals for Energy Policy.
- 1.3.7.** Following the Review of the National Climate Change Strategy, the Government will shortly publish a new Climate Change Strategy. Energy policy and climate change goals are closely aligned and this will be fully reflected in the Climate Change Strategy. Our Strategic Goals for reducing energy demand and energy related emissions will contribute in a major way to national climate change targets.
- 1.3.8.** The National Action Plan for Social Inclusion 2007-2016 is the overall policy framework within which we will take ongoing and enhanced measures to tackle fuel poverty in a coordinated way across Government and Agencies. We have a collective agenda to systematically address fuel poverty in an era of rising energy prices.
- 1.3.9.** The Planning and Development (Strategic Infrastructure) Act 2006, provides for the streamlining of the planning process for certain types of major energy, transport and environmental infrastructure of strategic importance. The new streamlined consent procedures apply to, among other things, major electricity transmission lines and interconnectors, strategic gas infrastructure development, major power stations, wind farms, Liquefied Natural Gas (LNG) facilities and gas storage facilities.
- 1.3.10.** The new procedures will ensure an enhanced service, with greater flexibility, full and robust decision-making, public participation and more certainty of time-frames in infrastructure delivery vital in terms of planning for security of supply, sustainability and competitiveness. The new system became operational on 31st January 2007. Following the initial implementation period, we will review the operation and effectiveness of the 2006 Act to ensure that the appropriate range of energy infrastructure projects can avail of the benefits of the streamlined consent process.
- 1.3.11.** The Wind Energy Development Guidelines for planning authorities 2006 are designed to ensure consistency of approach to wind energy developments throughout the country and to provide clarity to prospective developers and local communities. Gas supply infrastructure planning and consent procedures will be kept under review. Carbon capture and storage will need to be addressed over time from a planning perspective.

- 1.3.12.** The joint commitment by both Governments to the All-Island Energy Framework is demonstrated by the strengthening and deepening of all-island cooperation across energy matters. The immediate priority is delivery of the Single Electricity Market in 2007 while continuing to enhance the all-island approach in relation to gas, renewable energy, energy efficiency and energy research. We will jointly review the All-Island Energy Framework in 2007 to take account of the significant progress to date and to set new goals for the period 2008-2013.
- 1.3.13.** Our current legislative programme to underpin energy policy objectives has been successfully completed with the enactment of the Energy (Miscellaneous Provisions) Act 2006, the Electricity Regulation (Amendment) (Single Electricity Market) Act 2007 and the National Oil Reserves Agency Act 2007. Energy Policy goals will continue to be underpinned by primary and secondary legislation including further legislation in relation to EirGrid, restatement of the Electricity and Gas Acts and the timely transposition of EU Directives.
- 1.3.14.** Policy thinking in relation to the Energy Policy Framework has been informed by a range of energy modelling and analysis undertaken by Sustainable Energy Ireland. The work, published in a number of key Reports in the latter half of 2006, includes some specific modelling to demonstrate the alternative national scenario in relation to fuel mix 2020. SEI's alternative scenario assumes substantial growth in renewable energy, phasing out of oil firing for electricity and continued use of gas. The development of robust energy scenario modelling and long range energy planning is key to informed energy policy making. National work on this front will complement the IEA work on a global scale.

## **1.4. IEA Country Review**

- 1.4.1.** The IEA is currently engaged in an in-depth review of Irish Energy Policy. Its last review was undertaken in 2002. The IEA will finalise its report in June 2007. The IEA has been kept informed of developments in terms of this White Paper and the Country Review is expected to reflect national policy developments in addition to its own analysis and consultations in late 2006.
- 1.4.2.** The consultation process on the Green Paper has provided a rich source of views and analysis from very many players which have informed policy thinking and which are encapsulated in the following Section.

## **Section 2 Outcome of Energy Green Paper Consultation Process**

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### **2.1. Introduction**

- 2.1.1.** We received over 100 submissions in the consultation process on the Green Paper. There was a wide variety of responses, including submissions from individual citizens, submissions which focussed on particular issues as well as submissions covering all aspects of energy policy. Many submissions addressed the specific questions posed for views in the Green Paper. Over the consultation period the Department also held structured discussions with a number of key stakeholders.
- 2.1.2.** Open and participative policymaking requires informed parliamentary debate and political involvement. Submissions were received from political parties as part of the consultation process. An Oireachtas debate took place on the Green Paper during the consultation period.
- 2.1.3.** The process has provided many insights into specific concerns and views about Irish energy policy. This summary aims to capture the broad thrust of the opinions expressed in the consultation process. The submissions have been published on the Department's website and are listed in the Appendix to this White Paper.

### **2.2. Overall Comments**

- 2.2.1.** The publication of the Green Paper was welcomed by respondents. The fact that the Paper set out proposed high level policy options for debate was acknowledged, with a strong consensus that the White Paper should be strongly action oriented and time bound.
- 2.2.2.** There was wide agreement on developing energy policy around the three pillars of security of supply, sustainability and competitiveness. A number of respondents favoured an alternative approach, structured across the electricity, heat and transport sectors. The impact of climate change and its relationship with energy policy was a constant theme in the responses to the Green Paper.
- 2.2.3.** A number of submissions underlined the role of energy policy in meeting the Government's objectives for balanced regional development and the National Spatial Strategy. The need to provide quality energy infrastructure to address, or anticipate, the development and competitive needs of the regions was highlighted. The considerable potential of the renewable energy and bioenergy sectors to support regional and rural development was uniformly agreed. Developing greater community involvement in renewable energy initiatives was also widely endorsed.

## **2.3. Security of Energy Supply**

- 2.3.1.** All submissions emphasised the importance of security of energy supply both in terms of the adequacy of electricity generation capacity and plant availability and in terms of the reliability of gas supplies. There was general agreement on the need to develop further indigenous gas supply and strategic oil and gas storage. The finite nature of global oil and gas supplies was also a theme in many responses, leading to a focus on the need to develop alternatives for future energy needs.
- 2.3.2.** There was general support for the development of electricity interconnection both North/South and East/West and the continued enhancement of the electricity and gas grids. These were linked to concern about the level of reliance on imports and maintaining diversity of fuels. The need for additional electricity generation capacity and improved availability of existing generating stations was a keynote concern in relation to the continuity of electricity supply. There was broad recognition of the continued strong role for gas in electricity generation, particularly taking account of the absence of further large scale hydro and the prohibition on nuclear generated electricity.
- 2.3.3.** Ireland's reliance on oil imports was a major concern in responses, with emphasis being placed on the importance of nationally owned strategic stocks and the need for reliable contingency arrangements and emergency planning in the event of interruption of supply. The potential for the penetration of biofuels for the transport sector was a very strong theme in submissions.
- 2.3.4.** Most responses acknowledged the public antipathy towards nuclear power, but a number saw a need to maintain awareness of economic and technical developments in nuclear power and for public debate on the nuclear issue, particularly in the context of the need to create low carbon economies in response to climate change. There was an evident degree of polarisation, however, with responses which were completely opposed to nuclear power as well as responses which expressed complete support.
- 2.3.5.** In relation to hydrocarbon exploration and production, key issues raised in the submissions included the need to raise awareness amongst the international industry of the potential of the Irish offshore and the policy objectives underpinning our fiscal terms. Respondents commented upon the potential tension between safety, regulatory and promotional agendas and the need for transparency and fairness in our wider regulatory regime. A number of responses emphasised the need to bring Corrib gas ashore while safety and community concerns in that context were also articulated.
- 2.3.6.** Many respondents agreed on the potential for clean coal technology in terms of fuel diversity but recognised that further development is needed for market acceptance as a mainstream technology.



## **2.4. Sustainability of Energy Supply**

- 2.4.1.** Climate change was the compelling theme in the majority of responses relating to the sustainability of energy supply. Many responses expressed concern about projected increases in energy demand juxtaposed against the imperative to reduce greenhouse gas emissions. This concern was reflected in proposals for substantial increases in the use of renewable energy technologies as well as the introduction of fiscal measures including carbon taxation and other taxation to incentivise low-emission transport as well as the further development of emissions trading.
- 2.4.2.** Most responses identified the development of renewable energy technologies and improvements in energy efficiency as the key priorities for energy policy. The proposed 30% target for electricity from renewable energy was broadly welcomed, although some respondents believed that the target lacked ambition. The need for a comprehensive approach across Government Departments and Agencies was recognised as a prerequisite for achieving increased penetration of renewable energy.
- 2.4.3.** The growth in wind energy was welcomed in responses with acknowledgement of the intermittency of supply and the consequent need for back-up capacity. Further penetration of wind power was strongly supported. A number of responses pointed to the need to develop electricity storage capacity and dedicated back-up generation to improve the overall capacity value of wind power.
- 2.4.4.** A strong emphasis was put in responses on the full spectrum of bioenergy, stressing the need to take account of lead-in periods for biocrops, certainty in support measures for growers and the need to support the development of supply chains. The proposal to co-fire biomass at the peat-fired power stations was supported, but some concern was expressed about the most effective use of available bioenergy resources in terms of thermal efficiency, as well as caution about displacing wood-based supply for existing other enterprises.
- 2.4.5.** The broadening of the renewable energy base was seen as critical, with support expressed for developing ocean energy to commercial implementation. The need for action on waste-to-energy potential was another strong theme in the development of sustainable energy supply.
- 2.4.6.** Biofuels for transport were strongly supported, albeit with some cautioning on the inherent limitations for domestic resources in terms of land use. The need to develop indigenous capacity and the potential cross-benefits for the agriculture sector was, however, fully recognised in the context of setting targets for biofuels, as was the potential to integrate biofuels into the existing supply chain for vehicle fuels.
- 2.4.7.** The introduction of the Renewable Energy Feed-in Tariff (REFIT) scheme was broadly supported, with some responses seeking to have the scheme extended quickly to bring further renewable energy projects to fruition. The need for certainty about grid access for projects was a recurring theme and, in this context, there was strong recognition of the need for grid development to facilitate further penetration of renewable energy technologies. The importance of the All-Island Grid Study was recognised in terms of making strategic decisions about ensuring future capacity to accommodate increased use of renewable energy technologies.

- 2.4.8.** The importance of improvements in energy efficiency was emphasised in responses, with much support for the “Power of One” Campaign. A number of responses stressed the need for the Campaign to be backed up with strong support measures. In this context, the significant energy demand inherent in the built environment, as currently constructed, was strongly highlighted. Many responses stressed the need for more challenging building regulations which would require the implementation of renewable and energy efficient technologies as well as comprehensive enforcement of existing regulations. Responses also highlighted the potential of the public sector to act as an exemplar in this area.
- 2.4.9.** The need to develop combined heat and power and district heating was also identified as an area where energy efficiency could be improved at a structural level.
- 2.4.10.** Concern was expressed about fuel poverty. Responses emphasised the need to improve existing support measures to take account of increased energy costs, as well as the need for expanded support schemes for improving housing insulation and more comprehensive schemes for housing improvements in all areas of energy performance.
- 2.4.11.** The importance of research and development was fully recognised with particular emphasis on the need to develop energy research capacity. In this context, responses called for an increased profile and level of investment in energy research and development.

## **2.5. Competitiveness of Energy Supply**

- 2.5.1.** The issue of high energy prices and the need to protect competitiveness was a particularly strong theme in virtually all responses. There were recommendations for setting a target for electricity prices in comparison to the EU average. Respondents recognised that reliance on imports and world energy prices were strong external influences on energy prices here. Action on domestically controllable costs was consistently highlighted as essential.
- 2.5.2.** The development of the All-Island Market was strongly supported with an emphasis on the rapid development of East/West interconnection and increasing integration with the UK market, as well as responses which envisaged integration with a regional market to include mainland European countries.
- 2.5.3.** In the context of the structure of the electricity market, there were many recommendations for the full separation of the network from generation assets. There was strong support for giving EirGrid ownership of the transmission assets to underpin the independence and transparency of transmission. Respondents saw this issue and the ownership of price setting plant as key elements in the debate on reform of the electricity sector.
- 2.5.4.** The proposal to develop a landbank to facilitate power generation market entry was welcomed. However, many respondents saw this on its own as an insufficient response to the need for change in light of the recommendations of the Deloitte Report (*Review of the Electricity Sector in Ireland*). The full implementation of the Deloitte recommendations for structural reform of the electricity sector was sought in a number of responses.

**2.5.5.** Views on the desirability of splitting ESB power generation into a number of competing generating companies contrasted with views on the need for scale in Irish energy utilities to reinforce their ability to perform successfully at a European and world scale. Some responses highlighted trends for integration of gas and electricity utilities across Europe and questioned the merits of an approach in the Irish context which would diminish scale in a scenario of future regional market integration.

**2.5.6.** With regard to energy regulation, a number of responses stressed the need for timely and meaningful communication of the rationale and impact of regulatory decisions, notably in the area of price. Some saw the need for tariff regulation to more closely reflect immediate market movements in fuel prices. This contrasted with other views which stressed the need for regulatory certainty and stability.

**2.5.7.** The proposal to review the regulatory regime following the establishment of the Single Electricity Market was welcomed. Some respondents stressed the need for examination of the powers and duties of the CER which underpin the existing arrangements. Some responses focussed on the balance of responsibility between the regulator and the Minister with particular attention to the challenge of combining regulatory independence with Ministerial powers of policy direction. Many responses stressed the need for greater consumer focus in regulatory decisions, recommending the establishment of formal consumer representation in the regulatory framework.

## **2.6. Policy Delivery**

**2.6.1.** The proposal in the Green Paper for regular reporting and updating on energy policy directions was welcomed generally. There was broad recognition of the complexity of policy drivers in the energy sector and the resultant challenge in implementing policy proposals in a rapidly changing environment. Many called for greater clarity in relation to the various roles of Departments and their Agencies in delivering energy policy objectives. The need for better communication and delivery of energy policy initiatives at a regional and local level was highlighted. Many responses supported the recognition of and a clear remit for Local Energy Agencies. The existing and future role of Sustainable Energy Ireland was also highlighted in the context of developing structures which will fully support the development and delivery of energy policy.

**2.6.2.** There was a general call for more proactive and regular communication and explanation of energy policy and regulatory decision making. The role of the Oireachtas in ensuring scrutiny and accountability on energy policy and regulation was also highlighted.

## **2.7. Conclusion**

**2.7.1.** The overall thrust of the submissions and discussions from the consultation process was supportive of the fundamental approach taken in the Green Paper. There was inevitable divergence on specific strategies and targets.

## Section 3 The Policy Framework

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### 3.1. Actions to Ensure Security of Energy Supply

- 3.1.1.** Security of energy supply is crucial for the economy and society. Security of supply requires that we have reliable access to oil and gas supplies and the infrastructure in place to import, distribute and to store gas and oil. We also need robust gas and electricity networks and electricity generating capacity to ensure consistent supply to consumers and all sectors of the economy.
- 3.1.2.** Currently over 90% of Irish energy requirements are imported. Combined with our peripheral location and small market scale, this current reality leaves Ireland vulnerable to supply disruption and imported price volatility. Security of energy supply is a global issue and the European Union's growing reliance on energy imports increases Ireland's overall energy vulnerability.
- 3.1.3.** This underlines the critical importance for Ireland of a comprehensive EU energy policy approach to all the challenges of security of energy supply. Ireland also benefits from the role of the International Energy Agency in relation to strategic oil stocks and its work on security of energy supply issues generally.
- 3.1.4.** In addition to the external challenges of energy supply, the key imperative for Ireland is to deliver essential and timely investments in our domestic energy infrastructure. Immediate priority is being given to creating the right environment for delivering sufficient generation capacity and ensuring sustained investment in gas and electricity networks while delivering enhanced levels of electricity and gas interconnection within the next five years. Generation adequacy and the low availability and performance of existing plant are of critical concern. Ensuring Ireland's generation adequacy position between 2007 and 2011 and planning for adequacy beyond 2012 is an immediate and critical priority which will require close cooperation between EirGrid, CER and Government as well as existing and potential new players in the power generation sector.
- 3.1.5.** The Government's overriding policy objective therefore is to ensure that energy is consistently available at competitive prices with minimal risk of supply disruption. The underpinning Strategic Goals are as follows:
- Ensuring that electricity supply consistently meets demand
  - Ensuring the physical security and reliability of gas supplies to Ireland
  - Enhancing the diversity of fuels used for power generation
  - Delivering electricity and gas to homes and businesses over efficient, reliable and secure networks
  - Creating a stable attractive environment for hydrocarbon exploration and production
  - Being prepared for energy supply disruptions

**3.1.6.** The actions being taken under each Strategic Goal for security of supply are set out in the following Sections.

## **3.2. Strategic Goal 1: Ensuring that Electricity Supply Consistently Meets Demand**

**3.2.1.** The availability of reliable and secure and competitively priced electricity supply must be assured at all times. It is a vital ingredient in the competitiveness of Irish industry and Ireland's long term economic and social development. The challenge is underlined by the continued pace of growth in electricity demand reflecting sustained economic growth.

**3.2.2.** Achieving an adequate safety margin between electricity supply and demand requires additional generating plant including flexible plant and significantly higher standards of generating plant availability, as well as more interconnection. Our capacity to deliver a secure and uninterrupted energy supply at a competitive cost will be underpinned by the following actions.

**3.2.3.** Actions:

- We will deliver the Single Electricity Market in 2007 which will contribute to reliability and security of supply and which will progressively deliver a robust integrated infrastructure and more competitive energy prices for business and consumers on the island;
- We will support the progressive development of a regional electricity market with UK and North West Europe over the next five years underpinned by new interconnection;
- We will ensure delivery of the second North South electricity interconnector by 2011 which will more than double the existing cross border electricity transfer capacity to over 680 MW;
- We will ensure delivery of the East-West electricity interconnector no later than 2012 which will provide 500MW of capacity and which will remain in State ownership vested in EirGrid;
- We will ask EirGrid to undertake cost benefit analysis and feasibility planning within the next two years for decisions in relation to further interconnection with Britain or potentially with Europe;
- We will give positive consideration to an Exchequer contribution to the cost of strategic energy infrastructure to address security of supply over the period of the National Development Plan 2007-2013;
- We will ensure completion of the ongoing capital investment programme in transmission and distribution networks by 2010 and oversee further extensive investment in a programme expected to total €4.9bn up to 2013;
- We will, through EirGrid, publish a Grid Development Strategy in 2007 covering the period 2008-2025, which will set out the plans for the development of the transmission system over a 20 year horizon. The Strategy will take account of growing transmission demands given our economic growth as well as technology developments. It will be aligned to and facilitate greater certainty in relation to generation plant location, the growth of renewables, interconnection and the development of the all-island energy market framework as well as spatial strategy and regional development objectives;

- We will ensure that the strategic network development approach is underpinned by coordinated local, regional and national approaches to issues, which balance local interests with the national imperative to deliver strategic energy infrastructure. This approach will be supported by the new arrangements provided for in the Planning and Development (Strategic Infrastructure) Act 2006;
- We will give immediate priority to ensuring that generation adequacy margins are improved taking account of growing demand through appropriate actions by CER, EirGrid and the Power generation sector including:
  - the provision of accurate forecasts by generators on plant availability and performance to enable EirGrid to plan confidently the operation of the system;
  - EirGrid and CER to design a system of incentives/penalties and other measures to raise, in the short term, the standards of availability and performance of the existing plant portfolio;
  - Transparent and timely publication by EirGrid on a monthly in arrears basis of historic plant availability;
  - EirGrid and CER to develop immediate proposals for the development of new sites for additional flexible generation which could be procured and developed, if needed;
  - CER and EirGrid to facilitate and oversee the competitive provision of additional mid-merit/flexible generating plant of at least 240MW over the next 12-18 months to address demand and capacity constraints in the immediate term. This will also contribute to a more balanced power generation portfolio in support of competition and the growth of wind energy on the system;
  - EirGrid and CER to plan for the undertaking of a fast build option over the next 12 months should this be warranted for generation security of supply reasons and the ownership and operation of such plant will be awarded by competitive tender;
  - We expect a positive response by existing and potential players to the making available of three serviced ESB sites in 2007 under the CER/ESB divestment agreement.
- We will oversee the transformation of the generation portfolio between 2007 and 2013 through the CER-ESB Agreement on planned divestment of 20% of the existing ESB conventional plant portfolio by 2010, matched by the provision by independent operators of replacement conventional plant with operational flexibility which can support and complement the significant growth in intermittent wind powered generation while delivering increased capacity, security of supply and competition in support of the economy;
- We will oversee delivery to schedule of the new 430MW plant at Aghada (ESB) and 400MW plant at Whitegate (BGE) by 2009;
- We will mandate EirGrid, in consultation with CER, to develop a landbank of ESB owned sites by 2008 to facilitate independent power generation investment up to 2020. The landbank will complement the CER/ESB agreement which provides for the release of ESB sites in 2007 and incrementally up to 2010. Other suitable State-owned sites will be identified by EirGrid which could augment the ESB sites in the landbank. EirGrid will begin analysis immediately to support development of the landbank in the interest of security of supply and competition;

- We will complete a comprehensive cost benefit review in 2008 of the potential for distributed generation and on the implications for electricity networks as a long-term alternative or supplement to the existing centralised system. The review will take account of ongoing research by SEI, the results of the Grid Study and the long term Grid Strategy, addressing the incentives and barriers (including licensing and planning issues) that impact on the development of distributed electricity generation;
- We will facilitate and support the development of energy storage, such as additional pumped storage, through targeted R & D and ongoing work by EirGrid. This will support renewables integration, security of supply and the effective working of the electricity market.

### **3.3. Strategic Goal 2: Ensuring the Security and Reliability of Gas Supplies**

- 3.3.1.** Ireland has a well developed framework to ensure the adequacy of gas supplies and transportation infrastructure into the country. Recent years have seen substantial investment in the transmission network and the new pipelines recently completed (Mayo-Galway & South-North) will enable the indigenous gas find at Corrib to be brought to the market, assist in the development of an all-island gas network and enable more communities to benefit from the availability of natural gas. In light of global, EU and UK trends, natural gas will continue to play a vital role in the Irish fuel mix for some decades yet. Business as usual projections indicate that more than 70% of our electricity would be generated from natural gas by 2020. Our alternative scenario, with renewables contributing 33% by 2020, will see greater diversity in the fuel mix with gas contributing just under 50% to power generation.
- 3.3.2.** The UK is now the source of some 87% of our natural gas and the UK's own demand for imports is growing strongly. Norway will remain a significant supplier of gas to UK in the medium term. Ireland's location in Europe from the view-point of gas supply sources is becoming less peripheral. In the last 12 months the UK has achieved a significant increase in gas import capacity through accelerated infrastructure developments with resultant benefits for Ireland. Both Pipeline and LNG capacity has increased significantly. These include the Langeled pipeline from Norway, the new pipeline from the Netherlands and new LNG terminals at Milford Haven. Further expansion of LNG capacity and gas interconnection is underway in the UK and Europe which will benefit Ireland in terms of security of wholesale gas supplies within this regional market.
- 3.3.3.** While the prognosis for gas supplies is relatively secure as a result, it is prudent for Ireland to develop a longer term strategy to reduce over reliance on gas imports from the UK. This strategy will also address mechanisms to achieve greater benefits from trading with the competitive UK market.
- 3.3.4.** It is also the case that because of our reliance on gas supplies from the UK from the single exit point at Moffat, the Gas Exit Reform Measures to the National Transmission System planned by the UK authorities have implications for the Irish natural gas sector and for security of supply. Work is underway by CER and the Department to put in place, and agree with the UK authorities, the necessary arrangements to ensure security of gas supply, negate market risk and reduce entry barriers for new players in the markets downstream of Moffat.

### 3.3.5. Actions:

- We will ask CER to take a strategic “look forward”, taking account of EU and global trends, on a 20 year time horizon in its Gas Capacity Statement 2007-2014. This will support enhanced long term planning to 2020 and beyond for security of gas supply;
- We will review the scope for enhanced fuel switching in gas based power generation as a contributor to security of supply;
- We will set an explicit Security of Supply standard for the natural gas system from 2008 which will also set the framework for evaluating future supply options and protection standards;
- We will, through CER, agree and implement the necessary arrangements in 2007 to address the impact of changes in the UK regulatory regime for gas exit;
- We will continue to invest in the gas network for security of supply and regional development through BGE’s investment programme of over €1.7 billion under the NDP 2007-2013;
- We will continue to actively encourage private sector interest in investing in gas storage facilities and LNG and review the potential role for Government intervention in the event of market failure in light of the study’s findings;
- We will put in place an all-island strategy by 2008 for gas storage and LNG facilities in light of the outcome of the all-island study;
- We will continue to progress the all-island gas market, with 2010 set as the target date for implementation of streamlined tariff and market arrangements for the all-island market;
- We will ensure that infrastructure reinforcement in the Ireland/Scotland gas interconnection network is undertaken as necessary, on a fully cost effective basis;
- We will continue to enhance arrangements for regular structured dialogue with UK on issues of mutual interest in relation to gas supply and demand;
- We will, together with CER, work with the UK and the EU to deliver the Regional Gas Market initiatives and regional regulatory structures in the medium term which will facilitate gas trade between Ireland, the UK and Northern Europe;
- We will explore the medium to longer term options for further gas interconnection in light of the all-island market and development of the regional gas market;
- We will work in Europe to ensure Ireland’s needs are met under EU plans to assist diversification by Member States currently dependent on one gas supplier;
- We will work proactively with other EU Member States and the Commission through the forum of the Gas Coordination Group and the Energy Correspondents Network to ensure Coordination of security of supply measures by EU in the event of an energy crisis or a major gas supply disruption;
- We will work to develop a comprehensive energy dialogue with key partners, within the EU and the wider international framework, and drawing on input from our national diplomatic network;



- We will work with the UK, other Member States and the EU Commission to ensure that EU external energy policy builds strong mutually advantageous relationships with gas producing countries. We will also deepen our bilateral energy relations with key gas suppliers, both producers and transit countries, including the targeted use of our network of diplomatic missions and in particular, we will build enduring business and political relations with third country natural gas suppliers, including Norway, Russia and Algeria;
- We will work to support EU efforts to enshrine on a binding basis key international energy principles – as set out in the Energy Charter, the Transit Protocol and the St. Petersburg principles agreed by the G8 – in the EU’s framework agreements with energy, transit and neighbourhood partners;
- We will seek to extend further the EU energy regulatory space through the expansion of the Energy Community to include the countries covered by the European Neighbourhood Policy.

### **3.4. Strategic Goal 3: Enhancing the Diversity of Fuels for Power Generation**

**3.4.1.** In the absence of significant additional hydro resources, and given the statutory ban on nuclear generation, Ireland’s dependence on natural gas for power generation would be 70% by 2020 without policy intervention. Such a high level of reliance on gas is generally seen as unsustainable from a security of supply perspective although current analysis, the UK experience and EU and global trends, underlines the reality that natural gas will continue to constitute a significant part of our power generation fuel mix for the foreseeable future. The Government remains committed to reducing over-reliance on natural gas in the power generation sector by proactively pursuing all realistic alternatives for Ireland.

**3.4.2.** The Government will maintain the statutory prohibition on nuclear generation in Ireland. The Government believes that for reasons of security, safety, economic feasibility and system operation, nuclear generation is not an appropriate choice for this country. The Government will continue to articulate its strong position in relation to nuclear generation and transboundary safety concerns in Europe in the context of the EU Energy Strategy. Developments in relation to nuclear generation in the UK and other Member States will be closely monitored in terms of implications for Ireland.

**3.4.3.** The extension of current coal capacity, provided that environmental impacts can be managed effectively with the application of emerging clean coal technologies, has the potential to contribute to the Irish power generation mix over the long term. Coal is in very long world supply and is not correlated to oil or gas supplies in price or supply sources. Hence its renewed attraction as a contributor to fuel supply diversity and security. The completion of the €368 million retrofit of Moneypoint Power Station will significantly help to meet emission requirements and enhance efficiency. Carbon capture and storage (CCS) offers great potential and is in developing use. However the entire CCS process in conjunction with electricity generation has not yet been demonstrated on a commercial scale. Technical, environmental and economic aspects of CCS remain uncertain and international legal frameworks such as OSPAR will need to be amended.

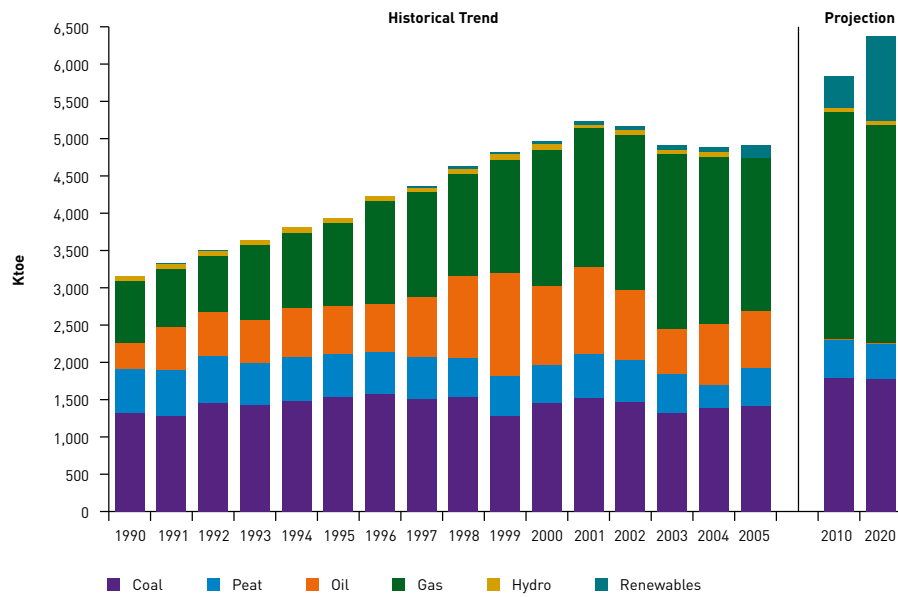
The EU Strategic Energy Review highlights the critical importance for Europe of clean coal technology advances. The Government will keep CCS potential under close review in conjunction with CER, EirGrid, SEI and the power generation sector as well as hydrocarbon exploration and production companies. We will pay close attention to developments in the UK and in the EU generally and we will build on analysis by SEI on costs, benefits and future potential for Ireland of CCS Strategies. Subject to developments, the Government would envisage the commercial operation of a new clean coal power generation plant before 2020.

- 3.4.4.** Co-firing of biomass with peat and other fossil fuels offers identified potential and the Government is fully supportive of its development. ESB and Bord na Móna will continue to work with the biomass sector on the potential of co-firing in the short term at the three State owned peat stations. Biomass power generation projects will be supported through the REFIT scheme.
- 3.4.5.** The future use of oil in electricity generation could feature in terms of dual firing capability of gas fired plants although there are economic and physical limits to the levels of on site oil storage as well as transport and other logistical constraints.
- 3.4.6.** The Government is committed to delivering a significant growth in renewable energy as a contribution to fuel diversity in power generation with a 2020 target of 33% of electricity consumption. Wind energy will provide the pivotal contribution to achieving this target. We also need a balanced portfolio of renewable technologies including biomass and ocean technology.
- 3.4.7.** Under SEI's energy forecast to 2020<sup>1</sup>, the fuel mix for power generation will be more diverse and less reliant on fossil fuels. The following two figures illustrate historic and forecast trends in the primary fuel mix input for electricity production and similar data for electricity generation by fuel. The 2020 forecast is based on a number of assumptions, amongst which are a high economic growth trajectory to 2010, with lower growth to 2020 and achievement of proposed renewable electricity targets.

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1. Energy in Ireland "1990-2005", SEI

## Primary Fuel Mix for Electricity Generation 1990-2020

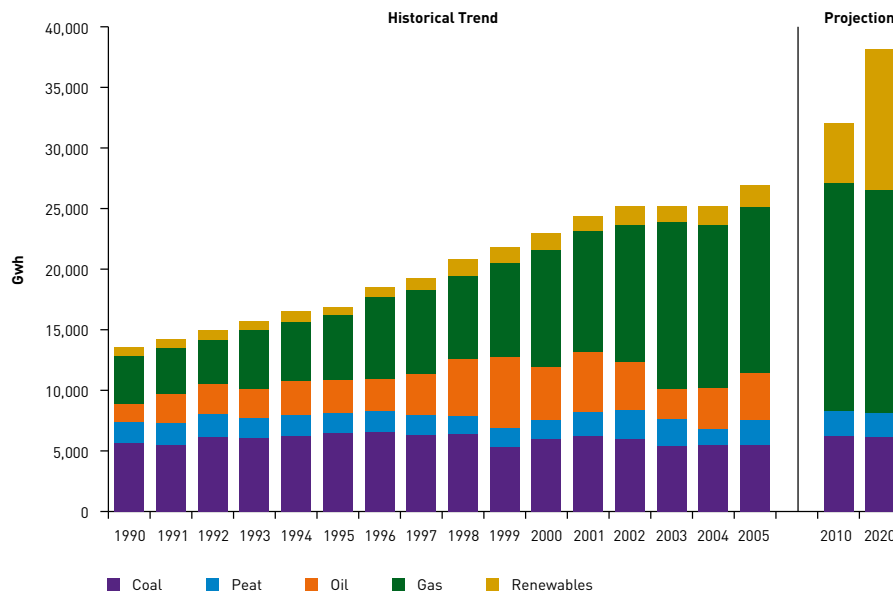


## Electricity generation fuel mix 2005-2020

Fuel	Electricity Gen. Fuel Inputs (ktoe)			Growth	Average Annual Growth Rate			Fuel Shares		
	2005	2010	2020		05-'20	05-'10	10-'20	2005	2010	2020
Coal	1416	1793	1783	25.9	1.5	4.8	-0.1	28%	31%	27%
Oil	766	8	0		-43.9	-60.2	-33.4	15%	0%	0%
Gas	2044	3051	2934	43.6	2.4	8.3	-0.4	40%	51%	45%
Peat	504	504	465	-7.6	-0.5	0.0	-0.8	10%	8%	7%
Electricity	176	176	176	0.0	0.0	0.0	0.0	3%	3%	3%
Renewables	180	420	1128	526.7	13.0	18.5	10.4	4%	7%	17%
<b>Total</b>	<b>5086</b>	<b>5951</b>	<b>6487</b>	<b>27.5</b>	<b>1.6</b>	<b>2.8</b>	<b>1.1</b>			

Source: SEI, 2007.

### Electricity Generation by Fuel 1990-2020



### Electricity generation by fuel 2005-2020

Fuel	Electricity Generated (GWh)			Growth 05-'20	Average Annual Growth Rate			Fuel Shares		
	2010	2020	05-'20		05-'10	10-'20	2005	2010	2020	
Coal	5447	6193	6159	13.1	0.8	2.6	-0.1	21%	19%	16%
Oil	3876	46	1	-100.0	-43.2	-58.8	-33.4	15%	0%	0%
Gas	13652	18804	18445	35.1	2.0	6.6	-0.2	52%	59%	48%
Peat	2101	2069	1902	-9.5	-0.7	-0.3	-0.8	8%	6%	5%
Renewables	1872	4884	11684	1096.2	18.0	38.0	9.1	7%	15%	31%
<b>Total</b>	<b>26949</b>	<b>31996</b>	<b>38191</b>	<b>46.6</b>	<b>2.6</b>	<b>4.2</b>	<b>1.8</b>			

Source: SEI, 2007.

**3.4.8.** Underpinning the Strategic Goals to enhance the diversity of fuels for power generation the following actions are underway or planned:

- We will maintain the statutory prohibition on nuclear generation and monitor developments in other Member States and global trends in terms of implications for Ireland;
- We will pursue the scope in the medium term for additional coal fired generation subject to the environmental challenges being addressed and the pace and scale of technological and commercial development, as well as planning frameworks, in relation to Carbon Capture and Storage;
- We will, in that context, set a target for biomass firing at Moneypoint generating station by 2010, in light of ongoing economic, technical and feasibility work by ESB;
- We are setting the target of 30% co-firing at the three State owned peat power generation stations to be achieved progressively by 2015 beginning with immediate development by Bord na Móna of its pilot project at Edenderry Power Station;

- We will encourage biomass in power generation by supporting biomass technology transfer, investment in specific biomass R & D and tackling of supply side (biomass feedstock) issues;
- We will extend the REFIT electricity support scheme to encompass co-firing and maintain the REFIT scheme in support of biomass electricity;
- We will deliver on the targets in the Bioenergy Action Plan, through continued strategic alliances across Government Departments and Agencies;
- We will eliminate the dedicated oil demand for the power generation sector by 2020 while reviewing the strategic necessity for dual firing at gas plants;
- We will achieve 15% of electricity consumption from renewable sources by 2010 through existing and new projects under the REFIT Scheme, extended as required;
- We will achieve 33% of electricity consumption from renewable sources by 2020 through support for research, development, commercialisation, and technology transfer as well as grid connections and planning issues for offshore wind, ocean technology and biomass;
- We will, together with the NI Authorities, set an all-island 2020 renewables target during 2007 informed by the All-Island Grid Study;
- We will review the options for a consistent approach to supporting renewable energy in the all-island framework;
- We will ensure the necessary transmission system planning and development in support of renewables by EirGrid and SONI and the Regulators in the all-island framework;
- We will limit Ireland's relative dependence on natural gas for power generation to approximately 50% by 2020;
- We will, under the National Energy Efficiency Action Plan, introduce measures to further enhance the energy efficiency of the power generation sector which will contribute to demand management and security of supply.

### **3.5. Strategic Goal 4: Delivering Electricity and Gas over Efficient Reliable and Secure Networks**

**3.5.1.** Substantial extension and upgrading of the electricity and gas network infrastructure will continue over the medium term in line with economic, social and regional development imperatives. The Semi-State Energy Companies (ESB, EirGrid and BGE) will invest in the region of €4.9bn in electricity and gas distribution and transmission networks under the National Development Plan 2007-2013.

**3.5.2.** Actions:

- We will keep the electricity and gas network infrastructure as strategic assets within State ownership. These assets will never be privatised;
- We will ensure under the National Development Plan that the Energy Semi-State Companies deliver the necessary infrastructure development and refurbishment on a timely basis to 2013 and beyond, regulated to international standards and procured cost effectively;

- We will continue to meet regional development requirements by supporting the major electricity investment programme underway and planned by ESB Networks in the high voltage transmission network and distribution network and connections to 2010 and beyond as approved by CER;
- We will ensure that energy infrastructure investment programmes beyond 2013 are consistent with strategic, economic, regional and all-island objectives;
- We will ensure through EirGrid's Grid Development Strategy 2007-2025 and in light of the All-Island Grid Study the necessary action to ensure that electricity transmission and distribution networks can accommodate, in an optimally economic and technical way, our targets for renewable generation for the island to 2020 and beyond;
- Informed by ongoing and further planned analysis, including the cost/benefits, of distributed energy potential, we will assess the long term implications for our distribution/transmission networks of realising that potential;
- We will ensure, through BGE's investment programme, the efficient, cost effective and economic extension of the gas network, and its development on an all-island basis which is already underpinned by the recent completion of the South-North gas pipeline;
- We will continue to support the major programme underway by BGE to upgrade and renew the gas transmission and distribution networks taking account of regional development needs;
- We will oversee the roll-out of the new town connections along the Mayo-Galway Pipeline to ensure completion to schedule;
- We will also support the connection of other new towns in line with regional growth and development objectives, having regard for BGE's economic criteria.

### **3.6. Strategic Goal 5: Creating a Stable Attractive Environment for Hydrocarbon Exploration and Production**

- 3.6.1.** The overarching objective of securing our national energy supply will be a key driver in the development of Ireland's approach to hydrocarbon exploration and production. It is a key Government policy objective to encourage investment in oil and gas exploration off the Irish coast and to optimise the value of any oil and gas finds for Ireland. Accordingly, our strategy for the exploitation of the State's natural hydrocarbon resources aims to maximise the level of exploration activity and increase the level of production activity, while ensuring a fair return to the State from these activities. This strategy is already underpinned by fiscal terms designed to attract an increased level of exploration activity, which will also ensure a higher return to the State from more profitable fields, where increased levels of exploration result in potential reserves being proven. If prospectivity improves substantially, the fiscal terms will be subject to review for future licences in that context.

**3.6.2.** Policy in this area will continue to be developed and adapted as our knowledge of our national hydrocarbon resource increases. Ireland's ability to plan for the future in relation to the production of indigenous gas or oil is very much constrained by the limited evidence currently available. Latest indications are that there are significant potential hydrocarbon resources offshore Ireland. However we need to increase our understanding of our "proven" hydrocarbon resources. Developing this knowledge will accordingly continue to be a key policy objective as it is essential to facilitate effective public policy development in this area.

**3.6.3.** Exploration and production activities must be subject to a robust and effective regulatory framework. The regulatory framework should encourage an increase in the level of exploration and production activity while ensuring that this activity is conducted in a manner that is both safe and has due regard for the environment.

**3.6.4.** We are taking a number of steps to enhance the exploration environment.

**3.6.5.** Actions:

- We will amend the regulatory framework to give effect to the proposed new licensing terms for exploration and production;
- We will continue the practice of holding annual licensing rounds in the Atlantic basins. These licensing rounds will be underpinned by a comprehensive Strategic Environmental Assessment; the 2007 licensing round will cover unlicensed blocks in the Porcupine Basin;
- We will publish updated rules and procedures manuals for both exploration and production activities;
- We will continue to strengthen the regulatory framework by introducing new legislation in 2007 that will confer statutory responsibility on the Commission for Energy Regulation for the safety of hydrocarbon exploration, production and upstream gas safety further strengthening safety in the sector;
- We will review the existing legislation governing exploration and production, in particular the Petroleum and Other Minerals Development Act 1960 and the Continental Shelf Act 1968;
- We will manage exploration licences in a manner that encourages timely exploration;
- We will continue intensive promotional activities to encourage an increased level of exploration offshore Ireland;
- We will implement and encourage initiatives directed at further developing our knowledge of Ireland's national hydrocarbon resources;
- We will establish, as part of a coordinated national approach to major infrastructure projects, a formal risk framework for major petroleum projects.

## 3.7. Strategic Goal 6: Being Prepared for Energy Supply Disruptions

**3.7.1.** The Government will continue to ensure that robust contingency plans are in place to minimise the impact of possible energy supply disruptions. The Green Paper on Energy Policy outlined current practice in relation to contingency planning and the holding of stocks and strategic reserves within the energy sector (including LNG). Reducing the growth in oil imports helps, of course, to mitigate the risk of exposure to external supply disruption – as does a more diverse fuel mix. We also need a resilient flexible energy system which is based on a mix of fuel types, a variety of supply routes, and which has the necessary back up facilities including storage as well as the requisite infrastructure to transport energy supplies to where the demand arises. While energy supply disruptions can result from international situations, disruptions can also be caused by domestic emergency scenarios.

**3.7.2.** Given the increasingly close links between the gas and electricity sectors, a coordinated approach to contingency management and emergency planning is essential to protect the integrity of both systems in the event of emergencies on either network. With regard to oil supplies, the National Oil Reserves Agency is responsible for maintaining strategic oil reserves, either wholly owned or by way of contractual options.

**3.7.3.** Actions:

- We will establish the National Oil Reserves Agency (NORA) as an independent statutory body in 2007;
- We will maintain and regularly review comprehensive and integrated contingency plans to mitigate energy supply disruptions in line with our EU and IEA obligations;
- We will, in light of the recent National Oil Stockholding Policy Review, rebalance the strategic oil reserve by maximising Ireland's wholly-owned stocks of oil and the level of stocks held on the island, subject to increased storage availability and value for money considerations;
- We will increase the current level of the levy on certain oil products in 2007 in order to underpin our oil stockholding strategy;
- In light of the findings of a Review of Security of Oil Supplies to Ireland, to be completed in 2007, we will introduce further strategic measures in 2008;
- We will shortly publish a Handbook on Oil Supply Disruptions Contingency Measures and update regularly in consultation with stakeholders;
- We will continue to renegotiate existing Bilateral Oil Stockholding Agreements, and to take a proactive approach to the conclusion of new such agreements, so as to ensure diverse and secure contractual sources, having regard to storage availability and value for money considerations;
- We will actively progress Ireland's strategic interests in the IEA and EU through the various Coordination Groups on Security of Supply and will seek to ensure that IEA and EU emergency responses are complementary and robust;



- We will support the work of the IEA in encouraging Member and Non Member countries to enhance oil security arrangements in the event of supply disruption;
- We will implement the ongoing recommendations of the CER Task Force on Emergency Procedures which will ensure a coordinated approach to electricity and gas emergency planning;
- We will ensure that energy emergency planning is fully coordinated with overall Government communication and coordination arrangements for National Emergency Planning.

### **3.8. Actions to Promote the Sustainability of Energy Supply and Use**

- 3.8.1.** Sustainability, now and for the long term, is at the heart of Irish energy policy objectives and is in line with the shared objectives of the European Union and the International Energy Agency. The challenge of creating a sustainable energy future for Ireland requires a range of strategies and solutions to deliver energy supply and energy use which is environmentally sustainable.
- 3.8.2.** The commitment to a sustainable energy future is shared North and South and is being jointly pursued within the All-Island Energy Market Development Framework. More diversity in the fuel mix, the accelerated deployment of a range of renewable energy technologies and radical energy efficiency improvements will help us to deliver on the sustainability and climate change agenda.
- 3.8.3.** The planning code will play its part in facilitating greater penetration of renewable technologies at residential, commercial and power generation levels. Amendments have been made to the Planning and Development Regulations to introduce exemptions from planning requirements for certain classes of micro-renewable technologies at residential level. Notably, this will allow households to install solar panels or erect small wind turbines, subject to some conditions, without having to apply for planning permission. Other options are being explored to enable the planning system to support the uptake of renewable energy sources in the industrial, commercial and agricultural sectors.
- 3.8.4.** The underpinning strategic goals for sustainable energy are as follows:
- Addressing climate change by reducing energy related greenhouse gas emissions
  - Accelerating the growth of renewable energy sources
  - Promoting the sustainable use of energy in transport
  - Delivering an integrated approach to the sustainable development and use of bioenergy resources
  - Maximising Energy Efficiency and energy savings across the economy
  - Accelerating Energy Research Development and Innovation Programmes in support of sustainable energy goals

### **3.9. Strategic Goal 1: Addressing Climate Change by Reducing Energy Related Greenhouse Gas Emissions**

- 3.9.1.** The Government has published the Review of the National Climate Change Strategy, which takes stock of developments since 2000 and reviews options for achieving further abatement of Greenhouse gas emissions. Following public consultation, a revised National Climate Change Strategy will be published shortly. The National Allocation Plan 2008-2012 was submitted to the EU Commission in mid 2006 and a final allocation decision is expected in mid 2007.
- 3.9.2.** The Government will ensure that the Irish energy sector continues to make a substantial contribution to reducing CO<sub>2</sub> emissions through energy efficiency improvements, changes in the fuel mix and the increased use of renewable energy as well as other initiatives planned under the energy policy framework including the use of emerging technologies to encourage development of more distributed energy systems over the period to 2020.
- 3.9.3.** We will need substantial new investment in conventional power generation of the order of at least 1000 MW to 2013 to meet demand growth and the planned closure of older plants. However, the carbon intensity of electricity production will continue to be progressively reduced with greater penetration of renewable energy, co-firing with biomass, and the planned replacement of older generation plant with modern efficient power generation facilities to 2020. Gas fired power stations will continue to play a key role over the period. There is strong potential for clean coal technology in the context of increasing carbon constraints. Subject to EU and international developments, the Government would envisage the commercial operation of a new clean coal power generation plant before 2020.
- 3.9.4.** Renewable energy and enhanced efficiency in power generation are therefore integral to the Government's strategy to deliver our existing national climate change targets under the Kyoto Protocol and targets to be agreed for subsequent periods.
- 3.9.5.** Actions:
- We will ensure that energy policy and climate change policy goals are closely aligned and that strategies for reducing energy demand and energy related emissions contribute to national climate change targets;
  - We will create strong linkages between energy policy and transport policy goals given that the transport sector is 99% oil dependent and accounts for around 33% of total Irish energy demand;
  - We will progressively achieve 33% of our electricity consumption from renewable sources by 2020 with 15% the target for 2010;
  - We will implement the National Bioenergy Action Plan through a cohesive Government approach across the agriculture, environment, enterprise, transport and energy sectors;
  - We will work to reduce demand for energy across the economy, guided by a strategy on energy efficiency. We will publish an Energy Efficiency Action Plan by June 2007.

## 3.10. Strategic Goal 2: Accelerating the Growth of Renewable Energy Sources

- 3.10.1.** We have already made clear that renewable energy will be a critical and growing component of Irish energy supply to 2020 and beyond. Renewable energy is an integral part of our climate change strategy and sustainability objectives. The additional diversity which renewables bring to Ireland's energy demand will also make a direct contribution to our goal of ensuring secure and reliable energy supplies.
- 3.10.2.** The Government has already introduced a range of measures to incentivise the development and deployment of renewable sources of energy. These include the REFIT Scheme, the mineral oil tax exemption scheme, the Greener Homes Bioheat and CHP Support Programmes and support for RTDI in renewable technology together with funding for a range of work by Sustainable Energy Ireland. At least €270 million will be invested under the National Development Plan 2007-2013 through Sustainable Energy Programmes and Schemes overseen by SEI, as part of investments and support measures of over €670 million in renewable technologies. We are also supporting research projects to develop the use of agriculture products in the biofuels sector as well as energy crops and wood energy. Strategic planning and investment in electricity infrastructure has as a key priority the accommodation of renewable energy growth. The Grid Development Strategy 2007-2025 will reflect this priority. The All-Island Grid Study will be ground-breaking in international terms.
- 3.10.3.** We are setting very ambitious targets for expanding the role of renewable energy notably the target of 33% of electricity consumption to come from renewable resources by 2020. There are considerable challenges inherent in realising these ambitious targets. The growth of emerging technologies remains constrained by their relative cost. (Offshore wind which is capital intensive and technologically challenging is a case in point). High fossil fuel prices have contributed to making renewables more cost competitive but investment costs do remain a key challenge. The Government considers that the balance of social costs and benefits must be recognised as positive and that is our starting point.
- 3.10.4.** Support, through incentives and accelerated research development and deployment, will continue to reduce the capital costs. There are other constraints to be addressed, including planning, and issues of public acceptance and local community support. These will be tackled through coordinated national, regional and local approaches. The Wind Energy Development Guidelines for Planning Authorities 2006 underline the need for a "plan-led" approach to wind and other renewable projects. Our framework support for renewables must continue to be fully cost effective. This is by no means unique to Ireland. The challenges for all Governments, at EU level and globally, in promoting renewables are clearly articulated in the EU Energy Strategy and in the IEA World Energy Outlook 2006. The global imperative to achieve a significant shift to renewable energy is equally emphasised.
- 3.10.5.** Growth in Combined Heat and Power deployment is an important objective to 2020. The national economic benefit from CHP grows with scale of deployment. It is also the case that CHP investment yields a relatively low return at high risk. So barriers need to be addressed and supports maintained in order to realise the deployment potential, not just in community and buildings, but also in large scale plants.

- 3.10.6.** The Government intends to make Ireland a world leader for research development and deployment of Ocean Energy technologies, through the National Ocean Energy Strategy with the aim of utilisation within a decade. Ocean Energy technologies must solve two major challenges – proving the energy conversion potential and overcoming very high technical risk from a harsh environment. Ongoing work is being intensified by SEI, the Marine Institute, UCC and other institutions, ESB and EirGrid to develop and deliver solutions to the challenges. Ireland is also working within the IEA Ocean Energy Systems Implementation Agreement and EU FP7 to encourage and benefit from collaboration on a wider scale.
- 3.10.7.** Solar energy has long term potential for Northern European countries, including Ireland. Our strong high-tech manufacturing capability points to the potential for us to play a greater role in the development and manufacturing of this technology.
- 3.10.8.** The National Bioenergy Action Plan underscores the Government’s commitment to a fully integrated approach to delivering on our ambitions for renewable and bio energy resources. This will be achieved by addressing supply and demand factors together with sustainability issues and providing R & D and other supports.
- 3.10.9.** The Government has announced the introduction of a biofuels obligation scheme by 2009. The introduction of this scheme requires that biofuels represent a given volume of overall sales, while allowing the market the flexibility to organise the appropriate mix of fuels offered at the supplier level. The obligation regime is in line with overall EU trends and is generally seen as the most effective long-term mechanism to promote biofuels.
- 3.10.10.** Actions:
- We will achieve 15% of electricity consumption on a national basis from renewable energy sources by 2010 and 33% by 2020;
  - We will set, jointly with Northern Ireland during 2007, a further all-island renewable energy target for 2020, which will complement and reinforce the ambitious national target of 33%. This will be informed by the recommendations of the forthcoming All-Island Grid Study and further consultation with the renewable energy sector North and South;
  - We will achieve at least 400MW from Combined Heat and Power by 2010 through continued support under the CHP Deployment Programme and R & D supports with particular emphasis on biomass fuelled CHP and will aim to achieve at least 800MW by 2020;
  - Within two years a further target for CHP will be considered for 2020 in light of further feasibility studies by SEI into CHP applications, a review by CER of potential administrative and regulatory barriers and decisions on appropriate price support mechanisms for electricity generated from new high efficiency large scale CHP. Our approach will be in line with the EU Directive on CHP and further EU developments;
  - We will set an initial ambition of at least 500MW of installed ocean energy capacity by 2020 underpinned by national and international work to accelerate technology advances and solutions to infrastructural and economic issues;
  - We will support further long term development of offshore wind projects through a review of cost benefits, further R & D and developing solutions for effective integration of offshore wind energy into the grid and addressing barriers, in consultation with the industry, including planning, licensing and capital costs. Our strategies to address the challenges for offshore wind will take full account of the EU Renewable Energy Roadmap which includes plans to initiate work on a European Offshore Supergrid;

- We will pursue the potential for solar energy in Ireland in photovoltaic and solar thermal research, technology and manufacture with a view to optimising deployment of solar energy in electricity and heating by 2020;
- We will achieve a minimum target of 5% market penetration of renewables in the heat market by 2010, facilitated through the expanded Greener Homes and Bioheat grants programmes and the development of further initiatives to encourage renewable energy in the domestic, community, commercial and industrial environments;
- We are setting a further target of 12% renewable heat market penetration by 2020. This target reflects the available resource and is ambitious when coupled with the additional target for co-firing with biomass;
- We will achieve the EU target of 5.75% biofuels market penetration by 2010 which will be delivered through the existing mineral oil tax relief scheme, the planned biofuel obligation on fuel supply companies and the promotion of biofuels in public fleets;
- We will provide further market certainty and encourage projects of scale by moving to a biofuels obligation on fuel suppliers by 2009, this will be developed and put to industry and public consultation within the next 12 months. This will further underpin delivery of the 2010 target;
- We are setting a biofuels penetration target of at least 10% for 2020 in light of EU developments and all relevant factors including supply and demand side issues and global sustainability impacts;
- We will support further research of second generation biofuels including collaborative projects with other countries through SEI and the Energy RTDI Programmes;
- We will work with SEI to develop sustainable energy programmes specifically designed to address the additional energy challenges faced by residents of our small offshore islands.

### **3.11. Strategic Goal 3: Promoting the Sustainable Use of Energy in Transport**

**3.11.1.** The main drivers for growth in the Irish transport sector include increasing population and employment, which has led to increased demand for housing, urban sprawl, long-distance commuting, and greater freight transportation. It is recognised that transport plays a pivotal role in supporting economic growth and balanced regional development with the total primary energy requirement (TPER) of the transport sector showing a close positive correlation with GDP.

**3.11.2.** However, it is imperative that growth in energy consumption in the transport sector is decoupled from economic growth in order for the transport sector to move along a more sustainable trajectory. The objective is to develop a transport system, which will allow for the maintenance of economic competitiveness by removing infrastructural bottlenecks and achieving security of supply through a diverse fuel mix, whilst increasing social cohesion and access for communities in peripheral rural areas and reducing environmental impacts.

- 3.11.3.** This requires the provision of supply-side infrastructure through capital investment along with the implementation of a complementary range of demand side management measures such as fiscal incentives and regulatory instruments in order to encourage a modal shift from private to public transport.
- 3.11.4.** In November 2005, Transport 21 was launched, which is a €34.3 billion capital investment framework for the transport system for 2006 to 2015. Overall €18.5 billion will be invested in the national roads programme, which will upgrade national roads, remove bottlenecks, reduce congestion, improve journey times and, consequently, improve competitiveness. Furthermore, €15.8 billion will be provided for public transport projects, in a significant rebalancing of public expenditure, which will encourage commuters to switch to public transport.
- 3.11.5.** It is expected that this will achieve a fully integrated transport system with 75 million additional passenger trips per annum on DART/suburban rail services, over 80 million additional passenger trips on Luas/Metro services, a 60% increase in bus capacity, an extension of the motorway network to all provincial cities and an upgrading of approximately 850 kilometres of other national roads by 2015.
- 3.11.6.** Modelling of the impacts of Transport 21 in the Greater Dublin Area shows a reduction of almost 20% in fuel consumption and CO<sub>2</sub> emissions during rush hour in 2016, compared to a situation in 2016 without Transport 21 in place, provided demand side measures are implemented.
- 3.11.7.** CIE have been instructed by the Minister for Transport to move its existing fleet to a 5% biodiesel blend with the view to achieving a higher blend of 30% in all new buses in as short a time frame as possible and have also been requested to assess the feasibility of using hybrid electric buses as part of future fleet replacement.
- 3.11.8.** This capital investment will complement the National Spatial Strategy (NSS) 2002-2020 and Regional Planning Guidelines (RPG) by better integrating land-use planning and spatial development and concentrating development in close proximity to transport infrastructure. This will facilitate a switch to more sustainable modes of transport such as public transport, cycling and walking and create greater certainty in knowing where best to focus higher density development within the Greater Dublin metropolitan area as well as concentrating development in the hinterland in strategically placed dynamic urban conurbations. The Cork Area Strategic Plan (CASP) provides a model for successful integration of land-use planning and public transport development in urban settlements and their hinterlands.
- 3.11.9.** A fundamental review of all existing and potential policy interventions is required to align strategy across Government and drive overall achievement of this goal. We will publish a Sustainable Transport Action Plan in late 2007 with the overall aim of achieving a sustainable transport system by 2020.
- 3.11.10.** This Action Plan will set out how Government will deliver this objective in terms of firm policies, actions and targets. The following issues will be addressed in the Action Plan:
- Better integration of transport infrastructure and land use planning;
  - Fiscal measures to reduce transport demand, including road pricing or congestion charges once sufficient infrastructure has been provided and public transport alternatives are in place;

- Support measures that aim to achieve greater energy efficiency from the transport sector and influence behavioural change, including car sharing schemes and workplace travel plans;
- Public awareness campaigns on issues such as eco-driving, which aims to achieve up to a 20% improvement in fuel efficiency among private transport users;
- Support for EU-level agreements with motor manufacturers' associations to reduce CO<sub>2</sub> emissions of new passenger cars to an average level of 130 g/km by 2012;
- A mandatory comparative labelling system for new cars based on CO<sub>2</sub> emission levels and continued support for the mandatory provision of consumer information on fuel economy and CO<sub>2</sub> emissions in order to influence behavioural change;
- Changes to both vehicle registration tax (VRT) and motor tax, which should provide further incentives for choosing fuel-efficient cars with lower CO<sub>2</sub> emissions. The extension beyond December 2007 of the preferential VRT treatment currently available to series production hybrid electric, flexi fuel and electric vehicles will be considered;
- Support for a national biofuels obligation on fuel suppliers of 5% by 2009, which will provide market certainty and encourage projects of scale;
- The use of 100% pure plant oil (PPO) in captive fleets maintained by local authorities and public bodies, and
- Support for measures to include the aviation and maritime sectors in the EU Emissions Trading Scheme (ETS), as part of a multilateral commitment by Member States.

## 3.12. Strategic Goal 4: Delivering an Integrated Approach to the Sustainable Use of Bioenergy Resources

- 3.12.1.** The Government will maximise the contribution of indigenous bioenergy resources to our goals for energy diversity, reduction in oil use, climate change, environmental sustainability, renewable energy and rural development. A consistent and coordinated strategic approach across Government and Agencies is critical to the successful delivery of bioenergy policy objectives. Sustainable growth in biomass use in the electricity and heat sectors and in bio fuels use in the transport sector will be achieved through systematic addressing of supply and demand challenges and providing market certainty for the long term. We will also support coordinated R & D, technology transfer and commercialisation as well as addressing regulatory and planning and resourcing issues.
- 3.12.2.** The National Bioenergy Action Plan, which was overseen by the Ministerial Task Force on Bioenergy, sets the agenda for collective realisation over the next five years of the benefits of bioenergy across the agriculture, forestry, enterprise, transport and energy sectors. The Plan is underpinned by the additional support provided in Budget 2007 and the Sustainable Energy Programme under the National Development Plan 2007-2013. The Bioenergy Plan takes account of the EU Biomass Action Plan and will be regularly reviewed in light of EU developments in the context of the Renewable Energy Roadmap.

### 3.12.3. Actions:

- We will implement (and report annually on) the strategies and targets in the National Bioenergy Action Plan through integrated and coordinated action across Government Departments and State Agencies in consultation with stakeholders;
- We will continue to roll-out, and review and expand as necessary, the fiscal and grant schemes supporting bioenergy development and deployment including:
  - Greener Homes
  - Bioheat
  - REFIT
  - Bio Energy Crop Scheme
  - Energy Crops Assistance Scheme
  - Biomass Harvesting Scheme
  - BES & Seed Capital Schemes
  - Research and Development and Innovation Schemes for forestry, biofuels, crops and technologies
- We will ensure that the public sector leads the way as exemplar through the deployment of bioenergy heating, the use of renewable electricity and CHP in public buildings as well as the use of biofuels in the public transport fleets. Specifically, we are mandating with immediate effect that Dublin Bus and Bus Éireann move all their fleet to a 5% biofuel blend and plan to achieve a 30% biofuel blend in all their new busses, with the technical capability to achieve this to be incorporated into tenders for new fleet;
- We will support the delivery of targets for biomass in the heating sector;
- We will accelerate progress in developing a reliable supply chain in the wood energy sector for the private as well as the national forest estate;
- We will encourage progress in the timely implementation of non-hazardous Waste Management Plans by local authorities in providing optimised “waste to energy” solutions compatible with our national waste policy goals for prevention reuse and recycling, including the National Strategy for Biodegradable Waste 2006, and taking account of EU and international experience;
- We will work to develop an all-island approach to bioenergy, including shared opportunities for scale in supply, over the next three years.

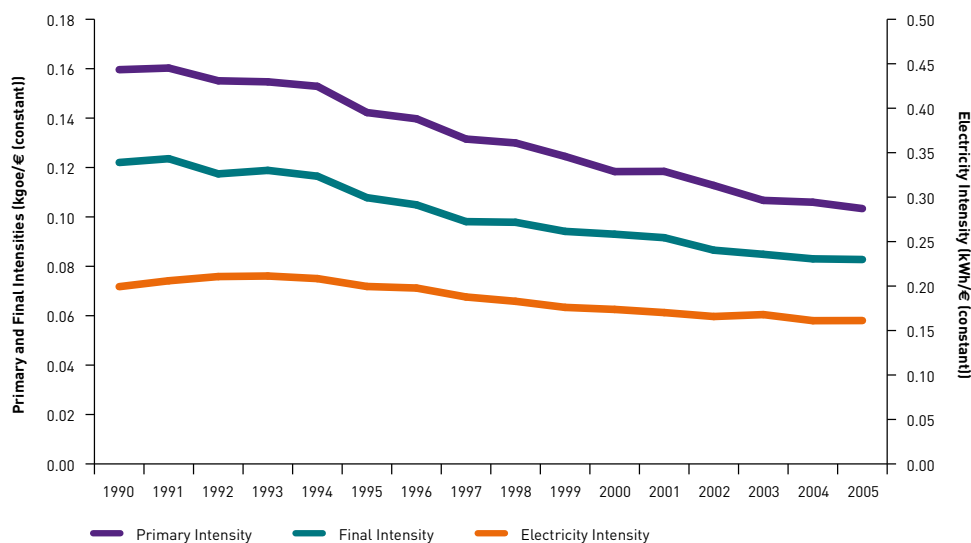
## 3.13. Strategic Goal 5: Maximising Energy Efficiency and Conservation

**3.13.1.** Energy Efficiency and energy savings are pivotal to meeting Ireland’s sustainable energy goals. It helps us reduce carbon emissions and energy costs. Efficient energy use directly contributes to security of energy supply, sustainable transport, affordable energy, competitiveness and environmental sustainability. Developing Energy Efficiency products and services will also support jobs and growth in the energy sector. Energy efficiency is therefore a priority for Ireland as it is for the European Union.



**3.13.2.** Ireland's overall energy intensity rating has improved significantly. Industrial energy intensity between 1990 and 2005 reduced by 54%. The overall energy intensity of the services sector was 17% lower in 2005 than 1990. The intensity of primary, final energy and electricity requirements have been falling since 1990, as illustrated in the graph below. This is due to technological efficiency, choice of fuel mix, economies of scale and changes in the structure of the economy. However, there is further scope for significant improvement and the critical challenge is to ensure that the energy intensity trend remains downward and that energy use is as efficient as possible across all the economic sectors and in all Irish households.

### Primary, Final and Electricity Intensity



Source: Energy in Ireland 1990-2005, SEI

**3.13.3.** The Government launched the National Energy Efficiency Campaign in 2006 which aims over the next three years to achieve real and measurable behavioural change and energy savings across all economic sectors.

**3.13.4.** The Government has welcomed the EU's ambitious Energy Efficiency Action Plan published in November 2006. Together with other Member States, Ireland endorses the need for an ambitious multi annual programme of priority actions. We have agreed a shared goal to realise a 20% energy saving for Europe by 2020 which will potentially mean annual savings of EUR 100 billion, and 390 Million tonnes oil equivalent while reducing the EU's CO<sub>2</sub> emissions by more than twice the Kyoto Protocol requirement by 2012. The EU Action Plan sets out 10 priority actions and will see the progressive negotiation and roll out of measures between 2007 and 2012 to achieve the 20% savings by 2020.

**3.13.5.** The forthcoming National Action Plan on Energy Efficiency, to be published for consultation in April 2007, will fully reflect the EU Action Plan on Energy Efficiency and will set out the concrete measures to deliver 20% reduction in energy demand for Ireland by 2020. It will build on achievements to date, target specific sectors for achieving better results and ensure maximum compliance with existing and forthcoming EU Directives.

- 3.13.6.** I.S. 393, the Irish Standard for Energy Management, was designed to promote energy consciousness in all aspects of business, from design and specification, through procurement, operation and maintenance. Properly applied, it can ensure that there are practical principles which can give effect to a company's energy/environmental policy, and can assist all staff to contribute towards better control of energy use.
- 3.13.7.** Electricity Demand Side Management (DSM) programmes have a key role to play in delivering energy efficiency by enabling suppliers, ESB Networks and EirGrid to plan better and to manage and modify customer demand. DSM also involves equipping consumers with the data and the means to monitor, manage and reduce their electricity demand.
- 3.13.8.** The Government considers that greater priority needs to be given to sustained cost effective DSM initiatives for the residential and business sectors building on existing programmes. Our own experience to date as well as international experience (including USA, Australia and Scandinavia) has demonstrated the benefits which can accrue for the electricity sector, the economy and for business and domestic customers. Enhanced DSM measures will be progressed as a priority starting now and continuing over the next 5 years. A comprehensive and fully costed DSM Plan will be finalised later this year. The measures to be taken will include the progressive provision of real-time electricity displays linked to meters which will provide householders with real-time information on their electricity usage and its cost.
- 3.13.9.** Smart meters have demonstrable potential to deliver benefits for energy suppliers and consumers. The benefits include more flexible tariffs offering greater choice and energy saving opportunities, remote meter reading resulting in reduced costs and full accuracy and real-time data to inform decisions by providers and consumers alike. Smart meters also facilitate the incorporation of on-site generation at consumer premises, including renewable generation.
- 3.13.10.** Informed by SEI's pilot project of 200 houses in the Dundalk Energy Zone and the full technical and economic review underway by CER, ESB Networks and SEI, we will decide by the end of 2007 on the roll-out and funding of a national five-year programme to install smart meters for all householders in both new and existing housing stock.
- 3.13.11.** Energy Efficiency strategies will be a key plank of all-island cooperation on energy matters and we are working with Northern Ireland to deliver shared approaches.
- 3.13.12.** Actions:
- We will achieve 20% savings in energy across the electricity, transport and heating sectors by 2020, in line with EU target and are setting an indicative target of 30% for 2020 to surpass the EU ambition;
  - Following the consultation process, we will finalise the National Action Plan on Energy Efficiency by June 2007 which will be subject to annual review;
  - We will sustain the National Energy Efficiency Campaign "Power of One" over the next three years at national, regional and community level as well as across the economic sectors and make it an all-island campaign during 2007;
  - We will promote the adoption of the Irish Standard for Energy Management in all workplaces and will, in particular, support its implementation in SMEs;

- We are committed to updating national building regulations governing energy efficiency of new buildings and buildings subject to major renovations. A full review of the scope, structure and form of the current regulations (Part L of the Building Regulations) will underpin the next amendment which will come into effect in 2008. The aim is
  - To provide for the systematic upgrading of energy performance standards,
  - To ensure that Ireland's standards are among the best in Europe and that they make the maximum practical contribution to achieving CO<sub>2</sub> emission targets,
  - To reflect relevant technological developments and
  - To reduce energy demand by 40% relative to current standards.
- We have introduced Building Energy Rating (BER) of new dwellings from January 1 2007. We will extend the requirement for rating to new non-domestic buildings from 1 July 2008, and to existing buildings (domestic and non-domestic) offered for rent or sale from 1 January 2009. This will provide the information necessary for energy efficiency to become a factor in purchase and sale decisions in the housing market and to drive the provision of higher standards in the housing stock;
- We will, under the National Development Plan and Regional Operational Programmes 2007-2013, continue to fund energy efficiency programmes and targeted initiatives at national and regional level;
- We will give priority to expanded cost-effective demand side management initiatives for industry and consumers from 2008 under a fully costed comprehensive DSM Plan to be finalised by the end of 2007;
- We will initiate steps in 2007 in conjunction with CER, SEI and energy suppliers, to roll-out the provision of real time energy displays for households which have demonstrable potential to reduce energy bills;
- We will oversee the introduction over the next five years of smart meters for all electricity customers, (new and existing housing stock) informed by the Dundalk Pilot Project and a technical economic and cost review to be completed in 2007. We will, in that context, review the most appropriate funding mechanism to meet the cost of installation;
- We will support targeted R & D and innovation in energy efficiency and technology conversion under the Energy RTDI Programme 2007-2013;
- We will lead by example setting a target of 33% for energy savings across the public sector. This will be achieved by introducing comprehensive Energy Efficiency Programmes (targets and standards) for Government Departments, State Agencies, Local Authorities, the Health Service and the public sector overall. The Programmes which will be rolled out progressively from 2008 will build on the achievements to date under the Public Sector Investment Programme and the work of the Energy Management Bureaux;
- We will publish an action plan for Green Public Procurement, with the aim of achieving, by 2010, a level of Green Procurement equal on average to that achieved by best performers in Europe. The plan will focus on targets to be achieved, how to drive the adoption of green procurement by public and semi-public authorities, indicators for measuring progress and the legal and administrative framework for public procurement;

- We will revise and update existing social housing design guidelines to ensure that all new capitally funded housing schemes are socially, environmentally and economically sustainable, achieving energy efficiency both at construction stage and during the lifetime of the scheme, e.g. by climate sensitive design which takes account of the orientation, topography and surrounding features so as to control wind effects, while optimising the benefits of sunlight, daylight and solar gain;
- We will continue to support and expand as necessary the SEI Energy Efficiency Programmes in the built environment, the large Industry Programme and the new targeting of the SME sector in conjunction with the National Energy Efficiency Power of One Campaign;
- We will commission an independent review of results and outcomes of these Programmes in 2008.

### **3.14. Strategic Goal 6: Delivering Energy Research Technology Development and Innovation Programmes in Support of Sustainable Energy Goals**

- 3.14.1.** The Government has committed an unprecedented level of funding to science, technology and innovation under the Science Technology and Innovation Strategy 2006-2013. The National Development Plan fully endorses the Strategy and sets a vision for 2013 of Ireland internationally renowned for research excellence and at the forefront of using new knowledge for economic and social progress within an innovation culture.
- 3.14.2.** Energy Research and Innovation is a key part of the Science Strategy and the National Development Plan, reflecting the vital importance of the energy sector and the imperative to deliver sustainable, competitive and secure energy supplies for the economy and society.
- 3.14.3.** The Government's priority commitment to energy research is fully in line with EU and international priorities. Europe is committed to delivering a sea change in European energy technology innovation to deliver the sustainable energy future. The Government endorses the EU Energy Strategy's commitment to energy research and will work to ensure that the European Strategic Energy Technology Plan reflects Ireland's priorities for energy RTDI.
- 3.14.4.** The Seventh Framework Programme and the Intelligent – Energy Europe Programme will play a key part in delivering a cohesive EU research and innovation platform, building on Member States own programmes. We also welcome the work of the International Energy Agency, in support of the G8 Plan of Action, to focus on efficient and emerging technologies and the pioneering Energy Technology Perspective to 2050. The Government will enhance Ireland's involvement in the IEA Energy Technology Collaboration Programme as well as supporting Irish researchers to maximise take up under FP7 and Intelligent Energy Europe.
- 3.14.5.** In order to position Ireland to do this, the expansion of national energy RTDI programmes and capability is a critical and immediate priority. Further developing an all-island approach to energy research is a key shared goal under the All-Island Energy Framework Programme. We are working to build the appropriate skills base and capability across all the energy RTDI areas to the highest international standard to support national energy policy goals.

**3.14.6.** The Government is committed to an energy research strategy for the medium to long term which delivers on our strengths and tackles specific national priorities while ensuring that Ireland benefits from energy research and innovation in the EU, USA and internationally. In addition to R & D on renewable technologies (including biomass, ocean, solar and wind), energy efficiency in transport, energy supply, buildings and industry will be given priority together with electricity storage projects and the specific challenges in integrating renewables into the grid.

**3.14.7.** The Irish Energy Research Council will play a key role in the prioritisation, coordination and oversight of energy research to 2013 and beyond. The Council will advise on the setting of priorities for Irish energy research, taking a leading role in linkages with key national bodies as well as EU and international programmes and bodies. The Council will coordinate existing RTDI, provide policy advice and analysis and support strategic initiatives and capacity building, complementary with existing initiatives. The Council has been requested to prepare a comprehensive Energy Research Strategy 2008-2013 during 2007 which will also reflect the National Strategy for Science, Technology and Innovation.

**3.14.8.** Actions:

- We will directly invest over €150 million in Energy Research under the NDP 2007-2013 which will also leverage additional funding under EU programmes;
- We will request ESB, BGE, Bord na Móna and EirGrid to enhance their contribution to energy RTDI as part of their corporate strategies from 2008 onwards;
- We will, through the Irish Energy Research Council, publish a comprehensive Energy Research Strategy 2008-2013 during 2007 which will set the priorities for Irish energy research taking account of EU and international developments;
- We will keep existing energy research structures North and South under review, jointly with the Northern Ireland Authorities and in consultation with the Irish Energy Research Council, to ensure effective collaboration across the energy research community;
- We will encourage and incentivise the active engagement of Irish energy industries with R & D Programmes through the Irish Energy Research Council;
- We will progressively develop a strong national energy research capability across all disciplines through significant funding for capacity building under the Charles Parsons Awards. This will complement other opportunities through IRCSET, Science Foundation Ireland and EU Programmes and have a strong all-island dimension;
- We will continue to develop all-island energy research cooperation through the Irish Energy Research Council including developing joint opportunities under the EU Seventh Framework Programme;
- We will ensure a fully coordinated approach across Departments and Agencies (SEI, Enterprise Ireland, Teagasc and Marine Institute) to the commercialisation by the energy industry of Energy R & D through the establishment of a group representing Departments, Agencies, Industry and the Irish Energy Research Council.

## **3.15. Actions to Enhance the Competitiveness of Energy Supply**

**3.15.1.** The Government reaffirms its overriding objective to ensure a reliable and competitively priced energy supply and competition in energy markets in support of economic growth and competitiveness. Our capacity to deliver a secure energy supply at competitive cost is critical for Ireland's ability to continue to attract foreign direct investment and to sustaining a favourable environment for all sectors of Irish industry to compete in export and domestic markets. It is also critical for all consumers.

**3.15.2.** Energy is equally a vital component in the development of an all-island economy and we are committed to joint cooperation on delivery of a shared agenda under the All-Island Energy Market Development Framework with introduction of the Single Electricity Market in 2007 as the immediate priority. The All-Island Framework is a logical first step towards creating regional electricity and gas markets between the island of Ireland and Britain in the medium term. Regionalisation will bring distinct benefits for the energy market for consumers and for the economy.

**3.15.3.** Security of supply and environmental sustainability directly contribute to the creation of a long term secure and stable energy investment framework and to competitive energy supply. Actions underway to address immediate and longer term capacity deficits in energy infrastructure (power generation, networks and interconnectors) are critical to underpinning the success of the economy. Equally important are actions to deliver a more sustainable and diverse energy mix and radically improved energy efficiency which reduces dependence on imported fossil fuels to 2020 and beyond. We also need structural change in the energy market which supports competition and delivers consumer choice.

**3.15.4.** The Strategic Goals underpinning the competitiveness of energy supply and competition in the energy market are as follows:

- Delivering competition and consumer choice in the energy market
- Delivering the All-Island Energy Market Framework
- Ensuring that the regulatory framework meets the evolving energy policy challenges
- Ensuring a sustainable future for Semi-State Energy Enterprises
- Ensuring affordable energy for everyone
- Creating jobs, growth and innovation in the energy sector

## **3.16. Strategic Goal 1: Delivering Competition and Consumer Choice in the Energy Market**

**3.16.1.** Irish energy policy must be strongly focused on contributing to greater productivity, national competitiveness, a strong economy and the needs of all consumers. Ensuring the relative competitiveness of Irish energy prices is a key concern for energy policy, reflecting the needs of the enterprise sector as well as domestic consumers. 2006 saw a particular focus on energy prices and the need for measures to address, where we can, the impact of high and volatile global energy costs and action to address domestically controllable costs. These include costs in power generation, costs associated with the use of the transmission and distribution electricity and gas networks and the costs of investment in major strategic energy infrastructure.

- 3.16.2.** It is also clear that further actions are needed to encourage competition and transparency in the interests of consumers. The Government believes that scale and peripherality are specific issues for the Irish energy market. In the context of a clear trend towards consolidation of European Energy utilities, the need for strong commercially viable players of scale in the all-island gas and electricity market is clear.
- 3.16.3.** Our plans for security of supply and sustainability, including diversity in the fuel mix and energy efficiency, will contribute to protecting the Irish economy and consumers.
- 3.16.4.** Where increases in non-controllable fuel prices are unavoidable they should be the subject of proactive consultation with all interested parties and communicated by the CER in an open and proactive way to business and domestic consumers. Greater choice of supplier for large and small/medium enterprise as well as for domestic consumers is a key issue in competition terms.
- 3.16.5.** Electricity prices remain high in comparison to other EU countries and third countries with similar small markets. Higher input costs and low availability of power generation plant contribute to higher production costs. The necessary investment in the network to meet the needs of the economy and regional development also contributes to higher prices.
- 3.16.6.** Structural change will reinforce the benefits which will accrue from the SEM. It is also clearly in the best interests of a fully functioning SEM itself. Firm signals in relation to structural change in the electricity sector both North and South will support the introduction of a fully functioning effective single wholesale electricity market on the island.
- 3.16.7.** Informed by a wide range of views from interested players, the Government endorses the case for a process of structural change in the electricity sector and will deliver change, starting now and progressively working with all stakeholders. The effective working of the all-island market, the competitiveness of energy costs, the interests of consumers and the economy require it. We want to create a new impetus for choice and innovation in a lighter regulated environment and delivering a responsive stable market.
- 3.16.8.** Ireland has been progressively implementing the transition of the gas and electricity markets in line with the EU Internal Energy Market Directives.
- 3.16.9.** The Government's commitment to liberalise the gas and electricity sectors is set in the context of existing and emerging EU developments in the internal energy market, the all-island energy framework and the primary interests of the economy and consumers North and South.
- 3.16.10.** The gas market is currently open for commercial competitive customers. As part of structural change, we will review and address any actual or perceived barriers to gas market entry by new players.

### 3.16.11. Actions:

- We will keep the electricity and gas network infrastructures as strategic national assets in State ownership and these assets will never be privatised;
- We will implement full market opening of the gas market in 2007;
- We will complete the legal unbundling of BGE's transmission and distribution operations and establish the new BGE subsidiary as the Irish system operator in 2007;
- We will work with Northern Ireland to expedite an all-island Transmission System Operator for the all-island gas market;
- We will consider and consult on the cost benefits of further restructuring of BGE following full market opening in 2007, in light also of EU developments;
- We will work with CER to drive the development of a regional gas market over the next 5 years for Ireland, Britain and France through a coordinated regulatory and policy approach;
- We will, through CER, examine ways in which to utilise the competitive pressures of the UK market, including options for improving access for market participants to UK gas volumes;
- We will ensure full operational independence of the Distribution Systems Operator as an ESB subsidiary by completing the legal unbundling by mid-2007;
- We will, in conjunction with CER, take the necessary steps to ensure that ESB's distribution network business, which is a natural monopoly, is operated under a risk-related rate of return sufficient to remunerate debt and retain capital to finance network investment requirements up to 2013. The resultant savings, through reduced network tariffs and a lower shareholder dividend from the networks business, will be passed on in full to electricity customers. The impact of this arrangement, which is subject to compliance with State Aid Rules, will be kept under regular review;
- We will establish EirGrid as the National Transmission Grid Company by end 2008, transferring to EirGrid ownership of the transmission assets. This will create efficiencies, reduce duplication and achieve full independence thus enhancing competition and transparency and reducing costs;
- We will progress the scope for an all-island single Transmission System Operator, following the establishment of the SEM, in conjunction with the Northern Ireland Authorities and the two Regulators;
- We will ensure that energy consumer interests are systematically protected and promoted through, in particular, supporting and resourcing the role of the National Consumer Agency as the statutory advocate for consumers in the regulated sectors. We will take further steps to ensure proactive communication, consultation and full transparency for consumers in relation to regulatory and policy actions in the energy field;
- We will ensure the progressive reduction in ESB's market share in power generation to around 40% in an all-island market context by 2010 through the CER-ESB Asset Strategy Agreement of November 2006;
- We will encourage BGE and Bord na Móna to develop their role in power generation and supply in competition with the ESB and Viridian and other Independent players through, in the first instance, their investment in Whitegate and Edenderry powerplants respectively;



- We will mandate EirGrid to work immediately in consultation with CER to develop the state owned landbank to facilitate new independent generation, including flexible/mid-merit plant, noting that several sites are becoming available immediately under the CER/ESB Asset Strategy Agreement;
- We will work with the Northern Ireland Authorities to ensure that policy actions to be taken North and South are fully complementary with the Market Power Mitigation Strategy being developed by the Regulators for the SEM;
- We will support the continued development of ESBI as a successful international player with strategic and economic benefits for Ireland;
- We will ensure, through CER, the delivery of real and effective competition in energy supply by progressively reducing the dominance of ESB PES in competitive sectors of the retail electricity market, while retaining its residual function of ensuring the Universal Service Obligation;
- We will ring fence the output from the new Aghada power generation facility from the rest of ESB Power Generation in terms of licence and business separation conditions and ensure that the output is sold to suppliers other than ESB Public Electricity Supply in the interest of competition;
- We will ensure adequacy of electricity supply 2007-2012 for the economy and consumers through the actions being taken under our security of supply goal and other measures outlined in this White Paper.

## 3.17. Strategic Goal 2: Delivering the All-Island Energy Market Framework

- 3.17.1.** The Government will continue to work with Northern Ireland to deliver a fully coordinated approach to energy policy North and South. We have a shared interest in achieving a more competitive energy (gas and electricity) market of better scale, improved security of supply and reduced energy costs. The All-Island Energy Market Framework 2004, which reflects the EU objectives for the internal energy market and regionalisation of markets, is the framework for delivery on an all-island basis across the range of energy priorities. The introduction of the Single Electricity Market in 2007 is the immediate priority. The Departments North and South together with CER and NIAER as well as EirGrid and SONI and the sectoral players are working intensively to deliver to this years challenging timetable.
- 3.17.2.** The Single Electricity Market will have around 2.5 million electricity customers. It will create a wholesale electricity market based on a gross pool system. It represents the first significant step towards the All-Island Energy Market. The AIEM is also the key context for the progressive delivery of competitive sustainable and reliable gas markets on the island which will support security of supply and competitiveness as well as sustainability.
- 3.17.3.** The completion of the second North South electricity interconnector will underpin the Single Electricity Market. The All-Island Energy Market will encourage open and transparent competition in gas and electricity and a more stable and attractive investment location for independent players.

#### 3.17.4. Actions:

- We will oversee the successful introduction of the Single Electricity Market in 2007 through enactment of the respective underpinning legislation and completion of the detailed market mechanisms by the Regulatory Authorities. We will also oversee full systems design by EirGrid and SONI and full readiness by market players by mid 2007;
- We will ensure the essential completion of the North South Electricity Interconnector by 2011;
- We will work with Northern Ireland to ensure that market dominance and competition issues continue to be addressed in the Single Electricity Market context;
- We will progress the delivery of all the strategic goals in the All-Island Energy Market Framework to 2010 including:
  - Delivering the all-island gas market and joint gas infrastructure and transmission policy;
  - An all-island strategy for gas storage and LNG this year;
  - An all-island 2020 target for contribution by renewable energy to electricity generation to be set this year informed by the All-Island Grid Study;
  - Sustained cooperation on support for the development and deployment of renewable technologies including wind, ocean, biomass and solar;
  - An all-island energy efficiency promotion campaign and delivery of the 20% EU target for 2020 on an all-island basis;
  - Cooperation on energy Research Technology and Innovation including an all-island energy research strategy (through the Irish Energy Research Council) and leveraging joint opportunities under the Seventh Framework Programme;
  - Examination by 2010 of benefits for creation of an all-island regulatory body for energy;
  - Security of supply and emergency planning;
  - Joint review of the case for a Single Electricity Transmission System Operator after the establishment of the SEM;
  - We will jointly review and update the All-Island Energy Market Framework in 2007 in light of progress to date and set fresh goals for the period 2008-2013 with the time horizon of 2020 taking account of the shared objective to develop a regional energy market with Britain and France in line with EU developments.

### **3.18. Strategic Goal 3: Ensuring that the Regulatory Framework Meets the Evolving Energy Policy Challenges**

- 3.18.1.** Given the range of challenges for Irish energy policy over the next decade and beyond, an ongoing flexible approach to the regulation of the energy sector is required. The CER's wide ranging statutory independent functions and duties continue to evolve in a changing and challenging environment. Most recently the Energy (Miscellaneous Provisions) Act 2006 has conferred additional functions and powers on the Commission in the development and oversight of the all-island energy market, regulation of electrical safety and electrical contractors and national gas safety and gas installers.
- 3.18.2.** The Act also provides for the general power of Ministerial Policy Directions to the Commission with particular regard to security, sustainability and competitiveness of energy supply. CER has also been statutorily empowered to secure the construction of interconnectors and to regulate access to the interconnectors.
- 3.18.3.** The development of the all-island energy market and regional EU energy markets and further action to deliver the EU internal energy market set the wider context for the CER. The EU Commission have signalled their intention in "Prospects for the internal gas and electricity market" 2007 to bring forward new proposals to strengthen the coordination and effective working of energy regulators across Europe. The Government welcomes these developments in the European Union.
- 3.18.4.** As the gas and electricity markets in Ireland mature, the necessity for "heavy" regulation must decrease. We welcome the emergence of lighter regulation in the retail electricity market where CER has recently withdrawn from regulating tariffs for large electricity users. We expect the trend by which tariff regulation incrementally ends to steadily continue over the next few years.
- 3.18.5.** The Government's objective is to deliver an Irish energy market characterised by many players and a light handed regulatory regime. We support independent regulation which is strongly oriented towards consumer interests rather than producer interests, which is fully in line with the principles of the Government White Paper "Regulating Better" and which ensures secure, sustainable energy supply, protects all consumers and serves the economic and competitiveness interests of Ireland.
- 3.18.6.** Actions:
- We will comprehensively review the Irish energy regulatory framework following the introduction of the Single Electricity Market and in the overall context of the All-Island Energy Market, regional energy market development and further developments in the EU internal energy market. The overall objective of the review will be to ensure the optimum regulatory environment to meet the energy challenges up to 2020 in relation to security of supply, sustainability and competitive markets. The review will involve comprehensive consultation with all stakeholders on the island, with the EU Commission and with the OECD.

### **3.19. Strategic Goal 4: Supporting a Sustainable Future for the Semi-State Energy Enterprises**

- 3.19.1.** The Semi-State Energy bodies, ESB, Bord na Móna and Bord Gais Éireann, and latterly EirGrid, serve Ireland very well and have played pivotal roles over the years in ensuring energy supplies, delivering energy infrastructure and serving consumers and business in line with economic, social and regional objectives. The Government recognises the fundamental role played by the Bodies in the economic and social development of Ireland. We recognise the strategic value of maintaining ESB, BGE and Bord na Móna as strong, commercially viable State owned companies into the future. EirGrid, as the most recently established Semi-State entity, has a crucial national role in keeping power flowing and available at all times in a transparent environment which delivers security of supply and supports competition and the consumer.
- 3.19.2.** ESB and BGE have crucial strategic roles in the electricity and gas markets, and must continue to change and adapt to the liberalised market in a constantly changing landscape. They play key roles in the All-Island Energy Market.
- 3.19.3.** Bord na Móna, as well as delivering on its existing core business, is developing new strategic directions with full Government support including renewable energy, waste to energy, energy research and development and power generation. Bord na Móna will play a key role in delivering national bioenergy/biomass goals up to 2020 including appropriate strategic partnerships with the private sector.
- 3.19.4.** EirGrid has a strategic set of challenges over the next decade in terms of all-island security of supply, sustainability and competitiveness including the implementation of a 20 year Grid Strategy, interconnection and taking on the role of Transmission Asset Owner as well as Operator.
- 3.19.5.** The retention of the gas and electricity transmission and distribution networks and strategic energy infrastructure in State ownership is Government policy and these assets will never be privatised. The continued strategic development through multi annual corporate strategies of the Semi-State companies both in terms of their competitive market activities and their “monopoly” network interests will be encouraged and overseen by the Government.
- 3.19.6.** In line with EU requirements and to ensure that State owned companies compete on a level playing field with the private sector, the continued separation and ringfencing of business is required. Unbundling of the distribution business will be completed for both ESB and BGE in 2007. We have also set out other structural changes which will reshape the remits of the Semi-State energy bodies in a new landscape.
- 3.19.7.** The prospect of BGE and Bord na Móna engaging in the power generation business is being realised and is to be welcomed. It is an additional means of introducing strong indigenous players (with supply customer base) into competition with ESB, Viridian, AES, Airtricity and other independent players. Given the size and scale of the market it makes sense and helps to create a dynamism in the small Irish energy sector. BGE has already developed an electricity supply base and we support their plans to develop a new power generation station at Whitegate by 2009. Bord na Móna has recently purchased Edenderry with Government approval which will provide a key testing ground for cofiring potential. With this development, together with its plans to expand its wind and bioenergy portfolio, Bord na Móna is positioned to become an important player in Irish renewable energy.

**3.19.8.** State owned enterprise must provide high quality customer service, and value for money and efficiency both for the customer and for the shareholder. The Government, as shareholder and from an energy policy perspective, will work to ensure that the Energy Semi-State bodies deliver on their commercial mandate, their strategic services and their investment programmes to the highest standards of efficiency in the interests of the economy.

**3.19.9.** Actions:

- We will ensure the delivery under the NDP 2007-2013 of the State bodies' planned capital programmes for critical energy infrastructure;
- We will review dividend policy in conjunction with Department of Finance during 2007 with a view to balancing Shareholder and overall energy policy goals;
- We will agree corporate strategic plans for the Semi-State Companies beyond 2010 within 12 months;
- We will support ESBI in its commercial development as a strong international player as part of the ESB Group.

## **3.20. Strategic Goal 5: Ensuring Affordable Energy for Everyone**

**3.20.1.** Everyone should be able to afford an adequate energy supply and to live in a warm home. While there are many definitions and measurements of fuel poverty, a good working definition from the National Action Plan for Social Inclusion 2007-2016 is the inability to afford adequate warmth in a home or the inability to achieve adequate warmth because of the energy inefficiency of the home.

**3.20.2.** The role of the social welfare system in relation to fuel poverty is primarily to provide income support through weekly social welfare payments. There are also dedicated specific allowances intended to supplement the payments system, such as the fuel allowance scheme and the Electricity or Gas Allowances paid as part of the household benefits package [HBS], with 471,000 recipients of one or both. There are some 274,000 recipients of fuel allowance, with over €161 million the 2007 estimate for this area, an increase of 29% on 2006.

**3.20.3.** Fuel allowance is not intended to meet heating costs in full but is intended as a supplement to other social welfare payments. Of the total number of fuel allowance recipients, over half, 143,000, also receive the relevant HBS allowance. There are over 340,000 recipients of the latter, with the 2007 cost estimated at €157 million, an increase of 32% on 2006. The Allowances were increased in January 2007 by 33%.

**3.20.4.** The dedicated schemes listed as well as general social welfare payments and allowances to address poverty and income shortfalls both assist with fuel poverty. However it is clear that more needs to be done in this area and this social aspect of energy policy is a key Government concern.

**3.20.5.** The National Action Plan for Social Inclusion 2007-2016 [NAPS] sets the overall policy framework for tackling poverty and social inclusion up to 2016 and sets out a coherent and comprehensive approach for the next ten years. It provides the appropriate context for the design and implementation of sustained actions and measures targeted at fuel poverty from all perspectives. DCMNR, SEI as well as ESB, BGE and all energy suppliers will continue to work with Departments and Agencies to systematically address Energy Efficiency and Affordability challenges for vulnerable members of Irish society.

**3.20.6.** Actions:

- We will deliver, under the National Action Plan for Social Inclusion 2007-2016, sustained collective action by all relevant Departments and Agencies to systematically tackle fuel poverty through effective delivery of existing schemes and the introduction of new measures as required;
- We will establish in 2007 a fully representative Inter Departmental/Inter Agency Group to oversee and drive coordinated delivery of all fuel poverty initiatives and programmes chaired by the Office of Social Inclusion. The Group will report, under the NAPs institutional structures to the Cabinet Committee on Social Inclusion, as well as to the Cabinet Committee on Infrastructure;
- We will ensure the full involvement of all agencies and local authorities in enhancing programmes for fuel poverty at national, regional and local level;
- We will ask CER to work with all energy suppliers and support agencies to intensify existing measures and identify and implement additional actions in time for Winter 2007/2008 to help their vulnerable customers including smart metering projects;
- We will regularly review and enhance as necessary the fuel allowance scheme and capital investment measures aimed at improved energy efficiency and demand reduction in support of eliminating fuel poverty;
- We will, through the SEI Warmer Homes Scheme, continue to deliver energy efficiency investment measures in low income housing and finalise a framework for significant extension of the Low Income Housing Schemes which will accelerate the pace of remedial actions;
- We will publish this year, and regularly update thereafter, a directory of all national and local schemes of assistance in relation to fuel poverty which will ensure awareness by vulnerable groups and support agencies of the help available;
- We will complete the 2006 Fuel Poverty Action Research Project by end 2007 which will improve energy efficiency in selected older houses and monitor and report on outcomes in terms of improved cost efficiency, household comfort and health levels. 300 houses are involved – urban houses in the Cork area and rural houses in Donegal. We will extend the initiative to other rural and urban areas in light of the results of the pilot project;
- We will build on the results of the €2 million Waterford Fuel Poverty Research Project being undertaken by SEI;
- We will ensure that all social housing refurbishment and new build schemes incorporate energy efficient heating to verified high quality standards;
- We will progress further measures to enhance the contribution of energy efficiency to alleviating fuel poverty as set out in the National Energy Efficiency Action Plan;

- We will allocate a further €70 million to the scheme for the installation of central heating in local authority rented dwellings over the period 2007-2008;
- We will allocate significant amounts towards the Remedial Works Scheme to fund major refurbishment works to groups of local authority rented dwellings, in line with the review of local authority action plans, over €440 million having been spent since the introduction of the scheme in 1985.

### **3.21. Strategic Goal 6: Creating Jobs, Growth and Innovation in the Energy Sector**

- 3.21.1.** The Irish energy sector directly employs over 12,000 people. It has a turnover of over €7 billion and directly contributes €1.8 billion to GNP. It is the Government's view that delivery on the policy directives and targets set out in this energy policy framework to 2020 in support of sustainability and competitiveness will create increased employment and growth within the energy sector itself, as well as in related sectors including agriculture, forestry, construction, engineering, information technology and the financial and legal services.
- 3.21.2.** Ireland already has a buoyant market in the supply of equipment and services to the energy sector, with both international and indigenous suppliers and service providers operating in the market place. The sector is already expanding in response to initiatives taken in recent years including the Greener Homes initiative and support for Renewable Energy. Further expansion is forecast as the market-driven opportunities are realised by both foreign and indigenous energy enterprises. There is considerable potential for economic growth and job creation in the energy efficiency area (given our targets for the built environment in particular) as well as in renewable energy technology, bioenergy supply and demand. Renewable and bioenergy will provide rural and regional employment and economic activity. Opportunities for technical and engineering services in renewables, energy efficiency, CHP heating and Demand Side Management are just some of the key possibilities.
- 3.21.3.** There is therefore considerable potential for the Irish energy enterprise sector right across the energy areas, to grow significantly as a market-led knowledge based sector, characterised by innovation and driven by technological development. This sector can competitively serve Ireland's energy needs and actively pursue overseas opportunities.
- 3.21.4.** The Government intends to capitalise on the opportunities for employment and growth in the energy and energy related sectors which will result from national and EU energy policy directions. While much of the growth will be demand led it is clear that a cohesive approach across Departments and Agencies working with the energy enterprise sector will help to create the right conditions to realise the opportunities. As a first step we need to undertake analysis to review and quantify the economic opportunities inherent in the new energy policy framework.

### 3.21.5. Actions

- We will ask Enterprise Ireland and SEI to review and recommend on economic, employment and value added opportunities across the value chain for the Irish energy sector in light of EU and national energy policy developments. The review will be completed by early 2008, overseen by the Enterprise Advisory Group;
- We will encourage development of energy enterprise led networks to establish a strategic agenda for their areas of activity;
- We will, through Enterprise Ireland, support appropriate investment opportunities in energy enterprises and research that have the potential to deliver new innovative products and services also to the international market, informed also by Enterprise Ireland's review in 2007 of the international market for greener technologies products and services.



## Section 4 Integrated Approach to Delivery

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### 4.1 Introduction

- 4.1.1.** We are setting a lead in this White Paper with unambiguous objectives for energy policy to 2020 and a range of actions to deliver a sustainable energy future for Ireland.
- 4.1.2.** We will work in partnership with others to achieve these goals. The energy sector itself, both private and semi-state enterprise, as well as the Commission for Energy Regulation, has a pivotal role to play in terms of delivering with us on the collective challenges for their businesses in a volatile world. The Irish economic sectors and consumers generally have a key contribution to make in ensuring that we deliver the right outcomes in the interests of the economy and society.
- 4.1.3.** The Social Partners have explicit roles and responsibilities to fulfil. Local authorities and regional bodies have a critical role to play. Independent organisations and voluntary groups can communicate messages and help the public get involved in decision-making.
- 4.1.4.** We will continue to cooperate closely with our Northern Ireland colleagues and the Northern Ireland energy sector in delivering our shared objectives under the All-Island Energy Framework.
- 4.1.5.** We need the research community to work closely with us to deliver on the ambitious agenda for Irish energy policy. We need expert and robust commentary and analysis on energy matters from the academic world, policy research institutes and the media.
- 4.1.6.** In the final analysis, delivering these changes requires substantive behavioural change. Each individual has a role to play in the structural shift needed to change the way we use energy so that we develop as a society and economy which values energy and is conscious of the need to contribute to a sustainable environment.
- 4.1.7.** The Government itself will ensure that energy policy is pursued as a whole of Government priority. Energy is highly complex and has a pervasive effect on other sectors. Energy policy by definition is very closely interrelated with other policy areas. The work cuts across traditional Departmental and Agency lines. We have already shown that we can achieve effective interdepartmental working on energy matters. We will build on this and ensure a fully integrated and cohesive approach, supported by comprehensive stakeholder involvement and backed up by full accountability for performance and delivery.
- 4.1.8.** The strategic goals for delivery of the energy policy framework are as follows:
- Strengthening our national capabilities in the energy policy field
  - Ensuring a whole of Government approach to energy policy
  - Reaching out to stakeholders in implementing our strategic goals for energy
  - Ensuring accountability and transparency through regular progress reporting and review

## 4.2. Strategic Goal 1: Strengthening our National Capabilities in the Energy Policy Field

4.2.1. Energy policy is a highly complex area and needs a fully evidence based approach to policy making, drawing on scientific, economic, financial, environmental and other expertise and analysis.

4.2.2. We need to enhance our analytical and forecasting capabilities in the field of energy policy in support of our strategic goals. We also need to draw effectively and build on existing capability in SEI and other State Agencies as well as other public sector organisations, both here in Ireland and internationally.

4.2.3. Actions:

- We will review our analytical and forecasting capability needs in 2007 and identify immediate options for building on existing energy capabilities in the public sector;
- We will commission a Strategic Review of Sustainable Energy Ireland which will make recommendations, in light of our energy policy goals, on its future remit, resources and structure;
- We will improve the linkages between Government Departments, State-sponsored bodies and regional and local organisations to enhance the delivery of energy policy and service delivery at all levels, and, in that context, review the remits, structures and funding arrangements associated with the local energy agencies, with the aim of enhancing their valuable role, taking account of the need to balance efficiency, operational economies of scale and the benefits of local action;
- We will continue initiatives to enhance significantly energy research capacity in third level institutions on the island and also encourage the Semi State Energy Enterprises to enhance their role in capacity building at undergraduate and graduate level;
- We will ensure the design and development of a wider range of energy related training and education courses in conjunction with providers in the public and private sector;
- We will expand our funding support for energy policy research activities by the ESRI and other public research agencies beginning this year;
- We will foster energy policy research projects, policy and programme reviews and evaluations in Irish academic and third level institutions and in public policy research organisations.

## 4.3. Strategic Goal 2: Ensuring a Whole of Government Approach to Energy Policy

4.3.1. Energy policy is interrelated with all significant areas of Government policy. Transport policy has a profound impact on energy use in the economy, and, in turn, is influenced by regional and urban planning policy. Agriculture and land use policies are central to our delivery of challenging goals for the bioenergy sector. Environmental policy has a fundamental involvement with energy policy

in relation to climate change and sustainability overall. Enterprise and competitiveness policy depends on secure supplies of energy at competitive cost for the economy and consumers. There are many other linkages including social policy and built environment interrelationships. The increasing importance of EU external energy policy and our own bilateral energy relationships with other countries have already led to new structured approaches, involving the Department of Foreign Affairs closely on energy matters.

**4.3.2.** Energy policy development and implementation must therefore be fully aligned with economic and social policy objectives. The alignment requires structured engagement and cooperation across Departments and Agencies under the Government's leadership.

**4.3.3.** Policy development and delivery requires fully open and informed parliamentary debate, in the interests of quality scrutiny and accountability for energy policy. Such debate heightens the profile of energy issues in the media and society. There is an opportunity for Oireachtas Committees to reflect on new directions, structural change and the impact of technological advances in the energy field, taking a more long term view.

**4.3.4.** Actions:

- We will continue to deliver the whole of Government approach to energy issues overseen by the Cabinet Committee on Infrastructure and other Cabinet Committees, including Social Inclusion and EU Affairs, as necessary, supported by the Senior Officials Groups;
- We will establish, as required, Ministerial Task Forces to oversee and drive energy policy issues requiring particular cross Government attention, based on the model of the Ministerial Task Force on Bioenergy and Ministerial Task Force on Climate Change;
- We will establish senior cross department and inter agency Groups as required, to move specific energy challenges ahead;
- We will oversee the collective delivery by Departments, the public sector and energy state enterprises of the €8.5 billion energy investment programmes in the National Development Plan;
- We will continue to work with the Houses of the Oireachtas and its Committees to deliver quality scrutiny and accountability in relation to the formulation and performance of energy policy, and particularly on legislation.

## **4.4. Strategic Goal 3: Reaching Out to Stakeholders in Implementing our Strategic Energy Goals**

**4.4.1.** Everyone in society has a stake in energy policy. Energy is essential to just about every aspect of our life. The Green Paper consultation process and the high profile of energy issues have underlined the appetite for a wider more sustained public debate on energy policy. There is also demonstrable public awareness of energy issues, including the complex global context. Better communication and clarity on decisions, which directly affect individuals, such as energy prices, is needed. We will lead the drive for better communication and engagement on energy issues at national and local level and for regular high quality consultation by the Public Service on energy policy decisions and service delivery. The energy sector itself should also encourage and inform public discussion and debate, in a proactive way.

#### 4.4.2. Actions:

- We will review existing mechanisms for engagement by Departments and Agencies with interest groups and stakeholders with a view to putting in place best practice structures for ongoing engagement on energy policy issues with all stakeholders;
- We will invite CER to review its own consultation and communication processes and to develop proposals to enhance them;
- We will put mechanisms in place to ensure high quality and frequency of consultation to inform energy policy making, in line with the objectives of the Government White Paper “Regulating Better” and the Guidelines on Consultation for Public Sector Bodies;
- We will promote and support informed debate in the media on energy policy including looking at the possibility of sponsoring energy fellowships and awards for journalists and sponsoring informed energy-related content across the range of media outlets.

## 4.5. Strategic Goal 4: Ensuring Accountability and Transparency Through Regular Progress Reporting and Review

4.5.1. Energy policy implementation must focus on tangible outcomes. The new energy policy agenda is inevitably complex and dynamic, with short and medium term priorities as well as a very long time horizon. We already, through SEI, publish an extensive range of energy indicators each year and these will continue to be published annually. These will continue to inform energy policy directions and we will expand the range of energy indicators and the national energy sector modelling capability.

4.5.2. Implementation of the energy policy framework in this White Paper, and the performance of energy policy in relation to delivering the key priorities will be regularly reviewed and reported on.

#### 4.5.3. Actions:

- Annual progress towards the energy policy aims will be reported and benchmarked in Departmental Annual Reports;
- We will ensure that the energy investment programmes are subject to rolling expenditure review and value for money policy review;
- We will undertake a review, in consultation with stakeholders, of the energy policy framework 2007-2020 every two years, reporting on implementation and progress towards targets, as well as adjusting them in light of developments. The first such report will be due in 2009;
- The 2007-2020 energy policy framework will be fundamentally reviewed, in consultation with stakeholders, every five years and adjusted to take account of energy developments at national, EU and international level as well as technological and macro economic trends. The first such comprehensive review will be due in 2012.

# Appendix – List of Submissions on Green Paper

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## Organisations

AES  
Airtricity  
AMERGIN Centre for Sustainable Energy Development  
Association of Irish Energy Agencies (AIEA)  
Ballyfermot Residential Energy & Fuel Poverty Project Group  
Better Energy Options  
Better Environment with Nuclear Energy (BENE)  
Bord Gáis  
Bioverda Sustainable Energy  
Bord Na Móna  
Border, Midland & Western Regional Authority  
Centre for Renewable Energy at Dundalk IT (CREDIT)  
Commission for Energy Regulation (CER)  
Coss Kilkenny  
Confederation of European Waste-to-Energy Plants (CEWEP) Ireland  
Chambers Ireland  
Clare Wood Energy Project  
Coastal Concern Alliance  
Coilte  
Combustion Research Centre (NUI) Galway  
Comhar  
ConocoPhillips  
Consumer Association of Ireland  
Cork City Council  
Cork County Council  
CSA Group Limited  
Cylon Control Ltd  
Dalkia Limited  
Department of Enterprise, Trade and Employment  
Dublin Regional Authority  
Eaga Group  
EirGrid  
Electricity Research Centre  
Emerald Energy  
Energy Consulting  
Engineers Ireland, Irish Academy of Engineering and the Energy Institute  
Enterprise Ireland  
EON  
Environmental Protection Agency (EPA)  
ESB

ESB ESOP Trustee Ltd  
Economic and Social Research Institute (ESRI)  
Fáilte Ireland  
Feasta  
Federation of Petroleum Suppliers  
Fingal Development Board  
Fingelton White & Co Ltd  
Forest Friends  
Forfás  
Friends of the Earth  
Galway City Council  
Ganymede Services  
GEM – Utilities Ltd  
Gluaiseacht  
Green Party  
Hunters Hotel  
Irish Business Employers Confederation (IBEC)  
Irish Congress of Trade Unions (ICTU)  
Irish Co-operative Organisation Society (ICOS)  
Industrial Development Authority (IDA) Ireland  
Imera Power  
Indaver Ireland  
Irish Offshore Operators Association  
Irish Academy of Engineering  
Irish Bioenergy Association  
Irish Solar Energy Association Ltd  
Irish Woodpellets Ltd  
Irish Small & Medium Enterprise (ISME)  
Irish Wind Energy Association (IWEA)  
Labour Party  
Landy Machinery  
Macra na Feirme  
Marine Institute  
Marine Research  
Marathon Oil  
National Consumer Agency (NCA)  
Northwest Group  
Oriel Windfarm Ltd  
PM  
Port of Cork  
Quinns of Baltinglass  
RDS Committee of Science and Technology  
Royal Institute of Architects of Ireland  
Sustainable Energy Ireland (SEI)  
Shannon LNG  
Shell to Sea  
South-West Regional Authority  
South-East Regional Authority  
Southern & Eastern Regional Assembly

SWS Energy Services  
Teagasc  
The Competition Authority  
The Irish Bio-Fuels Initiative  
Tipperary Energy Agency  
UCD Energy Research Group  
Vividlogic  
Viridian  
Waterford Chamber  
West Regional Authority  
West Regional Authority in support of the Irish Energy Agencies  
Western Development Commission  
White Young Green

### **List of individual submissions**

Mr. Andrew Algeo  
Mr. David Algeo  
Ms. Erica Algeo  
Senator Marc McSharry  
Mr. Tom Baldwin  
Ms. Anna Lawlor  
Rev. Gerard Mc Greevy  
Prof. Cleland McVeigh  
Dr. Tom O' Flaherty  
Mr. Ronnie Owens

## Glossary of Terms

**Bioenergy** is the general term for energy derived from biomass (see below).

**Biofuel Obligation** a government requirement that liquid fuel suppliers blend a certain proportion of liquid biofuels into fuel sold.

**Biofuels** are any solid, liquid or gaseous fuels produced from organic materials, either directly from plants or indirectly from industrial, commercial, domestic or agricultural wastes.

**Biomass** all the earth's living matter; materials such as wood, plant and animal wastes, which – unlike fossil fuels – were living matter until relatively recently.

**Carbon Capture and Storage** removing CO<sub>2</sub> from combustion products and sequestering (locking away) it in ways so that it cannot find its way back into the atmosphere, e.g. planting trees or pumping it into disused oil or gas wells, saline aquifers or in deep ocean areas.

**Clean Coal Technology** new combustion techniques such as Integrated Gasification Combined Cycle which result in lower emissions of sulphur and nitrogen compounds.

**Co-firing** burning biomass or waste material along with fossil fuels in power station boilers.

**Combined Heat and Power** the ability to usefully utilise some of the waste heat produced as well as electricity generated, resulting in increased efficiency of energy use.

**Demand Side Management** technical measures or behaviour which reduces energy demand when required.

**District Heating** the supply of hot water to many distributed premises from a single boiler.

**Electricity Distribution System** the lines, cables, etc. which deliver electricity from the transmission system to customer premises.

**Electricity Transmission System** the overhead lines, pylons, etc., which convey electricity across the country from generating stations to load centres.

**Energy Charter Treaty** The Energy Charter Treaty is an international treaty on energy intended to strengthen the law on energy issues, creating a level playing field of rules to be observed by participating governments, to mitigate the risks associated with energy-related investments and trade.



**Energy Community** The Energy Community is a process that aims to extend the EU internal energy market to the South East Europe region and beyond. The Treaty establishing the Energy Community was signed in Athens during 2005.

**Energy Demand** the sum of the energy requirements of customers at the point of use.

**Energy Infrastructure** the equipment or “hardware” needed to convey energy from points of origin to points of use.

**Energy Intensity** the amount of energy needed for one unit of economic activity, e.g. kg of oil per €GDP.

**European Neighbourhood Policy** Through this policy, the EU offers neighbouring countries the opportunity to build on a mutual commitment to common values such as democracy and human rights, rule of law, good governance, market economy principles and sustainable development.

**Generation** the process of conversion of fuels to electricity.

**Generation Adequacy** a measure of whether or not there is sufficient generating capacity to meet demand at given points in time.

**Grid** the electricity network (normally understood to refer to the transmission network).

**Hydrocarbons** fossil fuels consisting mainly of carbon and hydrogen, such as oil and gas.

**Interconnection** the linkage of the electricity or gas transmission networks of adjacent systems, e.g. between Ireland and Northern Ireland.

**Landbank** a portfolio of sites, e.g. where generating stations are situated.

**Mid-merit** generating plant which is required to run in variable output mode and/or for only part of the time. Not the cheapest plant on the system.

**Ocean Energy** energy from wave energy or marine current conversion systems.

**OSPAR** The 1992 OSPAR Convention guides international cooperation on the protection of the marine environment of the North-East Atlantic. It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution.

**Plant Availability** the percentage of the relevant time period that a particular plant is physically able to operate.

**Primary Energy** the total energy content of the fuels and other energy sources required to be utilised to meet the energy requirements of consumers (energy demand).

**Renewable** not depleted through constant use or can be replenished within a relatively short period of time (generally taken to be a human lifespan).

**Sustainable** In the context of energy, sustainability has come to mean the harnessing of those energy sources:

- that are not substantially depleted by continued use
- the use of which does not entail the emission of pollutants or other hazards to the environment on a substantial scale
- the use of which does not involve the perpetuation of substantial health hazards or social injustices

This definition derives from the United Nations Bruntland Commission, 1987.

In simple terms, “sustainable energy” includes concepts of renewable energy, cleaning up fossil fuel generation, and transporting and using converted energy forms as efficiently as possible.

## Selected Sources

### **IEA World Energy Outlook 2006**

<http://www.worldenergyoutlook.org/>

### **EU Commission's Strategic Energy Review**

[http://ec.europa.eu/energy/energy\\_policy/index\\_en.htm](http://ec.europa.eu/energy/energy_policy/index_en.htm)

### **The Commission's Report on the internal gas and electricity market**

[http://eurlex.europa.eu/LexUriServ/site/en/com/2006/com2006\\_0841en01.pdf](http://eurlex.europa.eu/LexUriServ/site/en/com/2006/com2006_0841en01.pdf)

### **published in conjunction with "An Energy Policy for Europe"**

[http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007\\_0001en01.pdf](http://eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0001en01.pdf)

### **and with the Sectoral Inquiry Report**

[http://eurlex.europa.eu/LexUriServ/site/en/com/2006/com2006\\_0851en01.pdf](http://eurlex.europa.eu/LexUriServ/site/en/com/2006/com2006_0851en01.pdf)

### **Green Paper on Energy Policy 2006 "Towards a Sustainable Energy Future for Ireland"**

<http://www.dcmnr.gov.ie/NR/rdonlyres/54C78A1E-4E96-4E28-A77A-3226220DF2FC/26716/EnergyGreenPaper1October2006.pdf>

### **The Framework Social Partnership Agreement "Towards 2016"**

[http://www.taoiseach.gov.ie/attached\\_files/Pdf%20files/Towards2016PartnershipAgreement.pdf](http://www.taoiseach.gov.ie/attached_files/Pdf%20files/Towards2016PartnershipAgreement.pdf)

### **The National Development Plan 2007-2013**

<http://www.ndp.ie/documents/ndp2007-2013/NDP-2007-2013-English.pdf>

### **The All-Island Energy Framework**

[http://www.dcmnr.gov.ie/NR/rdonlyres/BCF98EC4-7321-4E3F-8685-BFFCA2BF2DF4/0/All\\_island\\_Energy\\_Market\\_Development\\_Framework.pdf](http://www.dcmnr.gov.ie/NR/rdonlyres/BCF98EC4-7321-4E3F-8685-BFFCA2BF2DF4/0/All_island_Energy_Market_Development_Framework.pdf)

### **The Seventh Framework Programme**

[http://cordis.europa.eu/fp7/home\\_en.html](http://cordis.europa.eu/fp7/home_en.html)

### **Review of the National Climate Change Strategy**

[http://www.environ.ie/DOEI/doi/pub.nsf/0/741b010079da033a802571b5003c07ff/\\$FILE/1Irelands%20Path%20to%20Kyoto%20Compliance.pdf](http://www.environ.ie/DOEI/doi/pub.nsf/0/741b010079da033a802571b5003c07ff/$FILE/1Irelands%20Path%20to%20Kyoto%20Compliance.pdf)

### **The National Action Plan for Social Inclusion 2007-2016**

<http://www.socialinclusion.ie/documents/NAPinclusionReportPDF.pdf>

### **Wind Energy Development Guidelines 2006**

[http://www.environ.ie/DOEI/DOEIPub.nsf/0/5559589989dc56328025719c004eb778/\\$FILE/Wind%20Energy.pdf](http://www.environ.ie/DOEI/DOEIPub.nsf/0/5559589989dc56328025719c004eb778/$FILE/Wind%20Energy.pdf)  
<http://www.sei.ie/index.asp?locID=686&docID=659>

**Energy in Ireland “1990-2005”, SEI**

<http://www.sei.ie/index.asp?locID=686&docID=659>

**Ocean Energy in Ireland 2005**

<http://www.marine.ie/NR/rdonlyres/86491414-3E7E-48E5-A0E1-287CA9191C61/0/OceanEnergyStrategy.pdf>

**EU Renewable Energy Roadmap**

[http://ec.europa.eu/energy/energy\\_policy/doc/03\\_renewable\\_energy\\_roadmap\\_en.pdf](http://ec.europa.eu/energy/energy_policy/doc/03_renewable_energy_roadmap_en.pdf)

**EU Biomass Action Plan**

[http://ec.europa.eu/energy/res/biomass\\_action\\_plan/doc/2005\\_12\\_07\\_comm\\_biomass\\_action\\_plan\\_en.pdf](http://ec.europa.eu/energy/res/biomass_action_plan/doc/2005_12_07_comm_biomass_action_plan_en.pdf)

**National Strategy for Biodegradable Waste 2006**

[http://www.environ.ie/DOEI/DOEIPol.nsf/0/c8f71c4e05251d8280256f0f003bc802/\\$FILE/Biodegradable%20Waste.pdf](http://www.environ.ie/DOEI/DOEIPol.nsf/0/c8f71c4e05251d8280256f0f003bc802/$FILE/Biodegradable%20Waste.pdf)

**EU Energy Efficiency Action Plan 2006**

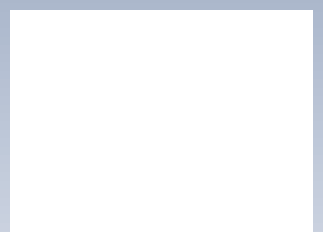
[http://ec.europa.eu/energy/action\\_plan\\_energy\\_efficiency/doc/com\\_2006\\_0545\\_en.pdf](http://ec.europa.eu/energy/action_plan_energy_efficiency/doc/com_2006_0545_en.pdf)

**The Science Technology and Innovation Strategy 2006-2013**

<http://www.entemp.ie/publications/science/2006/sciencestrategy.pdf>

**Government White Paper “Regulating Better”**

[http://www.betterregulation.ie/attached\\_files/upload/static/RegulatingBetterGovernmentWhitePaper.pdf](http://www.betterregulation.ie/attached_files/upload/static/RegulatingBetterGovernmentWhitePaper.pdf)



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## **ATTACHMENTS**

10. Proceedings of the 2<sup>nd</sup> International Conference of Renewable Energy in Maritime Island Climates. 26 – 28 April 2006. Security of Energy Supply in Ireland – A Key Driver for Renewable Energy. Kateryna Korneyeva, Brian P. Ó Gallachóir and Eamon J. McKeogh, Sustainable Energy Research Group, Department of Civil and Environmental Engineering, University College Cork, College Road, Cork, Ireland  
<http://www.ucc.ie/serg/pub/SOS-R2.pdf>

### **Security of Energy Supply in Ireland - A Key Driver for Renewable Energy**

Kateryna Kornyeveva\*, Brian P. Ó Gallachóir & Eamon J. McKeogh

Sustainable Energy Research Group, Department of Civil and Environmental Engineering,  
University College Cork, College Road, Cork, Ireland

\* Corresponding Author

#### **Abstract**

Recent oil and gas price rises coupled with Russia – Ukraine gas supply interruptions have again focussed attention on security of energy supply. Security of energy supply is not always a well-defined or understood term. It is a multi-faceted phenomenon and may be classified in terms of physical (quantity) risks and price (economic) risks. It may also be treated in different timeframes, with short-term risks typically having different characteristics and impacts than long-term risks. This paper investigates the issues associated with security of energy supply using Ireland a case study for the analysis. The focus is on the electricity rather than thermal or transport energy markets. This provides a direct linkage to renewable energy policy, which in Ireland has been concentrated principally on increasing renewable energy penetration in the electricity market. This in turn results in the focus of this paper being on security of gas supply, as gas accounts for 72% of Ireland's electricity generation fuel mix in 2020. The paper examines a number of concerns regarding the existing gas supply system and explores options to address these. These include the short term risks associated with the single point of failure on the Scottish Interconnector and low pressure gas supply in the Cork area. The long term issues are linked to the increasing geographical concentration from which imports are drawn coupled with delays in harnessing the gas from the Corrib Gas Field. While options do exist for improving the gas supply infrastructure, a key component of improving Ireland's security of energy supply is the increased penetration of renewable energy, in particular wind energy in the short term. The key advantages of renewable energy in this regard are related to the indigenous nature of renewable resources and that absence of fuel price volatility.

#### **Introduction**

Energy plays a vital role in our society and the economic impact of supply disruption can

be severe and wide ranging [1]. Projections for the adequacy of energy resources to meet future global demand are not optimistic. The International Energy Agency (IEA) reports in its World Energy Outlook 2004 that while the world's energy resources are adequate to meet the demand to 2030, it expresses concerns regarding the period thereafter [2]. Others are less optimistic and project that based on 'peak oil' analysis, if the Earth's fossil fuel resources are not utilised more economically and efficiently, they will run out within a relatively short time [3].

The primary energy resources inside the OECD are no longer sufficient to meet its own needs, and are declining significantly as the demand within the OECD increases rapidly. So dependence on imports is growing rapidly [2]. That is why it is important for Government to develop future strategy in energy imports, to encourage development and research of alternative sources of energy and provision of new technologies.

This paper focuses on the issues facing one such OECD Government in order to shed light on some of the myriad of issues that security of energy supply encapsulates. The country chosen for this case study analysis is Ireland, which is interesting in a number of ways. Within the EU Ireland is second only to Luxemburg in terms of the level of energy import dependency, which was 87% in 2004 [4].

Security of energy supply is not always a well-defined or understood term and the difficulties of grappling with the issue are touched on in this paper. The focus in this paper is on security of supply associated with the electricity market. The paper does not deal with the electricity network infrastructure, which clearly has a significant role in ensuring supply security.

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It rather explores the fuel mix for electricity generation and uses this as the launching point for analysis.

The rationale for this is to clearly link the topic to the theme for this conference, renewable energy. The focus of renewables policy in Ireland has been on the electricity market in order to achieve the EU Directive (2001/77/EC) for Ireland – 13.2% of gross electricity consumption from renewable sources by 2010. This is despite the potentials and opportunities that exist for renewable penetration into Ireland's other energy markets, namely thermal and transport. In 2004, the electricity and thermal energy markets each accounted for 34% of Ireland's primary supply while the transport market accounted for 32% [4].

There is recent evidence that this situation may be changing with the announcement within the 2006 Budget Speech [5] that new incentives are planned for both the transport market (excise relief to facilitate biofuels achieve 2% of transport energy market by 2008) and for the thermal market (grants for biomass heating systems in industrial, commercial and domestic buildings).

Focusing on the electricity generation fuel mix market leads to an analysis of gas dependency. While gas accounted for 27% of the generation fuel mix in 1990, this increased to 45% in 2004 and is projected to further increase to 71% in 2020, under a base case scenario [4].

The paper examines a number of issues associated with this level of dependency that include the risks associated with future sources of gas and with the gas supply infrastructure examining both short and long term risks and physical supply and economic risks.

The paper examines possible solutions to addressing these issues and finally discusses a number of key conclusions.

### **Aspects of Supply Security**

Security of energy supply is a multi-faceted phenomenon. It can be defined as the availability of energy at all times in various forms, in sufficient quantities, and at reasonable and/or affordable prices [6]. It can also be referred to as the likelihood that the energy will be supplied without disruption

and that there is enough capacity to cover demand at all times. It can further be considered as encompassing fuel diversity and hedging against volatile fossil fuel costs on international markets. Disturbances of energy supply may occur in various ways, in specific contexts, in a certain time frame, in different places and with a great variety in consequences [7].

There are not always clear measures for the security of supply, though some research and analysis have already been done. In particular, there has been ongoing activity in the UK [8] to develop a set of security of supply metrics and a recent initial exercise in defining security of energy supply metrics for Ireland [9].

There are a number of distinct aspects to security of supply. Quantity (physical) risks may be discussed separately to price (economical) risks, for example. The discussion may also be split into two timeframes, i.e. short-term and long-term security of supply [10].

This paper focuses largely on short-term quantity risks but also explores in less depth price risk and longer term security of supply issues for Ireland.

### Physical Risk

Physical risk is associated with system vulnerability to physical supply disruption, which can be temporary or permanent. Temporary disruption (short term) can result from a number of different conditions [11], including:

- inability of a producing country to export because of either internal (civil war or unrest) or external (transport accident, natural disaster) conditions;
- export restrictions by producing countries for political or strategic ends;
- embargo disruption;
- disruptions associated with faults or damage to the internal supply infrastructure within a country.

The Government's focus in the security of supply work in the short term covers working collectively to minimize the risks of a physical unplanned interruption in energy supplies [8].



Permanent disruption (long-term) can occur when an energy source is exhausted or production ceases, or in case of geopolitical problems. In this case in long-term new sources of fuel are required.

#### Price Risk

Price risk, or economic risk is linked to physical supply and arises from a general perception that supplies are or will be physically disrupted. If a physical disruption takes place, the price can increase significantly, and even the risk of such event makes the price more volatile. In case of supply disruption price increases and the energy supply becomes very shaky [12].

Thus price risk and physical risk are connected to each other as evidenced recently by the oil price increase to \$71.85 per barrel due to a number of geopolitical and environmental issues affecting physical supply (including hurricane Katrina in Mexican gulf which forced oil production to be stopped).

In percentage terms, the effect of recent oil price changes on Gross Domestic Production (GDP) is relatively small, producing losses in the order of 0.5% of GDP for a 10% oil price increase, however oil prices have increased more than 100% over the past 2 years.

This oil-GDP effect influences the security of supply by means of price risk, in addition oil price increase creates wealth transfers from oil importing to exporting countries; reduces production output and wages and induces inflationary tendencies [13]. Thus, for the government it is important to track oil price, to predict changes, to prevent supply interruption and to provide adequate regulation at the oil market.

Within the EU, as indigenous fossil fuel energy resources become exhausted, the evolving policy is aimed at minimizing the risks and articulated in the EU Green Paper – *Towards a European Strategy for Security of Energy Supply* [14]. The policy includes energy mix diversity and geographical diversification of fuel origin, use of indigenous fuel, increased penetration of renewable and alternative sources of energy, strengthening contacts and relationships with producing countries, energy efficiency,

technological innovation and development, public understanding and trust.

#### **Security of Supply in Ireland**

Ireland's energy supply is characterized by high fossil fuel dependency (98%) and high import dependency (87%) [4]. While each of the energy end use markets (electricity, thermal, transport) accounts for roughly an equal share in energy supply the fuel mix in each market is different. Oil dominates the transport energy market (99.7%), gas holds the largest share in the electricity fuel mix (45%) and the thermal energy market is split 60% oil and 26% gas, with solid fuels and renewables accounting for the remainder.

The focus of this paper is on the electricity market and hence gas supply, which is projected to increase its share in the fuel mix to 71% by 2020 in a base case scenario [4].

#### Physical Gas Supply Risk

Because of Ireland's projected dependence on gas for electricity generation in particular, short-term physical supply interruptions can have a significant impact on the economy, due to potential knock interruptions in electricity supply.

More than 80% of gas in Ireland is imported [15], there is physical risk of supply disruption, especially in the future with gas resources depleting in the UK and the need for new suppliers.

The integrity of the physical supply infrastructure (including Interconnector capacity and operation) holds the key to ensuring short term supply security. In the longer term, physical supply security is linked to the depleting European gas resources, consequent increase in distance from Ireland to gas sources and the end of pipe characteristics of Ireland's geographic location on the international gas pipeline.

#### Short Term Physical Gas Supply Risk

The risks associated with short term gas supply to Ireland are linked to two characteristics of the supply infrastructure, namely the single point of failure on the gas Interconnector onshore in Scotland and low pressure gas in the Cork area.

In order to increase short-term gas security, a second Interconnector (IC2) between Ireland and Scotland was built in 2002. This pipeline feeds natural gas from the UK's Transco pipeline at Beattock (Moffat) in Scotland to Gormanstown via Brighthouse Bay. It complements the original Interconnector (IC1), which has been in operation since 1993 and connects Beattock with Loughshinny. If there is an interruption in supply in IC1, gas can still follow through IC2 and vice versa.

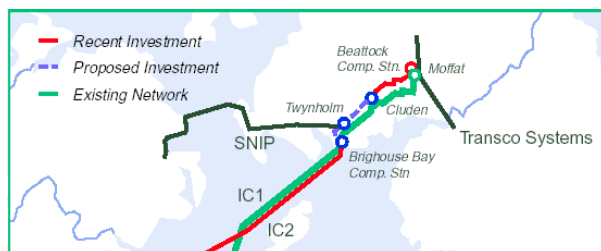


Figure 1 Possible solutions for Pipeline Cluden-Brighthouse Bay [15].

Referring to figure 1, the onshore pipeline in Scotland was reinforced with the construction of IC2, through a twinning of the pipeline from Beattock to Cluden (30 km). The remaining 50 km pipeline between Cluden and Brighthouse Bay remains as a single pipeline and hence a single point of failure on the system.

In addition, there is a further pipeline to Northern Ireland on this single pipe section, at Twynholm, the Scottish Northern Ireland Pipeline (SNIP). While plans are in place to build an Interconnector between Belfast and Gormanstown, this single pipeline between Cluden and Brighthouse Bay remains a key concern [16].

In case of an incident or accident disrupting supply between Cluden and Twynholm, all gas from Moffat is lost completely for Ireland. If such an event occurs between Twynholm and Brighthouse Bay, it will still be possible to transport a certain amount of gas to Northern Ireland by SNIP (approx. 8 mscmd), and subsequently to the Republic of Ireland<sup>1</sup>.

In addition to risk issues associated with the single pipeline, a further concern relates to the pipeline capacity. Based on the Mass Balance, provided by CER [15] the capacity,

<sup>1</sup> North-South pipeline due for completion in Q4 2006.

available from Britain is projected to be sufficient to cover growing gas demand in Ireland. In the case of high demand and low indigenous supply however (Corrib delays), which could coincide with a sudden supply interruption on a peak day<sup>2</sup> demand via Interconnectors are anticipated to increase over the capacities provided.

The other issue relating to short term supply security relates to the Cork area. The region is provided with gas mainly from the Kinsale gas field via the compression station in Middleton. Originally the Cork gas pipeline was designed for 70 bar pressure, but with the Kinsale gas reserve depletion, gas is supplied at the lower pressure of 30 bar. When gas from Kinsale field is insufficient for Cork area, gas is supplied from the Dublin region at a pressure of 70-80 bar. This would force the gas from Kinsale back to Inch terminal and as a result the gas from Dublin has its pressure stepped down at the Middleton compressor station.

In case of a pipeline leak or failure in Cork area, this low pressure will shorten the time frame for the problem to be addressed, which aspects.

#### Long Term Physical Gas Supply Risk

Long term physical gas supply risk in Ireland is linked to depletion of domestic gas resources, high level of gas import dependency and increase in distance from Ireland to gas sources.

The dependence on gas from Russia and Caspian Sea Countries in particular is set to increase. The main gas transmission routes from Russia to Europe are via Ukraine and Belarus. There has been recent evidence of tension between Russia and these countries concerning gas transit, which creates increased uncertainty and hence insecurity for the future. There is certain threat to the security of supply, in case if Ukraine or Belarus refuses to transit gas again. The option of raising the price of transit is also possible leading to a price risk.

<sup>2</sup> The coldest day in a winter in 50 years with extreme conditions which leads to the increase of gas consumption. Such day is likely to happen once in 50 years.

The most pressing issue in this regard is the delay in harnessing the available domestic resource of gas from the Corrib gas field, which can provide a 15-year supply of indigenous gas supply and to significantly reduce import dependency.

A subsidiary of Shell, Enterprise Energy, plans to bring the gas ashore on the north Mayo coast and treat it in a €150 m terminal nine miles inland at Bellanaboy. There is a strong objection by local residents and environmental, farming and inshore fishing groups, who have mounted a Shell to Sea Campaign [17], who wish to see the terminal relocated from its planned on-shore location to 70 km miles at the site of the gas field itself.

### **Improving Supply Security**

Based on an analysis of the key issues and within the limitations of the current discussion (electricity market and gas supply), the following recommendations are made with respect to improving security of energy supply in Ireland

#### Short Term Recommendations

1. Ensure all new electricity generators are complying with their licensing requirements to maintain a 5 day minimum supply of secondary fuel
2. Provide a twinning of the onshore Scotland pipeline Cluden – Brighthouse Bay to remove this single point of failure. The construction of this pipeline would cost approximately €75-85 million [15].
3. Actively develop and implement a workable solution to the current impasse with respect to the development of the Corrib Gas Field
4. Consider the following improvement in capacity for the supply infrastructure at Beattock Compressor Station. Upgrade the Brighthouse Bay Compressors Station and install of a compressor station in Twynholm on the SNIP to provide diversification in supply [16].
5. Raise the pressure in the Cork area up to 70bar. This requires an additional bypass pipe from the north side of Middleton compressor station going into Cork (apr. 2 km long). This pipeline would provide

gas delivery to Cork from Dublin at high pressure, avoiding Middleton [16].

6. Develop a long-term strategy for secure energy supply and optimal energy mix, providing an appropriate balance between fossil fuel availability and (both physical and price) risks and renewables.
7. Encourage the development of a limited commercial storage facility as a part of gas trade via the interconnectors, which would provide additional gas capacity in case of emergency or unexpected short-term demand growth due to the weather conditions etc.

#### Long Term Recommendations

1. In the longer term it is important to fully explore and maximise geographical diversification in gas supply. One potentially promising option is through LNG (liquid natural gas) trade. This would provide give possibility to transfer gas from remote countries (Algeria, Nigeria, Malaysia, Trinidad and Tobago, United Arab Emirates and Qatar), without using pipelines, which are not economically viable. An LNG terminal in Ireland could be constructed near Kinsale Gas Field, connected to the gas platform, thus the existing gas pipeline from the gas field to Inch can be used. In this way, LNG could be used provide at least a quarter of national gas demand or be sufficient entirely for the Cork area [16]. LNG can also be used as seasonable gas storage at the LNG plant (liquefaction and storage during warm season and vaporisation and injection into local pipelines during cold period). This service can increase the volume of storage in Ireland, which is currently limited to what is contained within the pipelines and remaining reserves at the Kinsale Gas Field.
2. Consider future possible routes of gas importation to Ireland after the UK reserves deplete and provide secure gas transmission. Explore the possibility of secure routes for gas transmission from Eastern Europe. For example, Germany has already started the construction of a gas pipeline from St-Petersburg to

Germany under the Baltic Sea, avoiding borders. This is expected to provide more reliable supply from Russia to the West by 2010 [16].

3. Explore possible imports from Iran (another major gas supplier), whose gas can be transmitted via Turkey and Mediterranean pipeline. In the current climate however, it cannot be considered secure, due to current geopolitical activity in the Persian Gulf.

### Link to Renewables

In the long term, with fossil fuel reserves depleting, the key component of improving Ireland's security of energy supply is to gradually diversify completely from gas. Given that oil is in shorter supply than gas and the environmental concerns associated with coal and nuclear energy (including safety in the case of the latter), this points clearly to the increased penetration of renewable energy, in particular wind energy in the short term.

By February 2006, Ireland's installed capacity from renewable energy reached 801 MW. In order to meet the 13.2% EU Directive target, Ireland requires approx. 1,433 MW by the end of 2009. Although a significant challenge, based on current build rates (178 MW in 2004, 163 MW in 2005), this is realistically achievable.

Looking out to 2020 and beyond, moving beyond this level of penetration (10% wind, the remaining 3.2% from hydro and biomass) will require the grid integration issues associated with wind energy in Ireland [18] to be properly tackled. This will require a concerted effort by the wind energy industry, the transmission system operators and the wind energy research community, facilitated by the Commission for Energy Regulation and Sustainable Energy Ireland.

Wind is the lowest-cost electricity source for the foreseeable future for Ireland. There is also significant potential biomass energy, in the first instance as co-firing within the existing peat fired power plants. Wave and tidal current energy also offer significant resource potential and require significant development and deployment effort, with potential export spin off benefits.

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11. Newspaper Article on Weaver's Cove

[http://biz.yahoo.com/ap/071024/maling\\_fall\\_river.html?.v=1](http://biz.yahoo.com/ap/071024/maling_fall_river.html?.v=1)

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AP

## Coast Guard Says Waterway Unsafe for LNG

Wednesday October 24, 4:11 pm ET

By Jay Lindsay, Associated Press Writer

### Coast Guard Says Fall River Waterway Unsafe for LNG Tanker Transit

BOSTON (AP) -- The river that runs past a proposed liquefied natural gas terminal in Fall River isn't safe for frequent traffic by massive LNG tankers, the Coast Guard ruled Wednesday in what could be a fatal blow to the controversial project.

"It kills the project, as proposed," Coast Guard Senior Chief Richard Uronis said.

The Coast Guard determined the tankers wouldn't have sufficient space to safely navigate between two bridges that are about 1,100 feet apart on the Taunton River. The Coast Guard expressed similar concerns in March 2006, but said then it was waiting for revisions from Weaver's Cove Energy, which proposed the LNG terminal.

"Vessel masters would face extraordinary navigational maneuvers when transiting the waterway and the safety risks are too great to favorably recommend the waterway as suitable," said Coast Guard Capt. Roy Nash, Captain of the Port for southeastern New England, which includes southern Massachusetts and Rhode Island. Nash has jurisdiction over vessel traffic in his region.

Fall River Mayor Edward Lambert said he was "joyous" over the Coast Guard report, and added it was time for Weaver's Cove to abandon its plans in Fall River.

"I think it does show you can beat very wealthy, powerful interests if you have right on your side," Lambert said. "We know this is not over until it's over, but this is, I think, a near death blow, if not a fatal blow."

Weaver's Cove spokesman Jim Grasso said the project was far from finished and the company would appeal the Coast Guard decision. He said Nash brought up new concerns the company didn't have a chance to respond to and ignored tests that showed the tankers could successfully navigate the river.

"We feel we can do this safely and securely," Grasso said.

The Taunton River bridges became obstacles to the project after maneuvering by opponents. The old Brightman Street Bridge was slated for demolition, but was preserved as a pedestrian walkway when opponents realized they could use it to stop the project.

The old bridge has a narrow, 98-foot-wide opening that is not aligned with the opening on the new Brightman Street Bridge, which is just 1,100 feet away. That leaves too little room for the tankers to maneuver between them, Nash said.

Weaver's Cove Energy, which is owned by Hess LNG, said it could safely negotiate the gap with smaller, specialized tankers making more frequent trips. But the Coast Guard said the tankers, which are about 700 feet long and 80 feet wide, still presented too great a risk.

Nash also said the proposed shipping route would bring LNG tankers within 100 feet of the U.S.S. Massachusetts battleship museum, another bridge and the State Pier.

"The risk of a mishap in Mount Hope Bay, and particularly in the Taunton River in the vicinity of the two Brightman Street bridges, is unacceptably high," Nash said.

The Weaver's Cove LNG terminal was approved by the Federal Energy Regulatory Commission in 2005 and has the support of various local unions. Company officials argued the project was badly needed to meet the region's growing energy demands.

But it met fierce opposition in Massachusetts and Rhode Island, which borders the route the tankers would have taken to reach the Fall River site. Opponents argued a terrorist attack or accident at the LNG terminal would be devastating to residents in the densely populated area.

Lambert declared himself a sworn enemy of the project and vowed to kill it with "a thousand paper cuts." Rhode Island in August refused to allow the dredging in Mount Hope Bay needed for the tankers to pass through.

Massachusetts Congressmen also fought for environmental protections for the site under the Wild and Scenic Rivers Act, though Weaver's Cove officials argued the heavily industrialized former Shell Oil site was neither wild or scenic.

Lambert said the relentless approach paid off.

"I think this community is proud of its effort," he said. "This is a working class community that nearly had something shoved down its throat simply to enhance profits for a company that could find alternative locations."

But Grasso said Weaver's Cove scouted locations from Maine to Connecticut and Fall River was the only one that worked. He said the company would keep pushing the project because of the acute demand for natural gas storage and supply.

"It's desperately needed," he said.

## **ATTACHMENTS**

12. Boston Globe Newspaper article on Weaver's Cove:  
[http://www.boston.com/news/local/rhode\\_island/articles/2007/10/24/coast\\_guard\\_says\\_lng\\_waterway\\_unsafe\\_for\\_tanker\\_transit/](http://www.boston.com/news/local/rhode_island/articles/2007/10/24/coast_guard_says_lng_waterway_unsafe_for_tanker_transit/)

[http://www.boston.com/news/local/rhode\\_island/articles/2007/10/24/coast\\_guard\\_says\\_lng\\_waterway\\_unsafe\\_for\\_tanker\\_transit/](http://www.boston.com/news/local/rhode_island/articles/2007/10/24/coast_guard_says_lng_waterway_unsafe_for_tanker_transit/)

## **Coast Guard says LNG waterway unsafe for tanker transit**

**October 24, 2007**

BOSTON --A proposed liquefied natural gas terminal in Fall River may have been dealt a fatal blow.

The Coast Guard has ruled the river approaching the Weavers Cove Energy project is unsafe for navigation by massive LNG tankers.

The decision affirms concerns the Coast Guard expressed last year. The agency has since done an extensive review of the project.

A major problem is the relatively short distance between two bridges on the Taunton River. The Coast Guard found the safety risks of the 700 foot long, 80 foot wide tankers navigating the 1,100 foot gap were too great.

A Coast Guard spokesman says the ruling "kills the project, as proposed."

Weavers Cove officials did not immediately return calls for comment on the ruling.



## **ATTACHMENTS**

13. Projo Newspaper article on Weaver's Cove

[http://www.projo.com/massachusetts/fallriver/content/BZ\\_COASTGUARD\\_WEAVE  
RS\\_10-25-07\\_RB7K2NO\\_v20.35aa5a2.html](http://www.projo.com/massachusetts/fallriver/content/BZ_COASTGUARD_WEAVE<br/>RS_10-25-07_RB7K2NO_v20.35aa5a2.html)

## **Coast Guard rejects LNG plan**

**01:00 AM EDT on Thursday, October 25, 2007**

**By Timothy C. Barmann**

### **Journal Staff Writer**

FALMOUTH, Mass. — The U.S. Coast Guard concluded yesterday that it would be too risky to allow liquefied natural gas tankers to travel through Mount Hope Bay and the Taunton River to a proposed LNG terminal in Fall River, a decision that might present an insurmountable roadblock for the project developers.

“After a careful analysis ... I find that the only reasonable conclusion is that the navigation safety risks associated with the vessels of the proposed dimensions and transit frequencies are unacceptably high,” said Roy A. Nash, the Coast Guard’s captain of the Port for Southeastern New England, at a news conference at the Coast Guard station at Woods Hole.

In a letter sent yesterday to the project developer, Weaver’s Cove Energy LLC, Nash said the area of most concern is the waterway from Prudence Island to the proposed site in Fall River. That waterway, Nash wrote to the company, “is unsuitable from a navigational safety perspective for the type, size, and frequency of LNG marine traffic associated with your proposal.”

As elected officials in Rhode Island and Massachusetts yesterday lauded the Coast Guard’s decision, Weaver’s Cove Energy LLC, said it would appeal, and questioned the facts Nash used to reach his conclusion.

“The decision disregards critical facts in the record and introduces both new data and new concerns on which Weaver’s Cover Energy was not provided an opportunity to comment,” the company said in a statement. “The Captain’s decision lacks the necessary factual support and we intend to appeal.”

“We haven’t gone through the document thoroughly,” Weaver’s Cove spokeswoman Marcia MacClary said in a brief telephone interview yesterday. “It will take us some time to review it. The important thing is we are moving forward.”

The company is owned by Hess LNG LLC, which is a joint venture owned equally by Poten & Partners and Amerada Hess Corp.

In an interview, Nash said there are several levels of appeal within the Coast Guard that Weaver’s Cove could pursue. First, the company must appeal to Nash directly, within 30 days. If Nash chooses not to reverse his decision, he would forward the appeal up the chain of command, to the First Coast Guard District in Boston. The final appeal within the agency lies with the Coast Guard headquarters in Washington, D.C., he said.

Weaver’s Cove first proposed building the LNG terminal in 2003. The project has been widely opposed by elected officials in Massachusetts and Rhode Island, as well as citizens groups and organizations in both states. Rhode Island was drawn into the debate because the LNG tankers that would supply the terminal would traverse a 26-mile route through Mount Hope Bay.

Opponents of the project say that the 725-foot LNG tankers that would make up to 130 trips a year would disrupt other uses of Narragansett Bay, and would create the risk of a disaster in the event of an accident or terrorist attack.

Despite that opposition, in 2005, the Federal Energy Regulatory Commission, the federal agency that issues permits for onshore LNG facilities, gave the Weaver’s Cove proposal its conditional approval.

Among those conditions was to gain additional approvals from several local and federal agencies, including the Coast Guard.

That agency first expressed concerns about LNG transits in March of last year, when Nash said that for tankers to safely pass through the old and new Brightman Street bridges over the

Taunton River would require “extraordinary maneuvers.”

The bridges — the new one is still under construction — are only 1,100 feet apart, and their openings are not aligned, creating a navigational maze for large tankers.

In May, Nash issued his preliminary finding, which was skeptical of whether LNG tankers could safely traverse that maze. The waterway, he wrote, “may not be suitable for the type and frequency of LNG marine traffic” that the company has proposed.

Yesterday’s decision comes three weeks after an announcement by National Grid that it would not continue to appeal a decision by federal regulators that rejected the company’s proposal to expand its LNG facility in Providence.

Lawmakers, who have almost unanimously opposed both projects, hailed the decision.

“The Coast Guard made the right decision,” U.S. Sen. Jack Reed said in a statement. “From a public safety and environmental standpoint, the Weaver’s Cove LNG project posed too many risks and would have placed a tremendous burden on local law enforcement and taxpayers.”

“The Coast Guard’s decision is good news in our efforts to stop this project and protect the environmental health of the Bay and the safety of thousands of Rhode Islanders,” U.S. Sen. Sheldon Whitehouse said in a statement.

“I applaud the Coast Guard for taking all aspects of the proposal into consideration and ruling on the side of safety,” said U.S. Rep. Patrick Kennedy.

“Our years of fighting the siting of LNG in a densely populated area have finally paid off,” said Rhode Island Attorney General Patrick C. Lynch, one of the key opponents of the project.

“The Coast Guard letter confirms what we have been saying all along and we hope this will not be overruled,” said U.S. Rep. Barney Frank, D-Massachusetts. “It is our hope that safety will be allowed to win out over political considerations.”

“I’m very pleased that the U.S. Coast Guard today agreed with my assessment that transporting LNG through Rhode Island’s waterways poses too many environmental and security risks to Narragansett Bay and to nearby residents,” said Governor Carcieri. “This is great news for Rhode Island and for everyone who treasures the Bay.”

Both Carcieri and Lynch called on Weaver’s Cove to end its quest to build an LNG facility in Fall River.

“I now formally call upon Hess LNG LLC to cease proceeding any further,” Lynch said. “I hope it recognizes the futility of pressing on.”

## **ATTACHMENTS**

14. “Maritime Security, Public Safety Consequences of a Terrorist Attack on a Tanker carrying Liquefied Natural Gas Need Clarification”, United States Government Accountability Office (GAO) Report to Congressional Requestors February 2007.  
<http://www.gao.gov/new.items/d07316.pdf>

February 2007

# MARITIME SECURITY

## Public Safety Consequences of a Terrorist Attack on a Tanker Carrying Liquefied Natural Gas Need Clarification



GAO  
Accountability · Integrity · Reliability

# Highlights

Highlights of [GAO-07-316](#), a report to congressional requesters

## Why GAO Did This Study

The United States imports natural gas by pipeline from Canada and by tanker as liquefied natural gas (LNG) from overseas. LNG—a supercooled form of natural gas—currently accounts for about 3 percent of total U.S. natural gas supply, with an expected increase to about 17 percent by 2030, according to the Department of Energy (DOE). With this projected increase, many more LNG import terminals have been proposed. However, concerns have been raised about whether LNG tankers could become terrorist targets, causing the LNG cargo to spill and catch on fire, and potentially explode. DOE has recently funded a study to consider these effects; completion is expected in 2008.

GAO was asked to (1) describe the results of recent studies on the consequences of an LNG spill and (2) identify the areas of agreement and disagreement among experts concerning the consequences of a terrorist attack on an LNG tanker. To address these objectives, GAO, among other things, convened an expert panel to discuss the consequences of an attack on an LNG tanker.

## What GAO Recommends

GAO recommends that the Secretary of Energy ensure that DOE incorporates into its LNG study the key issues identified by the expert panel.

In reviewing our draft report, DOE agreed with our recommendation.

[www.gao.gov/cgi-bin/getrpt?GAO-07-316](http://www.gao.gov/cgi-bin/getrpt?GAO-07-316).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Jim Wells at (202) 512-3841 or [wellsj@gao.gov](mailto:wellsj@gao.gov).

## MARITIME SECURITY

# Public Safety Consequences of a Terrorist Attack on a Tanker Carrying Liquefied Natural Gas Need Clarification

## What GAO Found

The six unclassified completed studies GAO reviewed examined the effect of a fire resulting from an LNG spill but produced varying results; some studies also examined other potential hazards of a large LNG spill. The studies' conclusions about the distance at which 30 seconds of exposure to the heat (heat hazard) could burn people ranged from less than 1/3 of a mile to about 1-1/4 miles. Sandia National Laboratories (Sandia) conducted one of the studies and concluded, based on its analysis of multiple attack scenarios, that a good estimate of the heat hazard distance would be about 1 mile. Federal agencies use this conclusion to assess proposals for new LNG import terminals. The variations among the studies occurred because researchers had to make modeling assumptions since there are no data for large LNG spills, either from accidental spills or spill experiments. These assumptions involved the size of the hole in the tanker; the volume of the LNG spilled; and environmental conditions, such as wind and waves. The three studies that considered LNG explosions concluded explosions were unlikely unless the LNG vapors were in a confined space. Only the Sandia study examined the potential for sequential failure of LNG cargo tanks (cascading failure) and concluded that up to three of the ship's five tanks could be involved in such an event and that this number of tanks would increase the duration of the LNG fire.

GAO's expert panel generally agreed on the public safety impact of an LNG spill, but believed further study was needed to clarify the extent of these effects, and suggested priorities for this additional research. Experts agreed that the most likely public safety impact of an LNG spill is the heat hazard of a fire and that explosions are not likely to occur in the wake of an LNG spill. However, experts disagreed on the specific heat hazard and cascading failure conclusions reached by the Sandia study. DOE's recently funded study involving large-scale LNG fire experiments addresses some, but not all, of the research priorities identified by the expert panel. The leading unaddressed priority the panel cited was the potential for cascading failure of LNG tanks.

### LNG Tanker Passing Downtown Boston on Its Way to Port



Source: GAO.

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## Abbreviations

BLEVE	boiling liquid expanding vapor explosion
DOE	Department of Energy
DOT	Department of Transportation
FERC	Federal Energy Regulatory Commission
kW/m <sup>2</sup>	kilowatts per square meter
LNG	liquefied natural gas
LPG	liquefied petroleum gas
m <sup>2</sup>	square meters
m <sup>3</sup>	cubic meters
m/s	meters per second
RPT	rapid phase transition
WSA	Waterway Suitability Assessment

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United States Government Accountability Office  
Washington, DC 20548

February 22, 2007

The Honorable John D. Dingell  
Chairman  
The Honorable Joe Barton  
Ranking Member  
Committee on Energy and Commerce  
House of Representatives

The Honorable Bennie G. Thompson  
Chairman  
The Honorable Peter King  
Ranking Member  
Committee on Homeland Security  
House of Representatives

The Honorable Edward J. Markey  
House of Representatives

Worldwide, over 40,000 tanker cargos of liquefied natural gas (LNG) have been shipped since 1959, and imports of LNG are projected to increase over the next 10 years. LNG is a supercooled liquid form of natural gas—a crucial source of energy for the United States. Natural gas is used in homes for cooking and heating and as fuel for generating electricity, and it accounts for about one-fourth of all energy consumed in the United States each year. Prices for natural gas in the United States have risen over the past 5 years as demand for natural gas has increased faster than domestic production. To make up for the domestic shortfall, the United States imports some natural gas in pipelines from Canada. However, most reserves of natural gas are overseas and cannot be transported through pipelines. Natural gas from these reserves has to be transported to the United States as LNG in tankers. Because of the projected increase in LNG tankers arriving at U.S. ports, concerns have been raised about whether the tankers could become terrorist targets.

LNG—primarily composed of methane—is odorless and nontoxic. It is produced by supercooling natural gas to minus 260 degrees Fahrenheit at atmospheric pressure, thus reducing its volume by more than 600 times. This process makes transport by tankers feasible. The tankers are double-hulled, with each tanker containing between four and six adjacent tanks heavily insulated to maintain the LNG's supercool temperature. Generally,

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these ships can carry enough LNG to supply the daily energy needs of over 10 million homes. Importing LNG requires specialized facilities—called regasification terminals—at ports of entry. At these terminals, the liquid is reconverted into natural gas and then injected into the pipeline system for consumers. Currently, the United States has a total of five LNG import terminals—four are considered onshore terminals, that is, they are located within 3 miles of the shore; one is an offshore terminal located 116 miles off the Louisiana coast in the Gulf of Mexico.<sup>1</sup>

The United States imports about 3 percent of its total natural gas supply as LNG in recent years, but by 2030, LNG imports are projected to account for about 17 percent of the U.S. natural gas supply, according to the Department of Energy's (DOE) Energy Information Administration. To meet this increased demand, energy companies have submitted 32 applications to build new terminals for importing LNG in 10 states and five offshore areas. Figure 1 shows the locations of LNG terminals that are operational, approved, and proposed.

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<sup>1</sup>The onshore facilities are near Boston, Massachusetts; Cove Point, Maryland; Savannah, Georgia; and Lake Charles, Louisiana. The United States also has one LNG export facility in Kenai, Alaska, that ships LNG to Japan.

**Figure 1: Existing, Approved, and Proposed LNG Terminals in the United States, as of October 2006**



Sources: FERC and GAO.

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As of October 2006, the Federal Energy Regulatory Commission (FERC)<sup>2</sup>—responsible for approving onshore LNG terminal siting applications—and the U.S. Coast Guard<sup>3</sup>—responsible for approving offshore LNG terminal siting applications—had together approved 13 of these applications. In addition, the Coast Guard contributes to FERC’s review of onshore LNG facilities by reviewing and validating an applicant’s Waterway Suitability Assessment (WSA) and reaching a preliminary conclusion as to whether the waterway is suitable for LNG operations with regard to navigational safety and security considerations. The WSA includes a security risk assessment to evaluate the public safety risk of an LNG spill from a tanker following an attack. The security risk assessment analyzes potential types of attacks, their probability, and the potential consequences. The WSA also identifies appropriate strategies that can be used to reduce the risk posed by a terrorist attack on an LNG tanker, either by reducing the probability of an attack, or by reducing its consequences. If the WSA deems the waterway suitable for LNG tanker traffic, the Coast Guard provides FERC with a “Letter of Recommendation,” which describes the overall risk reduction strategies that will be used on LNG tankers traveling to the proposed terminal. The Coast Guard is the lead federal agency for ensuring the security of active LNG import terminals and tankers traveling within U.S. ports.

As figure 1 shows, six new facilities have been proposed for the northeastern United States, a region that faces gas supply challenges. The Northeast has limited indigenous supplies of natural gas, and receives most of its natural gas either through pipelines from the U.S. Gulf Coast or Canada, or from overseas via tanker as LNG. The pipelines into the Northeast currently run at or near capacity for much of the winter, and demand is projected to significantly increase over the next 5 years, exceeding available supply by 2010. To meet the increasing demand, new supplies of natural gas must reach the Northeast by expanding existing pipeline capacity, constructing new pipelines, or constructing new LNG terminals—all of which have risk associated with them. Difficulties siting LNG facilities in the Northeast could lead to higher natural gas prices

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<sup>2</sup>Under the Natural Gas Act, as amended, FERC has exclusive authority to approve or deny an application for the siting, construction, or operation of onshore LNG terminals, including pipelines, and offshore facilities in state waters—that is, generally within 3 miles of shore.

<sup>3</sup>The Coast Guard, along with the Department of Transportation’s Maritime Administration, has jurisdiction under the Deep Water Port Act of 1974, as amended, to approve the siting and operation of offshore LNG facilities in federal waters.

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unless additional supply can be brought into the region via new, or expansion of old, pipelines.

Scientists and the public have raised concerns about the potential hazards that an LNG spill could pose. When LNG is spilled from a tanker, it forms a pool of liquid on the water. Individuals who come into contact with LNG could experience freeze burns. As the liquid warms and changes into natural gas, it forms a visible, foglike vapor cloud close to the water. The cloud mixes with ambient air as it continues to warm up and eventually the natural gas disperses into the atmosphere. Under certain atmospheric conditions, however, this cloud could drift into populated areas before completely dispersing. Because an LNG vapor cloud displaces the oxygen in the air, it could potentially asphyxiate people who come into contact with it. Furthermore, like all natural gas, LNG vapors can be flammable, depending on conditions.<sup>4</sup> If the LNG vapor cloud ignites, the resulting fire will burn back through the vapor cloud toward the initial spill. It will continue to burn above the LNG that has pooled on the surface—this is known as a pool fire. Experiments to date have shown that LNG fires burn hotter than oil fires of the same size. Both the cold temperatures of spilled LNG and the high temperatures of an LNG fire have the potential to significantly damage the tanker, causing multiple tanks on the ship to fail in sequence—called a cascading failure. Such a failure could increase the severity of the incident. Finally, concerns have been raised about whether an explosion could result from an LNG spill.

Although LNG tankers have carried over 40,000 shipments worldwide since 1959, there have been no LNG spills resulting from a cargo tank rupture. Some safety incidents, such as groundings or collisions, have resulted in small LNG spills that did not affect public safety. In the 1970s and 1980s, experiments to determine the consequences of a spill examined small LNG spills of up to 35 meters in diameter. Following the terrorist attacks of September 11, 2001, however, many experts recognized that an attack on an LNG tanker could result in a large spill—a volume of LNG up to 100 times greater than studied in past experiments. Since then, a number of studies have reevaluated safety hazards of LNG tankers in light of a potential terrorist threat. Because a major LNG spill has never occurred, studies examining LNG hazards rely on computer models to

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<sup>4</sup>LNG vapors only ignite when they are in a 5 percent to 15 percent concentration in the air. If the LNG concentration is higher, there is not enough oxygen available for fire. If the concentration is lower, there is likewise not enough fuel for fire.

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predict the effects of hypothetical accidents, often focusing on the properties of LNG vapor fires. The Coast Guard uses one of these studies, conducted in 2004 by Sandia National Laboratories,<sup>5</sup> as a basis for conducting the security risk assessment required in the WSA for proposed onshore LNG facilities.<sup>6</sup> Access to accurate information about the consequences of LNG spills is crucial for developing accurate risk assessments for LNG siting decisions. While an underestimation of the consequences could expose the public to additional risk in the event of an LNG spill, an overestimation of consequences could result in the use of inappropriate and costly risk mitigation strategies. DOE recently funded a new study—to be completed by Sandia National Laboratories in 2008—that will conduct small- and large-scale LNG fire experiments to refine and validate existing models (such as the one used by Sandia National Laboratories in their 2004 study) that calculate the heat hazards of large LNG fires.

In this context, you asked us to (1) describe the results of recent unclassified studies on the consequences of an LNG spill and (2) identify the areas of agreement and disagreement among experts concerning the consequences of a terrorist attack on an LNG tanker.

To address the first objective, we identified eight unclassified, completed studies of LNG hazards and reviewed the six studies that included new, original research (either experimental or modeling) and clearly described the methodology used. While we have not verified the scientific modeling or results of these studies, the methods used seem appropriate for the work conducted. We also interviewed agencies responsible for LNG regulations and visited all four onshore LNG import facilities and one export facility. To address the second objective, we identified 19 recognized experts in LNG hazard analysis and convened a Web-based expert panel to obtain their views on LNG hazards and to get agreement on as many issues as possible. In selecting experts for the panel, we sought individuals who are widely recognized as having experience with one or more key aspects of LNG hazard analysis. We sought to achieve balance in representation from government, academia, consulting,

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<sup>5</sup>Sandia National Laboratories. *Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water*. Albuquerque: 2004.

<sup>6</sup>DOE is also sponsoring additional research that applies the 2004 Sandia National Laboratories' methodology to LNG tankers larger than those previously studied, which is expected to be completed in July 2007.

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research organizations, and industry. Additionally, we ensured that our expert panel included at least one author from each of the six unclassified studies of LNG hazards. Because some of the studies conducted are classified, this public version of our findings supplements a more comprehensive classified report produced under separate cover. A more detailed description of our scope and methodology is presented in appendix I. We conducted our work from January 2006 through January 2007 in accordance with generally accepted government auditing standards.

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## Results in Brief

The six unclassified studies we reviewed all examined the heat impact of an LNG pool fire but produced varying results; some studies also examined other potential hazards of a large LNG spill and reached consistent conclusions on explosions. Specifically, the studies' conclusions about the distance at which 30 seconds of exposure to the heat could burn people ranged from about 500 meters (less than 1/3 of a mile) to more than 2,000 meters (about 1-1/4 miles). The Sandia National Laboratories' study concluded that the most likely distance for a burn is about 1,600 meters (1 mile). These variations occurred because researchers had to make numerous modeling assumptions to scale-up the existing experimental data for large LNG spills since there are no large spill data from actual events. These assumptions involved the size of the hole in the tanker, the number of tanks that fail, the volume of LNG spilled, key LNG fire properties, and environmental conditions, such as wind and waves. Three of the studies also examined other potential hazards of an LNG spill, including LNG vapor explosions, asphyxiation, and cascading failure. All three studies considered LNG vapor explosions unlikely unless the LNG vapors were in a confined space. Only the Sandia National Laboratories' study examined asphyxiation, and it concluded that asphyxiation did not pose a hazard to the general public. Finally, only the Sandia National Laboratories' study examined the potential for cascading failure of LNG tanks and concluded that only three of the five tanks would be involved in such an event and that this number of tanks would increase the duration of the LNG fire.

Our panel of 19 experts generally agreed on the public safety impact of an LNG spill, disagreed with a few conclusions reached by the Sandia National Laboratories' study, and suggested priorities for research to clarify the impact of heat and cascading tank failures. Experts agreed that (1) the most likely public safety impact of an LNG spill is the heat impact of a fire; (2) explosions are not likely to occur in the wake of an LNG spill, unless the LNG vapors are in confined spaces; and (3) some hazards, such

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as freeze burns and asphyxiation, do not pose a hazard to the public. Experts disagreed with the heat impact and cascading tank failure conclusions reached by the Sandia National Laboratories' study, which the Coast Guard uses to prepare WSAs. Specifically, all experts did not agree with the heat impact distance of 1,600 meters. Seven of 15 experts thought Sandia's distance was "about right," and the remaining eight experts were evenly split as to whether the distance was "too conservative" or "not conservative enough" (the other 4 experts did not answer this question). Experts also did not agree with the Sandia National Laboratories' conclusion that only three of the five LNG tanks on a tanker would be involved in a cascading failure. Finally, experts suggested priorities to guide future research aimed at clarifying uncertainties about heat impact distances and cascading failure, including large-scale fire experiments, large-scale LNG spill experiments on water, the potential for cascading failure of multiple LNG tanks, and improved modeling techniques. DOE's recently funded study involving large-scale LNG fire experiments addresses some, but not all, of the research priorities identified by the expert panel.

We are recommending that DOE incorporate into its current LNG study the key issues identified by the expert panel. We particularly recommend that DOE examine the potential for cascading failure of LNG tanks.

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## Background

Natural gas is primarily composed of methane, with small percentages of other hydrocarbons, including propane and butane. When natural gas is cooled to minus 260 degrees Fahrenheit at atmospheric pressure, the gas becomes a liquid, known as LNG, and it occupies only about 1/600th of the volume of its gaseous state. Since LNG is maintained in an extremely cooled state—reducing its volume—there is no need to store it under pressure. This liquefaction process allows natural gas to be transported by trucks or tanker vessels. LNG is not explosive or flammable in its liquid state. When LNG is warmed, either at a regasification terminal or from exposure to air as a result of a spill, it becomes a gas. As this gas mixes with the surrounding air, a visible, low-lying vapor cloud results. This vapor cloud can be ignited and burned only within a minimum and maximum concentration of air and vapor (percentage by volume). For methane, the dominant component of this vapor cloud, this flammability range is between 5 percent and 15 percent by volume. When fuel concentrations exceed the cloud's upper flammability limit, the cloud cannot burn because too little oxygen is present. When fuel concentrations are below the lower flammability limit, the cloud cannot burn because too little methane is present. As the cloud vapors continue to warm, above



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minus 160 degrees Fahrenheit, they become lighter than air and will rise and disperse rather than collect near the ground.

If the cloud vapors ignite, the resulting fire will burn back through the vapor cloud toward the initial spill and will continue to burn above the LNG that has pooled on the surface. This fire burns at an extremely high temperature—hotter than oil fires of the same size. LNG fires burn hotter because the flame burns very cleanly and with little smoke. In oil fires, the smoke emitted by the fire absorbs some of the heat from the fire and reduces the amount of heat emitted. Scientists measure the amount of heat given off by a fire by looking at the amount of heat energy emitted per unit area as a function of time. This is called the surface emissive power of a fire and is measured in kilowatts per square meter ( $\text{kW}/\text{m}^2$ ). Generally, the heat given off by an LNG fire is reported to be more than  $200 \text{ kW}/\text{m}^2$ . By comparison, the surface emissive power of a very smoky oil fire can be as little as  $20 \text{ kW}/\text{m}^2$ . The heat from fire can be felt far away from the fire itself. Scientists use heat flux—also measured in  $\text{kW}/\text{m}^2$ —to quantify the amount of heat felt at a distance from a fire. For instance, a heat flux of  $5 \text{ kW}/\text{m}^2$  can cause second degree burns after about 30 seconds of exposure to bare skin. This heat flux can be compared with the heat from a candle—if a hand is held about 8 to 9 inches above the candle, second degree burns could result in about 30 seconds. A heat flux of about  $12.5 \text{ kW}/\text{m}^2$ , over an exposure time of 10 minutes, will ignite wood, and a heat flux of about  $37.5 \text{ kW}/\text{m}^2$  can damage steel structures.

Four types of explosions could potentially occur after an LNG spill: rapid phase transitions (RPT), deflagrations, detonations, and boiling-liquid-expanding-vapor-explosions (BLEVE).<sup>7</sup> More specifically:

- An *RPT* occurs when LNG is warmed and changes into natural gas nearly instantaneously. An RPT generates a pressure wave that can range from very small to large enough to damage lightweight structures. RPTs strong enough to damage test equipment have occurred in past LNG spill experiments on water, although their effects have been localized at the site of the RPT.
- *Deflagrations and detonations* are explosions that involve combustion (fire). They differ on the basis of the speed and strength of the pressure

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<sup>7</sup>Generally, an explosion is an energy release associated with a pressure wave. Some explosions are large enough that the pressure wave can break windows or damage structures, while others are much smaller.

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wave generated: deflagrations move at subsonic velocities and can result in pressures (overpressures) up to 8 times higher than the original pressure; detonations travel faster—at supersonic velocities—and can result in larger overpressures—up to 20 times the original pressure. Methane does not detonate as readily as other hydrocarbons; it requires a larger explosion to initiate a detonation in a methane cloud.

- A *BLEVE* occurs when a liquefied gas is heated to above its boiling point while contained within a tank. For instance, if a hot fire outside an LNG tanker sufficiently heated the liquid inside, a percentage of the LNG within the tank could “flash” into a vapor state virtually instantaneously, causing the pressure within the tank to increase. LNG tanks do have pressure relief valves, but if these were inadequate or failed, the pressure inside the tank could rupture the tank. The escaping gas would be ignited by the fire burning outside the tank, and a fireball would ensue. The rupture of the tank could create an explosion and flying debris (portions of the tank).

World natural gas reserves are abundant, estimated at about 6,300 trillion cubic feet, or 65 times the volume of natural gas used in 2005. Much of this gas is considered “stranded” because it is located in regions far from consuming markets. Russia, Iran, and Qatar combined hold natural gas reserves that represent more than half of the world total. Many countries have imported LNG for years. In 2005, 13 countries shipped natural gas to 14 LNG-importing countries. LNG imports, as a percentage of a country’s total gas supply, for each of the importing countries ranged from 3 percent in the United States to nearly 95 percent in Japan. In 2005, LNG imports to the United States originated primarily in Trinidad and Tobago (70 percent), Algeria (15 percent), and Egypt (11 percent). The remaining 4 percent of U.S. LNG imports came from Oman, Malaysia, Nigeria, and Qatar.

LNG tankers primarily have two basic designs, called membrane or Moss (see fig. 2). Both designs consist of an outer hull, inner hull, and cargo containment system. In membrane tank designs, the cargo is contained by an Invar, or stainless steel double-walled liner, that is structurally supported by the vessel’s inner hull. The Moss tank design uses structurally independent spherical or prismatic shaped tanks. These tanks, usually five located one behind the other, are constructed of either stainless steel or an aluminum alloy. LNG tankers ships are required to meet international maritime construction and operating standards, as well as U.S. Coast Guard safety and security regulations.

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**Figure 2: LNG Membrane Tanker**



Source: GAO.

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## Studies Identified Different Distances for the Heat Effects of an LNG Fire

The six studies we examined identified various distances at which the heat effects of an LNG fire could be hazardous to people. The studies' variations in heat effects result from the assumptions made in the studies' models. Some studies also examined other potential hazards such as LNG vapor explosions, other types of explosions, and asphyxiation, and identified their potential impacts on public safety.

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## Studies Identified Various Distances That the Heat Effects of an LNG Fire Could Be Hazardous to People because of Assumptions Made

The studies' conclusions about the distance at which 30 seconds of exposure to the heat could burn people ranged from about 500 meters (less than 1/3 mile) to more than 2,000 meters (about 1-1/4 miles). The results—size of the LNG pool, the duration of the fire, and the heat hazard distance for skin burn—varied in part because the studies made different assumptions about key parameters of LNG spills and also because they were designed and conducted for different purposes. Key assumptions made included the following:

- *Hole size and cascading failure.* Hole size is an important parameter for modeling LNG spills because of its relationship to the duration of the event—larger holes allow LNG to spill from the tanker more quickly, resulting in larger LNG pools and shorter duration fires. Conversely, small holes could create longer-duration fires. Cascading failure is important because it increases the overall spill volume and the duration of the spill.

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- *Waves and wind.* These conditions can affect the size of both the LNG pool and the heat hazard zone. One study indicated that waves can inhibit the spread of an LNG pool, keeping the pool size much smaller than it would be on a smooth surface, and thereby reducing the size of the LNG pool fire. Wind will tend to tilt the fire downwind (like a candle flame blowing in the wind), increasing the heat hazard zone in that direction (and decreasing it upwind).
  - *Volume of LNG spilled.* The amount of LNG spilled is one of the factors that can affect the size of the pool.
  - *Surface emissive power of the fire.* While the amount of heat given off by a large LNG fire is unknown, assumptions about it directly affect the results for the heat hazard zone. It is expected that the surface emissive power of LNG fires will be lower for large fires because oxygen will not circulate efficiently within a very large fire. Lack of oxygen in the middle of a large fire would lead to more smoke production, which would block some of the heat from the fire.

The LNG spill consequence studies' key assumptions and results are shown in table 1.

**Table 1: Key Assumptions and Results of the LNG Spill Consequence Studies**

	Key assumptions					Key results			
	Environmental conditions modeled:					Fire surface emissive power (kW/m <sup>2</sup> )	Pool diameter (meters)	Distance to the 5kw/m <sup>2</sup> heat level (meters)	Duration (minutes)
	Hole size (m <sup>2</sup> )	Number of tanks that rupture (cascading failure)	Wind speed and its effect on waves (m/s)	Wind speed and its effect on fire (m/s)	Spill volume (m <sup>3</sup> )				
Quest Consultants Inc. (Quest) <sup>a</sup>	19.6	1	1.5	1.5	12,500	<sup>b</sup>	156	497	14.3
	19.6	1	5.0	5.0	12,500	<sup>b</sup>	146	531	16.6
	19.6	1	9.0	9.0	12,500	<sup>b</sup>	110	493	28.6
Sandia National Laboratories (Sandia)	2	3	<sup>c</sup>	<sup>c</sup>	37,500	220	209	784	20
	5	3	<sup>c</sup>	<sup>c</sup>	37,500	220	572	2,118	8.1
	5	1	<sup>c</sup>	<sup>c</sup>	12,500	350	330	1,652	8.1
	5 <sup>d</sup>	1	<sup>c</sup>	<sup>c</sup>	12,500	220	330-405	1,305-1,579	5.4-8.1
	12	1	<sup>c</sup>	<sup>c</sup>	12,500	220	512	1,920	3.4
Pitblado, et al. (Pitblado) <sup>e</sup>	1.77	1	<sup>c</sup>	3.0	17,250	<sup>b</sup>	171	750	32
ABS Consulting (ABSC) <sup>f</sup>	0.79	1	<sup>c</sup>	8.9	12,500	265	200 <sup>g</sup>	650	51
	19.6	1	<sup>c</sup>	8.9	12,500	265	620 <sup>g</sup>	1,500	4.2
Fay (Fay) <sup>h</sup>	20	1	<sup>c</sup>	<sup>c</sup>	14,300	<sup>b</sup>	<sup>b</sup>	1,900	3.3
Lehr and Simecek-Beatty (Lehr) <sup>i</sup>	<sup>b</sup>	<sup>b</sup>	<sup>c</sup>	<sup>c</sup>	500	200	<sup>b</sup>	500	2-3

Source: GAO analysis of spill consequence studies.

<sup>a</sup>“Modeling LNG Spills in Boston Harbor.” Copyright© 2003 Quest Consultants, Inc., Norman, OK 73609; Letter from Quest Consultants to DOE (October 2, 2001); Letter from Quest Consultants to DOE (October 3, 2001).

<sup>b</sup>Information not available.

<sup>c</sup>Not included in the model.

<sup>d</sup>The study examined multiple scenarios of 5m<sup>2</sup>. The ranges listed summarize the highest and lowest values for those scenarios.

<sup>e</sup>R. M. Pitblado, J. Baik, G. J. Hughes, C. Ferro, and S. J. Shaw. “Consequences of Liquefied Natural Gas Marine Incidents.” *Process Safety Progress* 24 no. 2 (June 2005).

<sup>f</sup>ABS Consulting Inc. *Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers*. May 13, 2004. FERC “Staff’s Responses to Comments on the Consequence Assessment Methods for Incidents Involving Releases from Liquefied Natural Gas Carriers,” June 18, 2004.

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<sup>a</sup>ABS Consulting modeled pool size as a semicircle and reported the radius of that semicircle in the study. The reported radii were used to calculate the diameter of the semicircle so the study results could be compared with the other studies.

<sup>b</sup>J.A. Fay. "Model of Spills and Fires from LNG and Oil tankers." *Journal of Hazardous Materials* B96 (2003): 171-188.

<sup>c</sup>William Lehr and Debra Simecek-Beatty. "Comparison of Hypothetical LNG and Fuel Oil Fires on Water." *Journal of Hazardous Materials* 107 (2004): 3-9.

In terms of the studies' results, we identified the following three key results:

- *Pool size* describes the extent of the burning pool—and can help people understand how large the LNG fire itself will be.
- *Heat hazard distance* describes the distance at which 30 seconds of exposure could cause second degree burns.
- *Fire duration* of the incident describes how long people and infrastructure will be exposed to the heat from the fire. The longer the fire, the greater potential for damage to the tanker and for cascading failure.

Although all the studies considered the consequences of an LNG spill, they were conducted for different purposes. Three of the six studies—Quest, Sandia, and Pitblado—specifically addressed the consequences of LNG spills caused by terrorist attacks. Two of these three studies—Quest and Sandia—were commissioned by DOE. The Quest study, begun in response to the September 11, 2001, attacks, was designed to quantify the heat hazard zones for LNG tanker spills in Boston Harbor. Only the Quest study examined how wind and waves would affect the spreading of the LNG on the water and the size of the resulting LNG pool. The Quest study based its wind and wave assumptions on weather data from buoys near Boston Harbor. The Quest study found that, while the waves would help reduce the size of the LNG pool, the winds that created the waves would tend to increase the heat hazard distance downwind. To simplify the modeling of the waves, the Quest study considered "standing" waves (rather than moving waves) of various heights and, therefore, did not consider the impact of wave movement on LNG pool spreading. The ABSC study expressed concern that Quest's standing wave assumption resulted in pool sizes that were too small because wave movement might help spread the LNG.

The 2004 Sandia study was intended to develop guidance on a risk-based analysis approach to assess potential threats to an LNG tanker, determine the potential consequences of a large spill, and review techniques that

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could be used to mitigate the consequences of an LNG spill. The assumptions and results in table 1 for the Sandia study refer to the scenarios Sandia examined that had terrorist causes. According to Sandia, the study used available intelligence and historical data to develop credible and possible scenarios for the kinds of attacks that could breach an LNG tanker. Sandia then modeled how large a hole each of the weapon scenarios could create in an LNG tanker.<sup>8</sup> Two of these intentional breach scenarios included cascading failure of three tanks on an LNG tanker. In these cases, the LNG spill from one tank, as well as the subsequent fire, causes the neighboring two tanks to fail on the LNG tanker, resulting in LNG spills from three of the five tanks on the tanker. After considering all of its scenarios, Sandia concluded that, as a rule-of-thumb, 1,600 meters is a good approximation of the heat hazard distance for terrorist-induced spills. However, as the table shows, one of Sandia's scenarios—for a large spill with cascading failure of three LNG tanks—found that the distance could exceed more than 2,000 meters and that the cascading failure would increase the duration of the incident.

Finally, the stated purpose of industry's Pitblado study was to develop credible threat scenarios for attacks on LNG tankers and predict hazard zones for LNG spills from those types of attacks. The study identified a hole size smaller than the other studies that specifically considered terrorist attacks.

The other studies we reviewed examined LNG spills regardless of cause. FERC commissioned the ABS Consulting study to develop appropriate methods for estimating heat hazard zones from LNG spills. FERC uses these methods, in conjunction with the Sandia study, to examine the public safety consequences of tankers traveling to proposed onshore LNG facilities before granting siting approval. The two scenarios in the ABSC study illustrate how small holes could result in longer fires, which have a higher potential to damage the tanker itself. One scenario used a hole size of 0.79 square meters and the other a hole size of about 20 square meters. The difference in duration is striking—it takes 51 minutes and 4.2 minutes, respectively, for the fire to consume all the spilled LNG.

Finally, the Lehr and Fay studies compared the fire consequences of LNG spills with known information about oil spills and fires. Although most

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<sup>8</sup>Please note that the information used to develop Sandia's terrorist scenarios is classified and will be discussed in GAO's classified report.

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studies made similar assumptions about the volume of LNG spilled from any single LNG tank, Lehr examined a much smaller spill volume—just 500 cubic meters of LNG, compared with a range of 12,500 to 17,250 cubic meters.

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### Some Studies Examined Other Potential Hazards and Identified Their Impact on Public Safety

Three of the studies also examined other potential hazards of an LNG spill, including LNG vapor explosions, other types of explosions, and asphyxiation.

*LNG vapor explosions.* Three studies—Sandia, ABSC, and Pitblado—examined LNG vapor explosions, and all agreed that it is unlikely that LNG vapors could explode and create a pressure wave if the vapors are in an unconfined space. Although the three studies agreed that LNG vapors could explode only in confined areas, they did not conduct modeling or describe the likelihood of such confinement after an LNG spill from a tanker. The Sandia study stated that fire will generally progress through the vapor cloud slowly and without producing an explosion with damaging pressure waves. The study did suggest, however, that if the LNG vapor cloud is confined (e.g., between the inner and outer hull of an LNG carrier), it could explode but would only affect the immediate surrounding area. The ABSC study and the Pitblado study agreed that a confined LNG vapor cloud could result in an explosion.

*Other types of explosions.* Three studies—Sandia, ABSC, and Pitblado—examined the potential for RPTs. The Sandia study concluded that, while RPTs have generated energy releases equivalent to several pounds of explosives, RPT impacts will be localized near the spill. Sandia also noted that RPTs are not likely to cause structural damage to the vessel. The ABSC study noted that their literature search suggested that damage from RPT overpressures would be limited to the immediate vicinity, though it noted that the literature did not include large spills like those that could be caused by a terrorist attack. Only one study, Pitblado, discussed the possibility of a BLEVE. According to our discussions with Dr. Pitblado, an LNG ship with membrane tanks could not result in a BLEVE, but he said that Moss spherical tanks could potentially result in a BLEVE. A BLEVE could result because it is possible for pressure to build up in a Moss tanker. A 2002 LNG tanker truck incident in Spain resulted in an explosion that some scientists have characterized as a BLEVE of an LNG truck. Portions of the tanker truck were found 250 meters from the accident itself, propelled by the strength of the blast.

*Asphyxiation.* Only the Sandia study examined the potential for asphyxiation following an LNG spill if the vapors displace the oxygen in



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the air. It concluded that fire hazards would be the greatest problem in most locations, but that asphyxiation could threaten the ship's crew, pilot boat crews, and emergency response personnel.

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### **Experts Generally Agreed That the Most Likely Public Safety Impact of an LNG Spill Is Fire's Heat Effect, but That Further Study Is Needed to Clarify the Extent of This Effect**

Our panel of 19 experts generally agreed on the public safety impact of an LNG spill and disagreed with a few of the conclusions of the Sandia study.<sup>9</sup> The experts also suggested priorities for future research—some of which are not fully addressed in DOE's ongoing LNG research—to clarify uncertainties about heat impact distances and cascading failure. These priorities include large-scale fire experiments, large-scale LNG spill experiments on water, the potential for cascading failure of multiple LNG tanks, and improved modeling techniques.

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### **Experts Agreed That the Heat from an LNG Fire Was Most Likely to Affect Public Safety, but That Explosions from an LNG Spill Are Unlikely**

Experts discussed two types of fires: vapor cloud fires and pool fires. Eighteen of 19 experts agreed that the ignition of a vapor cloud over a populated area could burn people and property in the immediate vicinity of the fire. While the initial vapor cloud fire would be of short duration as the flames burned back toward the LNG carrier, any flammable object enveloped by the vapor cloud fire could ignite nearby objects, creating secondary fires that present hazards to the public. Three experts emphasized in their comments that the vapor cloud is unlikely to penetrate very far into a populated area before igniting. Expanding on this point, one expert noted that any injuries from a vapor cloud fire would occur only at the edges of a populated area, for example, along beaches. One expert disagreed, arguing that a vapor cloud fire is unlikely to cause significant secondary fires because it would not last long enough to ignite other materials.

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<sup>9</sup>We considered experts "in agreement" if more than 75 percent of experts indicated that they completely agreed or generally agreed with a given statement. Not all experts commented on every issue discussed.

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Experts agreed that the main hazard to the public from a pool fire is the heat from the fire but emphasized that the exact hazard distance depends on site-specific and scenario-specific factors. Furthermore, a large, unconfined pool fire is very difficult to extinguish; generally almost all the LNG must be consumed before the fire goes out. Experts agreed that three of the main factors that affect the amount of heat from an LNG fire are the following:

- *Site-specific weather conditions.* Weather conditions, such as wind and humidity, can influence the heat hazard distances. For example, more humid conditions allow heat to be absorbed by the moisture in the air, reducing heat hazard distances.
- *Composition of the LNG.* The composition of the LNG can also affect the distance at which heat from the fire is felt by the public. In small fires, methane, which comprises between 84 percent and 97 percent of LNG, burns cleanly, with little smoke. Other LNG components—propane and butane—produce more smoke when burned, absorbing some of the fire’s heat and reducing the hazard distance. As the fire grows larger, the influence of the composition of LNG is hypothesized to be less pronounced because large fires do not burn efficiently.
- *Size of the fire.* The size of the fire has a major impact on its surface emissive power; the heat hazard distance increases with pool size up to a point but is expected to decrease for very large pools, like those caused by a terrorist attack.

Experts also discussed the following hazards related to an LNG spill:

- *RPTs.* Experts agreed that RPTs could occur after an LNG spill but that the overpressures generated would be unlikely to directly affect the public.
- *Detonations and deflagrations.* Experts made a key distinction between these types of explosions in confined spaces as opposed to unconfined spaces. For confined spaces, they agreed that it is possible, under controlled experimental conditions, to induce both types of explosions of LNG vapors; however, a detonation of confined LNG vapors is unlikely following an LNG spill caused by a terrorist attack. Experts were split on the likelihood of a confined deflagration occurring after a terrorist attack: eight thought it was unlikely, four thought it likely, and five thought neither likely nor unlikely.<sup>10</sup> For unconfined spaces, experts were split on

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<sup>10</sup>Two experts did not comment.

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whether it is possible to induce such explosions; however, even experts who thought such explosions were possible agreed that deflagrations and detonations in unconfined spaces are unlikely to occur following an LNG spill caused by a terrorist attack.

- *BLEVE*. Experts were split on whether a BLEVE is theoretically possible in an LNG tanker. Of the ten experts who agreed it was theoretically possible, six thought that a BLEVE is unlikely to occur following an LNG spill caused by a terrorist attack on a tanker.<sup>11</sup>
- *Freeze burns and asphyxiation*. Experts agreed that freeze burns do not present a hazard to the public because only people in close proximity to LNG spill, such as personnel on the tanker or nearby vessels, might come into contact with LNG or very cold LNG vapor. For asphyxiation, experts agreed that it is unlikely that an LNG vapor cloud could reach a populated area while still sufficiently concentrated to pose an asphyxiation threat.

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## Experts Disagreed with a Few Key Conclusions of the Sandia National Laboratories Study

Experts disagreed with heat hazard and cascading failure conclusions of the Sandia study. Specifically, 7 of 15 experts thought Sandia's heat hazard distance was "about right," and the remaining 8 experts were evenly split as to whether the distance was "too conservative" (i.e., larger than needed to protect the public) or "not conservative enough" (i.e., too small to protect the public). Experts who thought the distance was too conservative generally listed one of two reasons. First, the assumptions about the surface emissive power of large fires were incorrect because the surface emissive power of large fires would be lower than Sandia assumed. Second, Sandia's hazard distances are based on the maximum size of a pool fire. However, these experts pointed out that once a pool fire ignites, its diameter will begin to shrink, which will also reduce the heat hazard distance. Experts who thought Sandia's heat hazard distance was not conservative enough listed a number of concerns. For example, Sandia's distances do not take into consideration the effects of cascading failure. One expert suggested that a 1-meter hole in the center tank of an LNG tanker that resulted in a pool fire could cause the near simultaneous failure of the other four tanks, leading to a larger heat hazard zone.

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<sup>11</sup>Three experts said that BLEVEs were "neither likely nor unlikely," and one expert thought that BLEVEs were likely.

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Officials at Sandia National Laboratories and our panel of experts cautioned that the hazard distances presented cannot be applied to all sites. According to the Sandia study authors, their goal was to provide guidance to federal agencies on the order of magnitude of the hazards of an LNG spill on water. As they pointed out in interviews and in their original study, further analysis for specific sites is needed to understand hazards in a particular location. Six experts on our panel also emphasized the importance of site-specific and scenario-specific factors. For instance, one expert explained that the 5kW/m<sup>2</sup> hazard distance depends on the size of the tanker and the spill scenario, including factors such as wind speed, timing of ignition, and the location of the hole. Other experts suggested that key factors are spill volume and the impact of waves. Additionally, two experts explained that there is no “bright line” for hazards—that is, 1,599 meters is not necessarily “dangerous,” and 1,601 meters is not necessarily “safe.”

Only 9 of 15 experts agreed with Sandia’s conclusion that only three of the five LNG tanks on a tanker would be involved in cascading failure. Five experts noted that the Sandia study did not explain how it concluded that only three tanks would be involved in cascading failure. Three experts said that an LNG spill and subsequent fire could potentially result in the loss of all tanks on board the tanker.

Twelve of 16 experts agreed, however, with Sandia’s conclusion that cascading failure events are not likely to greatly increase (by more than 20 to 30 percent) the overall fire size or heat hazard ranges. The four experts who disagreed with Sandia’s conclusion about the public safety impact of cascading failure cited two main reasons: (1) Sandia did not clearly explain how it reached that conclusion and (2) the impact of cascading failure will partly depend on how the incident unfolds. For instance, one expert suggested that cascading failure could include a tank rupture, fireball, or BLEVE, any of which could have direct impacts on the public (from the explosive force) and which would change the heat hazard zones that Sandia identified.

Finally, experts agreed with Sandia’s conclusion that consequence studies should be used to support comprehensive, risk-based management and planning approaches for identifying, preventing, and mitigating hazards from potential LNG spills.

## Experts Suggest Future Research Priorities to Determine the Public Safety Impact of an LNG Spill

In the second iteration of the Web-based panel, we asked the experts to identify the five areas related to the consequences of LNG spills that need further research. Then, in the final iteration of the Web-based panel, we provided the experts with a list of 19 areas—generated by their suggestions and comments from the second iteration—and asked them to rank these in order of importance. Table 2 presents the results of that ranking for the top 10 areas identified and indicates those areas that are funded in the DOE study discussed earlier.

**Table 2: Expert Panel’s Ranking of Need for Research on LNG**

Rank	Research area	Funded in DOE’s study
1	Large fire phenomena	√
2	Cascading failure	
3	Large-scale spill testing on water	√
4	Large-scale fire testing	√
5	Comprehensive modeling: interaction of physical processes	
6	Risk tolerability assessments	
7	Vulnerability of containment systems (hole size)	
8	Mitigation techniques	
9	Effect of sea water coming in as LNG flows out	
10	Impact of wind, weather, and waves	

Source: GAO.

Note: A rank of 1 is the highest rank, and a rank of 10 is the lowest. Panel members ranked 19 areas of research from 1 to 19; a score was calculated for each area based on this ranking. Only the 10 areas with the highest scores are presented in this table.

As the table shows, two of the top five research areas identified are related to large LNG fires—large fire phenomena and large-scale fire testing. Experts believe this research is needed to establish the relationship between large pool fires and the surface emissive power of the fire. Experts recommended new LNG tests for fires between 15 meters and 1,000 meters. The median suggested test size was 100 meters. Some experts also raised the issue of whether large LNG fires will stop behaving like one single flame but instead break up into several smaller, shorter flames. Sandia noted in its study that this behavior could reduce heat hazard distances by a factor of two to three.

Experts also ranked research into cascading failure of LNG tanks second in the list of priorities. Concerning cascading failure, one expert noted that, although the consequences could be serious, there are virtually no

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data looking at the hull damage caused by exposure to extreme cold or heat.

As table 2 shows, DOE's recently funded study involving large-scale LNG fire experiments addresses some, but not all, of the research priorities identified by the expert panel. For DOE, Sandia National Laboratories plans to conduct large-scale LNG pool fire tests beginning with a pool size of 35 meters—the same size as the largest test conducted to date. Sandia will validate the existing 35-meter data and then conduct similar tests for pool sizes up to 100 meters. The goal of this fire testing is to document the impact of smoke on large LNG pool fires. Sandia suggests that these tests will create a higher degree of knowledge of large-scale pool fire behavior and significantly lower the current uncertainty in predicting heat hazard distances.

According to researchers at Sandia National Laboratories, some of the research our panel of experts suggested may not be appropriate. Sandia indicated that comprehensive modeling, which allows various complex processes to interact, would be very difficult to do because of the uncertainty surrounding each individual process of the model. One expert on our panel agreed, noting that while comprehensive modeling of all LNG phenomena is important, combining those phenomena into one model should wait for experiments that lead to better understanding of each individual phenomenon.

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## Conclusions

It is likely that the United States will increasingly depend on the importation of LNG to meet the nation's demand for natural gas. Understanding and resolving the uncertainties surrounding LNG spills is critical, especially in deciding on where to locate LNG facilities. Because there have been no large-scale LNG spills or spill experiments, past studies have developed modeling assumptions based on small-scale spill data. While there is general agreement on the types of effects from an LNG spill, the results of these models have created what appears to be conflicting assessments of the specific consequences of an LNG spill, creating uncertainty for regulators and the public. Additional research to resolve some key areas of uncertainty could benefit federal agencies responsible for making informed decisions when approving LNG terminals and protecting existing terminals and tankers, as well as providing reliable information to citizens concerned about public safety. Although DOE has recently funded a study that will address large-scale LNG fires, this study will address only 3 of the top 10 issues—and not the second-highest

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ranked issue—that our panel of experts identified as potentially affecting public safety.

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## Recommendation for Executive Action

To provide the most comprehensive and accurate information for assessing the public safety risks posed by tankers transiting to proposed LNG facilities, we recommend that the Secretary of Energy ensure that DOE incorporates the key issues identified by the expert panel into its current LNG study. We particularly recommend that DOE examine the potential for cascading failure of LNG tanks in order to understand the damage to the hull that could be caused by exposure to extreme cold or heat.

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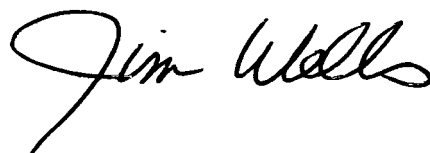
## Agency Comments and Our Evaluation

We requested comments on a draft of this report from the Secretary of Energy (DOE). DOE agreed with our findings and recommendation. In addition, DOE included technical and clarifying comments, which we included in our report as appropriate.

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As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to interested congressional committees, the Secretary of Energy, and other interested parties. We also will make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions regarding this report, please contact me at (202) 512-3841 or [wellsj@gao.gov](mailto:wellsj@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix IV.



Jim Wells  
Director, Natural Resources  
and Environment

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# Appendix I: Scope and Methodology

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To address the first objective, we identified eight unclassified, completed studies of liquefied natural gas (LNG) hazards and reviewed the six studies that included new, original research (either experimental or modeling) and clearly described the methodology used. While we have not verified the scientific modeling or results of these studies, the methods used seem appropriate for the work conducted based on conversations with experts in the field and our assessment. We also discussed these studies with their authors and visited all four onshore LNG import facilities and one export facility. We attended a presentation on LNG safety and received specific training on LNG properties and safety. We also conducted interviews with officials from Sandia National Laboratories, Federal Energy Regulatory Commission, Department of Transportation, Department of Energy, and the U. S. Coast Guard. During our interviews, we asked officials to provide information on past LNG studies and plans for future LNG spill consequences work.

To obtain information on experts' opinions of the public safety consequences of an LNG spill from a tanker, we conducted a three-phase, Web-based survey of 19 experts on LNG spill consequences. We identified these experts from a list of 51 individuals who had expertise in one or more key aspects of LNG spill consequence analysis. In compiling this initial list, we sought to achieve balance in terms of area of expertise (i.e., LNG experiments, modeling LNG dispersion, LNG vaporization, fire modeling, and explosion modeling). In addition, we included at least one author of each of the six major LNG studies we reviewed, that is, studies by Sandia National Laboratories; ABS Consulting; Quest Consultants Inc.; Pitblado, et al.; James Fay (MIT); and William Lehr (National Oceanic and Atmospheric Administration). We gathered resumes, publication lists, and major LNG-related publications from the experts identified on the initial list.

We selected 19 individuals for the panel. One or more of the following selection criteria were used: (1) has broad experience in all facets of LNG spill consequence modeling (LNG spill from hole, LNG dispersion, vaporization and pool formation, vapor cloud modeling, fire modeling, and explosion modeling); (2) has conducted physical LNG experiments; or (3) has specific experience with areas of particular importance, such as LNG explosion research. In addition, we included: (1) at least one author from each of the major LNG studies and (2) representatives from private industry, consulting, academia, and government. All 19 experts selected for the panel agreed to participate. The names and affiliations of panel members are included in appendix II.



To obtain consensus concerning public safety issues, we used an iterative Web-based process. We used this method, in part, to eliminate the potential bias associated with group discussions. These biasing effects include the potential dominance of individuals and group pressure for conformity. Moreover, by creating a virtual panel, we were able to include more experts than possible with a live panel.

For each phase in the process, we posted a questionnaire on GAO's survey Web site. Panel members were notified of the availability of the questionnaire with an e-mail message. The e-mail message contained a unique user name and password that allowed each respondent to log on and fill out a questionnaire but did not allow respondents access to the questionnaires of others.

In the questionnaires, we asked the experts to agree or disagree with a set of statements about LNG hazards derived from GAO's synthesis of major LNG spill consequence studies. Prior to the first iteration, we had an LNG spill consequence expert who was not a part of the panel review each statement and provide comments about technical accuracy and tone. Experts were asked to indicate agreement on a 3-point scale (completely agree, generally agree, do not agree) and to provide comments about how the statements could be changed to better reflect their understanding of the consequences of LNG spills.

If most experts agreed with a statement during the first iteration, we did not include it in the second iteration. If there was not agreement, we used the experts' comments to revise the statements for the second iteration. The second iteration was posted on the Web site, using the same protocol as used for the first. Again, panel members were asked to agree or disagree and provide narrative comments. We revised the statements where there was disagreement and posted them on the Web site again for the third iteration. At the end of the third iteration, at least 75 percent of the experts agreed or generally agreed with most of the ideas presented.

Because some of the studies conducted are classified, this public version of our findings supplements a more comprehensive classified report produced under separate cover. We conducted our work from January 2006 through January 2007 in accordance with generally accepted government auditing standards.

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# Appendix II: Names and Affiliations of Members of GAO's Expert Panel on LNG Hazards

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Myron Casada	ABS Consulting
T.Y. Chu	Sandia National Laboratories
Philip Cleaver	Advantica
Bob Corbin	U.S. Department of Energy
John Cornwell	Quest Consultants, Inc.
James Fay	Massachusetts Institute of Technology
Louis Gritzko	FM Global
Jerry Havens	University of Arkansas
Benedict Ho	BP
Greg Jackson	University of Maryland
Ron Koopman	Hazard Analysis Consulting
Bill Lehr	National Oceanic and Atmospheric Administration
Georges Melhem	ioMosaic Corporation
Gordon Milne	Lloyd's Register
Robin Pitblado	Det Norske Veritas
Phani Raj	Technology and Management Systems, Inc.
Velisa Vesovic	Imperial College
Harry West	Texas A&M University
John Woodward	Baker Engineering and Risk Consultants, Inc.

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# Appendix III: Summary of Expert Panel Results

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For each question below, we show only those responses that were selected by at least one expert. The number of responses adds up to 19—the total number of experts on the panel. Percentages may not add to 100% due to rounding.

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## Introduction

Large LNG spills from a vessel could be caused by an accident, such as collision or grounding, or by an intentional attack. While large accidental LNG spills are highly unlikely given current LNG carrier designs and operational safety policies and practices, these spills do pose a hazard to the public if they occur in or near a populated area. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

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Count	Percentage	Label
8	42.11%	Completely agree
11	57.89%	Generally agree

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## LNG Hazards

### Overall Hazards

LNG is a cryogenic liquid composed primarily of methane with low concentrations of heavier hydrocarbons, such as ethane, propane, and butane. LNG is colorless, odorless, and nontoxic. When LNG is spilled, it boils and forms LNG vapor (natural gas). The LNG vapor is initially denser than ambient air and visible; LNG vapor will stay close to the surface as it mixes with air and disperses. LNG and LNG vapor pose four possible hazards: freeze burns, asphyxiation, fire hazard, and explosions. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

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Count	Percentage	Label
5	26.32%	Completely agree
12	63.16%	Generally agree
2	10.53%	Do not agree

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LNG Hazards-Freeze Burns

LNG poses a threat of freeze burns to people who come into contact with the liquid or with very cold LNG vapor. Since LNG boils immediately and vaporizes after it leaves an LNG tank and LNG vapor warms as it mixes with air, only people in close proximity to the release, such as personnel on the tanker or nearby escort vessels, might come into contact with LNG or LNG vapor while it is still cold enough to result in freeze burns. Freeze burns do not present a direct hazard to the public. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
14	73.68%	Completely agree
5	26.32%	Generally agree

LNG Hazards-Asphyxiation

After an LNG spill, LNG vapor forms a dense, visible vapor cloud that is initially heavier than air and remains close to the surface. The cloud warms as it mixes with air and as portions of the cloud reach ambient air temperatures, they begin to rise and disperse. Asphyxiation occurs when LNG vapor displaces oxygen in the air. Asphyxiation is a threat primarily to personnel on the LNG tanker or to people aboard vessels escorting the tanker at close range. An LNG vapor cloud could move away from the tanker as it mixes with air and begins to disperse. However, it is unlikely that the vapor cloud could reach a populated area while still sufficiently concentrated to pose an asphyxiation threat to the public. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
8	42.11%	Completely agree
10	52.63%	Generally agree
1	5.26%	Do not agree

LNG Hazards-Vapor Cloud: Wind Effect

The effect of wind on an LNG vapor cloud varies with wind speed. The most hazardous wind conditions, however, are low winds, which can push a vapor cloud downwind without accelerating the LNG vapor dispersion into the atmosphere. Low wind conditions have the highest potential of allowing an LNG vapor cloud to move a significant distance downwind.

**What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
8	42.11%	Completely agree
10	52.63%	Generally agree
1	5.26%	Do not agree

LNG Hazards-Fire Hazard

Because LNG vapor in an approximately 5 to 15 percent mixture with air is flammable, LNG vapor within this flammability range is likely to ignite if it encounters a sufficiently strong ignition source such as a cigarette lighter or strong static charge. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
13	68.42%	Completely agree
6	31.58%	Generally agree

LNG Hazards-Fire Hazard:  
Thermal Hazard End Point

The main hazard to the public from a pool fire is the thermal radiation, or heat, that is generated by the fire rather than the flames themselves. Often this heat is felt at considerable distance from the fire. Scientific papers have used two different thresholds as end points to describe the impact of thermal radiation on the public: 5 kilowatts per square meter and 1.6 kilowatts per square meter.

**Which level do you think is the appropriate end point to use to define thermal hazard zones in order to protect the public?**

*(Please indicate your response, then provide an explanation in the textbox below your answer.)*

Count	Percentage	Label
8	42.11%	5 kilowatts per square meter
2	10.53%	1.6 kilowatts per square meter
6	31.58%	Other
3	15.79%	I do not have the expertise necessary to respond to this question.

Of the six experts who answered “other,” two experts indicated that 5kW/m<sup>2</sup> is a useful or appropriate level for measuring the impact on people. One expert suggested that dosage (a measure that combines thermal radiation and duration of exposure) is most appropriate. Another expert suggested that both thresholds are appropriate, depending on the circumstances of the analysis. (Finalized in the first iteration.)

LNG Hazards-Fire Hazard: Pool Fire

A pool fire could form in the wake of a vapor cloud fire burning back to the source or just after an LNG spill, if there is immediate ignition of the LNG vapor. A pool fire burns the vapor above a liquid LNG pool as the liquid boils from the pool. A large, unconfined pool fire is very difficult to extinguish; generally almost all the LNG must be consumed before the fire goes out. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
13	68.42%	Completely agree
5	26.32%	Generally agree
1	5.26%	Do not agree

The main hazard to the public from a pool fire is the thermal radiation, or heat, from the fire. This heat can be felt at a considerable distance from the flames themselves. Numerous factors can impact the amount of thermal radiation that could affect the public: site-specific weather conditions, including humidity and wind speed and direction, the composition of the LNG, and the size of the fire. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
13	68.42%	Completely agree
6	31.58%	Generally agree

The wind speed and direction also affect the distance at which thermal radiation from the fire is felt by the public. In high winds, the flames will tilt downwind, increasing the amount of heat felt downwind of the fire and decreasing the amount of heat felt upwind. More humid conditions allow heat to be absorbed by the moisture in the air reducing the heat felt by the public. **What is your level of agreement with the above paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
6	31.58%	Completely agree
11	57.89%	Generally agree but suggest the following clarification.
2	10.53%	I do not have the expertise necessary to respond to this section.

The composition of the LNG can also affect the distance at which thermal radiation from the fire is felt by the public. In small fires, methane, which comprises between 84 percent and 97 percent of LNG, burns cleanly, with little smoke. Cleaner-burning LNG fires, particularly those burning LNG with higher methane content, result in higher levels of thermal radiation than oil or gasoline fires of the same size because the smoke generated by oil and gasoline fires acts as a shield, reducing the amount of thermal radiation emitted by the fire. While LNG composition can have a large impact on the thermal radiation from small LNG fires, as LNG fires get larger, these effects are hypothesized to be less pronounced. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
5	26.32%	Completely agree
10	52.63%	Generally agree
3	15.79%	Do not agree
1	5.26%	I do not have the expertise necessary to respond to this section.

The size of the fire has a major impact on the thermal radiation from an LNG pool fire. Thermal radiation increases with pool size up to a point but is expected to decrease for very large pools, like those caused by a terrorist attack. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
4	21.05%	Completely agree
10	52.63%	Generally agree
4	21.05%	Do not agree
1	5.26%	I do not have the expertise necessary to respond to this section.

LNG Hazards–Vapor Cloud Fire

If an LNG vapor cloud formed in the wake of an LNG spill and drifted away from the tanker as it warmed and dispersed, the vapor cloud could enter a populated area while areas of the cloud had LNG vapor/air mixtures within the flammability range. Since populated areas have numerous ignition sources, those portions of the cloud would likely ignite. The fire would then burn back through the cloud toward the tanker and continue to burn as a pool fire near the ship, assuming that liquid LNG still remains in the spill area. Ignition of a vapor cloud over a populated area could burn people and property in the immediate vicinity of the fire. While the initial fire would be of short duration as the flames burned back toward the LNG carrier, secondary fires could continue to present a hazard to the public. **What is your level of agreement with the above paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
7	36.84%	Completely agree
11	57.89%	Generally agree but suggest the following clarification
1	5.26%	Do not agree

LNG Hazards–Vapor Cloud Fire: Burn Back Speed

**After ignition of a vapor cloud that drifted away from an LNG tanker spill, how fast could the flame front travel back toward the spill site if it was unconfined or confined?** (Finalized in the second iteration.)



Count	Percentage	Label
15	78.95%	Not checked
2	10.53%	I do not have the expertise necessary to respond to this section.
2	10.53%	No answer

Experts did not agree on the speed of a flame front traveling through an LNG vapor cloud in either a confined or unconfined state. Responses varied from less than 5 meters per second up to 50 meters per second in unconfined settings and from 0 meters per second to 2,000 meters per second in confined settings.

Explosions-RPT

A rapid phase transition (RPT) can occur when LNG spilled onto water changes from liquid to gas virtually instantaneously due to the rapid absorption of ambient environmental heat. While the rapid expansion from a liquid to vapor state can cause locally large overpressures, an RPT does not involve combustion. RPTs have been observed during LNG test spills onto water. In some cases, the overpressures generated were strong enough to damage test equipment in the immediate vicinity. Overpressures generated from RPTs would be very unlikely to have a direct affect on the public. **What is your level of agreement with this paragraph?** (Finalized in the second iteration.)

Count	Percentage	Label
15	78.95%	Completely agree
4	21.05%	Generally agree

Explosions-Deflagrations and Detonations

Deflagrations and detonations are rapid combustion processes that move through an unburned fuel-air mixture. Deflagrations move at subsonic velocities and can result in overpressures up to eight times the original pressure, particularly in congested/confined areas. Detonations move at supersonic velocities and can result in overpressures up to 20 times the original pressure. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

**Appendix III: Summary of Expert Panel Results**

Count	Percentage	Label
1	5.26%	Not checked
7	36.84%	Completely agree
10	52.63%	Generally agree
1	5.26%	Do not agree

**Explosions—Deflagrations, Detonations, and BLEVEs**

Please choose the response that best describes your opinion about each type of explosion of LNG vapors in each setting described. (Finalized in the third iteration.)

Answer	Deflagration with overpressure in an unconfined setting	Deflagration with overpressure in a confined setting	Detonation in an unconfined setting	Detonation in a confined setting	Boiling-liquid-expanding-vapor-explosion (BLEVE)
Under controlled experimental conditions, it is possible to induce this type of explosion in this type of setting.	7	18	4	15	11
This type of setting cannot support this type of explosion.	8	0	11	2	7
More research is necessary to answer this question.	3	0	3	0	0
I don't have the expertise necessary to answer this question.	0	0	0	1	0
No answer/not checked	1	1	1	1	1

If experts answered that “under controlled experimental conditions, it is possible to induce this type of explosion in this type of setting,” they were asked to answer the following question:

**What is the likelihood of a each type of explosion of LNG vapors in each setting described occurring following an LNG spill caused by a terrorist attack on a tanker?** (Finalized in the third iteration.)

Appendix III: Summary of Expert Panel Results

Answer	Deflagration with overpressure in an unconfined setting	Deflagration with overpressure in a confined setting	Detonation in an unconfined setting	Detonation in a confined setting	Boiling-liquid-expanding-vapor-explosion (BLEVE)
Highly unlikely	3	6	1	7	4
Unlikely	2	2	3	3	2
Neither likely nor unlikely	1	5	0	3	3
Likely	1	4	0	2	1
Highly likely	0	0	0	0	0
No answer/ not checked	0	1	0	0	1

LNG Hazards–Is BLEVE the Worst?

A BLEVE is the worst potential hazard of an LNG spill. It would result in the rupture of one or more LNG tanks, perhaps simultaneously, on the ship, with potential rocketing debris and damaging pressure waves. **What is your level of agreement with the above paragraph?** (Finalized in the first iteration.)

Count	Percentage	Label
2	10.53%	Completely agree
16	84.21%	Do not agree (Please explain in the textbox below.)
1	5.26%	No answer

Questions About the 2004 Sandia National Laboratories Study<sup>1</sup>

The Sandia report concluded that the most significant impacts to public safety exist within 500 meters of a spill, with much lower impacts at distances beyond 1,600 meters even for very large spills. **Please choose the response that best describes your opinion about these hazard distances.** (Finalized in the third iteration.)

<sup>1</sup>Since two of the experts were authors of the Sandia study, their responses to ALL the questions related to the study below have been excluded. For the questions related to the Sandia study, there are 17 experts responding.

**Appendix III: Summary of Expert Panel Results**

Count	Percentage	Label
4	23.54%	They are too conservative (i.e., should be smaller)
7	41.18%	They are about right
4	23.53%	They are not conservative enough (i.e., should be larger)
2	11.76%	No answer

The Sandia report concluded that large, unignited LNG vapor clouds could spread over distances greater than 1,600 meters from a spill. For a nominal intentional spill, the hazard range could extend to 2,500 meters. The actual hazard distances will depend on breach and spill size, site-specific conditions, and environmental conditions. **Please choose the response that best describes your opinion about these hazard distances.** (Finalized in the third iteration.)

Count	Percentage	Label
4	23.53%	They are too conservative (i.e., should be smaller)
6	35.29%	They are about right
4	23.53%	They are not conservative enough (i.e., should be larger)
1	5.88%	Do not have the expertise to answer
2	11.76%	No answer

The Sandia report concluded that cascading damage (multiple cargo tank failure) due to brittle fracture from exposure to cryogenic liquid or fire-induced damage to foam insulation is possible under certain conditions but is not likely to involve more than two or three cargo tanks for any single incident. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
3	17.65%	Completely agree
6	35.29%	Generally agree
6	35.29%	Do not agree
2	11.76%	I do not have the expertise necessary to respond to this section.

The Sandia report concluded that cascading events are not expected to greatly increase (not more than 20-30 percent) the overall fire size or hazard ranges (500 meters for severe impacts, much lower impacts beyond 1,600 meters) but will increase the expected fire duration. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
7	41.18%	Completely agree
5	29.41%	Generally agree
4	23.53%	Do not agree
1	5.88%	No answer

The Sandia report suggested that consequence studies should be used to support comprehensive, risk-based management and planning approaches for identifying, preventing, and mitigating hazards to public safety and property from potential LNG spills. **What is your level of agreement with this paragraph?** (Finalized in the third iteration.)

Count	Percentage	Label
8	47.06%	Completely agree
8	47.06%	Generally agree
1	5.88%	Do not agree

## Commodity Comparison

In your opinion, what is the risk to public safety posed by an attack on tankers carrying each of the following energy commodities? (Finalized in the first iteration.)

Answer	Liquefied natural gas	Crude oil	Diesel	Gasoline	Heating oil	Jet fuel	Liquefied petroleum gas
Little to None	1	2	1	0	1	1	0
Little	3	10	11	5	11	6	1
Medium	6	3	3	8	3	6	4

**Appendix III: Summary of Expert Panel Results**

Answer	Liquefied natural gas	Crude oil	Diesel	Gasoline	Heating oil	Jet fuel	Liquefied petroleum gas
Large	3	0	0	2	0	2	5
Very Large	2	0	0	0	0	0	5
No expertise to answer	1	1	1	1	1	1	1
No answer	3	3	3	3	3	3	3

**Future Research**

In the first and second survey iterations, you noted areas related to LNG spill consequences that need further research. We are interested in your thoughts on the relative level of need for research in these areas, and also the five areas you think should be of highest priority in future research.

**Please indicate the degree to which further research is needed in each of the areas listed below.** (Finalized in the third iteration.)

Responses to each part of this question are in the table below, which is sorted by mean score so that the highest-ranked research priorities appear first.

Type of research	Very great need (1)	Great need (2)	Moderate need (3)	Some need (4)	Little to no need (5)	Do not have the expertise to answer (6)	No answer (7)	Mean score
Large fire phenomena (impact of smoke shielding, large flame versus smaller flamelets)	9	5	3	0	1	1	0	4.17
Cascading failure	5	9	4	1	0	0	0	3.95
Large-scale LNG spill testing on water <sup>a</sup>	7	7	2	1	2	0	0	3.84
Large-scale fire testing <sup>b</sup>	7	6	3	2	1	0	0	3.84
Comprehensive modeling allowing different physical processes to interact	2	10	3	4	0	0	0	3.53
Risk tolerability assessments	5	4	3	1	3	1	2	3.44

**Appendix III: Summary of Expert Panel Results**

<b>Type of research</b>	<b>Very great need (1)</b>	<b>Great need (2)</b>	<b>Moderate need (3)</b>	<b>Some need (4)</b>	<b>Little to no need (5)</b>	<b>Do not have the expertise to answer (6)</b>	<b>No answer (7)</b>	<b>Mean score</b>
Vulnerability of LNG containment systems, including validating hole size predictions for the double hull ship structure	5	4	3	5	2	0	0	3.26
Mitigation techniques	3	5	6	3	2	0	0	3.21
Effect of sea water pouring into a hole as LNG flows out	2	6	5	3	2	0	1	3.17
Impact of wind, weather, and waves (on pool spread size, evaporation rate, pool formation, etc.)	3	4	6	3	3	0	0	3.05
Improvements to 3-D computational fluid dynamics dispersion modeling	0	4	6	6	2	1	0	2.67
Effects of different LNG compositions (on vaporization rates, thermal radiation, explosive behavior, etc.)	2	2	4	8	3	0	0	2.58
Whether an explosive attack will result in immediate vapor cloud ignition	0	5	4	5	4	1	0	2.56
Rapid phase transitions: likelihood in various scenarios and impact	1	2	6	6	4	0	0	2.47
Effects of igniting LNG vapors in containment or ballast tanks	0	5	3	5	6	0	0	2.37
BLEVE properties of tanks on LNG ships	1	4	3	4	7	0	0	2.37
Deflagration/detonation of LNG	1	0	5	8	5	0	0	2.16
Effects of a large, unignited vapor cloud drifting from the incident site	0	0	7	5	7	0	0	2.00

**Appendix III: Summary of Expert Panel Results**

<b>Type of research</b>	<b>Very great need (1)</b>	<b>Great need (2)</b>	<b>Moderate need (3)</b>	<b>Some need (4)</b>	<b>Little to no need (5)</b>	<b>Do not have the expertise to answer (6)</b>	<b>No answer (7)</b>	<b>Mean score</b>
Effect of clothing and obstructions on the radiant heat level received by the public	1	1	2	6	9	0	0	1.89
Other <sup>c</sup>	12	2	0	0	0	0	5	<sup>d</sup>

<sup>a</sup>Experts suggested pool sizes of 15 meters up to 1,000 meters, though the median response was 100 meters.

<sup>b</sup>Experts suggested pool sizes of 15 meters up to 1,000 meters, though the median response was 100 meters.

<sup>c</sup>Experts suggested frequency modeling, determination of acceptable risk to society, analysis of foam on LNG tankers, risk analysis for larger LNG tankers, CFD modeling for pool spreading and evaporation, and improvement to existing techniques used for fighting LNG fires.

<sup>d</sup>Not applicable.



---

# Appendix IV: GAO Contact and Staff Acknowledgments

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## GAO Contact

Jim Wells, (202) 512-3841, or [wellsj@gao.gov](mailto:wellsj@gao.gov)

---

## Staff Acknowledgments

In addition to the individual named above, Mark Gaffigan, Amy Higgins, Lynn Musser, Janice Poling, Rebecca Shea, Carol Herrnstadt Shulman, and James W. Turkett made key contributions to this report.

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## GAO's Mission

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Gloria Jarmon, Managing Director, [JarmonG@gao.gov](mailto:JarmonG@gao.gov) (202) 512-4400  
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Washington, D.C. 20548

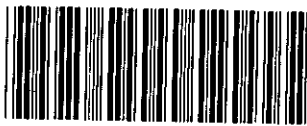
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## Public Affairs

Paul Anderson, Managing Director, [AndersonP1@gao.gov](mailto:AndersonP1@gao.gov) (202) 512-4800  
U.S. Government Accountability Office, 441 G Street NW, Room 7149  
Washington, D.C. 20548

## **ATTACHMENTS**

15. Shannon LNG Accounts B1 documents lodged at the Companies Registration Office.



3055458

# Companies Registration Office

Sections 125, 127, 128 Companies Act, 1963  
 Section 7 Companies (Amendment) Act 1986  
 Section 26 Electoral Act 1997  
 Sections 43, 44 Companies (Amendment)(No 2) Act 1999  
 Section 249A Companies Act 1990 (inserted by section 107 Company Law Enforcement Act 2001)  
 Companies Act 1990 (Form and Content of Documents Delivered to Registrar) Regulations 2002

CRB receipt date stamp



Companies Acts, 1963 to 2006

**Tick box if bond is attached**   
*note sixteen*

Company Number

3	6	8	2	3	6
---	---	---	---	---	---

# B1

Please complete using black typescript or BOLD CAPITALS, referring to explanatory notes

Company Name

*in full*

SHANNON LNG LIMITED

Return made up to

*note one*

Day	Month	Year
06	09	2007

If the return is made up to a date earlier than the existing ARD, do you wish to retain the anniversary of the existing ARD for next year? *note two*

Yes

No

Financial Year

*note three*

From	Day	Month	Year	To	Day	Month	Year
	01	01	2006		31	12	2006

The company is claiming the exemption from audit in respect of the financial year covered by the accounts attached to this return.

Registered Office

*note four*

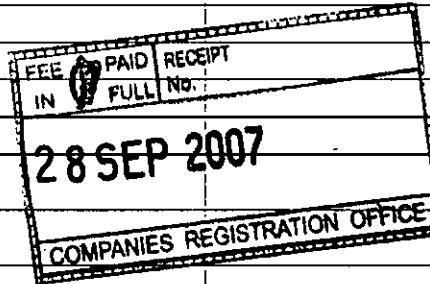
70 Sir John Rogerson's Quay, Dublin 2

Other Addresses

*note five*

Address

Register(s)/documents held at this address



Secretary

*note six*

Surname

Former Surname *note seven*

MATSACK TRUST LIMITED

None

Forename

Former Forename *note seven*

None

Residential Address *note six*

70 Sir John Rogerson's Quay, Dublin 2, Ireland

Donations for Political Purposes

*note eight*

Name of person or political party to whom donation was made

Value of donation € / \_

None

Presenter Details

Name

Matheson Ormsby Prentice

Address

70 Sir John Rogerson's Quay, Dublin 2, Ireland

DX Number

DX Exchange

Telephone Number

01 232 2000

Fax Number 01 232 3333

Email

Reference Number 32075

**Authorised Share Capital**

*note nine*

Total		€ / _	10,200.00	made up as follows:	Nominal Value
Class			Number of Shares		Per Share € / _
DEFERRED ORDINARY			20,000		0.01
ORDINARY			1,000,000		0.01

**Issued Share Capital**  
*(insert nominal values)*

Total		€ / _	600.00	made up as follows:
Paid up on shares issued for cash	€ / _	600.00		
Considered paid on other shares	€ / _	0.00		
Total calls unpaid	€ / _	0.00	(E)	} The sum of these figures must equal the total issued share capital.
Total not yet called	€ / _	0.00	(F)	

**Shares Issued**

**Consideration - all cash**

Total standing to credit of Capital Conversion Reserve Fund *note ten* € / \_ 0.00

Class	Number of Shares	Total Nominal Value € / _	Total Premium Paid € / _	Total Amount Paid € / _
DEFERRED ORDINARY	20,000	200.00	0.00	200.00
ORDINARY	40,000	400.00	0.00	400.00
<b>Totals (A)</b>	<b>60,000</b>		<b>(C)</b>	<b>600.00</b>

**Consideration - not all cash**

Class	Number of Shares	Total Nominal Value € / _	Total Premium Considered Paid € / _	Total Amount Considered Paid € / _
<b>Totals (B)</b>	<b>0</b>		<b>(D)</b>	<b>0.00</b>

**Totals**

Total number of shares issued (A) + (B)  Total paid and unpaid and considered paid (C) + (D) + (E) + (F) € / \_ 600.00

This total must agree with the total number of shares held by existing members as stated in the List of Past and Present Members section of the return.

**Other Share / Debenture Details**

*note eleven*

**List of Past and Present Members**

Persons holding shares on the date to which the annual return has been made up for 20 07 (insert year) and of persons who have held shares therein at any time since the date of the last return, or in the case of the first return, the date of incorporation of the company. *note twelve*

Tick box if the list of past and present members is submitted on CD.

*notes six and thirteen*

Name and Address	Share Class	Numbers Held <i>note fourteen</i>	Number Transferred and Date <i>note fifteen</i>	Particulars of Transferee <i>note fifteen</i>	
Name Address	Hess LNG Limited c/o Caledonian Bank & Trust Limited, Caledonian House, Dr. Roy's Drive , PO Box 1043 GT, George Town, Grand Cayman BWI, Cayman Islands	€0.01 ORDINARY	40,000		
Folio No.	KATE POWER 8 Trafalgar Terrace , Monkstown , Co. Dublin	€0.01 DEFERRED ORDINARY	5,000		
Name Address	JOHN POWER 14 Cliff Road, Tramore, Co. Waterford, Ireland	€0.01 DEFERRED ORDINARY	5,000		
Folio No.	PATRICK POWER 8 TRAFALGAR TERRACE, MONKSTOWN, CO. DUBLIN	€0.01 DEFERRED ORDINARY	5,000		
Name Address	SARAH POWER 8 Trafalgar Terrace , Monkstown , Co. Dublin	€0.01 DEFERRED ORDINARY	5,000		
Folio No.					
Name Address					
Folio No.					
Name Address					
Folio No.					
Name Address					
Folio No.					

Total number held

The total number of shares held must agree with the total number of issued shares given in the **Shares Issued** section (total of (A) plus (B)).

**Directors**

*including shadow/alternate directors if any*

*note six*

Surname	POWER	Former Surname <i>note seven</i>	None
Forename	PATRICK	Former Forename <i>note seven</i>	None

*note six*

Date of Birth	Day: 23, Month: 02, Year: 1948	Irish Resident <i>note sixteen</i>	<input checked="" type="checkbox"/>	Alternate Director <i>note seventeen</i>	<input type="checkbox"/>
---------------	--------------------------------	------------------------------------	-------------------------------------	--	--------------------------

Residential Address *note six*: 8 TRAFALGAR TERRACE, MONKSTOWN, CO. DUBLIN

Business Occupation: C.E.O. Nationality: IRISH

Other Directorships: See continuation sheet

*note six*

Surname	SHEARER	Former Surname <i>note seven</i>	None
Forename	GORDON	Former Forename <i>note seven</i>	None

*note six*

Date of Birth	Day: 11, Month: 08, Year: 1954	Irish Resident <i>note sixteen</i>	<input type="checkbox"/>	Alternate Director <i>note seventeen</i>	<input type="checkbox"/>
---------------	--------------------------------	------------------------------------	--------------------------	--	--------------------------

Residential Address *note six*: 19 VILLIAGE HILL ROAD, DOVER, MA 02030, UNITED STATES

Business Occupation: BUSINESS EXECUTIVE Nationality: AMERICAN

Other Directorships: None

*note six*

Surname		Former Surname <i>note seven</i>	
Forename		Former Forename <i>note seven</i>	

*note six*

Date of Birth	Day: , Month: , Year:	Irish Resident <i>note sixteen</i>	<input type="checkbox"/>	Alternate Director <i>note seventeen</i>	<input type="checkbox"/>
---------------	-----------------------	------------------------------------	--------------------------	--	--------------------------

Residential Address *note six*

Business Occupation: Nationality:

Other Directorships:

**Certification**

*note twenty*

We hereby certify that (i) this form has been completed in accordance with the Notes on Completion of Form B1, (ii) contains the particulars in respect of the company as at the date to which the return is made up and that (iii)

The company is not a private company.

The company is a private company and has not since the date of the last annual return (or the date of incorporation if this is the first return) issued any invitation to the public to subscribe for any shares or debentures in the company.

The company is a private company with more than 50 members, the excess of the number of members over 50 consisting wholly of persons who, under section 33(1)(b) Companies Act 1963, are not included in reckoning the number of 50.

Signed: Ed Miller For and on behalf of Matsack Trust Limited Secretary

Name in bold capitals or typescript

PATRICK POWER MATSACK TRUST LIMITED

**Note sixteen** Every company must have at least one full-time Irish resident director or a bond or certificate in place pursuant to s43(3) and s44 Companies (Amendment)(No.2) Act 1999. Note that an Irish resident alternate director is not sufficient for the purposes of s43. Place a tick in the "Irish resident" box if the director is resident in the State in accordance with s43 of the 1999 Act as defined by s44(8) and (9) of that Act. If no full-time director is so resident and no certificate has been granted, a valid bond must be furnished with the return, unless same has already been delivered to the CRO on behalf of the company. (Please note that "Irish resident" means resident in the Republic of Ireland.) For further information see CRO Information Leaflet No. 17.

**Note seventeen** Please tick the box if the director is an alternate (substitute) director. If the company's articles so permit and subject to compliance with those articles, a director may appoint a person to be an alternate director on his/her behalf. The appointment of any person to act as director is notifiable by a company to the CRO, regardless of how the appointment is described. The company is statutorily obliged to notify the CRO of the addition to and removal of each person from its register. In the event that a full-time director who has appointed an alternate director ceases to act as director, the company is required to notify the CRO of the termination of appointment of the full-time director and of his/ her alternate. Note: The CRO accepts no responsibility for maintaining the link between a full-time director and his/ her alternate.

**Note eighteen** Company name and number of other bodies corporate, whether incorporated in the State or elsewhere, except for bodies (a) of which the person has not been a director at any time during the past ten years; (b) of which the company is (or was at the relevant time) a wholly owned subsidiary; or (c) which are (or were at the relevant time) wholly owned subsidiaries of the company. Pursuant to s45(1) Companies (Amendment)(No.2) Act 1999, a person shall not at a particular time be a director of more than 25 companies. However, under s45(3), certain directorships are not reckoned for the purposes of s45(1).

**Note nineteen** Place of incorporation if outside the State.

**Note twenty** Tick the relevant box(es).

**Checklist of documents annexed**

- Balance Sheet** S 128 Companies Act 1963 (CA 63); S7 & S18 Companies (Amendment) Act 1986 (CAA 86)
- Profit and Loss Account** S7 and S18 CAA 86
- Notes to the Accounts** Schedule of CAA 86 (refer specifically to s12 for notes required in the case of small / medium sized businesses)
- Directors' Report** S128 CA 63; S7 & S18 CAA 86
- Auditor's Report** S128 CA 63; S7 & S18 CAA 86
- Special Auditor's Report** Duly certified by a director and secretary to be a true copy of the report S128(6B) CA 63
- Overall Certification** The Acts require that the balance sheet, profit and loss account, directors' report and auditor's report be certified by both director and secretary to be a true copy as laid or to be laid before the A.G.M. or sent to the sole member in accordance with the single member private limited company regulations. In the case of full accounts, an overall certification will be sufficient.
- Guarantee by parent undertaking of the liabilities of subsidiary undertaking** S17 CAA 86 as amended
- Declaration of consent by shareholders of subsidiary to exemption** S17 CAA 86 as amended
- Notification to shareholders of Guarantee** S17 CAA 86 as amended
- Note stating company has availed of exemptions in s17 CAA 86 as amended**
- Accounting documents**
  - Reg 39 E.C. (Companies: Group Accounts) Regulations 1992
  - Reg 7 E.C. (Credit Institutions: Accounts) Regulations 1992
  - Reg 7 E.C. (Accounts) Regulations 1993
  - Regs 5, 17 E.C. (Insurance Undertakings: Accounts) Regulations 1996
- Section 43 Bond** See note sixteen above.
- Form B73 Nomination of a new ARD**

**Further Information**

**Professional Advice** If you have a problem completing this annual return, and in particular are unclear of the requirements pertaining to a company's ARD, you should consult your professional adviser.

**Change in Details** Where applicable, the particulars given on Form B1 must accord with the particulars contained in the documentation already delivered to the CRO. The most common forms used to notify the CRO of any changes to the company details are:

- B2 Notice of change in the situation of the registered office
- B3 Notice of places where register of members, register of debenture holders, register of directors' and secretary's interests in shares and debentures, and directors' service contracts/ memoranda are kept
- B4 / G1 Notice of increase in authorised capital
- B5 Return of allotments (increase in issued share capital)
- B10 Notice of change of directors or secretaries or in their particulars

**CRO Address** When you have completed and signed the form, please send with the prescribed fee to the Registrar of Companies at:  
Parnell House, 14 Parnell Square, Dublin 1 - DX 145001 Parnell House

Please carefully study the explanatory notes overleaf. A Form B1 that is not completed correctly or is not accompanied by the correct documents or fee is liable to be rejected and returned to the presenter by the CRO pursuant to section 249A Companies Act 1990 (inserted by section 107 Company Law Enforcement Act 2001). Unless the document, duly corrected, is relogged in the CRO within 14 days, it will be deemed to have never been delivered to the CRO.

FURTHER INFORMATION ON COMPLETION OF FORM B1, INCLUDING THE PRESCRIBED FEE, IS AVAILABLE FROM [www.cro.ie](http://www.cro.ie) OR BY E-MAIL [info@cro.ie](mailto:info@cro.ie)



**Other Directorships**

Company Number 368236

**Form B1 Continuation sheet**

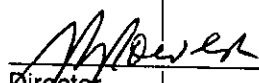
Director's Name PATRICK POWER

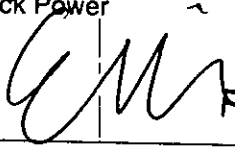
**Other directorships**

Company Name <i>note eighteen</i>	Place of Incorporation <i>note nineteen</i>	Company Number	Resigned
Cnocophillips Ireland Limited		341156	30/11/2002
Irish National Petroleum Corporation Limited		69757	16/07/2001
Petroplus Holdings Ag	Switzerland		
The Multiple Sclerosis Society of Ireland		296573	

**SHANNON LNG LIMITED**  
**REPORT AND FINANCIAL STATEMENTS**  
**YEAR ENDED 31 DECEMBER 2006**

Certified to be a true copy of the balance sheet, profit and loss account, directors' report and auditor's report as laid to the sole member of the Company in accordance with the European Communities (Single-Member Private Limited Companies) Regulations, 1994

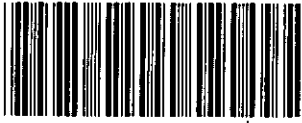
  
\_\_\_\_\_  
Director  
Patrick Power

  
\_\_\_\_\_  
Secretary  
Matsack Trust Limited

For and on behalf of Matsack Trust Limited  
Ed Miller  
\_\_\_\_\_  
Secretary

## **ATTACHMENTS**

16. Shannon LNG Limited – Director’s Report and Financial Statements for the Year Ended 31 December 2006.



**3055459**



**SHANNON LNG LIMITED**

**DIRECTORS' REPORT AND  
FINANCIAL STATEMENTS**

**FOR THE YEAR ENDED  
31 DECEMBER 2006**

FEE PAID	RECEIPT
IN FULL	No.
<b>28 SEP 2007</b>	
<b>COMPANIES REGISTRATION OFFICE</b>	

# Shannon LNG Limited

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## DIRECTORS' REPORT AND FINANCIAL STATEMENTS for the year ended 31 December 2006

TABLE OF CONTENTS	PAGE
COMPANY INFORMATION	2
DIRECTORS' REPORT	3
INDEPENDENT AUDITORS' REPORT	5
PROFIT AND LOSS ACCOUNT	7
BALANCE SHEET	8
NOTES TO THE FINANCIAL STATEMENTS	9

# Shannon LNG Limited

---

## COMPANY INFORMATION

### DIRECTORS

Patrick Power  
Gordon Shearer

### SECRETARY

Matsack Trust Limited

### REGISTERED OFFICE

30 Herbert Street  
Dublin 2

### SOLICITORS

Matheson Ormsby Prentice  
30 Herbert Street  
Dublin 2

### BANKERS

Allied Irish Bank  
Main Street  
Blackrock  
Dublin

### AUDITORS

Ernst and Young  
Chartered Accountants  
Barrington House  
Barrington Street  
Limerick

# Shannon LNG Limited

## DIRECTORS' REPORT

for the year ended 31 December 2006 (All figures are expressed in thousands of Euro)

The directors present their report and financial statements for the year ended 31 December 2006.

## PRINCIPAL ACTIVITIES, BUSINESS REVIEW AND FUTURE DEVELOPMENTS

Shannon LNG Limited (Company) is a development stage company, engaged in the development of liquefied natural gas (LNG) marine import terminals. The company is currently working to secure all necessary permits to develop a terminal located in County Kerry. Construction of the terminal is expected to begin once all the permits are obtained.

The company was formerly known as the Irish National Energy Company Limited (INEC). On 19<sup>th</sup> April 2006 Hess LNG Limited (HESS LNG), a joint venture between Hess Oil and Gas Holdings Inc. (HOGHI), a subsidiary of Hess Corporation (HESS) and Midstream Beta Limited, a subsidiary of Poten & Partners Group, LLC (POTEN) acquired INEC. The name of the company was changed from INEC to Shannon LNG Limited on that date.

On 19<sup>th</sup> April 2006, the company entered into an option agreement with Shannon Free Airport Development Company Limited to purchase up to 281 acres for the purposes of developing an LNG marine import terminal. As of 31 December 2006 the company has paid €493 under the terms of the option agreement.

## RESULTS FOR THE YEAR AND STATE OF AFFAIRS AT 31 DECEMBER 2006

The profit & loss account and balance sheet are set out on pages 7 & 8. All project startup costs incurred to date have been charged to expense, with the exception of option payments for the project site in Shannon and deposits for office space. The company recorded a loss of €2,550 for the year.

## IMPORTANT EVENTS SINCE THE YEAR END

On 8<sup>th</sup> March 2007, HOGHI increased its equity ownership in the company by acquiring 85% of Midstream Beta Limited's equity. Following the transaction, the company is owned 92.5% by HOGHI and 7.5% by Midstream Beta Limited.

## DIRECTORS

On 18<sup>th</sup> April 2006 Ms. Catherine Power resigned as a director and was replaced by Mr. Gordon Shearer.

## BOOKS AND ACCOUNTING RECORDS

The directors are responsible for ensuring that proper books and accounting records, as outlined in Section 202 of the Companies Act, 1990, are kept by the company.

To achieve this, the directors have appointed appropriate personnel to ensure that those requirements are complied with.

These books and accounting records are maintained at 30 Herbert Street, Dublin 2.

## DIVIDENDS

The directors of the company do not propose the payment of a dividend for the year.

# Shannon LNG Limited

## DIRECTORS' REPORT

for the year ended 31 December 2006

### DIRECTORS' AND SECRETARY'S INTERESTS

The interests of directors in the share capital of the company at the beginning and end of the year were as follows:

Director	<i>At 31 December 2005 Number of Ordinary Shares</i>	<i>At 31 December 2006 Number of Ordinary Shares</i>
Patrick Power	10,000	-
	<i>At 31 December 2005 Number of Def. Ordinary Shares</i>	<i>At 31 December 2006 Number of Def. Ordinary Shares</i>
Patrick Power	5,000	5,000

### STATEMENT OF DIRECTORS' RESPONSIBILITIES IN RESPECT OF THE FINANCIAL STATEMENTS

The directors are responsible for preparing the financial statements in accordance with applicable Irish law and Generally Accepted Accounting Practice in Ireland including the accounting standards issued by the Accounting Standards Board and promulgated by the Institute of Chartered Accountants in Ireland.

Company law requires the directors to prepare financial statements for each financial year, which give a true and fair view of the state of affairs of the company and of the profit or loss of the company for that period. In preparing those financial statements, the directors are required to:

- select suitable accounting policies and then apply them consistently;
- make judgements and estimates that are reasonable and prudent; and
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the company will continue in business.

The directors are responsible for keeping proper books of account which disclose with reasonable accuracy at any time the financial position of the company and enable them to ensure that the financial statements are prepared in accordance with accounting standards generally accepted in Ireland and comply with the Companies Acts, 1963 to 2006. They are also responsible for safeguarding the assets of the company and hence for taking reasonable steps for the prevention and detection of fraud and other irregularities.

### AUDITORS

The auditors, Ernst & Young, Chartered Accountants, will continue in office in accordance with Section 160(2) of the Companies Act, 1963.

On behalf of the board on

27 June 2007

  
Directors





## **INDEPENDENT AUDITORS' REPORT TO THE MEMBERS OF SHANNON LNG LIMITED**

We have audited the company's financial statements of Shannon LNG Limited for the year ended 31 December 2006 which comprises the Profit and Loss Account, the Balance Sheet and the related notes 1 to 13. These financial statements have been prepared under the accounting policies set out therein.

This report is made solely to the company's members, as a body, in accordance with section 193 of the Companies Act, 1990. Our audit work has been undertaken so that we might state to the company's members those matters we are required to state to them in an auditors' report and for no other purpose. To the fullest extent permitted by law, we do not accept or assume responsibility to anyone other than the company and the company's members as a body, for our audit work, for this report, or for the opinions we have formed.

### **Respective responsibilities of directors and auditors**

The directors are responsible for the preparation of the financial statements in accordance with applicable Irish law and Accounting Standards issued by the Accounting Standards Board and promulgated by the Institute of Chartered Accountants in Ireland (Generally Accepted Accounting Practice in Ireland) as set out in the Statement of Directors' Responsibilities.

Our responsibility is to audit the financial statements in accordance with relevant legal and regulatory requirements and International Standards on Auditing (UK and Ireland).

We report to you our opinion as to whether the financial statements give a true and fair view and are properly prepared in accordance with the Companies Acts, 1963 to 2006. We also report to you our opinion as to: whether proper books of account have been kept by the company; whether, at the balance sheet date, there exists a financial situation which may require the convening of an extraordinary general meeting of the company; and whether the information given in the Directors' Report is consistent with the financial statements. In addition, we state whether we have obtained all the information and explanations necessary for the purposes of our audit and whether the financial statements are in agreement with the books of account.

We also report to you if, in our opinion, any information specified by law regarding directors' remuneration and other transactions is not disclosed, and, where practicable, include such information in our report.

We read the Directors' Report and consider the implications for our report if we become aware of any apparent misstatements within it.

### **Basis of audit opinion**

We conducted our audit in accordance with International Standards on Auditing (UK and Ireland) issued by the Auditing Practices Board. An audit includes examination, on a test basis, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgments made by the directors in the preparation of the financial statements, and of whether the accounting policies are appropriate to the company's circumstances, consistently applied and adequately disclosed.

We planned and performed our audit so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or other irregularity or error. In forming our opinion we also evaluated the overall adequacy of the presentation of information in the financial statements.

## INDEPENDENT AUDITORS' REPORT TO THE MEMBERS OF SHANNON LNG LIMITED

### Opinion

In our opinion the financial statements give a true and fair view, in accordance with Generally Accepted Accounting Practice in Ireland, of the state of affairs of the company as at 31 December 2006 and of its loss for the year then ended and have been properly prepared in accordance with the Companies Acts, 1963 to 2006.

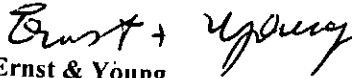
We have obtained all the information and explanations we consider necessary for the purposes of our audit. In our opinion proper books of account have been kept by the company. The financial statements are in agreement with the books of account.

In our opinion the information given in the Directors' Report is consistent with the financial statements.

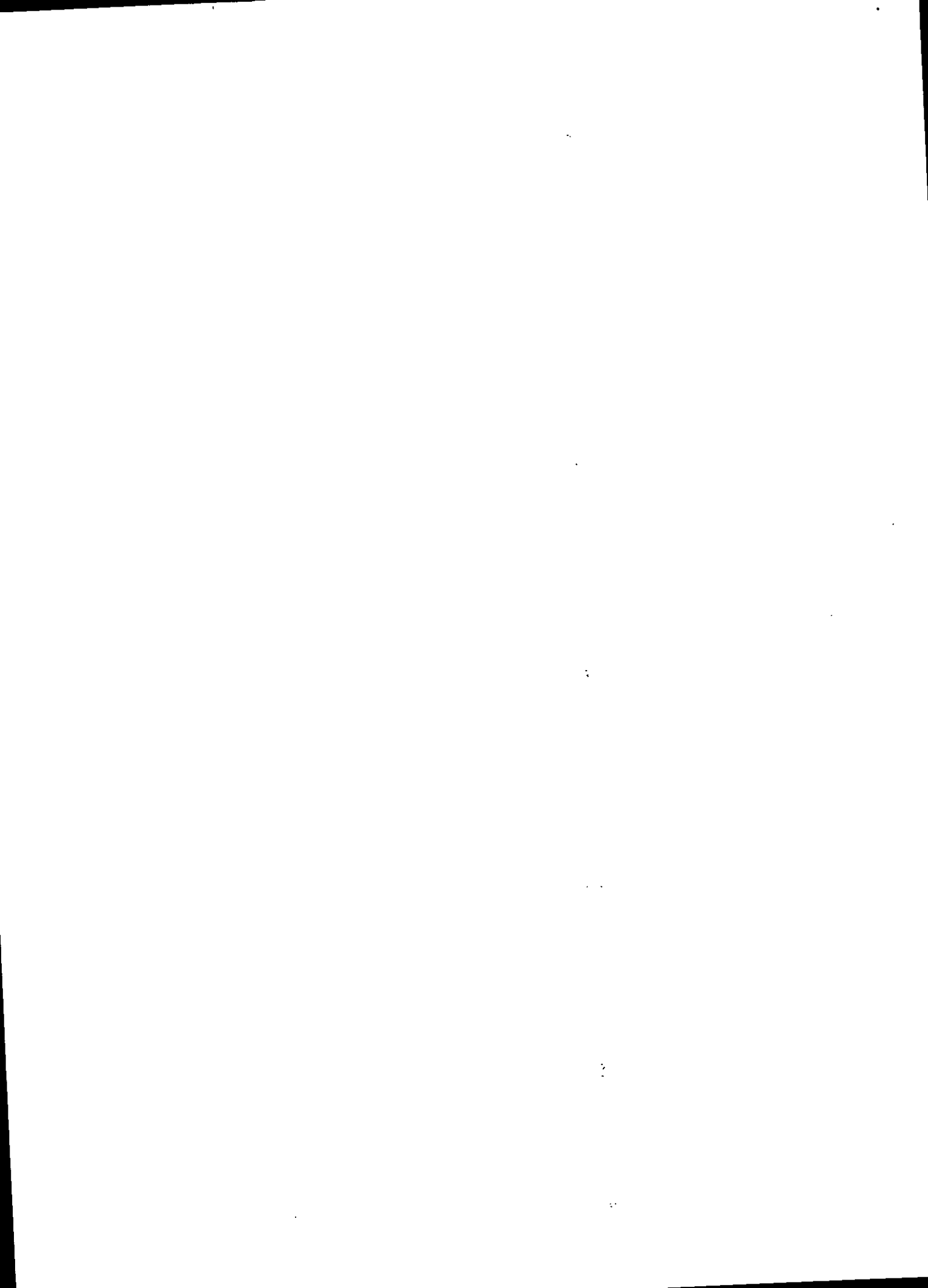
In our opinion, the balance sheet shows an excess of liabilities over assets and, in our opinion, on that basis there did exist at 31 December 2006 a financial situation which under Section 40(1) of the Companies (Amendment) Act, 1983 may require the convening of an extraordinary general meeting of the company.

### Emphasis of Matter – Going Concern

In forming our opinion, which is not qualified, we have considered the adequacy of the disclosures made in Note 1 to the financial statements concerning the uncertainty over the ability of the company to continue as a going concern. In view of the significance of this uncertainty we consider that it should be drawn to your attention. The financial statements do not include the adjustments that would result if the company was unable to continue as a going concern.

  
Ernst & Young  
Registered Auditors  
Limerick

Date: 18<sup>th</sup> July 2007





# Shannon LNG Limited

## PROFIT AND LOSS ACCOUNT for the year ended 31 December 2006

	<i>Note</i>	<i>2006</i> <i>€'000</i>	<i>2005</i> <i>€'000</i>
Sales		-	-
Cost of sales		-	-
<b>GROSS PROFIT</b>		-	-
Other (losses)/gains		-	-
Administrative expenses		-	-
Other income		-	-
Other expenses		(2,550)	(352)
(Loss) before income tax	2	(2,550)	(352)
Income tax expense	3	-	-
<b>LOSS RETAINED FOR THE PERIOD</b>		(2,550)	(352)

The company has no other recognised gains or losses in the current financial year other than those dealt with in the profit & loss account.

On behalf of the board on 27 June 2007

  
 Directors
 

# Shannon LNG Limited

## BALANCE SHEET for the year ended 31 December 2006

	<i>Note</i>	<i>2006</i> €'000	<i>2005</i> €'000
<b>FIXED ASSETS</b>			
Intangible fixed assets	4	493	-
Deposits		32	-
		525	-
<b>CURRENT ASSETS</b>			
Debtors	5	155	57
Cash and cash equivalents		39	1
		194	58
CREDITORS: amounts falling due within one year	6	(464)	(409)
<b>NET CURRENT LIABILITIES</b>		<b>(270)</b>	<b>(351)</b>
<b>TOTAL ASSETS LESS CURRENT LIABILITIES</b>		<b>255</b>	<b>(351)</b>
CREDITORS: amounts falling due after more than one year	7	(3,156)	-
<b>NET (LIABILITIES)</b>		<b>(2,901)</b>	<b>(351)</b>
<b>CAPITAL AND RESERVES</b>			
Share capital	9	1	1
Retained earnings		(2,902)	(352)
Shareholders' deficit (all equity interests)	8	(2,901)	(351)

On behalf of the board on 27 June 2007

  
Directors



# Shannon LNG Limited

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## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 1. ACCOUNTING POLICIES

(a) *Going concern*

The accompanying financial statements have been prepared on a going concern basis. As shown in the Profit and Loss account and Balance Sheet, the company has a limited amount of cash, has incurred losses and has accumulated a deficit during the development stage. These factors indicate the company may be unable to continue as a going concern. The financial statements do not include any adjustments that might be necessary should the company be unable to continue as a going concern.

The directors recognize that continuing as a going concern is dependent on among other factors, obtaining funding from Hess LNG. The company has an interest free loan agreement with Hess LNG. Through the end of 2006, the company has borrowed €3,156 under this agreement, with a further €1,370 borrowed since the end of 2006. The loan agreement provides project funding up to €10,000. The directors believe that the funding through the loan agreement will be sufficient to allow the company to continue as a going concern.

(b) *Basis of preparation*

The financial statements are prepared in accordance with generally accepted accounting principles under the historical cost convention and comply with financial reporting standards of the Accounting Standards Board, as promulgated by the Institute of Chartered Accountants in Ireland.

(c) *Start up costs*

All project startup costs incurred to date have been charged to expenses, with the exception of option payments for the project site in Shannon and deposits for office space.

(d) *Cash and cash equivalents*

Cash equivalents consist of highly liquid investments, which are readily convertible into cash and have maturities of three months or less when acquired.

(e) *Taxation*

The company has not generated any income to date, and as a result has not incurred any corporation taxes.

(f) *Cash Flow*

Financial Reporting Standard Number 1, "Cash Flow Statements", exempts small companies as defined in the companies' legislation from preparing cash flow statements. The company has availed of this exemption.

# Shannon LNG Limited

## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 2. PROFIT ON ORDINARY ACTIVITIES BEFORE TAXATION

	2006 €'000	2005 €'000
The profit before taxation is stated after charging:		
Directors' emoluments	276	-
Auditors' remuneration	42	-
	<hr/>	<hr/>

### 3. TAX ON (LOSS) ON ORDINARY ACTIVITIES

(a) Analysis of profit and loss account charge:	2006 €'000	2005 €'000
Current tax:		
Republic of Ireland corporation tax on profits of the period at 12.5% (see reconciliation below)	-	-
	<hr/>	<hr/>
Tax on (loss) on ordinary activities	-	-
	<hr/>	<hr/>

#### (b) Reconciliation of the expected tax charge at the standard tax rate to the actual tax charge at the effective rate

The tax assessed for the year is lower than the standard rate of corporation tax in the Republic of Ireland (12.5%).  
The differences are explained below:

	2006 €'000	2005 €'000
(Loss) on ordinary activities before tax	(2,550)	(352)
	<hr/>	<hr/>
(Loss) on ordinary activities multiplied by the standard rate of corporation tax in the Republic of Ireland of 12.5% (2005: 12.5%)	(319)	(44)
Effects of:		
Increase in losses forward	319	44
	<hr/>	<hr/>
Tax on (loss) on ordinary activities	-	-
	<hr/>	<hr/>

# Shannon LNG Limited

## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 4. INTANGIBLE FIXED ASSETS

	<i>Property, plant &amp; equipment</i> €'000	<i>Total</i> €'000
Opening balance	-	-
Additions	493	493
Amortisation	-	-
Net book value		

The intangible asset arises on the option to purchase land from Shannon Free Airport Development Company Limited.

### 5. DEBTORS

	<i>2006</i> €'000	<i>2005</i> €'000
Amounts falling due within one year:		
Trade and other receivables	155	57

### 6. CREDITORS: amounts falling due within one year

	<i>2006</i> €'000	<i>2005</i> €'000
Trade and other payables	464	409



# Shannon LNG Limited

## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 7. CREDITORS: amounts falling due after more than one year

	2006 €'000	2005 €'000
Amounts due to parent undertaking	3,156	-

The company has entered into an interest free loan agreement with Hess LNG to provide funding for project development. The facility provides funding up to €10,000. As at 31 December 2006 the company had a loan balance with Hess LNG of €3,156.

### 8. RECONCILIATION MOVEMENTS IN SHAREHOLDERS' FUNDS

	2006 €'000	2005 €'000
Profit retained for the year	(2,550)	(352)
Opening shareholders' funds	(351)	1
Closing shareholders' funds	(2,901)	(351)

### 9. CALLED UP SHARE CAPITAL

	2006 €'000	2005 €'000
Authorised:		
1,000,000 ordinary shares of €0.01 each	10,000	10,000
20,000 deferred ordinary shares of €0.01 each	200	200
Allotted, called up and fully paid:		
40,000 ordinary shares of €0.01 each	400	400
20,000 deferred ordinary shares of €0.01 each	200	200
	600	600
Rounded amount	€'000	€'000
Allotted, called up and fully paid	1	1

# Shannon LNG Limited

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## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 9. CALLED UP SHARE CAPITAL (contd.)

Each of the Ordinary Shares and the Deferred Ordinary Shares shall rank *pari passu* in all respects save as specifically set out below:-

#### *As Regards Dividend*

- a) Each of the Ordinary Shares shall rank *pari passu* in all respects as to dividends.
- b) The Deferred Ordinary Shares shall confer upon the holders thereof no right to receive any dividend thereon.

#### *As Regards a Return of Capital*

- a) In the event of any liquidation, dissolution or winding-up of the Company, either voluntarily or involuntarily, the assets and retained profits available for distribution to the holders of Ordinary Shares in the capital of the Company shall be distributed with equal priority among the holders of Ordinary Shares in the same proportions as the holders hold such Ordinary Shares.
- b) The holders of Deferred Ordinary Shares shall have no rights to share in the assets or retained profits of the Company in the event of any liquidation, dissolution or winding-up of the Company.

#### *As Regards Voting at General Meetings*

- a) The holders of Ordinary Shares shall each be entitled to receive notice of, and to attend and speak and vote at, general meetings of the Company.
- b) The Deferred Ordinary Shares shall not confer upon the holders thereof the right to receive notice of or to attend or vote at general meetings of the Company.

#### *As Regards Conversion of the Deferred Ordinary Shares*

The following rights shall attach to Deferred Ordinary Shares as regards conversion:

- (a) All of the Deferred Ordinary Shares held by a Deferred Ordinary Shareholder shall automatically convert into Ordinary Shares in accordance with the Conversion Rate specified in Article 4.4(b) in the Memorandum and Articles of Association, on the occurrence of the Final Investment Decision.
- (b) Each holder of Deferred Ordinary Shares shall be entitled to receive one Ordinary share and the corresponding share certificate for each Deferred Ordinary share held by him on the date of the Final Investment Decision

# Shannon LNG Limited

## NOTES TO THE FINANCIAL STATEMENTS for the year ended 31 December 2006

### 10. CONTROLLING PARTIES

Shannon LNG Limited is a wholly owned subsidiary undertaking of Hess LNG Limited, an undertaking incorporated in the Cayman Islands. The parent undertaking of the smallest group of undertakings for which group financial statements are drawn up, and of which the company is a member, is Hess Corporation. Copies of its group financial statements are available from 1185 Avenue of the Americas, New York, NY 10036, United States.

Hess LNG Limited is a joint venture between Hess Oil and Gas Holdings Inc. (HOGHI), a subsidiary of Hess Corporation (HESS) and Midstream Beta Limited, a subsidiary of Poten & Partners Group LLC (POTEN). The ultimate controlling parties are both incorporated in the United States. Copies of the group financial statements for Hess Corporation are available from 1185 Avenue of the Americas, New York, NY 10036, United States.

### 11. RELATED PARTIES

A summary of all material transactions between the company and its members and affiliates follows:

<u>Services Agreement</u>	<u>2006</u> <u>€'000</u>
Hess LNG	€330

The company has entered into a services agreement with Hess LNG to provide certain services including coordination of project development, as well as legal and accounting support.

### 12. CONTINGENCIES

The company is subject to contingent liabilities with respect to existing or potential claims, lawsuits and other proceedings. The company considers these routine and incidental to its business and not material to its financial position or results of operations. The company accrues liabilities when the future costs are probable and reasonably estimable.

### 13. APPROVAL OF FINANCIAL STATEMENTS

The directors approved the financial statements on *27 JUNE 2007*

## **ATTACHMENTS**

17. "Clean Energy Now. Liquid Natural Gas: A roadblock to a clean energy future".  
Greenpeace <http://www.greenpeace.org/raw/content/usa/press-center/reports4/liquid-natural-gas-a-roadbloc.pdf>



CLEAN ENERGY NOW



# Liquid Natural Gas: A roadblock to a clean energy future



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## **Acknowledgements**

This report was written by John Coequyt and Katie Albrecht with assistance from Lynda Arakelian, Lauren Gilbertson, Kristin Casper and Arturo Moreno. Greenpeace would like to thank Bill Powers, Co-Chair of the Border Power Plant Working Group, for his assistance in the writing and analysis of this report. This report draws heavily on the work of the RACE Coalition, of which Greenpeace is a member, and analysis completed for the Coalition by Synapse Energy Economics.

## **About Greenpeace**

Since 1971, Greenpeace has been a leading voice for the environmental movement. Greenpeace works around the world to protect oceans and ancient forests, and to fight toxic pollution and genetic engineering, global warming and nuclear threats. Without compromise, Greenpeace takes on powerful political and corporate opposition to protect the future of our planet.

## **Liquid Natural Gas: A roadblock to a clean energy future**

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Over the past few years, fueled by rising natural gas prices, some of the world's largest multinational corporations began searching for new sites for Liquid Natural Gas (LNG) terminals. Very early in this process these corporations identified the Northern most State in Mexico, Baja California, as a prime target for LNG development.

Hoping to avoid strict environmental laws and local opposition to coastal development in California, yet still have easy access to the United States, corporations like Sempra, Shell, ChevronTexaco, Marathon and ConocoPhillips proposed LNG terminals on the Baja California coast, just South of the California border. The first proposed projects, which were inappropriately located in residential neighborhoods, were driven away by local residents who feared for the safety of their families. However, two environmentally and socially flawed projects remain on the Baja California coast.

The first, a joint project of Sempra and Shell, is currently proposed near a resort community on a pristine stretch of the Baja California coast. The environmentally destructive terminal would use millions of gallons of seawater every day, potentially impede migrating whales, and put the safety of the local retirement community at risk.

ChevronTexaco has proposed a second terminal on the Coronado Islands eight miles off the coast. ChevronTexaco was handed the lease for the islands in a midnight deal that has angered residents and politicians equally. The project would endanger the bountiful wildlife on the island and could also impede whale migration.

The construction and operation of the LNG terminals in Mexico will degrade the environment and the Sempra/Shell terminal will put local communities at substantial risk in the event of a major accident or terrorist attack. But, it doesn't have to be that way. Now is the time to shift away from dangerous dependence on fossil fuels and towards global investments in renewable energy, conservation and energy efficient technologies.

### **Greenpeace is asking that:**

- 1. California policy makers not commit the state to long-term contracts to Liquid Natural Gas from either Mexico or California.**
- 2. Multinational companies and the governments of California and Mexico invest in clean energy technologies, such as wind and solar power, creating good local jobs without risking the public's health and safety.**

## Derailing California and Mexico Clean Energy Commitments

The fast tracking of LNG within the California government threatens the tremendous strides that the renewable energy industry had made in the State. Efforts are underway within the State of California to promote LNG over energy efficiency and renewable energy resources in conflict with the official policy of the State articulated only two years ago in the Energy Action Plan.

There is no reason to fast-track LNG investments. California can meet its future energy demands without building any LNG terminals. If the State pursues aggressive energy efficiency goals, retrofits the old inefficient coastal power plants, and expands the States renewable energy goals, the State can reduce natural gas demand by one-third, the equivalent of three LNG terminals.

### **California can reduce natural gas demand by one-third**

<b>Gas Demand, Projected Demand Increase by California Natural Gas Utilities, Supply/Demand Reduction Options</b>	<b>Gas Quantity, (mmcf/d)</b>
Average daily natural gas use in California, 2001	6,600
Projected increase in gas demand over 2002 baseline, 2006-2016	0-200 <sup>1</sup>
Average projected daily natural gas delivery from one LNG terminal	700-800
Total Reduction in California gas demand from conservation measures and accelerated renewable portfolio standard (20% by 2010)	1,100 – 1,500 <sup>2</sup>
Total Reductions assuming 30 percent renewable portfolio standard (a)	1,800 – 2,300 <sup>3</sup>

Source: Synapse Energy Economics, 2004

(a) Estimated from CEC baseline.

The development of LNG infrastructure in California and Baja California threatens the State's ability to combat global warming. The use of natural gas that has been liquefied and transferred across the Pacific reduces the difference between natural gas power plant CO<sub>2</sub> emissions and coal power plant emissions by nearly half. Yet more importantly, by reaching beyond the traditional boundaries of North America to South America, Russia and the Far East, the development of LNG terminals on the West Coast would open up nearly limitless quantities of natural gas to the energy markets in those states. This shift threatens to turn natural gas, previously viewed as a "transitional" fuel, into a permanent source of global warming gasses.

<sup>1</sup> Derived from presentations by PGE, SoCalGas, and SDGE at CEC/CPUC Natural Gas Workshop, Dec. 9-10, 2003. 2006-2016 demand increase in SoCalGas/SDGE territory: 0 mmcf/d. In PGE territory: 0-200 mmcf/d.

<sup>2</sup> Derived from Synapse Energy Economics evaluation submitted in March 23, 2004 RACE coalition comments in CPUC Utility Long-Term Natural Gas Procurement Proceeding, Rulemaking 04-01-25

<sup>3</sup> Derived from Synapse Energy Economics evaluation submitted in March 23, 2004 RACE coalition comments in CPUC Utility Long-Term Natural Gas Procurement Proceeding, Rulemaking 04-01-25



In Baja a renewable energy developer Fuerza Eolica is planning to build a 340 MW wind farm on Mexican side of the California border. This wind power, when combined with an upgrade of Cerro Prieto, would produce enough power to eliminate the need for the inefficient gas/oil burning state owned power plants in Rosarito. But those investments are unlikely if even one of the LNG terminals in Baja California and signs long term contracts for all of the State's natural gas needs.

### **Time Bomb or Terrorist Target?**

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As the number of proposed LNG facilities in North America has grown to national prominence, so have the safety concerns. These concerns were escalated after a study by the Algerian government into an accident at a LNG terminal indicated that LNG leak was responsible for the explosion. Additional concerns over the cost and feasibility of protecting an LNG terminal in Boston, which was closed again during the Democratic Convention, are spilling into the debate over costs and dangers at facilities across the United States and into Mexico, where politicians are debating who will ultimately pay for security at LNG facilities in Baja California.

It is likely that accident and terrorism safeguards will be updated in the United States to reflect new information and concerns since September 11<sup>th</sup>. But it remains to be seen whether these efforts will extend south of the border into Mexico. Neither Sempra/Shell nor Chevron-Texaco has indicated that they intend to implement any additional safety or security measures.

### **LNG's Global Blood Trail**

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Greenpeace and other environmental and social justice groups are currently opposing the development of LNG facilities on the West Coast. We stand together in an effort to protect not only the communities both in California and Mexico, but also the impacted communities around the world. From the partially contact indigenous communities in Peru to the residents of war torn Indonesia, to Sakhalin Island in Russia, the expansion of the Oil and Gas industry into new and sensitive areas represents a global threat for which the governments of the world are ill prepared.

## **Chapter 1. A New Global Warming Challenge**

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Global warming threatens to devastate the world's natural climate system. Over the past century, the earth's surface temperature has risen by about one degree Fahrenheit, and mounting evidence indicates that most of the recent warming can be attributed to human activities, such as the burning of oil, coal and gas. While a rise in temperature of just one degree may not sound threatening, that change in temperature is enough to cause unpredictable weather patterns with devastating results. Global warming is implicated for intensifying extreme weather conditions such as floods, droughts, wildfires, hurricanes and heatwaves and causes problems ranging from the spread of infectious diseases to the destruction of power lines and crops. The impacts of global warming not only impact our health; they also result in billions of dollars of expenses for relief efforts and insurance costs.

The burning of coal, gas and oil releases carbon dioxide (CO<sub>2</sub>) into the atmosphere, which is the primary cause of global warming. The United States is responsible for over a quarter of the world's carbon emissions, while representing only four percent of the global population. Instead of spending billions of dollars increasing dependency on fossil fuels (coal, gas and oil), the U.S government and powerful oil companies should invest in alternative, renewable sources of energy. The current trend towards an increased dependence on Liquid Natural Gas (LNG) is frightening because it increases reliance on environmentally destructive fossil fuels and significantly delays the possibility of moving towards renewable energy sources by creating a costly infrastructure for LNG. This is especially true of the West Coast of North America which, unlike the East Coast, currently has no LNG terminals or LNG infrastructure.

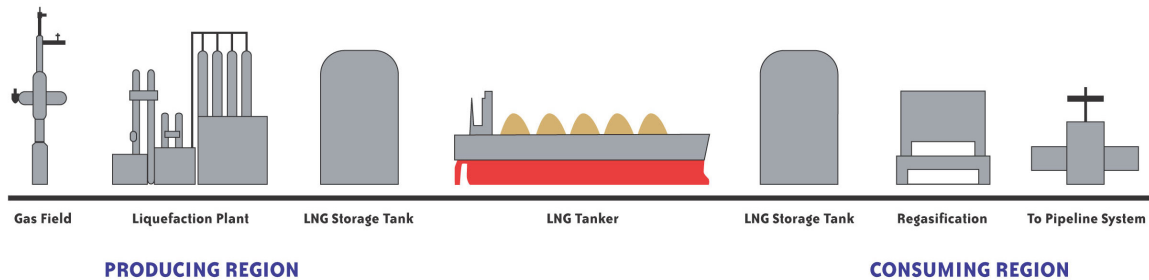
This report analyzes the impacts of two proposed LNG regasification sites on the environment and local communities of Baja California and the Coronado Islands in Mexico. The construction and operation of the LNG regasification terminals at these sites will both severely degrade the environment and put existing local communities at substantial safety risk in the event of a major accident or terrorist attack. But, it doesn't have to be that way. Now is the time to shift away from dangerous dependence on fossil fuels and towards global investments in renewable energy, conservation and energy efficient technologies.

### **What is liquid natural gas (LNG)?**

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Liquid Natural Gas (LNG) is the liquid form of natural gas. In a process called liquefaction, natural gas is condensed at minus 260 degrees Fahrenheit. Liquefaction greatly reduces the volume of natural gas making it economically feasible to transport LNG great distances via special tankers. The tankers deliver the LNG to receiving terminals, such as those proposed in Baja California, where the LNG is converted back to natural gas and delivered to customers. The creation of this LNG receiving infrastructure

will increase the United States' and Mexico's dependence on foreign fossil fuels and open up Mexico's energy market to exploitation by multinational corporations.



### Shell/Sempra LNG terminal in Baja California

Shell International Gas Limited and Sempra Energy LNG Corp have jointly proposed a Liquid Natural Gas (LNG) receiving terminal in Baja California<sup>1</sup>. The two companies will own and operate the \$600 million facility. The proposed location for the terminal is on the Costa Azul in Mexico, 23 km Northwest of the city of Ensenada. The terminal has a designed natural gas delivery rate of 1000 million cubic feet per day (mmcf/d).<sup>2</sup> A 64 km pipeline will stretch northwards from the terminal to the Industrial Park, El Florido, in the municipality of Tijuana.

The Baja California site was chosen after evaluation of potential coastal sites near the U.S. border. The final decision was made based on zoning, proximity to population centers, and proximity to deep water. The Shell/Sempra LNG terminal will be located within 2 miles of one of the most of the popular tourist resorts, Bajamar. The associated pipeline will pass through an inland route that avoids residences, but has a more negative environmental impact as compared to other proposed routes.

The Baja California LNG terminal will occupy 40 acres of coastal land, with 24 additional acres being used for the service road. It will take three and a half years to construct, requiring approximately 1,000 construction workers. Construction of the pipeline will disrupt nearby communities and will take one year to complete. After construction, 30-40 technical workers will be required to operate the facility. It is likely that already trained individuals will fill all of the higher-paid, skilled positions. Members of the local community are not likely to fill these higher-paying jobs. In addition, 35 contract workers will be hired for services such as security, catering, cleaning, and maintenance.

The terminal will unnecessarily harm the coastal environment. Shell and Sempra plan to use at least 100 million gallons per day of seawater to regasify the LNG at the terminal. This process is expected to kill 100 percent of any sea life entrained in the seawater used for regasification.<sup>3</sup>

There is concern that construction will destroy archeological remains dating back thousands of years. The archeologists who conducted the review are scrambling to study the site before the evidence is lost forever.

## **Chevron-Texaco Proposed LNG terminal at the Coronado Islands<sup>4</sup>**

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Chevron-Texaco has proposed an offshore LNG terminal that will use oil and gas industry technology to construct a receiving and regasification site in 20 meters of water, 13 km off the coast of Tijuana, Mexico. The terminal will have an average capacity of 700 mmcf/d.<sup>5</sup> The LNG terminal will be located just 600 meters east of the Coronado Islands and will cost \$650 million dollars to build. Construction will last at least three years and is expected to require 1,200 construction workers.

The offshore LNG terminal at the Coronado Islands will receive LNG from a Chevron-Texaco-owned exploitation site located in the Gorgon gas fields off the coast of Western Australia. The site of the proposed Chevron-Texaco LNG liquefaction plant in Barrow Island, Australia is highly controversial due to the unique habitat Barrow Island provides for a number of unique or endangered species. The LNG receiving terminal off the Baja California coast will have the capacity to store 250,000 cubic meters of LNG. The LNG will be warmed using seawater and then shipped through a new underwater pipeline that will join Baja California's existing energy infrastructure. The gas will be available to customers in Northern Baja California and throughout the West Coast of the U.S.

The offshore site was chosen based on the natural breakwater provided by the Coronado Islands. Another consideration was the distance that an offshore site provided from residential communities. The site is within 600 meters of the Coronado Islands, critical habitat for a number of marine bird species. A major concern is the impact of lights from the terminal on birds nesting on the island.

## **How does LNG contribute to global warming?**

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LNG uniquely increases the emissions of CO<sub>2</sub> into the atmosphere. The composition of natural gas emissions are identical whether it has been converted to LNG or burned straight from gas. However, the processes necessary to convert and transport LNG are energy intensive. As shown in Table 1, the process of converting natural gas into a liquid, transporting it across the Pacific Ocean, and then returning it to its gaseous form, known collectively as the "LNG supply chain," requires an increased natural gas consumption of 18-22 percent.<sup>6</sup> An additional 11 to 18 percent increase in CO<sub>2</sub> emissions is likely to occur because of high CO<sub>2</sub> content in the raw source gas being converted to LNG and exported to Mexico.<sup>7</sup> The CO<sub>2</sub> in the source gas may be vented to atmosphere during processing.

The combined impact of venting CO<sub>2</sub> during processing and the energy penalty of the LNG supply chain would increase CO<sub>2</sub> emissions by roughly 20 to 40 percent over California's current emissions from domestic sources of natural gas (see Table 1). This increase significantly closes the gap between coal and natural gas with respect to global warming gases.

**Table 1. Transportation of liquid natural gas to California would significantly increase greenhouse gas emissions**

<u>Process Step</u>	<u>Additional Gas Use (Percent)</u>
Domestic Natural Gas	Basecase
Liquification	9 – 10
Transport	7 – 9
Regasification	2 – 3
Carbon Dioxide in Gas	0 – 18
<b>Total Additional Gas Consumed</b>	<b>18 – 40</b>

Source: Powers Engineering 2004, June 1, 2004 Global LNG Summit presentation.

The coal industry claims that LNG increases gas consumption by 30 percent<sup>8</sup> over natural gas for the liquefaction and regasification alone which is nearly three times the Powers Engineering estimate. The discrepancy stems from the age and thus efficiency of the LNG infrastructure. The Powers Engineering study assumes the most efficient technology available, while the coal industry used the current condition of plants when conducting its study.

The net result of the increase in global warming emissions is that natural gas power plants burning high CO<sub>2</sub> natural gas that has been shipped as LNG to California would have a global warming impact that falls in-between coal and domestic natural gas (see Table 2). In other words, LNG power plants will only reduce global warming pollution by about half as much as a domestically produced natural gas versus current electricity from coal. Given the tremendous worldwide reserves of natural gas that could be shipped to developed countries for decades, this difference is significant.

**Table 2. Liquid natural gas power plants**

<u>Power Plant Type</u>	<u>Global Warming Gas Pollution</u>
Natural gas – low CO <sub>2</sub> domestic gas	400 g/Kwh
Liquid Natural Gas	480 g/Kwh
Liquid Natural Gas – high CO <sub>2</sub> (a)	560 g/Kwh
Coal – Advanced IGCC	660 g/Kwh (b)
Coal – pulverized coal	770 to 830 g/Kwh (c)

Source: <http://www.ieagreen.org.uk/sr1p.htm>

(a) Assumes a 40 percent increase in CO<sub>2</sub> emissions, see above.

(b) Three demonstration integrated gasification combined cycle (IGCC) plants exist in the U.S. Gasification plants turn coal into gas, and are touted as the next generation of coal-burning power plants, but have not been embraced by industry. Assumes a 50 percent thermal efficiency.

(c) Half of U.S. electricity is generated from pulverized coal. Assumes 40 – 43 percent efficiency.

Because of the small difference between LNG and coal power plants, renewable energy and conservation investments are much more effective in slowing global warming and produce a multitude of co-benefits. California's natural gas demand can be reduced by 2,300 mmcf/d through conservation and renewable energy measures, avoiding the emission of 100 billion pounds of CO<sub>2</sub> per year. This would reduce California's natural gas consumption by a third, and the equivalent of removing more than 10 million passenger cars per year from the road.<sup>1</sup>

### **The proposed LNG terminals will serve U.S. demand almost entirely**

While the two proposed LNG sites in Baja California will primarily serve the California market, both Shell/Sempra and Chevron-Exxon claim that these plants will eventually also provide LNG in quantity to the Baja California market. The Mexican government has stated that the terminals built in Mexico will serve the U.S. market. A report presented by the Mexican Secretary of Energy, Felipe Calderon Hinojosa, states, "Mexican LNG terminals could supply directly to the south of the United States."<sup>2</sup>

Sempra Energy continues to assert that it will sell the majority of the natural gas from its LNG terminal to Mexico. In response to Greenpeace's request for information, a Sempra official stated "[Greenpeace's letter] incorrectly stated that Energia Costa Azul is being built solely for the benefit of the United States. In fact, when our facility is completed in 2007, we expect that Mexico will consume about half of the gas from the plant and virtually all of the output by the middle of the next decade."<sup>3</sup>

A review of the natural gas use in Baja California shows that the demand is nowhere near the proposed LNG supply, and shows that Baja California could only use a fraction of the natural gas that one LNG terminal would provide. The peak amounts of natural gas used in Baja California, excluding the power plants that serve the U.S. market, is approximately 250 mmcf/d when all the power plants are running. The average natural gas use is considerably less, in the range of 150 to 200 mmcf/d. The Shell/Sempra LNG terminal will have a peak capacity of 1,300 mmcf/d. The Chevron-Exxon site at the Coronado Islands will have a capacity of 1,000 mmcf/d.<sup>4</sup>

No new power plants are currently proposed or under construction in Baja California. The typical lead-time between permit application and an operational project is at least three years. There will be no new large natural gas customers in Baja California when the proposed Costa Azul and Coronados Islands terminals begin operation in 2007. Power plants serving the Baja California market are also served by existing long-term natural gas contracts. As shown in Table 3 below, less than 10 mmcf/d of the planned

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<sup>1</sup> Environmental Protection Agency (assumes auto emissions of 10,000 pounds of CO<sub>2</sub> per year).

<sup>2</sup> Hinojosa, Felipe Calderon, Secretary of Energy, Mexico. "Opportunities for LNG Terminals in Mexico." *LNG Ministerial Summit December 2003*. Available from <http://www.usea.org/lngsummitpresentations.htm>

<sup>3</sup> May 21, 2004, from Michael J. Murray of Sempra

<sup>4</sup> California Energy Commission, March 2004.

output of 2,300 mmcf/d, or less than one percent, could be purchased directly for use in Baja California in 2007.

**Table 3. Mexico’s natural gas demand is far less than LNG output**

Power Plant/Industry	Capacity MW	Daily gas use (mmcf/d) (a)	Contract Expires	Power Use
CFE Rosarito	550	64	2010 (b)	Mexico
Intergen	500	58	2013	Mexico
CFE Rosarito (gas/oil)	650	120	2010	Mexico
Mexicali Local Use	NA	<10	Unknown	Mexico
<b>Subtotal Mexico</b>	<b>1,700</b>	<b>252</b>		
Intergen	560	70	No	California
Sempra Mexicali	650	76	No	California
<b>Subtotal California Export</b>	<b>1,210</b>	<b>146</b>		
<b>Total</b>	<b>2,910</b>	<b>398</b>		

(a) assumes an annual capacity factor 70 percent

(b) Available from <http://www.sempratrading.com>

The lack of natural gas infrastructure and demand in Baja, along with the fact that California ratepayers are being asked to bear the burden of \$200 million in costs to modify the SDGE natural gas pipeline transmission system, indicates that much of the Baja California LNG supply is expected to serve the California market. The \$200 million in pipeline upgrades is needed to reverse flow and allow the importation of large quantities of natural gas from LNG terminal(s) located in Baja California to the U.S market.

### **Renewable Energy Options for Baja California**

The opportunity cost of fostering dependency on natural gas in Mexico is enormous. Northern Baja California currently meets about 40 percent of its electricity requirements through geothermal plant, Cerro Prieto. Cerro Prieto currently produces 720 MW and has the potential to reach 1,500 MW<sup>9</sup>. Additionally, clean energy production from solar and wind energy technologies have tremendous potential in Baja California. The mountainous area between Tijuana and Mexicali includes some of the best sites in Mexico for producing wind energy. A prime site for solar power production, there are an average of 290 sunny days per year in Baja California, with seven hours of sunlight per day.

In Baja, Fuerza Eolica is planning to build an additional 340 mw of wind power on Mexican side of the California border. This wind power, when combined with an upgrade of Cerro Prieto, would produce enough power to eliminate the need for both CFE power plant in Rosarito, and would easily replace the inefficient gas/oil plant.

There is also tremendous demand for renewable energy in Mexico. A poll completed by the Commission for Environmental Cooperation found that 94 percent of energy buyers in Mexico would like to purchase renewable energy, and 90 percent would accept a requirement that they purchase renewable energy.<sup>10</sup>

**Table 4. Renewable Energy Options for California and Baja California<sup>11</sup>**

Energy Options (a)	Cost (\$/kwh) (b)
Natural gas combined-cycle power plant (baseload)	0.05
Natural gas simple cycle power plant (peaking)	0.16
Wind	0.05
Solar Photovoltaic (residential) (f)	0.25
Solar thermal (residential)	0.14-0.17
Geothermal (flash)	0.05
Energy conservation (c)	0.03-0.06
San Diego Gas and Electric 2004 residential charge	0.15 (d)
CFE, North Baja California 2004 residential charge	0.22 (e)

- (a) California Energy Commission, *Comparative Cost of California Central Station Electricity Generation Technologies*, August 2003, page 3 and 11.
- (b) “levelized direct cost”—assumes life of project natural gas cost in \$5/MMBtu to \$6/MMBtu range.
- (c) California Consumer Power and Conservation Financing Authority, “Clean Growth: Clean Energy for California’s Economic Future- Energy Resource Investment Plan.” February 2002, Table 6-2, pg.54.
- (d) Includes only metered kwh usage charge and “electric energy charge”, April 2004.
- (e) Includes only December 2003 published CFE summer usage charge based on 1,000 kwh/month.
- (f) California Energy Commission, Energy Power Calculator; SEIA cost calculations.

The combination of renewable energies in Mexico could produce at least 50 million to 100 million MWh of energy.<sup>12</sup> In southern California, the unsubsidized price for residential solar power is approximately 25 cents per kwh.<sup>13</sup> The current residential power rate in Baja California is 22 cents per kwh (see Table 4). This difference is negligible when the cost of environmental degradation and safety issues associated with LNG are included.

Mexico has tremendous potential for solar thermal energy. A report by the European Solar Thermal Industry Association and Greenpeace states that with the right incentives and policies Mexico could generate 1,290 MW of power at solar power stations by 2015.<sup>14</sup>

Mexico also has great potential for energy efficiency, the Mexico’s Comisión Nacional para el Ahorro de Energía (CONAE) estimated that Mexico can reduce energy consumption by 20 percent, saving the country 100,000 million pesos every year.

<sup>1</sup> Available from [www.shell.com](http://www.shell.com)

<sup>2</sup> California Energy Commission, *West Coast LNG Projects* April 29, 2004.

<sup>3</sup> July 15, 2003 envr coalition comment letter on USCG DEIS for ChevronTexaco Port Pelican offshore LNG project, Gulf of Mexico.

<sup>4</sup> Available from [www.chevrontexaco.com](http://www.chevrontexaco.com)



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- <sup>5</sup> California Energy Commission, *West Coast LNG Projects*, April 29, 2004.
- <sup>6</sup> B. Powers, July 6, 2004 PowerPoint presentation to CalEPA, Sacramento.
- <sup>7</sup> Both the Gorgon gas field (NW Australia, source of ChevronTexaco LNG) and the Tangguh gas field (Indonesia, source of Sempra/Shell LNG) are high in CO<sub>2</sub>.
- <sup>8</sup> Coal Industry: Utility Fax Alert #681, July 9, 2004.
- <sup>9</sup> Conversations with Alejandro Abril, Director of CFE Geothermal Projects
- <sup>10</sup> [http://www.cec.org/files/PDF/ECONOMY/breceda\\_es.pdf](http://www.cec.org/files/PDF/ECONOMY/breceda_es.pdf)
- <sup>11</sup> Powers Engineering, "Worldwide View of Global Supply Chains" *Global LNG Summit* June, 2004.
- <sup>12</sup> Munoz, Enrique Caldera. "Potencial de la Energia Eoloelectrica en Mexico," Investigacion elaborada para Greenpeace Mexico, 1999.
- <sup>13</sup> California Energy Commission, Clean Power Estimator.
- <sup>14</sup> Greenpeace, Solar Thermal Power: 2020 Exploiting the Heat From the Sun to Combat Climate Change.

## **Chapter 2. Time Bomb or Terrorist Target**

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As the increasing number of proposed LNG facilities in North America has grown to national prominence in the United States, so have the safety concerns. These concerns escalated after a study by the Algerian government into an accident at a LNG terminal indicated that LNG vapor was responsible for the explosion. In addition, concerns over the cost and feasibility of protecting an LNG terminal in Boston is spilling into the debate over costs and dangers at facilities across the United States and into Mexico, where politicians are debating who will ultimately pay for security at LNG facilities in Baja California.

It is likely that accident and terrorism safeguards will be updated in the United States to reflect new information and concerns since September 11<sup>th</sup>. But it remains to be seen whether these efforts will extend south of the border into Mexico. Neither Sempra/Shell nor Chevron-Exaco has indicated that they intend to implement any innovative safety or security measures.

### **A recent accident in Algeria raises new questions about the safety of LNG**

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The LNG industry claims that new LNG facilities are no longer dangerous. They claim that the disaster in Cleveland in 1944 that killed 128 people, and the non-fatal vapor cloud releases in Boston in 1988 and the UAE in 1978, are problems of the past. But the fatal January 2004 accident that destroyed a good portion of an Algerian LNG liquefaction plant indicates that the industry has not solved its safety problems and provides dramatic evidence that these facilities should not be located near people.

The new report by the Algerian government, presented at a LNG conference in Qatar in March 2004, states that “large amount of liquid gas escaped from a pipe and formed a cloud of highly flammable and explosive vapor that hovered over the facility. The cloud exploded after coming into contact with a flame source.” According to leading LNG safety experts, the accident in Algeria could occur at plants like the ones being proposed in Baja Mexico.<sup>1</sup>

### **Multinational companies move LNG terminals to Mexico to avoid U.S. opposition**

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The safety concerns that LNG sites invite are one of the reasons that people across the U.S have fought to ensure that LNG facilities are not built in their cities. The Mayor of Boston, Thomas M. Menino, sued to keep LNG tankers out of Boston harbor after the Sept. 11 attacks. Menino lost that court fight but maintains LNG tankers should not enter metropolitan areas due to safety concerns. Boston fire officials told a state panel in February 2004 that they remain unprepared to deal with the potential disaster stemming from an explosion aboard one of the giant tankers that carries LNG through Boston Harbor.<sup>2</sup>

Massive security measures are now involved in bringing each LNG tanker into Boston. Since Sept. 11 at least a dozen vessels clear a safety and security zone two miles ahead and one mile behind the ship - and the Coast Guard also inspects the tankers offshore. The security measures taken to guard LNG related equipment from terrorist attacks in the U.S demonstrate an implicit recognition of the extreme potential danger that LNG terminals create no matter where they are constructed.

LNG terminals have been defeated in Vallejo (California), Oxnard (California), Eureka (California), Harpswell (Maine), Mobile (Alabama), Tijuana and Rosarito, (Mexico). All of these proposed sites were withdrawn when local residents declared that they did not want the LNG terminals in their communities. These communities cited "serious safety concerns"<sup>3</sup> as their reason for refusing these LNG terminals. Successes in these seven cities demonstrate that local resistance is an effective means of preventing poorly sited LNG terminals from being completed.

### **LNG facilities pose a terrorist and safety threat to local communities**

A recent report of the U.S. Congressional Research Service identified LNG terminals, tankers and pipelines as prime terrorist targets. In the United States, federal warnings about Al Qaeda threats since September 11, 2001 have repeatedly mentioned energy infrastructure. On the morning of Sept. 11, 2001, top officials in the White House situation room expressed an almost immediate fear of an attack on the Boston LNG plant, according to the former White House terrorism chief Richard A. Clarke.<sup>4</sup>

The Congressional Research Service report outlines the potential for an attack on LNG facility as a "serious hazard." Although there has not yet been a terrorist attack on LNG tankers or land-based facilities, gas and oil pipelines and oil tankers have been attacked in at least six countries, including the 2002 attack on the French oil tanker *Limberg* off the Yemeni coast by a bomb-laden boat.<sup>5</sup> Paul W. Pafomak explains why LNG tank facilities may be targeted; "because LNG infrastructure is highly visible and easily identified, it is also potentially vulnerable to terrorist attack...LNG is inherently volatile and is usually shipped and stored in large quantities."<sup>6</sup>

Potential hazards include pool fires, which occur when combustible gas-air mixture burns above a pool of leaked LNG. "Such pool fires are intense, burning far more hotly and rapidly than oil or gasoline fires," the report adds. "Many experts agree that a pool fire, especially on water ... is the most serious LNG hazard."<sup>7</sup> It is also the consensus that such a fire could not be extinguished.

If LNG were released in an attack, it would most likely ignite immediately. However, if the LNG escaped without catching fire, a cloud of the gas could drift elsewhere and cause a fire, according to the report. Beyond physical damage, an attack on a LNG facility, especially one serving a large percentage of the population of California, could have a tremendous ripple effect on the California economy.

In Alabama, a similar LNG terminal proposal for the City of Mobile led the *Mobile Register* to conduct research, which it claimed “revealed significant flaws in the research used by the (federal) government when approving the construction of such facilities.” Leading LNG scientists warned that an accident or terrorist attack involving a tanker could lead to a fire a mile wide, inflicting second-degree burns on people two miles away,” leading to overwhelming local public opposition to the \$600 million ExxonMobil proposal.<sup>8</sup>

A study by Lloyd's Register of Shipping presents a chilling examination of what might happen if a terrorist attacked a LNG tanker. According to the study, terrorists who blew relatively small holes in the inner and outer hulls of a LNG tank could trigger an escalating series of explosions and fires. The ship, said the Lloyd's study, “would become a total loss with a continuous fire that would be inextinguishable until all gas had been consumed.”<sup>9</sup>

James A. Fay, professor emeritus at the Massachusetts Institute of Technology, a leading expert on LNG and former chairman of the Massachusetts Port Authority board, believes a boat bomb, like the one used against the USS Cole in 2000 or the French oil tanker *Limburg* in 2002, would cause at least half of the ship's cargo to seep over the water and ignite in a raging blaze. “There's no doubt that with a big enough bomb you can blow a hole in the side of the vessel and the cargo will burn,” Fay said. “It's well understood that for the big fires we're talking about that distances like half a mile or so, you can get second-degree burns to exposed skin in about 30 seconds...”<sup>10</sup>

“In just over three minutes, the fire could spread two-thirds of a mile from the ship. There is nothing safety officials can do in such a case. They would have no time to evacuate people or to put out the fire.... Like the attack on the World Trade Center in New York City, there exists no relevant industrial experience with fires of this scale from which to project measures for securing public safety.”<sup>11</sup>

Jerry Havens, a University of Arkansas professor and expert in both fires and weapons of mass destruction, agrees with Fay's assessments. Haven's concern is primarily with the lack of security measures required in the transport of LNG. In testimony before the House Subcommittee on Energy Reforms given on June 22, 2004, he commented that spills from a LNG tanker could require an exclusion zone of several miles in order to protect the public. He also emphasized that “present regulations do not require the address of spills from a tanker at the facility”.<sup>12</sup> Dr. Havens agrees with the findings of Lloyd's Register and is also concerned that the entire tanker could be lost in fire if attacked, a concern that has recently been validated by consultants to the Federal Energy Regulatory Commission (FERC).

### **New studies indicate need for larger safety zones**

The FERC has received important new evidence regarding the safety of LNG tankers. On May 13, 2004, FERC's consultant, ABS Consulting, Inc, found that the 2001 LNG

hazard study previously relied on by the FERC was flawed in both its methodology and its conclusions, and that there is a lack of data on the consequences of an accident or act of sabotage involving tankers carrying LNG. ABS also found that the previous study, by Quest, underestimated both LNG vapor cloud dispersion distances and thermal radiation zones associated with major LNG release events.<sup>13</sup>

The report concluded that if the tanker's hull and cargo tanks were successfully breached, a pool fire could burn victims up to 4,600 feet away. Such an event could cause "severe pain" within 13 seconds and third-degree burns within 50 seconds. The report only analyzed the effect of a 20 percent loss of LNG, even though scientists are concerned that any breach of the hull would result in a total loss of the cargo. The safety zone required for a full breach of the tanker would likely be several miles.

It is critical that the Mexican Government, the State of California and FERC expand their LNG siting considerations to include this new evidence. Though tankers are the most vulnerable aspects of the LNG supply chain, current U.S. and Mexican regulations do not require safety zones for tanker accidents or acts of terrorism. Despite this, it is not clear whether FERC will apply the ABS recommendations to currently proposed LNG terminal sites, or whether multinational corporations operating in Mexico would adopt those regulations.

### **Who will protect LNG facilities in Mexico?**

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There is concern in Mexico about who will pay for security precautions. These costs are growing quickly in the U.S, where communities are paying up to millions of dollars per year for tanker and terminal security. Manuel Bartlett, a PRI senator, Cuauhtemoc Cardenas, a founding member of PRD, and other politicians warn, "Mexico will be forced to provide security for a project that will be part of the U.S. energy system."<sup>14</sup> They also "contend the [Chevron-Texaco] project would violate Mexico's sovereignty and compromise its national security."<sup>15</sup>

The cost of protecting each LNG shipment to Boston, the only LNG receiving plant in an urban area in the United States, is about \$80,000 per tanker. This includes a contribution of about \$30,000 per tanker from the surrounding communities and the state.<sup>16</sup> The cost of this protection has been rising as the measures become more extreme, matching the increasing fear of attack. Currently, safety measures include "maritime patrol boat escorts, helicopters, police divers, fire fighting tug boats, and the closing of the Tobin Bridge - the U.S. Route 1 commuting expressway, which LNG ships clear by less than 10 feet. In addition, Massachusetts State Police cruisers are placed strategically along the shore to watch for possible land-based missile attacks."<sup>17</sup>

In the United States LNG facilities are considered "critical assets" that warrant special protection. For this reason, Senator John F. Kerry, the Democratic Presidential candidate, is pressuring Secretary of Homeland Security Tom Ridge to raise the terrorist threat level from elevated to high in Boston when weekly LNG tankers enter the port in Everett. "The Everett LNG facility should be considered a critical asset that warrants

enhanced protective measures consistent with those implemented when the threat level was elevated to Orange in December 2003," Kerry wrote.<sup>18</sup>

Despite the precautions taken with the LNG facilities in the USA, little planning has been done regarding how to safeguard the proposed LNG sites in Baja California. The double standard generally evident in the decision to build dangerous facilities in Mexico, after they have been refused by local opposition groups in multiple U.S. states including Louisiana, Maine and California, is especially evident when the security of the sites is scrutinized. Neither Shell/Sempra nor Chevron-Texaco outlines any security plan relevant to the threat of a terrorist attack on the proposed sites in Baja California. In contrast to the degree of concern over the existing LNG sites in the U.S, the lack of analysis and foresight regarding the proposed sites in Baja California indicates an increased risk of terrorist attack and demonstrates a lack of responsibility and concern from Shell/Sempra and Chevron-Texaco.

### **Mexico has a history of fuel storage accidents**

Historically, fuel storage in Mexico has been risky business. In 1984, over 500 people were killed in an explosion at liquid petroleum gas (LPG) terminal in Mexico City. The same LPG terminal experienced a second failure in 1996; four more lives were lost.

LPG is not the only fuel to have caused a tremendous loss of life in a Mexican City. A leak of hexane from a PEMEX operated factory in Guadalajara, Mexico devastated the area. Over 20 city blocks were flattened by blasts from the series of explosions.<sup>19</sup> As a result of this explosion, 15,000 people were left homeless, at least 1,500 people were injured and 170 people were killed.<sup>20</sup> Natural gas has also been the source of a deadly explosion in Mexico. In 1996, a natural gas leak caused an explosion that killed 6 people and injured 30.

The history of fuel storage explosions in Mexico is long and deadly. It has not been one specific form of fuel that has caused these deaths, but many different non-renewable energy sources. Shell, Sempra, Chevron-Texaco and PEMEX state that LNG is a safer energy source, despite recent accidents in Algeria and the potential for terrorist attacks. Each of these previous sources of energy has been touted as "safe" and the results have been deadly.

### **Offshore LNG facilities still require security**

Even offshore LNG facilities, while not posing an imminent safety hazard, will require extensive security measures because of the economic consequences of an attack on a facility that supplies such a large volume of Southern California's natural gas. According to the U.S. Congressional Research Service:

Offshore oil and gas facilities...have been attacked in the past during wartime and in territorial disputes. Since September 11, 2001, international concern about terrorist attacks on these platforms has grown.

Some experts believe terrorists attacks against offshore platforms have been on the rise recently in countries with a history of terror activity.... Because offshore oil and gas facilities are remote, isolated, and often lightly manned, some experts believe they are more vulnerable to terror attacks than land-based facilities....if several new offshore terminals were attacked in the future, the effects on natural gas availability and prices could have serious consequences for U.S. energy markets.<sup>21</sup>

LNG facilities in Mexico would be a terrorist target only because they are supplying a large amount of natural gas to the United States. Although it is not clear right now that Mexico will use any significant amount of natural gas from these facilities, it is possible that Baja California could become dependent upon natural gas once an LNG receiving terminal is built. The dependency of both the United States and Baja California on natural gas would dramatically increase the value of the site as a terrorist target. If an LNG receiving terminal were attacked, the economic and social consequences would be severe. The industry standard given for restoring a LNG receiving terminal to functional capacity is four years. Dependency on the centralized power of LNG creates a tremendous opportunity for terrorists to strike and cause lasting chaos in both the United States and Mexico.

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<sup>1</sup> Raines, Ben. "Report Sheds New Light on LNG Blast in Algeria." *Mobile Register* April 14, 2004.

<sup>2</sup> Daniel, Mac. "Fire Officials Voice Concerns on LNG Threat." *The Boston Globe* February 27, 2004.

<sup>3</sup> Fenske, Sara. "Welcome to Fire Island." *Houston Press* May 27, 2004.

<sup>4</sup> Bender, Bryan. "US feared 9/11 hit in Boston, book says: LNG site in Everett was considered at risk," *Boston Globe*, March 23, 2004.

<sup>5</sup> Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

<sup>6</sup> Ibid

<sup>7</sup> Ibid

<sup>8</sup> Finch, Bill. "Poll finds growing opposition to LNG Majority in Mobile and Baldwin counties against terminal in Mobile Bay," *Mobile Register* March, 2004.

<sup>9</sup> LNG Watch: "Samoa LNG: What is it?" February, 2004.

<sup>10</sup> *Energy Security*, January 21, 2004.

<sup>11</sup> Ibid

<sup>12</sup> Hearing before the Subcommittee on Energy Policy, Natural Resources and Regulatory Affairs, U.S House of Representatives testimony, June 22, 2004.

<sup>13</sup> ABS found that in the scenario most often cited as a sample tanker sabotage case, a flammable LNG vapor cloud could travel as far as 18,000 feet (over three miles) before dissipating, and that thermal radiation from an LNG pool fire at the tanker could cause second-degree burns at a distance of 4,600 feet within 30 seconds. Available from <http://www.ferc.gov/industries/gas/indus-act/lng-model>

<sup>14</sup> Lindquist, Diane. "LNG Controversy Heating Up: Mexico's opposition leaders criticize plans for terminals off Baja." *San Diego Union Tribune* April 7, 2004.

<sup>15</sup> Ibid

<sup>16</sup> Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

<sup>17</sup> Howland, Jonathan. *JINSA* April 1, 2004.

<sup>18</sup> Bryan Bender, "U.S Feared 9/11 Hit in Boston, Book Says." *The Boston Globe* March 23, 2004.

<sup>19</sup> Staten, Clarke EMT. "Explosions rip Mexican City" *Emergency News Net*, April 22, 1992.

<sup>20</sup> Eisner, Peter. "Mexico Reels from Explosion" *Newsday* April 24, 1992.

<sup>21</sup> Paformak, Paul W. "Liquefied Natural Gas (LNG) Infrastructure Security: Background and Issues for Congress," Congressional Research Service, Library of Congress, September 9, 2003.

### **Chapter 3. Transforming Baja California into a Dirty Energy Zone**

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Hoping to avoid strict environmental laws and local opposition to coastal development in California, yet still have easy access to the United States, corporations like Semptra, Shell, ChevronTexaco, Marathon and ConocoPhillips proposed LNG terminals on the Baja California coast, just South of the California border. The first proposed projects, which were inappropriately located in residential neighborhoods, were driven away by local residents who feared for the safety of their families. However, two environmentally and socially flawed projects remain on the Baja California coast.

#### **Secret deal hands Coronado Islands to Chevron-Texaco**

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In order to build the proposed LNG terminal at the Coronado Islands site, Chevron-Texaco had to secure a concession, or a right to use public assets, from the Mexican federal government. The Ministry of Communications and Transport (SCT) is the branch of the government responsible for issuing concessions. The SCT and Chevron-Texaco quietly negotiated a deal to hand over control of the Coronado Islands to the multinational corporation for 30 years. The SCT announced that the solicitation for a concession for the use of federal waters would be made on December 8, 2003. However, the notice was not published until December 29, 2003, a time when the public would pay little attention to the announcement.<sup>1</sup>

The information regarding the concession did not appear in any of the expected locations. It was not published on the web page of the SCT or the standard public website of the Interior Ministry, which is a violation of the Federal Law of Transparency and Access to Governmental Public Information.

The delayed release of the announcement that a solicitation for a concession to use public assets was timed to correspond with the holiday season in Mexico. The notice specified that parties interested in the concession must express interest before January 12, 2004. Mexico was on holiday until January 5, leaving one week for an interested party to obtain, complete and deliver the necessary documents. If these documents were not delivered by 2 PM on January 12, 2004, the interested party was not able to participate in the upcoming tender.<sup>2</sup>

The timing of the release, and the lack of publication of the document on readily accessible sites, demonstrate a lack of transparency in the negotiation of the tender, and the subsequent granting of exclusive rights to use the Coronado Island site for 30 years to Chevron-Texaco.

The exceptional conservation value of these islands has been recognized by the Mexican Federal Congress, which exhorted the relevant Federal agencies to create a natural protected area for the Baja California Pacific islands, including the Coronado Islands, as well as San Benito, Cedros, Guadalupe, San Martín, San Jerónimo, and Todos Santos (Congreso de la Unión 2003) on July 23, 2003.



## **Shell has misrepresented their intentions in the past**

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In May 2003, the Border Power Plant Working Group (BPPWG) used the courtroom to highlight the unfair practices of California's Sempra Energy and InterGen, a power generation venture of Shell. Sempra and Shell were in the process of constructing transmission lines to connect power plants just across the border to United States' markets. The BPPWG filed suit against the Department of Energy (DOE), as the DOE granted the permits necessary to import power to the U.S. along the transmission lines. Federal Judge Irma Gonzalez initially appeared to set higher pollution reduction standards for the region. However, she eventually ruled in favor of the DOE after taking into consideration the economic impacts of shutting down the plants.

Shell had agreed to install smog reducing Selective Catalytic Reduction (SCR) technology, considered to be Best Available Control Technology (BACT), on its two export turbines by the time of commercial startup in June 2003. The company was initially unwilling to install BACT on the two remaining turbines supplying power to Mexico. Pressure from citizens, local government, and California federal politicians ultimately forced InterGen to capitulate and agree to install SCR on the two domestic turbines as well.<sup>3</sup>

Despite their written commitment, InterGen did not install SCR on one of the export turbines before startup in June 2003. The plant operated without control from the summer 2003 through January 2004. One reason that Judge Gonzalez did not shut down the power plants during the remedy phase of the court case was InterGen's insistence that its plant's emissions would be controlled to less than significant levels through the use of SCR.

Shell – as InterGen – misrepresented itself to the court, the DOE, and to the community, which was directly impacted by the unexpectedly high emission levels. Although the failure of InterGen to install SCR was pointed out to the DOE by the Border Power Plant Working Group in November 2003, InterGen continued to operate the affected turbine until January 2004. The company agreed to stop operating the turbine only in response to a threat of a complete shutdown by the DOE.<sup>4</sup> As a result of this "breach of faith," Senator Diane Feinstein of California negotiated an accelerated SCR installation schedule for the remaining two InterGen turbines in January 2004. The initial spring 2006 SCR installation target date has been advanced to the spring of 2005.

## **Violation of the Constitution**

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According to a group of Mexican Federal legislators and local activist groups, the proposed LNG terminals in Baja California and the Coronado Islands also violate the Mexican Constitution. Their argument stems from Article 27 of the Mexican Constitution, which states:

Ownership of the lands and waters within the boundaries of Mexico belong to the State, and the State has direct ownership of all natural resources including petroleum and all solid, liquid and gaseous

hydrocarbons. No petroleum or hydrocarbon concessions may be granted, and the State must manage the exploration and development of such products in accordance with terms established in the regulatory law.<sup>5</sup>

The independence of Mexican oil and gas from foreign interests has been a matter of national pride since 1938 when the company Petroleos Mexicanos was created.<sup>6</sup>

According to the legislators, President Vicente Fox attempted to sidestep the Mexican Constitution in order to open the energy sector to private investors. However, the legislators filed a constitutional challenge in the Supreme Court on July 4, 2001. The legislators claimed that President Fox announced an amendment to the Constitution that would allow for increased investment by the private sector. Proposing an amendment to the Constitution is a function reserved exclusively for the Congress. The Mexican Supreme Court ruled against President Fox's changes on February 26, 2004. The Supreme Court declared "that President Vicente Fox had overstepped his authority in raising the amount of power that the Federal Electricity Commission could buy from private companies that generate more than they need to fuel their own operations."<sup>7</sup>

### **Legal battle over environmental permits for Sempra LNG terminal**

Fifteen lawsuits that challenge environmental permits issued to Shell/Sempra have been filed in Mexican Courts. The flood of lawsuits caused a temporary injunction against the permit to be issued in November of 2003.<sup>8</sup> The injunctions were lifted in March 2004 when the Mexican City courts declared that the suits had merit. Although Shell/Sempra now claim that they are moving ahead "in full force and effect",<sup>9</sup> the removal of the injunction actually indicates that the lawsuits are proceeding within the Mexican Court System. Shell/Sempra's claims that the legal problems have been completely resolved may be designed to reassure investors.

### **The LNG terminals do not help the local economy in the long-term**

The LNG terminal proposed by Shell/Sempra will require 1,000 workers during the construction phase. This phase is expected to last 40 months. When construction is completed, the LNG terminals will employ between 30 and 40 technical workers.<sup>10</sup> It is unclear if these workers will be from the local community or not, but as the job requires specific technical skills, it is expected that the company will bring workers in from other locations who have already completed the necessary training.

Chevron-Texaco plans on employing 1,200 construction workers during the construction phase. The estimated number of local jobs that will be indirectly created is 2,400. Chevron-Texaco does not further articulate how these jobs will be created. However, the Chevron-Texaco and Shell/Sempra terminals are similar in size and employment expectations are similar.

Chevron-Texaco claims that placing an LNG regasification terminal in Mexico will move Mexico from the end of the natural gas supply chain to the beginning. However, Mexico

is really being placed near the end of one of the longest supply chains in history. It will take 18 days for LNG from Chevron-Texaco's proposed LNG liquefaction site in Australia to reach the West Coast of Mexico.<sup>11</sup> Importing LNG from the proposed Sakhalin Island site in the Russian Far East will take a minimum of 11 days one-way.<sup>12</sup> The amount of CO<sub>2</sub> emitted during the transportation process increases with the length of the voyage. Despite Chevron-Texaco's claim, Mexico is not being moved to the beginning of the supply chain, and it is not moving in the direction of energy independence as this implies.

### **The LNG terminal is bad for the economy in Baja California**

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The economy in Baja California relies heavily on tourism, and the importance of tourism to the area is growing steadily. In 2003, almost three billion U.S dollars were generated from Baja California travel and tourism, and that amount is growing at a rate of 6.7 percent annually.<sup>13</sup> Strong growth in this sector is expected to continue and increase because of investments being made in the area. The tourism sector is critical to Mexico, as the factory jobs that Mexico depends heavily upon are being moved to countries with cheaper labor. While Baja California has not lost many jobs at the border assembly plants to lower cost labor abroad, the tourism industry is seen as an essential means of stabilizing the economic situation in the state.<sup>14</sup>

The tourism industry is largely focused on expanding ecotourism. To that end, the state government created a series of ecotourism circuits in each of the six major regions of Baja California. These ecotourism circuits take tourists through historic missions, natural hot springs, cave paintings and archaeological sites. More traditional tourism is still based almost entirely on the natural surroundings of the area. Activities include seaside spas, wilderness and beach camping, deep-sea fishing, beach horseback riding, golf, kayaking, hiking, scuba diving and sailing.<sup>15</sup>

The ecotourism industry is a major driving force in the economy of Baja California. The proposed LNG terminals on the coastline and the Coronado Islands will introduce unsightly terminals and tankers to the area, hampering the tourism industry. The tourism industry requires both skilled and unskilled labor and provides many job opportunities. The LNG terminals will reduce the number of tourism related jobs and will create very few local jobs.

### **Sempra/Shell terminal jeopardizes Bajamar Resort**

A popular tourist resort, Bajamar, is located within 2 miles of the LNG terminal proposed by Shell and Sempra. Developer Roberto Valdes spoke out against the LNG terminal, "I think Ensenada city and state government officials need to put a hold on the project and consider if it is wise to jeopardize the safety and peace of mind of people who are living and investing in the Bajamar resort".<sup>16</sup> Valdes is especially concerned because the recent explosion at an LNG facility in Algeria caused damage up to seven miles away. An accident of similar magnitude at the Sempra/Shell LNG terminal would put Bajamar residents and property in danger. If the Bajamar resort is perceived as a risky investment, investors will be hesitant to continue to purchase property in the area.

## **Chevron-Texaco's proposed terminal would damage tours to the Coronado Islands**

The LNG terminal proposed by Chevron-Texaco would compromise critical marine bird habitat and greatly damage the tourist appeal of the Coronado Islands. The islands provide a prime habitat for a threatened species of marine bird, the Xantus Murrelet. This bird and its chicks are particularly sensitive to light pollution during the nesting season. The huge terminal, brilliantly lit at night, will be only 600 meters from the South Coronado Island. The Islands also offer encounters with Sea Lions, Harbor Seals, octopus, Horn Sharks, Moray Eels, Garibaldis, and purple coral for divers and nature viewers out for day trips. Chevron-Texaco's LNG terminal would be an eyesore at this beautiful site and decrease both the popularity of the Islands and the revenue that tourism to the Islands generates.

## **PEMEX will not gain from LNG importation**

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The proposed LNG terminals will not help Petroleos Mexicanos (PEMEX), the state owned energy firm, in the long term. Although the LNG regasification sites will be located in Mexico, they will be owned and operated by multinational companies. Due to legal constraints, PEMEX will be a partner of the LNG terminal developers, although PEMEX will not be a primary benefactor of income generated from the sale of the regasified LNG. In fact, PEMEX could become one of the largest customers of the multinational corporations. PEMEX hopes to purchase enough natural gas from Shell/Sempra and ChevronTexaco to be able to export it to the U.S, where demand is

### ***Proposed LNG terminals have been rejected by communities***

*In both Tijuana and Rosarito, when citizens became informed about the potential dangers associated with the proposed LNG terminals, the community opposed the proposed terminals, and the developers abandoned the projects.*

*In Tijuana, Marathon Oil attempted to construct an LNG regasification site. However, the people living in that area fought against the LNG terminal because they realized that they were going to be undertaking 75 percent of the risk, for, at most, 10 percent of the natural gas. The community became educated about the dangers of the proposed LNG terminal, and rallied against the terminal when they realized the damaging environmental and health impacts it created. Faced with such strong local opposition, the federal and local governments decided to enforce the Tijuana Urban Development Plan, which had zoned the area for "low impact tourism". Marathon Oil was forced to discontinue its plans for the terminal.*

*In Rosarito, El Paso Energy and Conoco Phillips proposed an LNG terminal that met with strong local opposition and was forced to stop its construction plans. The local citizens were angered by the proposed the location of the LNG site - near a power plant owned by Petroleos Mexicanos. The people living near the Petroleos Mexicanos power plant refused to allow an additional plant to devastate their health, neighborhoods and the environment.*

high.<sup>17</sup> However, it is highly unlikely that multinational corporations like Sempra/Shell and ChevronTexaco will allow PEMEX to make any significant profits on the natural gas they intend to sell to the United States. This PEMEX export concept does little to help the situation in Baja California, where energy prices are high, and many are unable to afford electrical service.

According to a recent analysis of the North American market for natural gas, PEMEX customers are also unlikely to gain financially from the importation of LNG into Mexico. Although some commentators have stated that LNG imports will reduce the cost of natural gas, recent analysis<sup>18</sup> of the economics of natural gas in North America indicates that LNG importation will cause essentially no natural gas price depression either locally (at point of importation) or nationally. This is not surprising since the finding basically confirms that LNG developers will not be “shooting themselves in the foot” financially by undercutting gas prices with LNG. The static North American natural gas models being used by many to show a dramatic price depression with the importation of LNG are inappropriate models because they fail to take into account the depletion of low-cost conventional natural gas in North America.

There are insufficient supplies of low-cost domestic gas left for it to remain at the margin, so higher cost unconventional gas must be drilled. The abundant, higher cost domestic sources of gas, such as conventional (small gas field), unconventional, and arctic will be the marginal source of supply—with or without LNG importation—and these higher cost supplies will set the domestic price of gas at \$4.00 to \$4.50/MMBtu. Because these will set the market price of gas, “injections” of imported LNG will have little or no impact on the marginal price of natural gas.

## **Environmental Harms in Mexico**

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Although both of the proposed terminals in Baja California will have a significant impact on the surrounding environment, neither Sempra/Shell nor ChevronTexaco are making any significant effort to use the best available technology to reduce or avoid these impacts by investing in alternative, clean energy sources. In fact, both projects are being pushed forward in the absence of completed scientific study of the potential impacts. Furthermore, the past practices of these companies, particularly Sempra and Shell, show that they are willing to put their profits ahead of environmental and social concerns.

## **Seabirds and the Coronado Islands**

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The Coronado Islands, located off the Baja California coast in Mexico, just below the border about 20 miles south of San Diego, will be placed in serious jeopardy by the proposed LNG regasification terminal. The Coronado Islands are uninhabited and remain largely isolated. The species that inhabit the islands have not adapted to human activity. The proposed LNG sites expose these previously isolated islands to damaging forms of human activity.

The construction and general operation of the terminal, along with the tankers supplying the terminal, will have a continuous impact on the islands. The LNG terminal will cause distinct disturbances to the globally significant species of seabirds that inhabit the Coronado Islands. There are ten species of seabirds that use the Coronado Islands as their breeding grounds. Of these ten species, seven are listed as either threatened or endangered in the U.S or Mexico. The numbers of seabirds inhabiting the Coronado Islands are significantly lower than historical numbers due to impacts from habitat degradation as well as the prevalent use of the pesticide DDT which causes harmful thinning of the birds' shells.<sup>19</sup> While these seabird populations are currently rebounding, the proposed LNG terminal would make it very unlikely that these seabirds would continue to increase in number.

There are a number of factors linked to the LNG terminal that could cause continued loss of seabird populations. The construction of the terminal would introduce previously unknown sounds and sights to the islands. Surface nesting seabirds, such as the Brown Pelican, Double-crested, Brandt's, and Pelagic Cormorants, flee their nests when they are disturbed, leaving eggs unprotected. These vulnerable eggs are then susceptible to gull predation. A study conducted by Anderson and Keitt (1980) showed that 80 percent or more of eggs are lost due to human disturbances and the gull predation that follows.<sup>20</sup> The construction of the LNG terminal, and the subsequent operation of the terminal, would result in a severe threat to the already-endangered Brown Pelican, and would drastically reduce the populations of the Double-crested, Brandt's and Pelagic Cormorants.

Another category of seabird that inhabits the Coronado Islands is nocturnal seabirds. The Coronado Islands are at least 8 miles from any sources of light pollution, ensuring a proper nocturnal period for the seabirds that have evolved to be active only during the nighttime in order to avoid predators. The LNG terminal will require extensive lighting for safety purposes. The required lighting threatens nocturnal seabirds in two distinct ways. First, the lighting increases the risk of predation to nocturnal seabirds by illuminating their habitat during their active hours. Two types of seabirds, auks and storm petrels, breed only at night. The light pollution caused by the LNG terminal will disturb the breeding process while simultaneously exposing the active seabirds to predatory gulls and falcons. Seabirds are attracted to light. Mortality rates will increase as birds fly into lights and structures surrounding the lights.<sup>21</sup>

The Xantus's Murrelet is especially threatened by the light pollution that will be introduced to the Coronado Islands if the LNG terminal is built. This species is important to protect because of reduced population numbers. The Xantus Murrelet was listed as threatened by the California Department of Fish and Game in February 2004. This bird is extremely light sensitive. The world's largest population of this endangered seabird gathers in the nearshore waters of the Coronado Islands from January through July.<sup>22</sup>

## **A Potential threat to migrating whale populations**

The LNG tankers will also impact the marine life in the ocean surrounding the LNG regasification site. The waters off the coast of Baja California are particularly important to the gray whale population, which returns to the Baja California waters each year to reproduce.

The potential harms to the gray whale population from the proposed regasification site at Baja California have not yet been formally studied, although two studies are in the preliminary stages. ChevronTexaco has recently commissioned a study by the Hubbs Sea World Research Institute and Shell has commissioned a study by the Center for Scientific Research and Advanced Study (CICESE) located in Ensenada, Mexico.

Past research demonstrates that the two most significant threats to the gray whale population are pollution and the disturbance of calving lagoons. The LNG regasification site at the Coronado Islands will sit directly in the middle of the migration path that gray whales follow each spring.

While the specific impact of the LNG tankers is unknown, the massive size of the tankers, coupled with the frequency of their visits, is certain to increase the threat to the gray whale population. A peer-reviewed scientific study showing that construction and operation of the LNG terminals would have a minimal impact on ocean life, particularly the gray whale population, must be conducted and disclosed before construction begins.

## **Unnecessary seawater use at terminals will impair marine ecosystems**

The LNG terminal requires the intake, disinfection, and discharge of between 100 and 200 million gallons of chlorinated seawater per day. Chlorinated seawater is toxic to marine life, effecting the processes of reproduction, feeding, and respiration. It can also cause mutagenic effects.<sup>23</sup> The cold temperatures at which the water is discharged, as much as 20 degrees colder than the ocean's water, amplify the negative impacts of toxic, chlorinated seawater.<sup>24</sup>

The immediate impacts of discharging chlorinated water into the ocean are significant. Chlorine does not dissolve, but rather breaks down and forms complexes with other substances to create chlorinated organics. Chlorinated organics remain toxic to marine life forms for extended period of time.

The Clean Water Act requires the use of “the best technology available for minimizing adverse environmental impact” of LNG terminals within the borders of the United States. Submerged combustion vaporization (SCV) is the least environmentally damaging technology available for regasification. It uses less than two percent of the natural gas to vaporize the LNG. Although use of SCV results in a slight increase in terminal air emissions, these emissions can be substantially reduced by employing selective catalytic reduction (SCR) for nitrogen oxide control. SCR is used to control nitrogen oxide emissions from the SCV system in use at the oldest LNG regasification terminal in the

United States, Distrigas LNG in Boston.<sup>25</sup> Mexico is not governed by the Clean Water Act, and the LNG sites in Baja California will use less sophisticated, and much more environmentally devastating, regasification technology.

### **Pipeline construction by Sempra Energy has damaged ancient artifacts**

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Costa Azul is the only remaining undisturbed stretch of coastline between Tijuana and Ensenada. The site has a rich history of habitation by indigenous peoples, extending back over 10,000 years. The Mexican government has zoned the Costa Azul area for low-impact tourism, and recognized that “this area, with its magnificent coastal landscapes, its rare and well-preserved biological and coastal resources, its strategic location along the most scenic part of the tourist corridor, should be preserved as a state park or preserve for all Baja Californians, generating sustainable employment through ecotourism and related services, long-term excavations, and park management.”<sup>26</sup>

Unfortunately, the current plans for developing an energy market in Baja California do not consider the value of the undisturbed coastline or the archeological significance of Costa Azul in particular. Instead, some of the environmental damage associated with the LNG terminals has already been done. The proposed terminals at both sites will connect with the Bajanorte Gas Pipeline, which extends 130 miles from Tijuana to Mexicali and on to the U.S and was completed in 2002. Sempra Energy’s subsidiary, Gasoducto Bajanorte, cleared an 80-foot wide right-of-way along the entire length of the pipeline route.<sup>27</sup>

Although the path of the pipeline passed through a federally protected indigenous art site, Sempra made no attempt to get the necessary permits or take any steps to protect the invaluable artifacts. They were finally stopped by the efforts of Mexico’s National Institute of Anthropology and History. Although Sempra eventually changed the path of the pipeline, they left a disastrous trail of irreparable damage in their wake. The clearing of the right-of-way led to the destruction of hundreds of oak and pinyon trees and their habitats. Bedrock mortars, grinding slicks, ancient encampments and potential archaeological sites were also destroyed. When the company agreed to alter their path to avoid the federally protected Vallecitos Archaeological site, they did not repair, replant or make any attempt to mitigate the damages the clearing had caused. This complete disregard for the value of the local culture and habitat to maintain the construction schedule bodes ill for the environment in the vicinity of the proposed LNG project.<sup>28</sup>

### **Construction by Sempra/Shell will destroy more artifacts**

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The National Institute for History and Anthropology (INAH) was commissioned to carry out an investigation of the potential impacts of the Sempra/Shell LNG terminal on the archeological remains at the site. After one season in the field collecting and compiling information, the archeologists working for INAH produced a report on their findings. This report established the urgent need to take measures preventing irreversible loss, which can contribute to the historical understanding of the Baja California peninsula.



Their findings indicate that construction of the proposed liquid natural gas plant, including the access road and a large portion of the plant, will destroy artifacts and evidence of people that lived in Baja California thousands of years ago.

The current plan is to excavate the artifacts and human remains at the site before construction begins. The work will be primarily one of archeological rescue and preservation. The time frame of the work is currently dictated not by the needs of the project, but by the construction schedule set by Sempra/Shell.

Based on studies carried out in areas near the proposed gas processing facility, archeologists think there is a possibility that there are graves on the site. The archeologists want to study those remains for clues to the nutrition and marine economy of the humans that lived here thousands of years ago, but they fear that most of the artifacts will be destroyed in a rush to construct the plant.

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<sup>1</sup> Banker and Associates, Energy Consultants, "New Actors in LNG politics in Baja California." *MEI report No. 660*, January 27, 2004.

<sup>2</sup> Ibid

<sup>3</sup> Barron, Jeffrey. "Evolving Impact of Environmental Laws on Cross-border Power Between Mexico and the United States", *Power in Latin America* August, 2003.

<sup>4</sup> Lindquist, Diane. "InterGen gives in, unplugs turbine." *San Diego Union Tribune* January 17, 2004.

<sup>5</sup> Young, Randel and Charles Meacham. "Pemex's Multiple Services Poses Financial Issues." *International Oil and Gas Finance Review* 2003, pg 73.

<sup>6</sup> Day, Paul. "Does MSC stand for Mexico Sold Cheap?" *Business Mexico* 2003.

<sup>7</sup> *Alexander's Gas and Oil Connections* volume 7, issue #10 May 16, 2002.

<sup>8</sup> Lindquist, Diane. "Permits for Sempra's LNG Plant Suspended." *San Diego Union Tribune* December 19, 2003.

<sup>9</sup> Phase 1 Comments of Sempra Energy LNG Corp., March 23, 2004.

<sup>10</sup> [www.shell.com](http://www.shell.com)

<sup>11</sup> Maul, David. CEC Staff Update on Liquefied Natural Gas, February 24, 2004 (assumes 18.5 knots).

<sup>12</sup> Oman, 25 days; Australia, 18 days; Malaysia, 17 days; Indonesia, 16 days; Brunei, 16 days; Russia, 11 days; Alaska, 5 days.

<sup>13</sup> "WorldTradeShow.com and Mexican Tourism Bureaus Partner." *Business Wire* March 24, 2004.

<sup>14</sup> Luken, Carlos. "Mexico's hope in Baja California." *Contra Costa Times*, August 24, 2003.

<sup>15</sup> "New Fox Studios Movie Park & Other Cultural Improvements Make Baja California An Exciting Summer Vacation Destination." *PR Newswire*, May 10, 2001.

<sup>16</sup> Lindquist, Diane. "Mexican agency warns of potential for LNG disaster." *The San Diego Union-Tribune*, January 23, 2004.

<sup>17</sup> "S.A. firm cashes in on Mexican connections in energy market." *San Antonio Business Journal*, May 28, 2004.

<sup>18</sup> Fahd, George and Dale Nesbitt (President). "Impact of LNG Imports on North American Natural Gas Prices." *Energy Pulse* June 10, 2004.

<sup>19</sup> Aguirre, Alfonso and Bradford Keitt. "Potential effects of a liquefied natural gas offshore terminal on seabirds at Coronado Islands, Baja California, Mexico."

<sup>20</sup> Ibid

<sup>21</sup> Ibid

<sup>22</sup> Ibid

<sup>23</sup> Patin, Stanislav *Environmental Impact of the Offshore Gas and Oil Industry*, Ecomonitor Pub, December 1999.

<sup>24</sup> <http://www.environmentalhealth.org/DeadlyPowerExecSumm.html>

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<sup>25</sup> Border Power Plant Working Group (and others) letter to U.S Coast Guard Docket Management Facility *Revised Comments on Draft Environmental Impact Statement Prepared for Port Pelican LLC Deepwater Port License Application- LNG vaporizer system* Global LNG Summit June 2004.

<sup>26</sup> Robertson, Miguel Wilken. "Costa Azul: A Threatened Cultural Landscape (notes for a talk)" September 12, 2003.

<sup>27</sup> Ibid

<sup>28</sup> Ibid

## **Chapter 4. Liquid Natural Gas: Derailing California's Golden Dream**

California is currently engaged in a fight for its energy future. The majority of California voters, along with Greenpeace, are demanding clean renewable resources. On the other side, multinational corporations are arguing that the State should invest billions in new LNG facilities and polluting power plants, including plants that would be sited in Mexico but supply California's market.

Shell, Sempra, Chevron-Texaco and BHP corporations are pressuring California to postpone its renewable energy goals, goals that are supported overwhelmingly by California voters. Instead, these energy giants propose the purchase of foreign supplies of natural gas in the form of LNG. In addition to the influence of the big corporations, all of California's natural gas utilities either have or until recently had, a direct stake in the importation of LNG.<sup>1</sup>

Greenpeace is part of a larger coalition of environmental groups and community activists in California that is advocating for increased investment in renewable energy and energy efficiency in California, instead of the creation of long-term dependence on liquid natural gas facilities.

California can meet its future energy demands without building any LNG terminals. If the State pursues aggressive energy efficiency goals, retrofits the old inefficient coastal power plants, and expands the States renewable energy goals, the State can reduce natural gas demand by the equivalent of three LNG terminals.

### **Conservation and renewable energy are California's top priority**

In 2002 the California Assembly overwhelmingly voted to make California a national renewable energy leader. California's Renewable Portfolio Standard ensures that 20 percent of California's energy will be produced from clean energy like wind, solar and geothermal by 2017. New legislation has been introduced, pushed by Governor Schwarzenegger, which would accelerate the target date to 2010.

In the same year, the California Power Authority (CPA) sent its Energy Resource Investment Plan to the state legislature. The Energy Resource Investment Plan details a strategy to prevent a future energy crisis by meeting California's energy supply shortfalls through energy efficiency, conservation and renewable generation. In total, the CPA will generate \$5 billion in revenue bond financing that will leverage over \$12 billion in clean energy investment by 2007.

In addition, the State's Energy Action Plan, adopted in 2003 by the California Public Utilities Commission, the California Energy Commission and the CPA, places energy efficiency and the acceleration of the State's renewable energy goal as the first priority for the State.

## California can eliminate the need for three LNG facilities

Natural gas demand in California can be cost-effectively reduced by one third, through conservation and renewable energy,<sup>2</sup> reducing CO<sub>2</sub> emissions by 101 billion pounds per year. This reduction is equal to removing more than 10 million passenger cars per year from the road<sup>3</sup> and provides the same benefits as building three LNG terminals.

This transition to renewable energy is especially important as decisions made now impact the future of energy production. If the LNG infrastructure is built on the West Coast, California and Baja California will become increasingly dependent on natural gas and a valuable opportunity to switch to a cleaner, safer, more sustainable method of energy production will be significantly delayed, or lost altogether.

## California already has a plan for reducing natural gas consumption by one-quarter

Numerous studies on the potential for energy efficiency and renewable energy were conducted when the State was putting together its Energy Action Plan. The fundamental result of these studies is a consensus that the state can significantly reduce its natural gas use through increased investments in energy efficiency and renewable power while saving money and improving the environment.

The studies by the California Energy Commission and others show that the State can reduce its natural gas use by nearly 1,500 mmcf/d or roughly 25 percent through cost-effective energy efficiency measures and by accelerating investments in renewable energy. Further increasing the State renewable energy goals to 30 percent of the State's energy use by 2017 would reduce natural gas use by the equivalent of another LNG terminal (see Table 1).

**Table 1: Extending California's renewable energy goal to 30 percent by 2017 would allow the State to cut natural demand by one-third.**

Gas Demand, Projected Demand Increase by California Natural Gas Utilities, Supply/Demand Reduction Options	Gas Quantity, (mmcf/d)
Average daily natural gas use in California, 2001	6,600
Projected increase in gas demand over 2002 baseline, 2006-2016	0-200 <sup>4</sup>
Average projected daily natural gas delivery from one LNG terminal	700-800
Total Reduction in California gas demand from conservation measures and accelerated renewable portfolio standard (20% by 2010)	1,100 – 1,500 <sup>5</sup>
Total Reductions assuming 30 percent renewable portfolio standard (a)	1,800 – 2,300 <sup>6</sup>

Source: Synapse Energy Economics, 2004

(a) Estimated from CEC baseline.

### *Increased Energy Efficiency Investments*

The largest single consumer of natural gas in California is the electric power industry, accounting for roughly one-third of the natural gas use in the state. Consequently, one of the best ways to reduce California's natural gas demand is to reduce the need for electricity through accelerated energy efficiency programs.

Studies by the California Energy Commission and an Xenergy Inc. consultants report commissioned by the Energy Foundation and Hewlett Foundation<sup>7</sup> found that over the next decade there is a significant potential for energy-efficiency savings in California. The CEC found that increased investments in energy efficiency could save 30,000 gigawatt hours (gwh) of electricity, which would reduce natural gas consumption in the state by 550 mmcf/d over the CEC base case forecast.<sup>8</sup> Similarly, Xenergy found that even more cost-effective energy efficiency measures can be implemented – saving 40,000 gwh of electricity – that would equal 820 mmcf/d of natural gas savings over the CEC base forecast. The baseload throughput of one LNG terminal is approximately 700 mmcf/d.

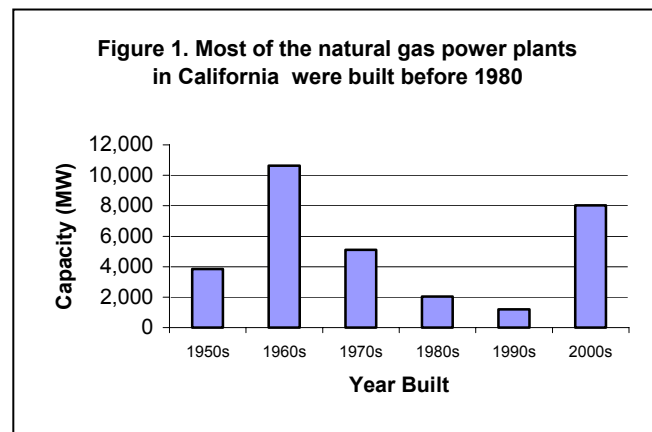
### *Building Standards*

More efficient technology is available at the consumer level. Recently adopted 2005 building standards will provide a 10 percent improvement over the 2001 standard. They are expected to produce annual electricity savings of nearly 5,000 gwh, which translates into 130 mmcf/d of natural gas reductions by 2016.<sup>9</sup> Improved appliance standards also are expected to provide significant additional savings.

### *Improving the efficiency of coastal natural gas power plants*

The State can take a giant step forward in energy efficiency by upgrading the old coastal utility boiler plants. Most of these units were built before 1975 and consume at least 50 percent more natural gas per unit of electricity produced than a new power plant. There are approximately 16,600 MW of old generating capacity in California.<sup>10</sup> Upgrading just the older non-peaking plants in California with newer technology would save approximately 500 mmcf/d.<sup>11</sup>

There are also significant health and economic benefits to replacing these aging power plants. Newer plants have lower fuel and operating costs, and produce less smog-forming nitrogen oxide emissions. Water usage from inefficient cooling could also be dramatically reduced with more efficient processes, which can be critical in mitigating the harm to



aquatic ecosystems. According to the California Energy Commission, all of the natural gas power plants built in this decade, 8,000 MW of power plants, have a nitrogen oxide limit of 5 ppm or less. However, over 10 percent of the older natural gas plants are permitted to emit over 50 ppm and another 12 percent can emit between 15 and 50 ppm (see Figure 1).<sup>12</sup>

*Renewable energy is the key to reducing natural gas use in the state.*

An accelerated Renewable Portfolio Standard (RPS)<sup>13</sup> is another key to significantly reducing natural gas use in the State. The RPS, adopted by California voters in 2002, currently states that 20 percent of energy generation in California should be from renewable sources of electricity by 2017. This represents a doubling of the renewable energy production from 2001.

**Table 2: Energy Efficiency and a 30 percent RPS will reduce the need for three LNG terminals in California**

Supply/Demand Reduction Options	Gas Savings (mmcf)
Increased Investments in Energy Efficiency Programs	550 – 820
Newly Implemented Building Standards	80 – 130
Improved Efficiency of Old Natural Gas Power Plants	475
Accelerated Renewable Portfolio Standard to 20 percent by 2010	27 – 55
Renewable Portfolio Standard 30 percent by 2017 (a)	685 – 820
<b>Total Natural Gas Demand Savings</b>	<b>1,800 – 2,300</b>

Source: Synapse Energy Economics, 2004

(a) Estimated from CEC baseline.

New legislation has been introduced, endorsed by the new Governor Arnold Schwarzenegger, which would accelerate the target date to 2010. This change would offset 220 mmcf of natural gas use in 2010, falling to 55 mmcf in 2013 as compared with the current RPS.<sup>14</sup>

Policy makers and environmentalists are calling on the State to continue to pursue aggressive renewable energy targets. An increase the RPS to 30 percent by 2017 would represent a significant increase in energy production and further reduces the demand for natural gas in the state. A 30 percent renewable energy goal by 2017 would reduce natural gas demand by an additional 685 to 820 mmcf, the equivalent of one LNG terminal.

<sup>1</sup> Southern California Gas and San Diego Gas and Electric are owned by Sempra. Until recently PGE owned the U.S. extension of the North Baja Pipeline in partnership with Sempra.

<sup>2</sup> Synapse report and assuming renewable energy goal of 30 percent by 2017.

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- <sup>3</sup> Environmental Protection Agency (assumes auto emissions of 10,000 pounds of CO<sub>2</sub> per year).
- <sup>4</sup> Derived from presentations by PGE, SoCalGas, and SDGE at CEC/CPUC Natural Gas Workshop, Dec. 9-10, 2003.
- <sup>5</sup> Derived from Synapse Energy Economics evaluation submitted in March 23, 2004 RACE coalition comments in CPUC Utility Long-Term Natural Gas Procurement Proceeding, Rulemaking 04-01-25
- <sup>6</sup> Ibid
- <sup>7</sup> Xenergy, 2002, California's Secret Energy Surplus, the Potential for Energy Efficiency"
- <sup>8</sup> The CEC assumed 10,000 gwh of energy efficiency savings.
- <sup>9</sup> Energy Action Plan Legislative Report, dated January 5, 2004.
- <sup>10</sup> "Aging Natural Gas Power Plants in California." *California Energy Commission Staff Paper*, July 2003.
- <sup>11</sup> Synapse Energy Economics on the California Natural Gas Utilities' Phase 1 Proposals, March 23, 2004.
- <sup>12</sup> California Energy Commission, Aging Natural Gas Power Plants in California, July 2003.
- <sup>13</sup> "Proposed Energy Savings Goals for Energy Efficiency Programs in California." *California Energy Commission Staff Report*, dated October 27, 2003, pg 32.
- <sup>14</sup> *Renewable Resources Development Report*, a Presentation by Ann Peterson, Project Manager, at the California Energy Commission Business Meeting, November 19, 2003, assuming 8,000 Gwh increase.

## **Chapter 5. LNG's Global Blood Trail**

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Liquid natural gas production results in environmental damage and human rights violations around the world. The natural gas used to make LNG destined for Mexico will be mined for in some of the world's most sensitive environments, such as the Peruvian jungle and Sakhalin Island in the Russian Far East. The world's banks are poised to finance these destructive practices around the globe.

### **Government Overthrow in Bolivia**

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Plans by Sempra Energy to export Bolivian gas to Chile for liquefaction and shipment to California fueled a popular uprising that left 65 dead and forced President Sanchez de Lozada from power. The revolt began in September of 2003, when indigenous and workers' groups began protests, strikes and roadblocks against the government's plan to export natural gas to the United States and Mexico via Chile. The demonstrations against the natural gas project subsequently spiraled into widespread protests against the Bolivian government. The opposition to the project has been particularly strong because many Bolivians are against exporting natural gas through a Chilean port. Bolivia lost access to the ocean in 1883 after being defeated by Chile in the War of the Pacific.

### **Bringing Disease and Destruction: The Camisea Project in Peru**

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The Camisea Gas Project in Peru is located in previously inaccessible Peruvian jungle in one of the most biologically diverse areas in the world. The project is also located in the Nahua Kugapakori State Reserve neighboring the Urubamba River, which was created over a decade ago to protect vulnerable native cultures. These nomadic, indigenous communities have had little or no contact with the outside world. In spite of the protected status of this land, Phase I of the Camisea Gas project will be completed in August 2004. This project is highly controversial due to the extensive environmental damage and the impact on indigenous peoples caused during the construction of the gas wells, gas plant, and 700-kilometer pipeline from the jungle to the coast.

Companies involved in the Camisea project consortium include Hunt Oil, Halliburton, Argentina's PlusPetrol and Techint, and Belgium's Tractebel. The consortium has been fined by the Peruvian government for violating erosion control and water quality standards. The pipeline right-of-way passes through many kilometers of steep jungle terrain with unstable soils and has been completely exposed for two consecutive rainy seasons. The failure of the consortium to promptly replant and close the pipeline right-of-way has resulted in tremendous erosion, landslides, and water quality impacts in the jungle portion of the project. This failure has also opened the region to "invasion" by outside colonists, further degrading this sensitive environment and threatening the health and way-of-life of the indigenous inhabitants.



Hunt Oil will be responsible for Phase II of the project, the construction of a liquefied natural gas (LNG) liquefaction terminal on the Peruvian coast south of Lima. The target markets for this LNG are California and Mexico. While Hunt Oil and the other companies involved stand to make a substantial profit from LNG, the cost to the Machiguenga indigenous communities in the Camisea region is a decline in health, attributed to pollution and the invasion of construction, and the potential loss of their culture.

The indigenous cultures living in the Nahua Kugapakori State Reserve are in the initial stages of contact with the outside world. One of their early communications with the outside world was an expression of outrage at the invasion of the oil companies; "In the past, Shell worked here and almost all of us died from the diseases...We know that if another company comes here, our rivers and land will be destroyed. What will we eat when the rivers are dead and the animals have run away?"<sup>1</sup>

### **Endangering the Whales: Russia's Sakhalin Island<sup>2</sup>**

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Sakhalin is a Russian island that is located about 50 miles north of Japan. After the collapse of the Soviet Union in the early 1990's, multi-national oil and gas companies wasted little time in exploring the waters around the island for oil and gas. It is now one of the leading oil and gas producing regions in Russia, and almost all of what is being produced is for the export market.

Natural gas is a by-product of the crude oil that is being extracted from Sakhalin. Despite industry claims to the contrary, getting natural gas from beneath the ocean floor has proven to be a dirty and dangerous process. Sakhalin's oil and gas is being drilled from two huge off-shore oil platforms, one operated primarily by ExxonMobil (the Sakhalin I project), and the other primarily by Shell and Mitsubishi (the Sakhalin II project). Sakhalin II would be a potential supplier of the Shell/Sempra import terminal at Costa Azul in Baja California.

Both of these platforms are located in a pristine marine habitat, and can potentially impact the only feeding ground of the critically endangered Western Pacific Gray Whale. There are about only 100 of these magnificent creatures alive, and the health of the surviving whales is being seriously compromised. Scientists studying the whales have observed malnourished, or "skinny," whales in the area. These scientists are concerned that continued oil and gas drilling adjacent to whale habitat, tanker traffic, and underwater pipeline construction could push the last of this dying breed into extinction.

For the next phase of the Sakhalin II project, Shell wants to build massive infrastructure to get the oil and gas to markets abroad. This will involve laying underwater oil and gas pipelines that will run right through whale feeding habitat, as well as through the home of many other species of fish, and on to the shores of Sakhalin. Environmentalists and local fishermen are very concerned that the construction of these pipelines could seriously disrupt this habitat, and that the pipeline could leak and contaminate the waters.

Once on the island, the oil and gas would be sent through parallel pipelines that will run the length of Sakhalin Island, over 800 kilometers, to its southern tip. Along its route, the pipeline will cross over 1,000 streams and rivers. Hundreds of these waterways provide spawning grounds for wild salmon, and together they contribute to one of the most robust salmon habitats in the world. The pipeline crossings will gouge right through the beds of these streams, with very little concern given to the well-being of the salmon, or the local economy and community that depends on the salmon for a substantial part of their diet.

The Sakhalin II project is dependent upon the public's money for its construction. The U.S. Export-Import Bank, and the European Bank for Reconstruction and Development are currently considering financing the further development of the Sakhalin II project, including the gas pipeline and the regasification terminal.

### **Jepordizing Biodiversity: Australia's Barrow Island<sup>3</sup>**

ChevronTexaco, ExxonMobil and Shell are currently proposing to put over \$6 billion worth of industrial gas processing facility and equipment on Barrow Island in a development known as the Gorgon Project. This infrastructure, which includes an LNG liquefaction plant, could be located offshore, on the mainland or on less important islands nearby.

Barrow Island is Western Australia's second largest island and home to internationally significant biodiversity. If no concerted effort to regulate human access and activities on the island is made, the unique biodiversity of the island will be jeopardized or lost forever.

There are 24 known indigenous animal species or subspecies that exist only on Barrow Island. This exceptional assemblage includes five forms of mammals, two types of reptiles, one species of bird and sixteen species of invertebrates. The island is also a refuge for the magnificent Perentie that, at lengths of over six feet, is the world's second largest lizard.

Barrow Island is such an important habitat for unique species that it is referred to as "Australia's Ark". A large construction workforce will soon invade this important habitat in order to build the proposed facilities. The estimated 52,037 personnel movements per year that will be required to build the new facilities is a manifold increase in the level of human industrial activity presently occurring on Barrow Island. This activity is one of the central threats posed to the 24 known types of animals that live nowhere else but Barrow Island. Increased human activities on the island increase the risk of the introduction of weeds and diseases that could wipe out the island's biological diversity forever.

Presently, only 150 barge movements occur per year and only 150 people live on Barrow Island at any one time. The number of visitors to the island is carefully controlled based on Barrow Islands status as a Permanent Class A Reserve. Yet, even this relatively low level of activity has led to the introduction of eight known species of environmental weeds, four of which have been impossible to eradicate. In recent years it has also been necessary to implement eradication programmes for black rats, house mice, and European bees.

The Gorgon proposal estimates that 861 barge movements and 52,307 personnel movements per year will be required to build the new facilities. The Australian Northwest Territory State Environmental Protection Authority (EPA) warns that temporary contractors will do the majority of this work. This transitory work force will increase the risk of introducing foreign weeds, pests and diseases to the degree that the EPA considers “virtually certain”.

### **A Traditional Way of Life at Risk: BP’s Tangguh Project in Indonesia**

BP has proposed an LNG exploitation site at the Berau and Bituni Bays, which are located in the Indonesian province, Papua. The project, named the Tangguh (which translates to all-powerful in Indonesian) project by BP, requires the construction of two offshore gas platforms, a 2,000 meter long and 150 meter wide airfield and an LNG plant that will cover 600 hectares of what is now rainforest.<sup>4</sup> The massive construction required to operate BP’s plant is having a significant impact on the local populations.

Bituni Bay is a fishing community. Fishing and shrimping account for US\$13 million/year. Many fisher folk, both male and female, have taken jobs with BP. However, the effects of BP’s construction threaten those that are not fortunate enough to claim one of the limited available positions of employment. The seismic testing performed in the waters south of Bituni Bay has impacted fishing and reduced revenues for the local fisher folk. Additionally, large fields of Mangrove have been cut to clear the way for the construction, resulting in large stacks of logs that disrupt local fisheries.

As the mangroves are cut down to create space for the new LNG plant, the mangrove ecosystem is disrupted. Mangroves are a major source of revenue, generating over US\$10 million per year. The mangrove ecosystem is already under pressure from the wood chip exporting industry.

While many community members view the Tangguh project as an opportunity, citing BP estimates that 5,000 temporary construction jobs will be created with about 10 percent of those jobs being permanent, many citizens are angry about the lifestyle changes that the Tangguh project will force on them. The Economist reported that all information supplied to the villagers came from BP, NGO’s paid for by BP, or the Indonesian government, which stands to profit from the site. If the villagers were informed of the potential safety and environmental harms associated with the site, they may be less captivated by the promise of a comparatively small number of jobs.

The Papua province is in a state of extreme unrest as it seeks independence from Indonesia. Local conflicts and investigations into human right’s abuses made the area too volatile for Exxon Mobil to operate in nearby Aceh, another province seeking independence from Indonesia. Developing a natural gas exploitation site in this conflict stricken community may cause additional problems in the area. In addition, if BP is forced to close its LNG site due to safety concerns resulting from the conflict, the California market that it supplies will suffer a lack of supply<sup>5</sup>. The impacts of that drastic reduction in supply could be reminiscent of the previous energy crisis.

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<sup>1</sup> Available from [www.amazonwatch.org](http://www.amazonwatch.org)

<sup>2</sup> Available from [www.pacificenvironment.org](http://www.pacificenvironment.org)

<sup>3</sup> Available from [www.rescuebarrowisland.org.au/](http://www.rescuebarrowisland.org.au/)

<sup>4</sup> Mining Advocacy Network. *Kerebok* Volume 3 Number 27 October 2002

[http://www.jatam.org/english/case/bt/uploaded/not\\_power.html](http://www.jatam.org/english/case/bt/uploaded/not_power.html)

<sup>5</sup> JATAM- Mining Advocacy Network, "From Persia to Papua: Tracking the Perils of BP's Mining, Oil and Gas Operations Around the World" January 2003.

**GREENPEACE**

702 H Street, NW, Suite 300  
Washington, D.C. 20001

## **ATTACHMENTS**

18. Ballylongford Oyster Festival <http://www.ballylongford.com/ballylongfordoysters.htm>

<http://www.ballylongford.com/ballylongfordoysters.htm>

## History of the Oyster

Ancient Greeks used to serve oysters as an incentive to drink. Romans imported them from England, placed them in salt water pools and fattened them up by feeding them wine and pastries. Native Americans on both coasts of North America considered oysters a staple foodstuff. Many cultures consider

Nowadays, in Europe, a dozen is considered a standard serving size for a course, whereas in the US, a half-dozen is the usual. The nutritional value of oysters is well-known, with its prodigious vitamin and mineral content, and including calcium,

Modern science has credited the high levels of zinc in oysters with the aphrodisiac qualities that have been attributed to them, finding zinc to be a contributor to male fertility. The link with love has long been an integral part of oyster lore, from the birth of Aphrodite (i.e. Venus, from the sea on an oyster shell as depicted by Botticelli), observations on its resemblance to female parts, to the reputed daily fare of five dozen oysters consumed by Casanova to sustain



Oysters are harvested either wild from natural beds or, as is more often the case today, from cultivated grounds. (Wild oysters are rough and irregular, while cultivated oysters assume a more uniform shape, and produce more standard meat.) Not all oysters taste the same. In fact, of the many species, only a few have any commercial value.

And the size, shape, flavor and food value of oysters are severely affected by their habitat, the foods eaten, and the temperature of the water in which they have grown. Oysters, due to their native element, are more or less salty, and in fact were at one time sold as accompaniments

## **ATTACHMENTS**

19. "Undersand LNG Fire Hazards" Iomosaic Corporation, 2007.  
[http://archives1.iomosaic.com/whitepapers/0100ioM02202007WPS\\_Understand%20LNG%20Fire%20Hazards.pdf](http://archives1.iomosaic.com/whitepapers/0100ioM02202007WPS_Understand%20LNG%20Fire%20Hazards.pdf)





# Understand LNG Fire Hazards

An ioMosaic Corporation  
Whitepaper



G. A. Melhem, Ph.D.  
H. Ozog, and  
A. S. Kalelkar, Ph.D.

**ioMosaic Salem**

93 Stiles Road  
Salem, NH 03079

Tel: 603-893-7009

Fax: 603-893-7885

Email: [support@iomosaic.com](mailto:support@iomosaic.com)

Web: [www.iomosaic.com](http://www.iomosaic.com)

**ioMosaic Houston**

2650 Fountain View Drive  
Suite 410  
Houston, TX 77057

Tel: 713-490-5220

Fax: 713-490-5222

**ioMosaic Minneapolis**

333 Washington Avenue North  
Suite 334  
Minneapolis, Minnesota 55401

Tel: 612-373-7037

Fax: 832-533-7283

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# Understand LNG Fire Hazards

G. A. Melhem, Ph.D.  
H. Ozog, and  
A. S. Kalelkar, Ph.D.  
ioMosaic Corporation  
93 Stiles Road  
Salem, New Hampshire 03079

## I. Introduction

Potential hazards resulting from intentional or accidental spilling of large quantities of LNG include thermal radiation from vapor cloud fires (also referred to as flash fires) and pool fires.

There is general agreement among LNG experts regarding the following aspects of potential LNG fire and explosion hazards:

1. Vapors from large, un-ignited spills of LNG cannot travel far into developed areas without finding an ignition source, igniting, and burning back to the source.
2. Once delayed ignition of the vapor cloud occurs, and provided that the cloud is unconfined and rich in methane, the LNG vapors will burn in the form of a vapor cloud fire.
3. A vapor cloud traversing over commercial and/or residential terrain will almost certainly encounter an ignition source early in its downwind drift and the resulting vapor cloud fire will burn back to the source.
4. The vapor cloud fire will burn back to the source and cause a pool fire at the source if the release is a continuous release and the release duration is longer than the time it takes the cloud to find an ignition source.
5. If the vapor cloud is confined and/or the vapors contain large amounts of heavier hydrocarbons<sup>1</sup> (C2+), then the flame can accelerate and result in an explosion. The magnitude of the explosion and explosion damage will depend on several factors including the amount of vapors above the lower flammable limit, the presence of obstacles and degree of confinement, the composition of the vapor cloud, and the strength of the ignition source.
6. If immediate ignition occurs, a pool fire will result. The extent of the pool spreading (diameter) and flame height will depend on several factors including the flow rate of LNG, the spill surface type (water or land), the spill surface geometry, spill surface roughness, release composition, release temperature, ambient wind speed, ambient temperature, and ambient relative humidity.
7. If the liquid pool is unconfined and the inventory of LNG is large, the fire will continue to burn<sup>2</sup> until all the fuel is exhausted by the pool fire. It is not practical or even possible to extinguish large LNG pool fires resulting from large spills of LNG unless the flow of LNG feeding the pool can be stopped.

The maximum vapor cloud fire hazard area from large LNG spills is typically estimated by calculating a downwind dispersion distance to the lower flammable limit (LFL<sup>3</sup>) and a cross-wind dispersion distance to ½ LFL at low wind speed and stable atmospheric conditions. This maximum fire hazard zone is very unlikely to

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<sup>1</sup> Actual test data with methane-ethane mixtures show that explosion potential increases significantly with fractions of C2+ exceeding 20 percent.

<sup>2</sup> This conclusion is also reached by a recent GAO expert panel study. In addition, the terrorist scenario considered in this paper assumes that the LNG tanker is in port with calm waters (no waves), fully loaded, and ready to unload.

<sup>3</sup> If heavy gas box dispersion models are used, it is recommended that the downwind distance be estimated to ½ LFL to account for peak to mean concentration averaging and pocketing. If well validated CFD models are used, then a downwind distance to LFL provides an adequate representation of the extent of dispersion downwind. The cross-wind distance should be computed to ½ LFL in both cases.

be experienced in any situation where the cloud drifts over populated areas<sup>4</sup>. As indicated in point 3 above, the cloud will soon encounter an ignition source and burn back to the source well before the maximum hazard area is reached.

Only the outdoor population present within the flammable boundaries of the vapor cloud is assumed to be injured due to (a) short exposure to very high thermal radiation fluxes from the vapor cloud fire, (b) direct flame contact, (c) secondary fires of clothing, and (d) inhalation of hot combustion products. It is assumed that people inside buildings at the time of the flash fire will not be injured<sup>5</sup>. It is also assumed that people inside buildings which are ignited by flash fire or a pool fire will be able to escape from the burning structure without direct thermal impact injuries. This is because the flash fire will ignite buildings from the outside and it will take some time for the fires to penetrate inside.

## A. Issues Surrounding Potential Damage from LNG Fires

Published thermal radiation damage criteria often associate a level of damage with a heat flux value or an integrated heat flux value for short duration events such as fireballs. Typical values used and their observed effects are provided by CCPS:

**Table 1: Thermal Radiation Flux**

Thermal Radiation Flux. kW/m <sup>2</sup>	Observed Effect
37.5	Sufficient to cause damage to process equipment
25.0	The minimum energy required to ignite wood at indefinitely long exposure (nonpiloted)
12.5	The minimum energy required for piloted ignition of wood, and melting of plastic tubing. This value is typically used as a fatality number
9.5	Sufficient to cause pain in 8 seconds and 2nd degree burns in 20 seconds.
4.0	Sufficient to cause pain to personnel if unable to reach cover within 20 seconds. However, blistering of skin (second degree burns) is likely; 0% lethality
1.6	Will cause no discomfort for long exposure

There is general disagreement among LNG experts pertaining to the extent of thermal radiation hazard zones resulting from large LNG pool fires due not only to uncertainties regarding flame emissive power but also the limiting thermal radiation impact criteria.

## B. Flame Emissive Power

Some experts argue that very large LNG pool fires such as those resulting from a terrorist attack on an LNG tanker will produce sooty flames and the flame emissive power is expected to be much less than 220 kW/m<sup>2</sup>. The main argument is that the pool center will be starved from oxygen.

An opposite view, which is more likely to be the correct one, is that the fuel that does not burn at the center of the pool due to oxygen starvation will rise due to thermal buoyancy and burn at a higher elevation as it contacts oxygen there (see references). This is also supported by recent computational fluid dynamics modeling of pool fires<sup>6</sup>. As a result, the flames will be taller and the associated thermal radiation hazard footprints may be higher. In

<sup>4</sup> Most experts agree that an LNG vapor cloud will have a near 100 % probability of ignition within one mile of ingress into developed areas.

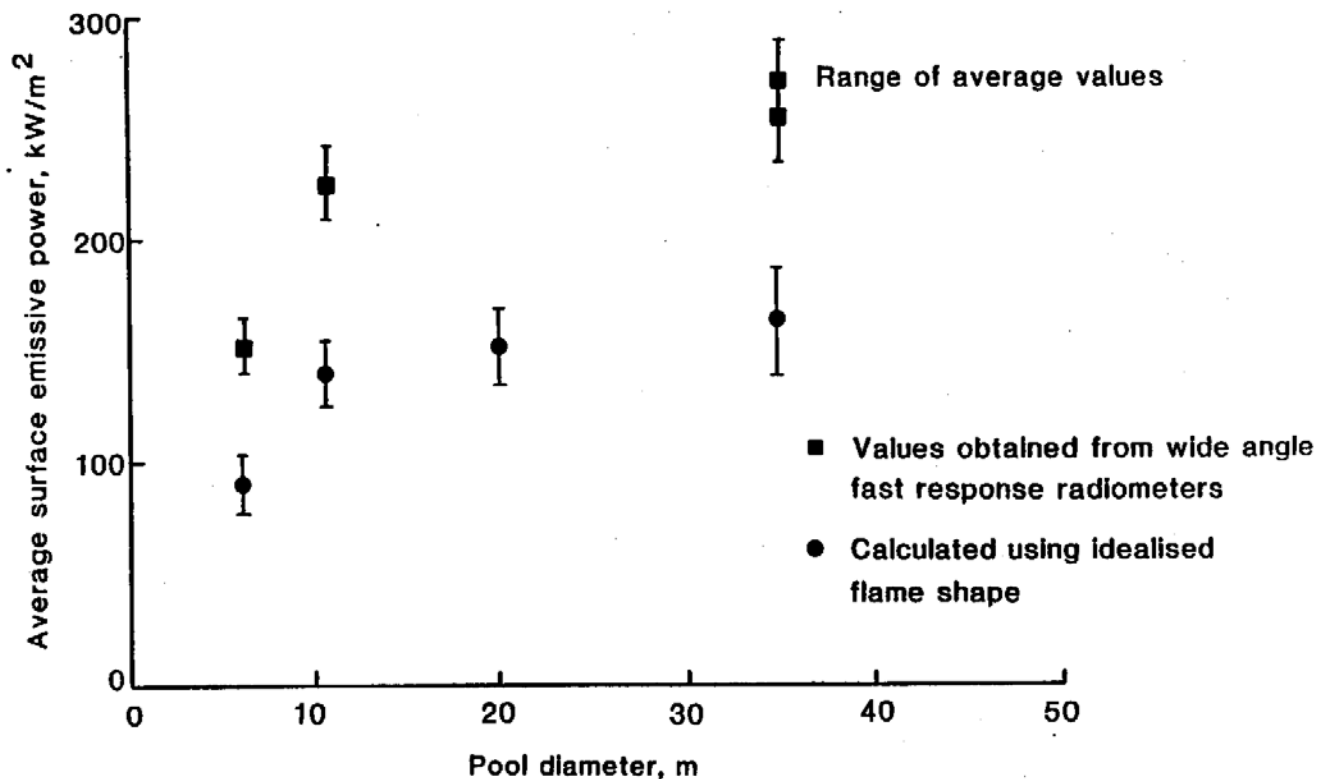
<sup>5</sup> Although it is possible for people in buildings to be exposed to thermal radiation through windows.

<sup>6</sup> Many fire research scientists consider the computational flame zone to extend to the point where the composition of carbon monoxide is 1000 ppm or less.

addition, in large scale pool fires field data such as the Montoir field trials, emissive power values of approximately 300 kW/m<sup>2</sup> were reported.

In general, the thermal radiation flux experienced by an observer exposed to a fire decreases in proportion to the square of distance from the fire source.

Figure 1: LNG Pool Fires – Measured Flame Emissive Power



### C. Limiting Thermal Radiation Damage Criteria

Some experts argue that a 20-second 5 kW/m<sup>2</sup> limiting thermal radiation exposure criterion is sufficient to establish safe separation distances for the general public. The main argument here is that a typical person will sense pain quickly and can run away fast enough and take shelter. This criterion is adopted for example by NFPA-59 without reference to exposure duration.

An opposite view argues that these criteria cannot be applied to sensitive population or critical areas / infrastructures. Elderly and the very young for example, constitute sensitive populations that may not be able to take cover within 20 seconds when outdoors. “Critical areas” include unshielded areas of critical importance where people without protective clothing can be expected or required at all time including during emergencies. “Critical infrastructure” includes buildings or places that are difficult to evacuate on short notice such as sport stadiums, hospitals, schools, play grounds, theaters, etc. As a result a lower criteria is adopted by EN-1473<sup>7</sup> (1.5 kW/m<sup>2</sup>), the US Department of Housing and Urban Development (450 BTU/ft<sup>2</sup>/hr or 1.4 kW/m<sup>2</sup>), API-521<sup>8</sup> (1.58 kW/m<sup>2</sup>), and the society of fire protection engineers (SFPE Handbook) recommends a level of (2.5 kW/m<sup>2</sup>) as a public tolerance limit.

<sup>7</sup> Value excludes solar flux.

<sup>8</sup> Value is at any location where personnel with appropriate clothing are continuously exposed. Note that this value includes solar flux.

We must recognize that in the specific case of LNG terminals large quantities of LNG will be stored in bulk storage tanks and frequently arriving by ship. Under the right scenario, loss of containment can yield very large pool fires and the extent of the potential hazard zones must be accurately determined in order to establish a prudent estimate of a safe separation distance.

We must also recognize that there are some uncertainties associated with the application of several of the models used to establish safe thermal radiation separation zones. For example, the flame height correlations have not been validated against pool fires that are several hundred meters in diameter.

There are two practical approaches to addressing the issues of thermal radiation damage criteria, assuming we can all agree on what to use as a reasonable value of flame emissive power:

1. Be prudent and conservative. Set the value low enough such that anyone that is continuously exposed will not suffer irreversible injuries.
2. Evaluate the risk accurately. Consider both the exposure duration and the exposure flux (dosage), and consider the demographics of the current and projected population density nearby the proposed facility to be sited, i.e. what fraction of the people will be outdoor, what fraction is sensitive, where the critical locations are, etc. This approach will require a risk tolerability criterion that is acceptable to the community tolerating the risk in lieu of some economic benefit.

The NFPA-59 thermal radiation criteria should not be confused with and/or considered as a risk acceptability criteria. Hazards are just one aspect of risk. Other important aspects of risk management include operational, economic, social, political, and environmental factors as well as the probability of the occurrence of the hazard itself.

The 5 kW/m<sup>2</sup> limiting criterion does not adequately represent the risks presented by an LNG facility to sensitive population and/or critical areas/buildings. Dosage must be considered as mentioned in item 2 above. The most widely recognized and used methods for establishing the impact of thermal radiation on people are those developed by TNO in the Green Book. These methods are referred to as thermal radiation probits or vulnerability models.

## D. Thermal Radiation Damage Probits

Probits are used to relate level of injury and exposure duration to a hazardous event of a given intensity. Hazardous events of interest in consequence modeling include dispersion leading to exposure to toxic chemicals, fires leading to exposure to thermal radiation, and explosions leading to exposure to overpressure and flying fragments.

The method of probit analysis was first introduced between 1940 and 1950. A probit (probability unit, Y) is a normally distributed random variable with a mean of 5 and a standard deviation of 1 (see Figure 2).

The mortality response (percent fatality) is expressed as:

$$P = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Y-5} \exp\left(-\frac{u^2}{2}\right) du = \frac{1}{2} + \frac{1}{2} \operatorname{erf}\left(\frac{Y-5}{\sqrt{2}}\right) \quad (1)$$

For mortality response to a toxic exposure of concentration  $C$  and duration  $t$ ,  $Y$  is given by:

$$Y = A + B \ln\left[C^N t\right] \quad (2)$$

If  $C$  varies with time, then  $Y$  can be expressed as:

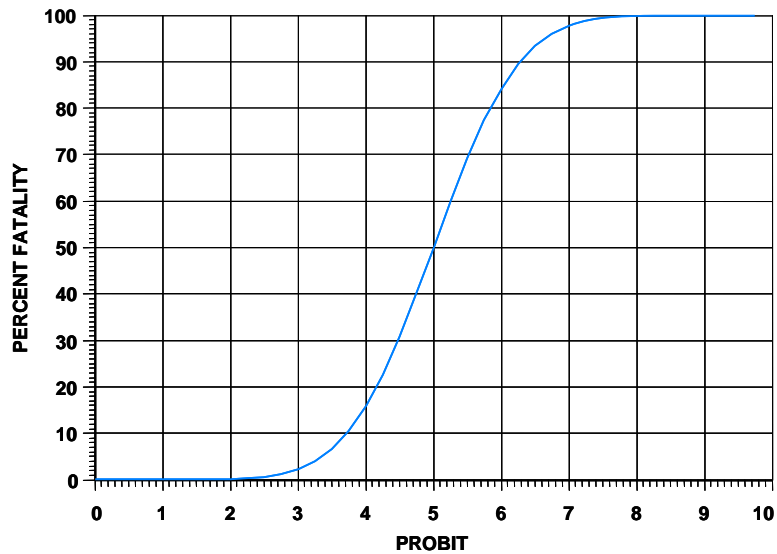
$$Y = A + B \ln\left[\int C^N dt\right] \quad (3)$$

Here, the integral containing concentration represents a dose factor. Probit analysis can also be applied to thermal radiation hazards:

$$Y = A + B \ln t I^{4/3} \quad (6)$$

Where, A and B are the probit parameters established from measurements and/or critically evaluated scientific data (see Table 2), I is the radiation intensity in  $W/m^2$ , and t is the exposure time in seconds.

**Figure 2: Probit Function**



The TNO Green book provides probit functions for first and second degree burns as well as lethality from exposure to heat radiation within the infra-red part of the spectrum (see Table 2). The last probit function reported in Table 2 accounts for clothing protective influence on fatality for humans. It assumes that 20 % of the body area remains unprotected for an average population. As a result, the fatality for protected bodies is about 14 % of the fatality for unprotected bodies.

**Table 2: Typical Reaction Times to Thermal Radiation Exposure Levels**

Intensity ( $kW/m^2$ )	Time to react (s)
22	0.2
18	1.5
11	3.5
8	5.5
5	9.0
2.5	25.0

The influence of running away from a location with high heat radiation to a location where the level of heat radiation is safe (approximately  $1 kW/m^2$ ) can also be used for the assessment of injury and fatality from heat radiation. TNO considers  $1 kW/m^2$  as the maximum heat-flux the skin can absorb during a long time without feeling pain. The probits presented in Table can be modified to take that into account by replacing the exposure time t by an effective exposure time  $t_e$ :

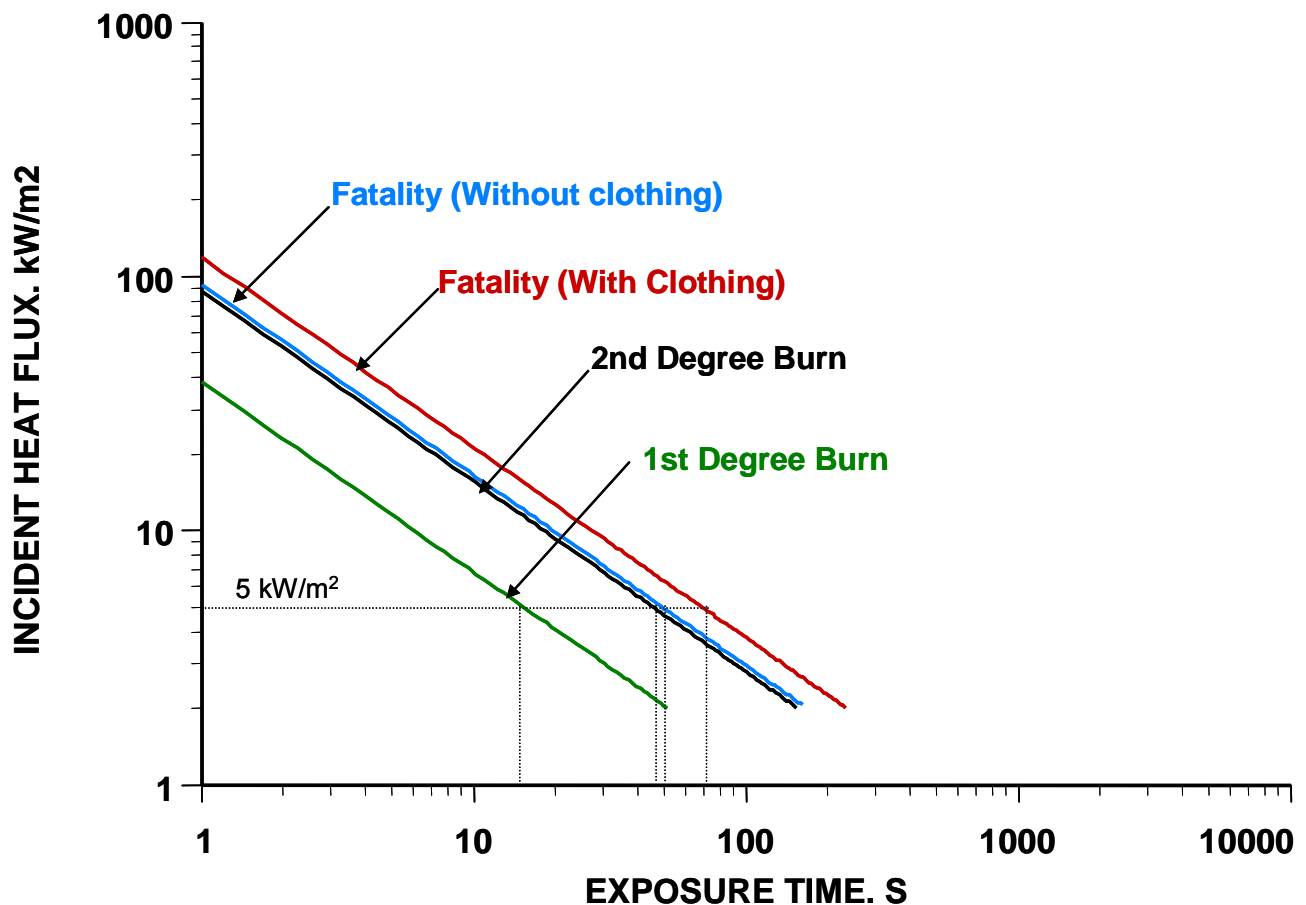
$$t_e = t_r + 0.6 \frac{x}{u} \left[ 1 - \left( 1 + \frac{u}{x} t_v \right)^{-5/3} \right] \quad (7)$$

Where,  $t_r$  is the reaction time and is about 5 seconds (see Table 2),  $x$  is the distance to  $1 \text{ kW/m}^2$ ,  $u$  is the run velocity in  $\text{m/s}$ , and  $t_v$  is the time to reach  $1 \text{ kW/m}^2$ . To illustrate the use of the TNO thermal radiation probits, we present in Figure 3 the thermal radiation dosage required to produce a 1 % probability outcome. **Note that the probit equations shown in table 2 should not be extrapolated to values less than  $1 \text{ kW/m}^2$ .**

Table 3: Heat Radiation Probit Parameters (taken from the TNO Green Book)

Damage	Probit
First degree burns	$Y = -39.83 + 3.02 \ln tI^{4/3}$
Second degree burns	$Y = -43.14 + 3.02 \ln tI^{4/3}$
Fatality (Unprotected)	$Y = -36.38 + 2.56 \ln tI^{4/3}$
Fatality (Protected)	$Y = -37.23 + 2.56 \ln tI^{4/3}$

Figure 3: Thermal Radiation Flux vs. Exposure Time Leading to 1 % Probability of Injury or Fatality



## **E. Intentional Terrorism Acts against an LNG Tanker**

The potential of terrorist attacks against LNG tankers is highly debated by the media and the public. The major concern centers around the large quantity of energy stored on these large ships. New LNG supertankers now under construction will carry up to 265,000 cubic meters of LNG.

In general, and despite the large amount of energy stored on LNG tankers, they are not attractive “mass casualties” targets unless the ship is berthed in ports near highly populated areas when attacked. This is so because the hazard impact zones from a terrorist attack on an LNG tanker will be highly localized near the ship. Many communities opposing the siting of LNG terminals argue that some U.S. ports represent attractive terrorism “economic targets”.

We have considered numerous scenarios involving terrorism and acts of sabotage including hijacking, small boat attack, standoff weapon attack, aircraft attack, underwater diver/mine attack, placing solid explosives in the cargo hold areas, blocking the pressure relief valves, starting the pumps and unloading while the ship is berthed, etc. Based on our review we believe there is one maximum potential impact scenario that should be considered as a threat. This scenario involves multiple cascading tank failures<sup>9</sup>.

This review will not comment on the likelihood of occurrence of this scenario but will focus on the evaluation of the maximum potential hazard zone that could be realized from this scenario. The scenario involves a fully loaded LNG ship that is berthed before cargo unloading begins.

Before describing this particular scenario in detail we begin by looking at the characteristics and dimensions of different types of existing and planned LNG tankers.

## **F. LNG Tanker Structural and Safety Features**

At the beginning of 2005, there were 175 LNG carriers with a combined capacity of 20.68 million m<sup>3</sup>. The principal ships in the LNG fleet range from 125,000 m<sup>3</sup> to 150,000 m<sup>3</sup>. At the end of 2004, the first orders were placed for LNG carriers of more than 200,000 m<sup>3</sup>. Carriers with a capacity of 265,000 m<sup>3</sup> are now under construction. Six of these carriers were ordered recently by Qatar Gas.

LNG carriers are double-hulled vessels specially designed and insulated to prevent leakage and rupture in the event of accidents such as grounding or collision.

The different types of cargo tanks utilized for shipping LNG are illustrated in Figures 4, 5, and 6. The Kvaerner-Moss system employs free standing spherical tanks fitted unto the hull. The second designs incorporate variations of a membrane type tank. In this case, the LNG cargo is contained within thin walled tanks of stainless steel. The tanks are anchored at various points to the inner hull of the double-hulled vessel, and the cargo load is transmitted to the inner hull by the intervening insulation. The world fleet is roughly divided between these two systems.

Boil-off gas during transit is limited by insulation and maximum normal boil-off is about 0.15% of cargo per day. Boil-off gas is used to supplement fuel in the ship’s boilers; hence many ship propulsion systems use steam turbines. Diesel propulsion is finding favor, but for those ships onboard boil-off gas recovery systems and gas combustion units are required. Gas turbines are also being considered.

Due to the low density of the cargo, LNG carriers ride with a high freeboard. For this reason, maneuvering in port in windy conditions makes the ships susceptible to being blown to one side of the channel. Therefore, port maneuvering usually requires traffic restrictions and extra tug power for such conditions. In general, this is not a safety concern because LNG ships are normally restricted from entering ports in rough weather.

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<sup>9</sup> The recent GAO 2007 study considered a terrorist attack on an LNG tanker. The study recommended to DOE that the potential for cascading tank failures should be studied (ranked as the second highest topic requiring more study by GAO’s expert panel) in order to better understand the damage to the hull that can be caused by exposure to extreme cold or heat.



**Table 4: Typical Modern LNG Carriers Dimensions**

	Membrane Carrier		Spherical Carrier	
LNG Carrier Capacity (m <sup>3</sup> )	145,700	216,000	125,000	235,000
L - Length (m)	277.2	303.0	282.0	328.5
B - Breadth (m)	43.4	50.0	41.6	55.0
D - Depth moulded (m)	26.0	27.0	25.0	32.5
Top of tank above base line (m)	31.0	33.2	37.7	49.0
T - Draft moulded (m)	12.3	12.5	11.5	12.5
Displacement (Tonnes)	116,941	151,599	99,130	178,247
Double bottom height (m)	3.2	3.4	1.4	1.6
Double side width (m)	2.2	2.6	2.4	3.0
Outer side plate thickness (mm)	17-18	16-21	19	18-20
Inner side plate thickness (mm)	14-18	18-19	14-18	14.5-16.5
Transverse frame space (mm)	2,800	4,105	4,180	4,130
<b>Cargo Tank Dimensions</b>				
L - Length (m)	47.6	41.0		
H - Height (m)	27.7	29.8		
B - Breadth (m)	39.0	44.8		
Tank Diameter (m)			35	46
Approx. Volume of Tank (m <sup>3</sup> )	43,504	48,174	22,449	50,965

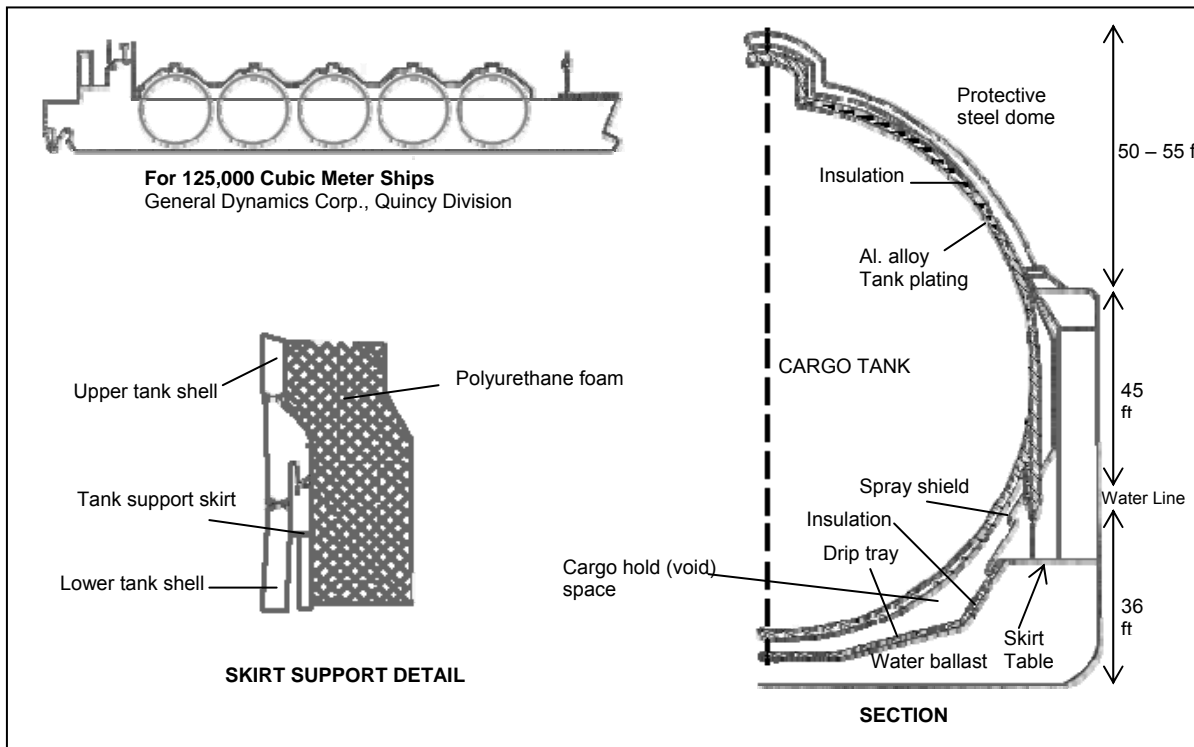
## G. Spherical Tanks

The spherical tanks (see Figure 4) are supported by a cylindrical structure “skirt” attached to the sphere at approximately mid-height. The cylinder sits on the skirt table attached to the side and bottom hull. The sides and bottom are of double hull construction, with longitudinal stiffeners and spaced web frames which act to tie the inner and outer hulls into a box frame arrangement. The webs are open to allow passage of the water ballast (used on the return voyage) to move freely.

The outer hull is typically ¾” plate steel and the inner hull is ½” plate steel. The spacing between hulls is about 187 inches (220cm). The tanks are typically insulated with foam material.

Each tank is contained within water-tight bulkhead compartments. The most common ship design in use has five spherical tanks, each holding 25,000 cubic meters of LNG. Typical dimensions are length between perpendiculars of 936 ft (285m), beam of 143 ft, depth of 82 ft, and draft (constant) of 36 ft.

**Figure 4: Free Standing Spherical LNG Tank**



All of the ship structure comprising the hulls, bottom, bulkheads, and skirts, are fabricated from non-cryogenic steels, with minimum toughness (resistance to brittle fracture) at LNG temperatures. Thus, exposure of these structures directly to LNG is not a design criterion.

A disadvantage of the Moss system is that the spherical tanks do not fit the contour of the ship's hull and consequently a Moss design will result in a ship that is 10% longer for the same cargo capacity. Since shipyards usually specialize in one type or the other, the selection of the design will, to some extent, dictate the shipbuilder. Moss tank diameter is somewhat limited to about 40 meters due to crane lifting limitations.

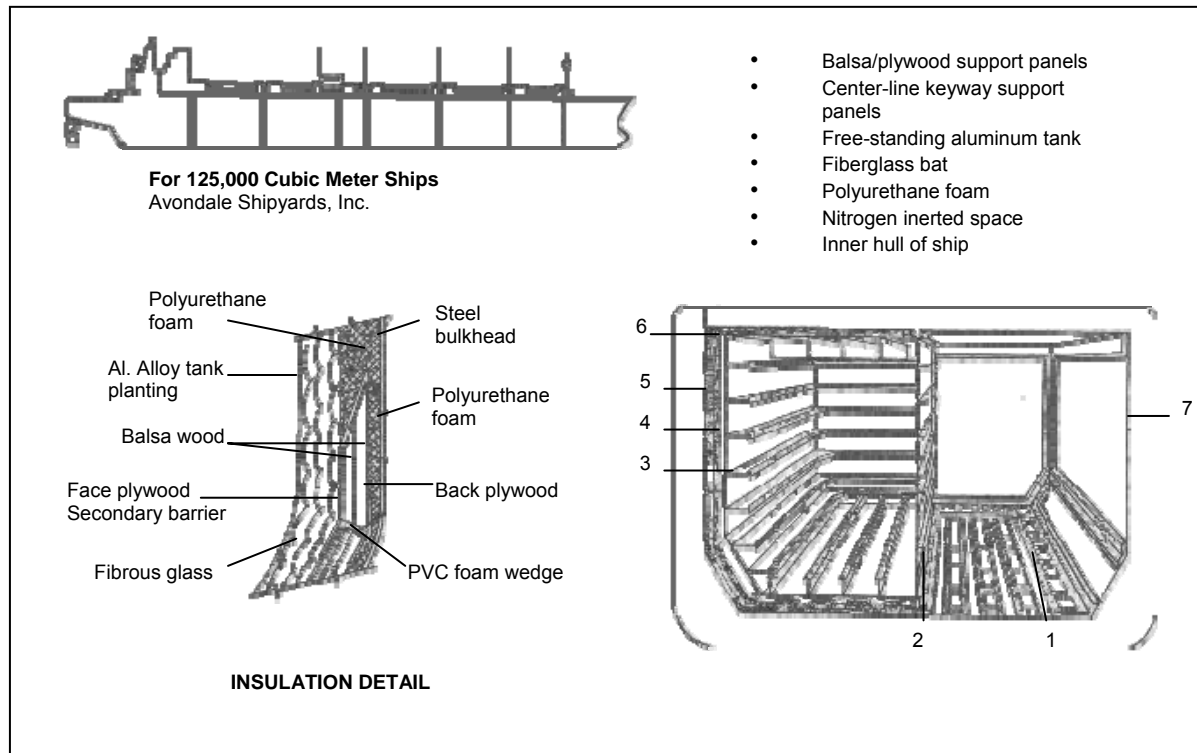
## H. Membrane Tanks

The prismatic or membrane tanks are supported by insulation material backed by the inner hull and inner bottom structures (see Figure 4 and Figure 5). The sides and bottom are of double construction, with longitudinal stiffeners and spaced web frames. Watertight bulkheads separate the individual tanks. The double hull and bottom are open between bulkheads to provide space for the water ballast.

A typical design would include 4 to 6 tanks. Typical dimensions would be a length between perpendiculars of 260 meters (850 ft), a beam of 42 meters (138 ft), a depth of 28 meters (92 ft) and a draft of 12 meters (39 ft).

All of the ship structure comprising the hulls, bottom, bulkheads, and skirts, are fabricated from non-cryogenic steels, with minimum toughness (resistance to brittle fracture) at LNG temperatures. Thus, exposure of these structures directly to LNG is not a design criterion.

**Figure 5: Free Standing Prismatic LNG Tank**



## I. Storage Tanks Key Features

Table 5 provides a comparison of key characteristics of the different LNG tank systems. LNG tanks are typically operated at approximately 2 psig independent of carrier type. Membrane tanks are designed for low pressures (3.55 psig max), spherical tanks are designed for 30 psig and prismatic tanks are designed for 10 psig.

Spherical tanks are more difficult to puncture than membrane tanks unless hit at a vulnerable spot or a bigger explosive charge is used. The most vulnerable spot on a spherical tank is the tangent line which is approximately 5 ft below deck or 40 ft above the water line in a typical 125,000 m<sup>3</sup> vessel. In general, spherical tanks are more resilient than membrane tanks as shown in Table 5.

## J. Maximum Impact Scenario Description

For this maximum impact scenario we assume that a terrorist was successful in creating a 1 m diameter hole in the center tank of an LNG tanker at (or slightly above) the water line. The tanker is berthed and fully loaded. We also assume the hole was created using an explosive charge delivered using a small aircraft or other equivalent means and as a result immediate ignition occurs leading to an unconfined pool fire on the water surface. Some experts argue that precise targeting and explosive charge spacing are required in order to cause significant penetration to the inner hull.

Although the maximum impact scenario and the subsequent hazard footprint are developed for a 1 m diameter hole, we also evaluate the impact of larger holes on pool fire diameter and duration of the fire. We also examined the fire behavior for the case of immediate ignition as well as for delayed<sup>10</sup> ignition.

<sup>10</sup> Delayed ignition is assumed to occur immediately after the release ends.

**Table 5: Comparative Characteristics of LNG Tank Systems**

Characteristics	Free-Standing Tanks		Membrane Tanks
	Prismatic	Spherical	
1. System Designs	Conch Esso McMullen A.G. Weser Hitachi / Esso	Kvaerner-Moss Technigaz Gaz Transport (Cylindrical) Sener	Gaz Transport Gazocean  I.H.I (semi-membrane) Bridgestone (semi-membrane)
2. Safety in event of vessel grounding / collision or other emergency	Compared with membrane system less likelihood of hull damage being transmitted to cargo tanks. More efficient use of cubic space.	Safest system in event of grounding or collision – tank structure independent of hull and most void space between vessel hull and cargo tanks. Spherical tanks can be pressurized for emergency discharge in case of cargo pump failure.	Damage to hull of vessel may be more easily transmitted to tank structure than with free-standing tanks. Membrane systems are also more liable to damage or puncture due to causes such as: <ul style="list-style-type: none"> <li>▪ surging of cargo in tank</li> <li>▪ entry of tank for inspection</li> <li>▪ entry of tank for repair</li> </ul>
3. Reliability of Containment System	Most ship years operating experience and most experience without primary barrier failure. Structure can be analyzed and risk of fatigue failures minimized. Tanks can be constructed and 100% inspected prior to installation in vessel.	Tank system easiest to analyze structurally; therefore can be made most reliable.	Structure cannot easily be analyzed and therefore difficult to assure absence of fatigue failures. This could potentially lead to costly off-hire and repair time over the project life.

Figure 6 illustrates the impact of hole size on pool fire diameter from a nominal 25,000 m<sup>3</sup> spherical tank. There are three important observations to be made:

1. Immediate ignition (within 60 seconds) results in smaller pools,
2. As the hole size increases, the maximum pool fire diameter will asymptote,
3. The pool fire resulting from a 1 m diameter hole or larger will be big enough to engulf one entire side of the LNG tanker if the hole is in the center tank<sup>11</sup>.

This pool fire will be large enough so that it cannot be extinguished. It is prudent to assume that the pool will continue to burn until the LNG supply is exhausted. For a typical 125,000 m<sup>3</sup> Moss spherical vessel the tank inside diameter will be 37.5 m and 9.5 meters will be below the water line. As a result, the release duration from 1 m diameter hole will be approximately 1 hour, and therefore the pool fire will last approximately 1 hour. The associated flame height will be in excess of 200 meters, well above the height of the ship.

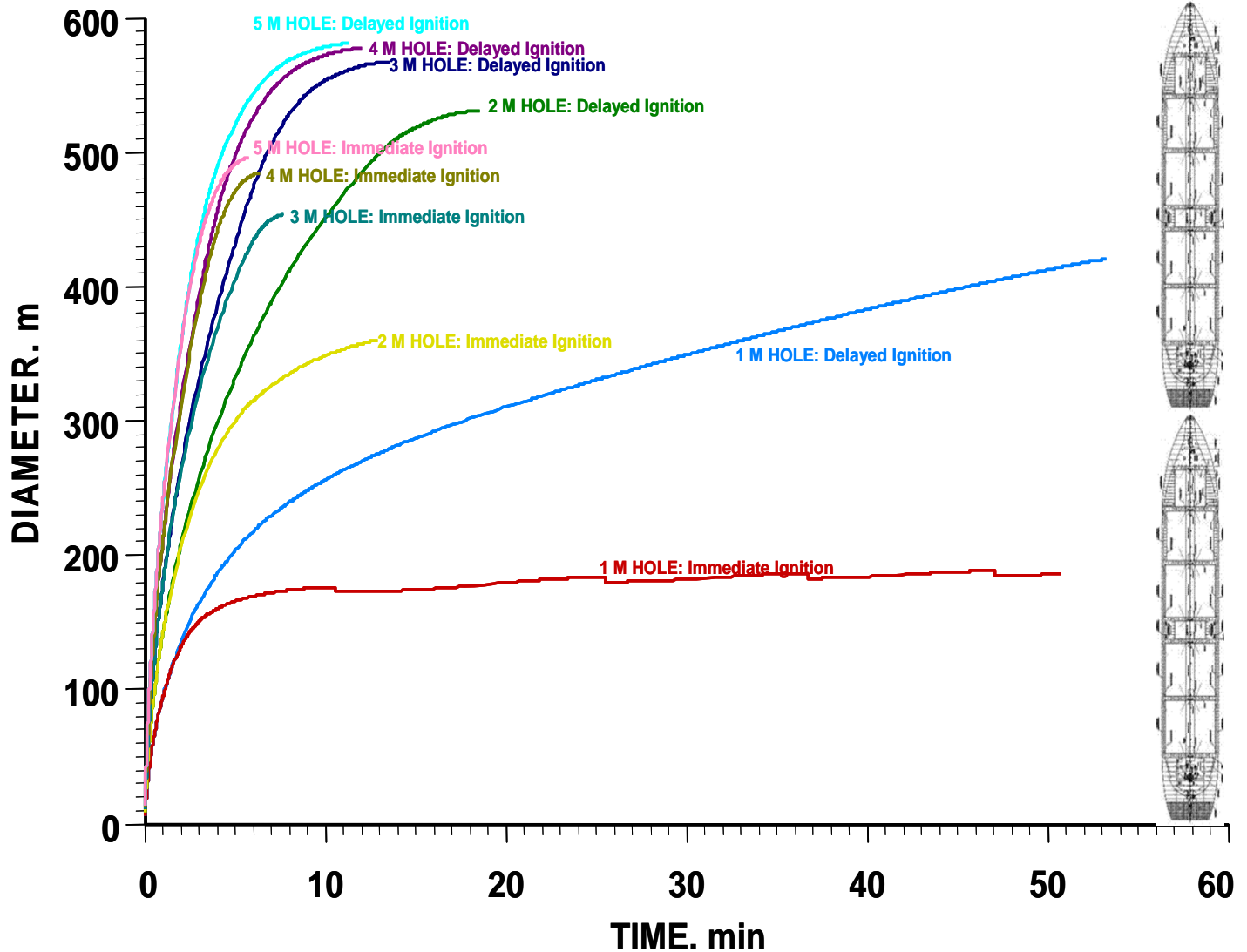
If the tanker is a spherical tanker, the cargo hold space will fill with LNG. The hold space is open and the LNG will distribute in the bottom. For either ship design, if the LNG spills into the double sidewall of the hull (ballast<sup>12</sup>

<sup>11</sup> Modeling was conducted assuming a wind speed of 2 m/s, F atmospheric stability, and 50 % relative humidity.

<sup>12</sup> Note that the ballast areas have little water in them when the ship is fully loaded. Water is pumped into the ballast tanks as LNG is discharged to prevent the tanker from rising and stressing the loading arms.

areas) and into the water, the tanker might tilt, exposing more of the ship's top to the flames. It is possible for the ship to roll and end up on its side or even sink if enough LNG inventory has been depleted (say 50 %). The initial spill into the hull structure or the cargo hold area would likely produce a brittle fast fracture of the hull steel plates, causing local failure of the hull, the bulkheads, and subsequently the bottom structure.

Figure 6: Impact of Hole Size on Pool Fire Diameter from a 25,000 m<sup>3</sup> Tank



Concurrently, the fire, impinging on the hull, and radiating onto the top of the ship would be expected to significantly heat the metal structure and cause it to lose its structural integrity. A 20 mm metal plate, the outer hull steel, is calculated to lose 80 % of its tensile strength after approximately five minutes of exposure. Transverse web frames will conduct heat into the inner hull and will create distributed hot spots on the inner hull. This will cause high thermal stress.

It is important to note that for this pool fire engulfment scenario, the relief valves for a typical LNG tank are undersized by at least a factor of 20 if the insulation is not damaged. If the insulation gets damaged by the fire or gets wet then the relief valves would be undersized by a factor of 200. Note that older ships contain non-fire proof insulation. For spherical tankers, the relief valves in the hold space will lift and discharge to the top of the

dome/protective cover. These relief valves are only sized for thermal expansion. For either design, the main tank relief valves will also discharge. The discharge will catch on fire causing additional flame radiation contribution being experienced by the top of the tanks.

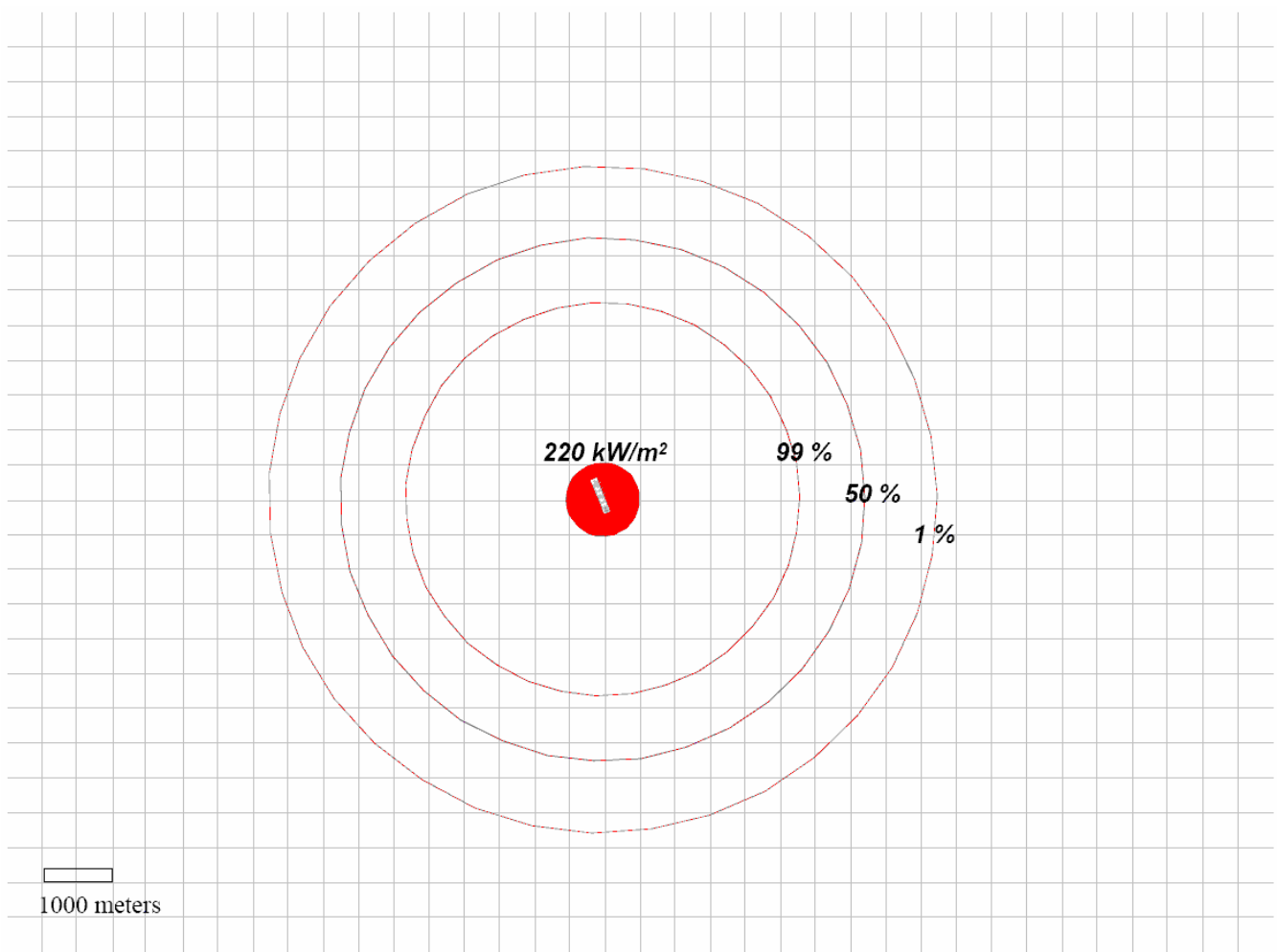
The bottom of the ship will see cryogenic temperatures while one side of the ship and the top of the ship will see close to flame temperatures.

In this scenario, the failure mechanisms would be expected to propagate along the ship, causing failure of, and spillage from, ALL the adjacent tanks (three or four tanks<sup>13</sup>) near simultaneously. For membrane tankers the center tanks, typically contain 60 % of the cargo. Our expectation is that this complete failure of the ships containment system and of the ship itself would develop quickly, of the order of 5 to 10 minutes due to the initial brittle fracture and to the extreme temperatures from the pool fire.

The insulation on the tanks would not be expected to provide much protection from the intense fire, acting only to prolong the time to failure of the adjacent tankage and of the ship from a few minutes to the expected 5 to 10 minutes stated above.

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**Figure 7: Hazard Impact of a Terrorist Attack on a 200,000 m<sup>3</sup> LNG Tanker Leading to Pool Fire on Water. Thermal Radiation Hazard Zones expressed using Probits in Percent Fatality.**



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<sup>13</sup> Some new LNG ships with membrane tanks only contain four tanks.

## **K. Hazard Footprint Estimates for a Typical 200,000 m<sup>3</sup> LNG Ship**

We estimate that the maximum impact hazard footprint for this scenario will result from a pool fire fueled by the simultaneous failure of three or four tanks, releasing approximately 150,000 m<sup>3</sup> of LNG from a 200,000 m<sup>3</sup> tanker. These hazard footprints were estimated assuming a 5 minutes release of 150,000 m<sup>3</sup>. The results are shown graphically in Figure 7.

A flame emissive power of 220 kW/m<sup>2</sup> leads to a distance of 3.7 km to the 50 % fatality limit excluding the contribution of solar flux. The % fatality contours shown in Figure 7 should only be used in the context of a detailed risk assessment.

## **L. Consideration by Regulatory Agencies (NRC, FERC) for Utilizing a Portfolio Approach to Permitting**

Most United States regulatory agencies charged with regulating potentially hazardous facilities have a tendency to evaluate each new applicant on a case by case basis. Each new facility that is approved by the agency causes an incremental additional risk to its environment and to the jurisdiction of the regulatory agency. The Nuclear Regulatory Commission was the first regulatory agency to examine risks presented by nuclear power plants and express risk in the form of F-N curves to examine the overall risk for general acceptability. They further had the foresight to anticipate that there may be as many as 100 nuclear plants in the United States and developed design basis criteria and other standards and guidelines so that the risk presented by 100 operating nuclear power plants as measured by F-N curves would be acceptably low. Their pioneering analysis is reported in the Reactor Safety Study (WASH-1400). Today there are 104 operating nuclear operating units at 65 power plant locations in the United States.

At present FERC does not require a quantitative, F-N style, risk analysis to evaluate applications for onshore LNG facilities, especially those close to highly populated areas. Further, FERC has not, to our knowledge, embarked on an evaluation of what is the total risk presented to the United States from all existing peak shaving and importation LNG facilities and how it changes with each new import terminal that is approved.

A quantitative risk analysis approach to siting approval should be explored. FERC may wish to consider moving from a case by case approval process to considering all anticipated applications for LNG terminals (and peak shaving facilities, if any) and treating them as a portfolio of risk which require management rather than individual projects.

## **II. Conclusions**

Despite the issues raised in this paper regarding the value of flame emissive power, flame height, and pool size for large LNG pool fires, prudent estimates of safe separation distances can be developed for both intentional and accidental release scenarios.

The NFPA-59 thermal radiation criteria should not be confused with and/or considered as a risk acceptability criteria. Hazards are just one aspect of risk. Other important aspects of risk management include operational, economic, social, political, and environmental factors as well as the probability of the occurrence of the hazard itself.

The 5 kW/m<sup>2</sup> limiting criterion does not adequately represent the risks presented by an LNG facility to sensitive population and/or critical areas/buildings. Recognized and peer reviewed vulnerability and/or probit models for establishing the impact dose of thermal radiation such as those developed by TNO represent a better alternative.

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**Dr. Georges Melhem** is president and CEO of ioMosaic Corporation. Prior to ioMosaic Corporation, Dr. Melhem was president of Pyxsys Corporation; a technology subsidiary of Arthur D. Little Inc. Prior to Pyxsys and during his twelve years tenure at Arthur D. Little, Dr. Melhem was a vice president and managing director of Arthur D. Little's Global Safety and Risk Management Practice and its Process Safety and Reaction Engineering Laboratory.

Dr. Melhem is an internationally known pressure relief design, chemical reaction systems, and fire and explosion dynamics expert. In this regard he has provided consulting and design services, expert testimony and incident investigation support and reconstruction for a large number of clients.

Dr. Melhem holds a Ph.D. and an M.S. in Chemical Engineering, as a B.S. in Chemical Engineering with a minor in Industrial Engineering, all from Northeastern University. In addition, he has completed executive training in the areas of Finance and Strategic Sales Management at the Harvard Business School.



**Mr. Henry Ozog** is a General Partner at ioMosaic Corporation. Prior to joining ioMosaic, Mr. Ozog was a consultant with Arthur D. Little, Inc. for twenty one years, where he managed the process safety consulting business. He also worked for seven years at the DuPont Company as a process and startup engineer.

Mr. Ozog is an expert in process safety and risk management, process hazard analysis (HAZOP, FMEA, FTA), and process safety auditing. He has helped numerous companies and governmental agencies identify process risks and implement cost effective mitigation measures. He teaches courses in each of these areas and is also an instructor for the American Institute of Chemical Engineers' Educational Services.

Mr. Ozog has a B.S. and M.S. in Chemical Engineering from the Massachusetts Institute of Technology. He is a member of the American Institute of Chemical Engineers and serves on various sub-committees for them.



**Dr. Ashok S. Kalelkar** is a Principal Consultant with ioMosaic. He brings very progressive experience in the area of LNG safety, hazard, and risk management as it applies to LNG Peak Shaving facilities, Import Terminals, Ocean transport and overland shipments by truck. Prior to joining ioMosaic, Dr. Kalelkar was a senior executive with the firm Arthur D. Little, Inc where he led numerous engagements concerning existing LNG facility safety and operability, proposed new LNG import terminals, state-of-the-art handling of LNG seagoing tankers as well as overland shipments by truck.

The ultimate purpose of most of his work was the sound risk management of the operations being analyzed. He has testified numerous times in public hearings regarding LNG facility siting and tanker transport.

## **About ioMosaic Corporation**

Founded by former Arthur D. Little Inc. executives and senior staff, ioMosaic Corporation is the leading provider of safety and risk management consulting services. ioMosaic has offices in Salem - New Hampshire, Minneapolis - Minnesota, and Houston - Texas.

Since the early 1970's, ioMosaic senior staff and consultants have conducted many landmark studies including an audit of the Trans-Alaska pipeline brought about by congressional whistle blowers, investigation of the Bhopal disaster, and the safety of CNG powered vehicles in tunnels. Our senior staff and consultants have authored more than ten industry guidelines and effective practices for managing process safety and chemical reactivity and are recognized industry experts in LNG facility and transportation safety.

[ioMosaic Corporation](#) is also the leading provider of pressure relief systems design services and solutions. Its pressure relief system applications are used by over 250 users at the world's largest operating companies. It holds key leadership positions in the process industries' most influential and active pressure relief system design, and chemical reactivity forums, and plays a pivotal role in defining relief system design, selection, and management best practices.

## **ATTACHMENTS**

20. Final Report of the INTERREG IIB Advocacy, Participation and NGOs in Planning Project – “community engagement in planning – exploring the way forward”. October 2007

[http://www.apango.eu/closingconference/20071016\\_APaNGO\\_ENGLISH\\_FINAL\\_REPORT\\_PRINT\\_UK.pdf](http://www.apango.eu/closingconference/20071016_APaNGO_ENGLISH_FINAL_REPORT_PRINT_UK.pdf)

# community engagement in planning - exploring the way forward



**Final Report of the INTERREG IIIB  
Advocacy, Participation and NGOs in Planning Project**



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# community engagement in planning - exploring the way forward

**Final Report of the INTERREG IWB  
Advocacy, Participation and NGOs in Planning Project**



## **Community Engagement in Planning – Exploring the Way Forward**

Final Report of the INTERREG IIIB Advocacy, Participation and NGOs in Planning (APaNGO) Project

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**Edited by:** Gideon Amos, Diane Warburton and the APaNGO Project Partners  
**APaNGO Project Manager:** Jonathan Rock

### **The APaNGO core partners are:**

Gideon Amos – Town and Country Planning Association  
Jonathan Rock – Town and Country Planning Association  
Eva George – Town and Country Planning Association  
Hilde Geens – Brusselse Raad voor het Leefmilieu  
Maarten Dieryck – Brusselse Raad voor het Leefmilieu  
Steyn van Assche – Brusselse Raad voor het Leefmilieu  
Mark Saunders – Spectacle Productions Ltd  
Age Niels Holstein – Amsterdam City District Geuzenveld-Slotermeer  
Pieter van Dijk – Amsterdam City District Geuzenveld-Slotermeer  
Wiebe van der Veen – Amsterdam City District Geuzenveld-Slotermeer  
Carol Ryall – Planning Aid for London  
Nancy Astley – Planning Aid for London

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**Translators:** Stéphane Sadoux; Fransien Kroon; Susanne Bittner  
**Design and layout (French and Dutch versions):** Wim Didelez  
**APaNGO experts:** Johan Woltjer; Albert Martens; Raoulx Benoit; Diane Warburton  
**APaNGO researchers, First Interim Report:** Claudia Veltrop; Laurence Gauthier; Elmar Jünemann; Mike Devereux; David Waterhouse; Stéphane Sadoux

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**APaNGO – a transnational partnership project part-funded by the European Union's INTERREG IIIB programme for North West Europe (NWE). The INTERREG programme encourages closer co-operation and integration through transnational spatial development initiatives that promote sustainable development.**

### **priorities and scope**

INTERREG IIIB project areas must fall within the scope of the following five priorities:

- A more attractive and coherent system of cities, towns and regions.
- Accessibility to transport, communication, infrastructure and knowledge.
- The sustainable management of water resources and the prevention of flood damage.
- Stronger ecological infrastructure and protection of cultural heritage.
- Enhancing maritime functions and promoting territorial integration across seas.

The APaNGO project was approved under the first priority, and its aim was to find ways of increasing community involvement in spatial planning processes, particularly at regional level.

### **objectives**

The APaNGO project had six objectives:

- To develop an understanding of the techniques, systems and infrastructure that are available in different member states to help the general public and community groups to engage constructively in planning and development decision-making at regional level.
- To test and implement methods and processes for involving local people in regional planning.
- To set up a standing transnational forum between a variety of NGOs which provide community representation in forward planning and development processes at city, regional or (with the emergence of the European Spatial Development Perspective) European level.
- To enhance skills and resources for community involvement in planning.
- To produce a good practice guide aiming to disseminate best practice in community involvement in local and regional planning issues.
- To provide an enduring resource for community involvement in planning for Europe.

**For further information on the APaNGO project, visit the APaNGO website, at [www.apango.eu](http://www.apango.eu)**

# foreword

By Professor Sir Peter Hall

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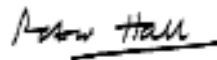
This is a hugely important and timely report – not only for planners and developers in the UK, where the Government is addressing an urgent need for more homes to meet the needs of a longer-living and growing population, but also in other EU Member States. Across the Union, from the UK to Bulgaria and from Sweden to Malta, it is no longer acceptable to make decisions from the centre and expect them to be implemented unquestioningly. The legitimacy of any planning decision will vitally depend on the quality of democratic input to the process; without that input, decision-making itself will be discredited.

But this raises very difficult questions of the right locus for decisions. Europe-wide and Member State policies for major developments will come face to face with the views of local communities, and at that local level one community may differ entirely in its view from another. We have to rely upon good planning to resolve issues and arguments of this kind. Cross-sectoral working, in which housing associations, developers, local authorities and communities all play their part, is vital to achieving successful outcomes.

This project therefore set out as a partnership between very different sectors, to address these challenges head on. It proceeds through a series of case studies in different Member States. In all such work, the devil is always in the detail, which makes these studies uniquely valuable in demonstrating how to attack the problems and reach viable solutions through better engagement and better dialogue.

The report's recommendations distil these lessons, providing a guide for central and local governments across the EU to reform and improve their planning processes in the interests of their people and of sustainable development generally.

On behalf of the TCPA, I commend the report and hope that its lessons will be widely read and enthusiastically adopted.



**Professor Sir Peter Hall**  
President, Town and Country Planning  
Association

## 1

# introduction

## 1.1 Introduction to the APaNGO project

The APaNGO<sup>1</sup> project was devised as one of the first European Union action research projects on community participation in planning and development. Its underlying philosophy was the importance of fostering constructive community engagement in order to help deliver sustainable development on the ground.

The project's central purpose was to provide a better understanding of the practice of community participation as it relates to planning and development. This then formed the basis for making recommendations on how practice can be improved. Although derived from the experience of North West Europe, it is expected that the findings of APaNGO will be of interest to all EU Member States and other countries.

Perhaps because development and its impact is by its nature local and place specific, there has been very little exchange between Member States about appropriate engagement techniques and services. These are being developed largely in isolation to deal with the same kinds of participation and advocacy challenges. Furthermore, because of pressure on funding for the NGO (non-governmental organisation) sector, the provision of information for local communities on how to engage with planning and development effectively is few and far between. APaNGO aimed to help fill these gaps. One further important feature of the APaNGO project was its focus on planning and development of regional or city-wide significance. The larger and more significant a project or plan, the greater will be its impact on the community concerned. However, there is a common perception that, ironically, this is the scale at which it is hardest to engage local

communities. In this respect the project built on research conducted by the Town and Country Planning Association (TCPA).<sup>2</sup>

The APaNGO project was launched in December 2005 by Brusselse Raad voor het Leefmilieu,<sup>3</sup> (Belgium); Geuzenveld-Slotermeer, City District of Amsterdam (the Netherlands); Planning Aid for London (UK); Spectacle Productions Ltd (UK); and the Town and Country Planning Association (UK). The TCPA served as the lead partner accountable for the project to the main funding body, the European Commission's North West Europe INTERREG Secretariat.

The First Interim Report from the APaNGO project covered the findings from the first stage background research. This consisted of desk studies of the seven Member States in North West Europe (Belgium, France, Germany, Luxembourg, the Netherlands, the Republic of Ireland, and the UK) and analysis of the responses to an extensive questionnaire survey. **The First Interim Report can be downloaded from the APaNGO website at [www.apango.eu](http://www.apango.eu)**

This Final Report of the APaNGO project comprises essays on the individual demonstration projects from the UK, Belgium and the Netherlands written by the partner bodies concerned. They tell different stories but each relates to the central questions of APaNGO – how to successfully engage communities in planning and development. These four case studies each describe a major project, the participation processes employed, and the lessons learned. This Final Report concludes with a summary of the overall issues arising from the case studies, followed by conclusions drawn from them on the conditions necessary for effective participation in planning.

<sup>1</sup> Advocacy, Participation and NGOs in Planning

<sup>2</sup> Baker, M., Roberts, P. and Shaw, R. (2003) *Stakeholder Involvement in Regional Planning. National report of the TCPA study.* Town and Country Planning Association, London

<sup>3</sup> BRAL, Brussels Environmental Association

# 2

## executive summary

### 2.1 Introduction

The APaNGO project has operated in two linked phases:

- Phase 1 was a desk research and questionnaire survey of existing planning systems across North West Europe, the techniques currently being used for community involvement, and the infrastructure of support (the organisations and services available) for community involvement in planning. This research is fully reported in the APaNGO First Interim Report.
- Phase 2 was the establishment and reporting of a series of demonstration projects by the APaNGO partners:
  - An evaluation of Brusselse Raad voor het Leefmilieu's (Bral's) Brussels-wide work as an NGO supporting community-led campaigns for involvement in planning since the 1980s in the international quarter of Brussels.
  - The Amsterdam City District Council of Geuzenveld-Slotermeer's project to use 'branding' as a way of creating community identity and a focus for community participation in planning the regeneration of the Eendrachtsparkbuurt neighbourhood.
  - Spectacle's work in the UK and Brussels, using community-controlled media (especially video) for creating, supporting and documenting community participation in regeneration.
  - Planning Aid for London's (PAL's) work as an NGO providing planning aid services to community and voluntary groups and individuals across London; particularly the development of a toolkit for the Greater London Authority to support community participation in the sub-regional development frameworks of the London Plan.

The APaNGO Final Report focuses on case studies of these demonstration projects, and identifies some common themes from their work before drawing out a set of conditions for successful participation in planning based on

the experience of the APaNGO projects. This Executive Summary focuses on these common themes and conditions.

### 2.2 Common themes across APaNGO projects

#### 2.2.1 Who is involved?

The APaNGO projects demonstrate ways of identifying the key sectors of society that need to be involved in planning, based on both the ethical principles of democratic planning (for example planning processes that are fair, inclusive, open and transparent) and the need to be effective in terms of the quality of the technical planning processes and outcomes.

The key issues arising in the APaNGO projects in relation to who to involve include:

- The need to start participatory working with a focus on the existing interests and motivations of local people, because they will then see the relevance of being involved.
- The need to find innovative ways of reaching all sectors of the community – for example young residents, minority ethnic communities and small business, and including the 'silent majority' as well as 'hard to reach' groups.
- The need to balance securing the involvement of all sectors of the community with avoiding further alienation of disadvantaged sectors of the community from mainstream society and the decision-making processes of planning by creating separate processes that isolate these groups.
- The need to tackle the 'voluntary exclusion' of the rich and powerful, who may bypass formal consultative structures that are established for the public and communities, and instead use privileged access to exert influence.
- Those who get involved in current participatory processes may have past experiences of community activism based on

protest which will affect how they approach participation. However, the APaNGO projects have successfully created participatory processes that have brought a wide range of activists together to work productively.

### 2.2.2 Local focus for participation

All the APaNGO projects were identified to illustrate regional planning issues, but their experience is that, in order to involve local people and local communities, issues need to be translated to a local scale to show local relevance. The relationship between local, regional and national planning is complex.

All the APaNGO projects demonstrate how what are seen as local planning issues have regional, national and even sometimes international implications, including the role of international institutions and the ‘participation by stupefaction’ that often accompanies high-profile, big-budget developments. Similarly, the projects show how regional and national planning policies impact on local communities and what that means for participation. The APaNGO projects found that working at regional level is not just about working at a different spatial level, but requires working in a fundamentally different way. Issues that have emerged include:

- Regional planning issues cross traditional geographical boundaries that affect any community sense of identity, and are also likely to cross the boundaries of existing organisations.
- Identifying the decision-makers is more complex at regional levels, where it is not always clear who makes key decisions or where accountability lies, which in turn makes it hard for NGOs and communities to identify appropriate ‘targets for influence’.
- The sheer scale of regional work means that NGOs may need to work across large geographical areas, often with hundreds or thousands of active voluntary groups and organisations that may be difficult to reach and encourage to participate, even working through existing networks.
- There is a need for different involvement techniques for working with communities on regional issues, including new analytical and practical toolkits for planning professionals to enable them to identify the appropriate technique for the circumstances.

### 2.2.3 Implications of ‘community’

The APaNGO projects show that there can almost never be any easy assumption about

the nature of communities, even in clearly defined neighbourhoods. They found that:

- Diverse groups from many different backgrounds (with different cultures and languages) may be rooted in neighbourhoods in different ways, requiring particular participatory opportunities to enable them to be involved.
- The ‘community’ that will live in a regenerated area may be different from the current residents, some of whom may be participating in the design of a future neighbourhood they will never live in: there are different ‘communities of time’ with different roles in participation.
- ‘Community memory’ affects participation in two ways:
  - the collective sense of local identity that exists among local people (or is created through mechanisms such as the City District of Geuzenveld-Slotermeer project’s ‘branding’); and
  - the memory of previous failed participatory activities that have undermined trust in such processes – APaNGO projects such as those run by Bral and PAL explicitly built trust in some circumstances to overcome past failures by other institutions.

Planners have a particular role in bringing communities of time, space and social relationships together in participatory processes that can contribute to appropriate planning as well as to the desired social outcomes (for example strong and cohesive communities).

### 2.2.4 Levels of involvement

The APaNGO First Interim Report found that the great majority of community participation in planning takes place at the ‘lowest’ level of participation – information provision and minimal consultation. However, the depth and nature of involvement does largely depend on the different focus, legal structures, processes and systems for participation in planning in different countries. The experience of the APaNGO projects shows that:

- There is significant interest and commitment in all the partner countries in deepening community participation in planning, and the APaNGO projects have been able to develop within this positive context.
- Community capacity-building, often provided through the support of NGOs (and public authorities), helps local groups to develop

the confidence and skills that contribute to deeper and more effective participation. Such capacity-building includes helping these groups to understand how planning processes work and how they can be influenced.

- Communications and cultural activities have been particularly effective at building capacity – whether through ‘branding’ to create identity; artistic and cultural activities; or the use of communications media to capture and share the cultural and political resonances of participation.
- Information provision, although seen as a ‘low’ level of participation, is a vital element of all participatory activities. Where appropriate information has not been forthcoming from official sources, finding out and communicating relevant information has been a core strand of the work of several of the APaNGO projects.

### 2.2.5 Timing of involvement

Much participation in planning takes place at a stage at which communities can merely comment on highly developed plans or proposals. Participation at this stage tends to generate negative input, because the focus is on stopping what is not wanted rather than on making proposals to include good new ideas. The APaNGO projects show that:

- One-off, shallow consultation with tight deadlines does not gain effective or positive community participation. The APaNGO projects show the value and importance of early involvement followed by long-term relationships in creating effective participatory processes and planning outcomes. The projects found that longer-term relationships between support organisations (NGOs and public authorities) and local communities could be developed without requiring enormous investment of resources at all stages.
- Support by NGOs for participation in planning tends to be funded project by project, which limits the potential for longer-term relationships (although ways can be found of overcoming this problem). Longer-term investment in the voluntary sector infrastructure of support could help support these longer-term links more effectively.
- Continuous involvement brings problems for community organisations, as long-term vigilance on planning issues is time-consuming and demanding, causing ‘burn out’ among committed activists. However,

this continuous involvement is what is sought by communities and NGOs, and with effective support the demands can be made more manageable.

### 2.2.6 Linking participation and decision-making

The gap between the development of national policy promoting greater participation in planning and practice on the ground remains most apparent where participation processes meet decision-making structures. This gap can undermine the trust of communities in participatory processes by weakening the clarity of the influence of these processes on decisions and action. The APaNGO projects found the following:

- Formal consultative structures can provide useful mechanisms for continuing dialogue between communities, NGOs and authorities, but are only effective when linked directly into decision-making processes. Participatory processes are undermined if there is no clear link to decision-making. Openness, honesty and transparency in these processes is vital.
- It is not the role of NGOs or community groups to be representative: they usually represent particular interest groups in the wider political process in which decisions are made by democratically elected authorities.
- For communities, it is often the action that follows planning that is the most important motivation for their involvement: the plan is merely a mechanism leading towards the desirable outcome on the ground. Community groups will often experience ‘consultation fatigue’ if all their involvement does not lead to any change or action on the ground.
- Increased capacity-building is needed among public authorities to enable them to achieve the cultural change necessary to value the input from local communities as highly as the input they traditionally receive from professional and academic sources. New skills are also needed to enable authorities to assess and integrate data from these different sources to contribute to better-quality planning outcomes.

## 2.3 Recommendations

The issues raised from the experience of the APaNGO demonstration projects have led to the APaNGO partners identifying the

following six key conditions for successful participation in planning:

- Recommendation 1**  
 The APaNGO partnership recommends that both voluntary sector bodies and government should recognise a responsibility to provide independent resources for community participation in planning in all major development areas.

- Recommendation 4**  
 The APaNGO partnership recommends that statutory rights in planning for those most affected should be maintained and that agreements on development with communities should be legally recognised wherever possible.

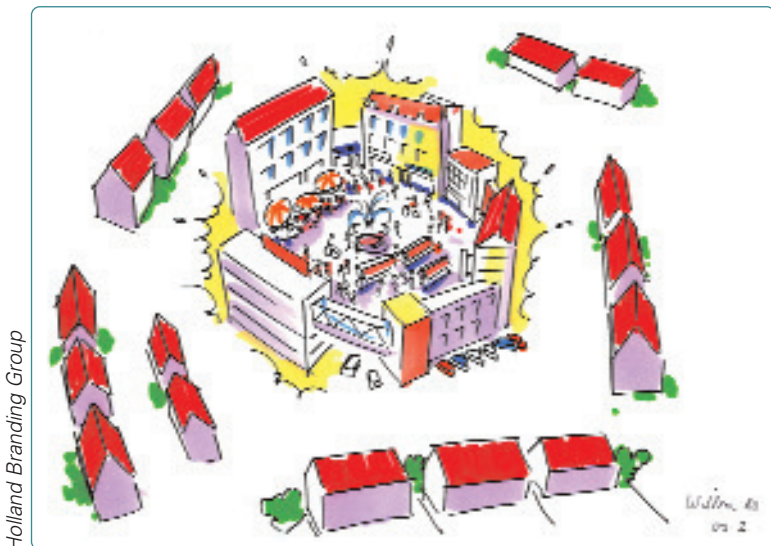
- Recommendation 2**  
 The APaNGO partnership recommends wider take-up of the use of community media, branding techniques and street-based and cultural activities where communities judge these appropriate or helpful.

- Recommendation 5**  
 The APaNGO partnership recommends that responsible authorities in charge of community participation set out as a priority what can and cannot be changed as a result of the dialogue of participation or involvement.

- Recommendation 3**  
 The APaNGO partnership recommends that public authorities appreciate the value of community views which are generated in various ways through the participation services it supports. As a result government bodies should better integrate community input in its different forms in the decision-making process.

- Recommendation 6**  
 The APaNGO partnership recommends that all those engaged in participation in planning and development should recognise that decision-makers must consider evidence which represents best the variety of interests of current and future communities, including taking into account representations from specific interest groups with particular knowledge.

The APaNGO partners consider these conditions and recommendations to be essential for effective participation in planning, both in terms of creating better-quality planning decisions and outcomes, and in terms of principles of fairness and transparency – all of which are essential in supporting the contribution of planning to sustainable development.



Holland Branding Group



Rob Bakker

**Above**  
 APaNGO partners meeting in Brussels

**Left**  
 Output from an Amsterdam City District Geuzenveld-Slotermeer branding workshop

## 3

# reaching out to the region – methods of strategic policy engagement

## APaNGO Demonstration Projects – Planning Aid for London By Carol Ryall and Pat Castledine

This chapter describes two examples of community involvement at the regional level of planning: the first is the development of a toolkit to assist the Greater London Authority planners working at the London-wide regional level; the second relates the experience of two workshops where we applied the lessons learned during the development of the toolkit to the issue of waste management.

### 3.1 The GLA sub-regional development frameworks ‘toolkit’ project

#### 3.1.1 Reason for the project

Community involvement is central to the reform of the UK’s planning system. The Government’s publication *Community Involvement in Planning*<sup>1</sup> stressed the need to ensure a continuing commitment to improving access for everyone to both planning information and the planning system (particularly those processes which manage new development and develop policy). Local planning authorities (LPAs) are encouraged to evaluate their arrangements for community involvement to ensure that everyone has access to information and can take part in shaping policy and influence planning decisions.

Securing the involvement of diverse communities in strategic planning policy development is a challenge for any government authority. In the first instance, there is the need to reach the wide range of communities affected, often with competing and conflicting requirements in terms of priorities and concerns. There is also the difficulty of involving communities meaningfully at a strategic level when, normally, most contact on planning matters occurs at the local level where

democracy, decision-making and its impacts are more directly linked and visible.

#### 3.1.2 Regional context

The Greater London Authority (GLA), its Assembly and Mayor have a statutory responsibility to develop strategic planning guidance for the capital. The Mayor’s vision is to develop London as an exemplary, sustainable World City. One of the key interwoven themes is the promotion of social inclusivity to give all Londoners the opportunity to share in London’s future success. The London Plan – a strategic plan – was approved (by a process called ‘adoption’) in



PAL

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London sub-regions map

February 2004. The Plan, covering the whole of Greater London, has policy implications for all of the 33 London boroughs. Each borough must produce its own local planning policies, set out in local development documents

<sup>1</sup> Office of the Deputy Prime Minister (2004) *Community Involvement in Planning*. London: ODPM



(LDDs), and these policies must be *in accordance* with the London Plan; i.e. they must set out how they will achieve the Mayor's policies on issues such as affordable housing targets, employment growth and the provision of social infrastructure.

A key implementation tool of the London Plan was the concept of sub-regional development frameworks (SRDFs<sup>2</sup>) for the North, South, East, West and Central areas. Each document took the relevant London Plan policies and applied them across six to eight boroughs, setting out more detailed targets and policies. The final agreed frameworks provide non-statutory guidance on the implementation of the London Plan. Consultation on drafts of the SRDFs took place between June and October 2005, and the consultation process formed the basis of the APaNGO demonstration project.

### 3.1.3 Partners and stakeholders in the project

Three pan-London voluntary and community sector organisations – London Civic Forum (LCF), Planning Aid for London (PAL) and London Sustainability Exchange (LSx) (the partners) – were commissioned to assist the GLA to develop a process which would assist the GLA's planning staff to be more effective in engaging the community and voluntary sector in consultation on sub-regional planning matters.

Prior to the start of consultation on the SRDFs, it was clear that there had already been some cross-boundary working between London boroughs. Sub-regional partnerships or alliances made up of representatives from local councils, businesses, and health and learning and skills organisations had already been established. There was, however, limited community and voluntary sector involvement in these arrangements. The voluntary sector is significant in London:<sup>3</sup> it includes organisations which vary from small to large and formal to informal, is supported by paid and/or unpaid workers, and works to address a wide range of community needs. Their communities are also diverse (gay and lesbian, young people and black and minority ethnic groups) or are issue-based on topics such as disability or health.

It was therefore essential that the sector was involved in the development of strategic planning policy. The APaNGO project enabled PAL to undertake more in-depth work than it

would otherwise have been able to resource, and provided a practical opportunity for PAL to examine the opportunities for and difficulties of consultation at a strategic level. The project aimed to develop a toolkit for the Greater London Authority for use in consulting the voluntary sector on sub-regional development frameworks.

### 3.1.4 Level of involvement

The partners commenced by pooling their extensive range of expertise in the community and voluntary sectors, and identifying contacts, gaps requiring outreach work, and measures to ensure good sampling across London. This involved identifying different sub-sectors, creating a matrix from which the sample could be selected.

Well over 500 organisations were approached to take part, but this number underestimates the final total involved as a number of networks and umbrella organisations were also used to approach their own membership of smaller organisations.

At the time of the project, the SRDF documents had been drafted by GLA staff with some involvement from the various sub-regional partnerships. The three demonstration project partners used this opportunity to undertake consultation on the SRDFs themselves.

### 3.1.5 Preparation of the toolkit

The details of the toolkit itself are not discussed here because it was produced for GLA staff and is relevant only for producing the SRDFs themselves. However, the findings of the surveys and consultation events with the voluntary sector provide valuable guidance and advice in respect of consultation at the regional and sub-regional level. The research document, including the toolkit itself, was designed to be used by GLA staff as a stand-alone point of reference: one which could be easily updated, extended and applied to future consultations. It was electronic using standard Microsoft Office software (Excel and Word).

The main document contains:

- a simple checklist which takes staff through the process of consultation with the sector;
- a contacts database in a format that can be networked, allowing staff to update it as

<sup>2</sup> The concept of sub-regional development frameworks (SRDFs) is identified in the Mayor's London Plan, to provide direction and focus for implementation for each of the five identified sub-regions. They were to be produced by the Mayor in partnership with boroughs and other stakeholders

<sup>3</sup> Contributing over £3 billion to London's GDP, in 2005, there are 761 start-up charities, 60,00 community groups and 5,00 social enterprises. £18.7 billion was generated by 26,634

former contacts change or new contacts become involved;

- clear direction on the importance of communicating the programme, scope and content of consultation to the voluntary and community sector; and
- the background research to the toolkit, produced as an appendix.

The document was submitted to the GLA in December 2005.

### **3.1.6 Conclusions: lessons learned from the process**

The research revealed some key features related to consultation on strategic planning issues at a sub-regional level.

- It takes a good deal of time for consultation information to percolate down to the local level.
- Response time must also be factored in.
- A three-month period should be the minimum for any strategic consultation.
- Relating policies to more local issues/areas wherever possible aids understanding and encourages involvement for those not necessarily aware of the wider strategic issues. Indeed, the findings of the project partners were that generally the sub-regional development frameworks were, in fact, a more effective way of communicating regional policy than the London Plan itself.
- Using existing voluntary networks to reach different parts of the voluntary sector was more effective in reaching particular communities than setting up new outreach programmes for every project, and such methods were more likely to be met with a more positive response.
- Networks and other voluntary organisations need resources and support in order to be able to take part in any consultations, but in return they can assist local authorities to undertake more effective consultations. Funding them is therefore good value for money.
- Information should not be too technical, and plans and diagrams should be easy to read. Authorities often lapse into jargon, and do not check before publication that information is provided in a range of levels and formats and include a glossary.
- Consultation methods and information should be tailored to the needs of the different groups.
- Regular community focus groups may be a useful way of ensuring communication methods are appropriate.
- Signposting to additional sources of information and help is appreciated by the voluntary sector, as is a glossary and contents/index page. Any measure that assists the reader to understand a document, and the relevance of their involvement in it, is more likely to encourage an informed response.
- We should not rely on e-technology. Many people still have no access or only limited access to computers and have limited capacity to receive documents or print them off. Ideally a hard copy of information should be related to the event. Good indexing and splitting e-documents into downloadable sections can also help, but they have to be well referenced to enable the reader to understand the whole picture.
- Finally, we should approach consultation like a marketing exercise, providing targeted information rather than a 'one size fits all' approach. The public sector could learn a lot from commercial sales and marketing on reaching and targeting communities in particular. Our communities are certainly all very different, and our approach to them should be sensitive to this in the ways in which we reach them.

We have been warned!

## **3.2 Environmental/waste workshops – involving communities in local and strategic planning policies on the locations for waste management facilities**

### **3.2.1 Background**

By applying some of the key lessons learned in the course of the toolkit project, we aimed to disseminate information about a regional issue to a targeted audience, specifically designing the access to the information in a way that was best suited for those targeted. We set out here our experience in relation to the examination of waste management with groups of young people.

### **3.2.2 Southwark**

Southwark is an inner London borough on the south bank of the Thames. It has a wide diversity of communities and is experiencing high levels of growth and regeneration led by both private and public sectors. A lively workshop was held



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#### Junior planners

in March 2007 at the Kennington offices of the Kickstart Youth Inclusion Project in Southwark. Seven young people who live on the Heygate Estate, a large housing estate that is undergoing renovation as part of the regeneration of the Elephant and Castle, located in Walworth in the London Borough of Southwark, participated. The workshop was designed to assist young people in the area to become more involved in the regeneration of the borough and planning in their neighbourhood, leading into the establishment of young people's planning panels in specific wards of the borough.

Planning Aid for London prepared a variety of different materials for the workshop including hand-outs and displays explaining the impact of climate change and the ways in which strategic planning policies could be altered to lower the carbon footprint of regeneration. We learned from the workshop about the concerns of local young people regarding their own regeneration priorities and their concerns about the environment, and also about some of the ways in which young people might be involved creatively and effectively in making decisions about planning issues.



PAL

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#### Model-based exercise

Activities in the workshop involved, among other things, a model-based design exercise whereby young people had to create a neighbourhood on a site which already had a number of constraints on it, such as a waste management facility and other uses. Participants also had to find suitable locations for different types of waste management facility, from recycling collection points, to transfer facility, to processing facility, in different areas within the site.

### 3.2.3 Newham

Newham is another inner London borough with some areas of extreme deprivation. It is one of the host boroughs for the Olympics and forms

part of the Thames Gateway regeneration area. Some areas are experiencing high levels of growth.

A workshop facilitated by PAL was held in April 2007 at the Grassroots Community Centre in West Ham. Young people and one youth worker participated from a group called the 'Architecture Crew', which is run by Fundamental Architectural Inclusion, an architecturally based regeneration project based in Newham. The workshop was intended to raise awareness about waste, recycling, and young people's personal and household consumption, making the connection between their everyday activities and sub-regional planning issues relating to the treatment and disposal of waste. This workshop helped the group to examine and comment on plans for a new bio-fuels facility in nearby Silvertown.

We learned from the workshop that many young people were aware of the need to recycle, but were unclear as to whether many of the materials in the products that they bought could be recycled, and how they might go about this.

We also learned that the young people who took part understood what made different land uses compatible or incompatible with other land uses in a given area, and that there were ways also of minimising negative impacts from development, such as waste facilities, through using different forms of design, creating buffer

areas and not locating facilities close to other sensitive uses.

The workshop built on some of the knowledge about regional planning that the Architecture Crew had amassed through working with PAL during their preparations to edit the young people's section of the Mayor of London's website earlier in the year.

### 3.2.4 Conclusions

The conclusions drawn underline the lessons learned in the previous project:

- Prepare materials that are appropriate to the group and subject.
- Use existing networks and groups.
- Maintain and build on knowledge to reinforce understanding.
- Use everyday situations familiar to the group to assist in the understanding of strategic issues.
- The process of engagement requires resources to provide ongoing support, and workshops, although effective, are labour intensive with significant resource implications.

We must ensure that, once engaged, groups and individuals continue to contribute to the debate about our environment.

## 4

# how to brand a neighbourhood? innovative citizen participation in urban planning

## APaNGO Demonstration Projects – Geuzenveld-Slotermeer, City District of Amsterdam

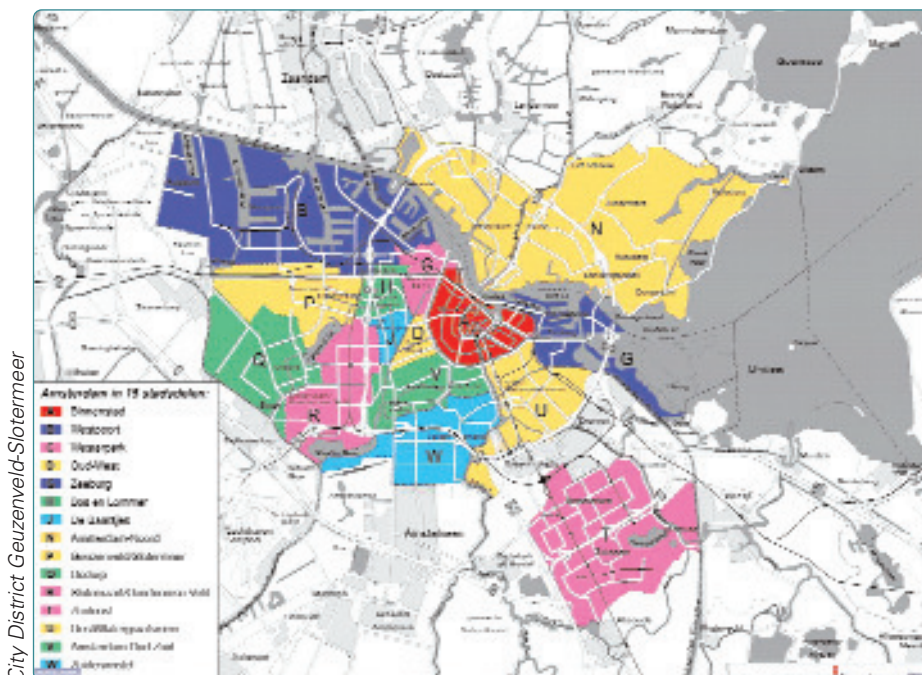
By Pieter van Dijk and Age Niels Holstein

In 2006 the Amsterdam City District of Geuzenveld-Slotermeer experimented with the technique of ‘branding’ in the regeneration of the Eendrachtsparkbuurt (Eendrachtspark Neighbourhood), a post-war neighbourhood. This approach differs from conventional techniques of citizen participation in urban planning, which are usually aimed at acquiring feedback on a planning proposal that has already been made. Branding turns the traditional planning world upside down, by taking the perspectives and experiences of residents as a starting point. What did this new approach look like? What were the results? And what are the lessons that have been learned? This chapter reports how an innovative process led one neighbourhood towards its new

identity, led by an ambition that *‘The atmosphere in the new neighbourhood should be relatively relaxed. Urban, without the hectic feel of the big city.’*

### 4.1 Introduction – planning objectives for the Eendrachtsparkbuurt

The Eendrachtsparkbuurt is a neighbourhood in the Geuzenveld-Slotermeer City District. It is located in Amsterdam’s ‘Western Garden Cities’ (Westelijke Tuinsteden), which were built as part of the ‘New West’ expansion of the city of Amsterdam. Now home to over 40,000 residents, Geuzenveld-Slotermeer is characterised by numerous green spaces,



City District Geuzenveld-Slotermeer

Left

Map of Amsterdam

typical post-war medium-rise buildings, and an extremely diverse multicultural population (64% are from minority ethnic groups). Among its many green areas Geuzenveld-Slotermeer has no less than five public parks and designated conservation areas, offering many recreational facilities, such as the Sloterpark with its national swimming facility, the Sloterparkbad.

In Geuzenveld-Slotermeer the need to plan for change arises because the area faces severe social problems. The renewal area is encountering social and economic decline (the average yearly family income is 19,000 euros and the unemployment rate is 20%). To deal with this decline the City District Council has adopted a wide-ranging improvement programme, covering the fields of social, economic and urban development. In the Geuzenveld-Slotermeer City District substantial demolition and construction work is scheduled up to 2015 – work that will have a major impact on the residents' familiar surroundings. The City District Council and the housing corporations are endeavouring to minimise this impact through a social plan, as well as by management of the living environment during the construction work.

Among the most urgent reasons to improve the quality of living conditions and urban daily life in general in the Eendrachtsparkbuurt are:

- the poor quality of the relatively small houses;
- the high concentrations of social housing (up to 100% in some parts);
- multiple social problems; and
- the difficulties in maintaining public spaces at a level of basic quality.

#### 4.2 Planning – the case of urban regeneration and the involvement of residents

In the early phase of urban regeneration in the City of Amsterdam, established planning processes were adopted in a fairly straightforward and routine way. Planning objectives mainly focused on translating regional housing programmes – with ambitious targets in terms of numbers of new housing units – into spatial strategies for under-developed city areas. Planning aimed to

improve the spatial quality of run-down neighbourhoods. At the same time housing programmes resulted in an increase in urban density. Urban planners and designers drafted urban structure and zoning plans for regeneration areas which were comparable to city extension plans. These were publicly announced so that residents could react to them. As a consequence of this planning activity many residents had to move to other neighbourhoods so that their old homes could be demolished and replaced by high-quality, modern housing. They could return after the completion of the regeneration process. Still, most of them did not, since by this time they had adjusted to their new environment and had 'rooted' in another part of the city, through for example their children attending a new school.

Although the basic rights of residents were protected in so called 'social plans' accompanying the regeneration schemes, many residents still felt their influence in the planning process to be marginal. The role of the community in the planning process did not correspond to the impact this had on community life and the interests of individual residents. As criticism gained force, the central municipal council and the city district councils became aware of the necessity that urban regeneration should focus more on neighbourhood communities and should also involve current and future residents in the process of planning itself. The voices of residents should be heard more clearly and their interests should be represented in the core of new urban plans.

As a consequence of these criticisms, the City District Council of Geuzenveld-Slotermeer changed the process of planning by attributing a more central role to participation. A minimum level of involvement of the communities and individual residents should be guaranteed, and the City District Council approved a participation bylaw for this purpose. At the outset of each planning initiative the City District Council decides which of three models of participation prescribed in the bylaw is appropriate and should therefore be adopted. These models are:

- **Information model:** The community is given all the information on the planning process, to enable them to exercise their legal right to be heard within the political process<sup>1</sup> of decision-making on the final plan. Active

<sup>1</sup> The 'right to be heard' is provided for in a City District bylaw: the participation regulation of the City District ('Participatieverordening'). This regulation gives the right to every individual resident to appear at the public meeting of the Advisory Committee of the City District and to express views and insights about the decision of the City District Council being considered in this public meeting

participation in the production of the plan is not possible because of fixed limitations that make real influence impossible.

- **Consultation model:** Residents are consulted over various choices that have to be made in the plan. Policy is sufficiently flexible to guarantee real influence. Consultation does not affect citizens' legal right to be heard in the decision-making on the final plan.
- **Co-production model:** Local government and residents together 'produce' the urban plan. Both are responsible for the plan, and thus both must agree on it. After agreement, residents can still exercise their legal right to be heard as part of the political process of decision-making on the final plan.

In addition to these rules of participation, residents still have their rights of legal participation, embedded in a statutory process. Each plan has to be released publicly. After publication, citizens have the right to inspect the plan for a period of six weeks. In this period they have the opportunity to give comments, both in writing and orally at a public 'hearing' in front of councillors that the local authority organises for this purpose. When the plan is on the agenda of the District Council, the public has the right to give comments before the political deliberations 'take off' at the public meeting. The whole planning process is completed when the District Council arrives at a final decision on the plan. (The statutory planning system in the Netherlands is further explained in the APaNGO First Interim Report.<sup>2</sup>)

The bylaw tries to establish a delicate balance between informal participation and legal participation rights. The commitment is to serious investments in co-operative or even co-productive participation at the outset of planning, which should minimise criticism or resistance within communities and thus pay off at the decision stage of the plans. The belief is that these plans will become better plans because they are informed by real-life experience, and thus they will gain the necessary support. This is, of course, only true under the assumption that communities will be engaged in the 'real' planning practice. In the Eendrachtsparkbuurt, therefore, a serious effort is made to engage the local community, and especially a number of 'hard-to-reach groups', through employing the identity-based participation technique of 'branding' a regeneration area. It is an example of testing

out new perspectives for urban regeneration in the western parts of Amsterdam. This effort became Geuzenveld-Slotermeer's first APaNGO demonstration project.

### 4.3 Looking ahead – dilemmas on participation

At the outset of the planning process in the Eendrachtsparkbuurt a series of 'dilemmas of participation' were identified. They were discussed at an APaNGO workshop in June 2005. Three dilemmas are concerned with basic conditions for successful citizen participation; two others focus on the relation between bottom-up participation and professional standards and/or commercial interests:

- **The participation-representation dilemma:**<sup>3</sup> This dilemma is created by the tension between formal support by the District Council for citizen participation on the one hand, and a lack of real 'policy space' for this to take effect on the other. When citizens are asked to contribute to an urban planning project, they expect to be taken seriously. If they experience that local councillors, who formally represent the public as democratically chosen representatives, have already reached a decision on all major elements of the plan, the process is likely to result in frustration and loss of trust in local government.
- **The lack of interest dilemma:** In the Eendrachtsparkbuurt this dilemma amounts to the rhetorically phrased question: 'Why participate when you are asked to leave?' This question results from a strategic and pre-judged decision to demolish a large zone of housing blocks as the starting point of a plan. The level of community engagement by residents who live in these blocks is expected to be very low. This planning situation existed within the Eendrachtsparkbuurt. Current residents were more interested in finding a new home in a new neighbourhood – for the time being or permanent – whereas future residents were not yet known. So who would be left to help design the 'look and feel' of the neighbourhood?
- **The silent majority dilemma:** The third dilemma deals with the challenge of diversity: how do you make sure that citizens with different backgrounds, gender, ages etc. join the participation process, instead of a

<sup>2</sup> Town and Country Planning Association (2007) *Advocacy, Participation and NGOs in Planning. Interim Report 1*. APaNGO Project Report. London: TCPA

<sup>3</sup> For a general discussion of this dilemma, see also the APaNGO First Interim Report, paragraph 2.2.7

small number of 'usual suspects'? In the Geuzenveld-Slotermeer City District, youngsters and Moroccan and Turkish women are known to be 'hard-to-reach groups', even though together they constitute a substantial part of the resident community. This dilemma has to be taken into account when asking them to contribute to a participation process, but also when crucial information has to be communicated to those groups. For instance, cheerful and colourful brochures containing information on new urban plans do not always succeed in getting the message across.

City District Geuzenveld-Slotermeer



Above

Being a neighbourhood reporter

- **The 'blindness by insight' dilemma:** The fourth dilemma concerns the gap between the professional's perspective and the average citizen's perception of the built environment. Good participation ensures that the interests of the community and of individual citizens are translated in the various urban plans and designs, while at the same time meeting all relevant professional standards. The big question is: how do you achieve this? How do you integrate two apparently separate worlds?
- **The conflict of interests dilemma:** The fifth and last dilemma deals with institutional interests versus community interests. In the Netherlands, housing associations<sup>4</sup> increasingly act as real estate developers in the commercial housing market. There might be a conflict of interest between citizens and their view of a happy, liveable neighbourhood, and the real estate developer, who might want to market the new place in a way that serves their commercial interests best (in terms of letting and selling the houses and apartments).

#### 4.4 The participation strategy

To address these dilemmas a threefold participation strategy was chosen, consisting of a framework of tasks that answered three basic questions:

- **Whom?** Identify the *network of all possible participants* and pay specific attention to hard-to-reach-groups.
- **Which means or instruments?** The '*medium*' is almost as important as the

message' – introduce new perspectives on planning by adopting innovative means.

- **Which ways?** Use branding as an innovative planning tool to integrate *participation and urban design* by determining the future identity of the neighbourhood.

Although each element in the participation process related to these three task areas, some additional specific activities also complemented and characterised the chosen strategy:

- **Networks:** To be sure that members of usually under-represented groups would join in, two initiatives were undertaken initially. A group of *young residents* was trained in the use of video cameras and sound recording so that they could function as 'neighbourhood reporters' during participation meetings and document the events. *Turkish and Moroccan women* were given training in participation. These social investments had real positive results as the branding sessions turned out to be more diverse than usual. But also regular contacts with tenants committees who would be affected by the regeneration process were maintained.
- **Community art:** In the art project 'The Imaginary Refurbishment of your Neighbourhood', residents were invited to come up with imaginative ideas about their own neighbourhood and to communicate them to three artists. These artists worked for three months in the Eendrachtsparkbuurt. The artists elaborated these ideas in their

<sup>4</sup> In the Netherlands housing associations in the 1980s were semi-governmental organisations that received government funds to provide social housing. After reforms they became privatised organisations that are allowed to make profits, but remain restricted by detailed regulations. Through these regulations the Dutch Government aims to guarantee its main objective to continue to deliver social housing within the context of a 'free' housing market. As a result housing associations in the Netherlands can be seen as private enterprises that are allowed to invest 'societal capital' and therefore are also bound by strict rules and regulations





City District Geuzenveld-Slotermeer

Left

Mobile studio and projection screen: Platform Neighbourhood Nine



City District Geuzenveld-Slotermeer

City District Geuzenveld-Slotermeer



Above

Left: The prize-winning idea 'Imaginary refurbishments of your neighbourhood': Fountain

Right: Prize-winning idea 'Imaginary refurbishment of your neighbourhood': Four seasons van (Translation: Spring: Peanuts for 1 euro; Summer: Lovely ice creams; Autumn: Fruit for 1 euro; Winter: Hot chocolate)

mobile studio, which also served as neighbourhood projection screen.

Several screenings were staged after sunset, and in this way the neighbourhood was kept informed about the progress of the project. The art project came to a close with the selection of two prize-winning ideas: a 250 euro reward was given for the most imaginative idea and a 250 euro reward for a feasible solution that could be incorporated in the urban plan. A celebration of the prize-winning ideas was organised at a neighbourhood party. All the ideas were documented and used as another resource for the future identity of the Eendrachtsparkbuurt.

#### 4.5 Participation and urban design through 'branding'

The most significant component of the participation in the urban plan was the adoption of a branding technique in a series of

participation exercises. In the case of the Eendrachtsparkbuurt, the City District and the housing corporation Het Oosten/Kristal commissioned the Holland Branding Group to design and realise the branding trajectory. The challenge in the Eendrachtsparkbuurt consisted of designing an attractive, diverse and vital neighbourhood that would fit the needs of current and future residents. The central goal of participation in the Eendrachtsparkbuurt was to re-assert the core aim of the planning process: to create new attractive urban spaces for current and future resident communities. A collaborative quest for the current and desired identity of a neighbourhood has several important advantages. A search for a well formulated and 'rooted' identity:

- addresses participants less as 'consumers' of a plan and more as a 'producers' of their own neighbourhood;
- supports and informs the marketing strategy for a specific area;

- attracts potential future residents and entrepreneurs who ‘fit’ into this identity;
- directs professionals towards the objective that they will have to realise collectively; and
- connects ‘hard’ and ‘soft’ aspects of renewal, such as housing blocks and roads (‘hard’), and activities and public services (‘soft’).

The future identity has to be ‘rooted’ in the history of the existing neighbourhood. Branding would be an empty gesture if it did not establish a delicate interplay between continuity and discontinuity; thus lodging new elements of the identity into the ongoing history of the neighbourhood. The ‘brand book’ (one of the concrete products delivered) opens with a description of the history of the neighbourhood. Interviews and conversations held with residents can be considered as forms of oral history. Interviews were also documented in a separate booklet that was offered as a present to every resident that now lives in the neighbourhood or has been relocated as a result of the demolition programme. The identity, thus informed by local history, also links features of the new urban plan to the existing situation. A number of qualities and characteristics of the Western Garden Cities (the famous Van Eesteren Extension Plan) return in the new urban plan – thus also physically expressing continuity in the urban layout of this part of Amsterdam.

In particular, working with identity and branding, in the case of long-term, grand-scale urban regeneration projects, provides a ‘far-away beacon’ that helps co-ordinate different plans and projects, and keeps all actors involved on track towards a common objective. Even when the demolition of current housing blocks has been completed and the new dwellings have been delivered, the desired identity remains relevant. It can be a resource for neighbourhood management, or it may well inspire the organisation of diverse activities in the neighbourhood.

The branding project was intended to overcome ‘blindness by insight’, mentioned above. A concerted effort was made to bridge the gap that often exists between professional standards and community interests. Its ambition was to make the perspectives and the genuinely held interests of the community the starting point for the planners and their use of highly sophisticated tools and standards for urban planning. Branding was deployed to ‘open up’ the planning process so that the plan drew on the perceptions and desires of residents and diverse ‘clients’, gained through detailed discussions about the future identity of the renewal area.

## 4.6 The branding process in detail

The participation process was divided into three clear-cut phases:

- an orientation phase;
- an identity phase; and
- a design phase.

Participants in the exercises could be categorised as follows:

- current and potential future residents;
- City District professionals;
- the housing association (Het Oosten);
- the real estate developer branch of the housing association (Het Oosten Kristal);
- representatives of local non-governmental organisations (NGOs) and residents networks;
- local entrepreneurs;
- researchers and other experts in urban planning and housing – for example from housing associations;
- visual artists employed by the City District; and
- the branding consultants (Holland Branding Group).

The orientation and identity phases were characterised by participation-by-invitation, whereas for the participation in the design phase open enlistment was chosen. The invitation of participants for the identity sessions was based on the following criteria:

- participants with knowledge about, experience of or responsibilities for the area;
- participants who wanted to make a contribution to its future;
- participants who would speak freely and on their own behalf only;
- participants who would demonstrate interest in the opinions of others; and
- participants selected and invited who would together constitute a diverse group of people, in terms of gender, cultural background and age.

Another important aspect was that the group consisted of both professionals – project

managers, researchers – and citizens and volunteers from local NGOs. In more traditional forms of citizen participation these two worlds are kept separate. In the branding sessions they were actively mixed, so that different types of knowledge could inspire and reinforce each other in a live project.

The branding process started with an orientation phase. An ‘orientation day’ was designed to identify relevant themes for the future brand. These themes would direct the regeneration of the neighbourhood. By walking through the neighbourhood and joining a so called ‘theme group’, questions about the new neighbourhood were discussed:

- What kind of people are there now?
- What types of new residents would fit in?
- What should the new ‘atmosphere’ be?

Instead of jumping to conclusions, the main objective was to discern the themes and topics of concern to the neighbourhood that were considered important by its residents. In order to complement and express the discussion, visual artists transformed the views of the participants (not only those of residents but also those of researchers and professionals from the City District, the housing corporation, NGOs and real estate companies) into colourful drawings that served as visual conceptions of the future. Both the central questions and the list of invitees for the identity sessions of the next phase were determined by the results of the orientation day.

The next phase was about identifying core values for the Eendrachtsparkbuurt. Two sessions were organised with about 15 participants (plus eight ‘observer’ officials who only witnessed the process), who were requested to search for common values concerning the neighbourhood. This was triggered by questions like:

- What does the word ‘home’ mean to you?

- What atmosphere do you appreciate in the surroundings of your house?
- What type of residents should the new neighbourhood attract?

In the expression of personal views and the ensuing discussion, visual communication again played an important role. Participants were asked a question, and also asked to present their views by means of a drawing. They could ‘order’ this drawing from the same ‘visualisers’ of the orientation day. With the drawing in their hands, they shared their experiences with the rest of the group.



City District Guezenveld-Slotermeer

Above

Talking by images

The two sessions resulted in the formulation of five core values or qualities for the Eendrachtsparkbuurt:

- developing;
- lively;
- inclusive;
- hospitality; and
- park.

These core values were related to emotional, functional and aspirational aspects, as shown in the value table (Table 4.1). This value table was



Holland Branding Group

Above

Drawings of visual concepts: Icons of identity

**Table 4.1**  
**Value table**

Core values	Development	Lively	Inclusive	Hospitality	Park
Emotion	Building a future	Inspiring	Compassionate	Organic	Relaxed
Function	Equip	Enterprising	Tolerant	Community	Green and spacious
Aspiration	Catharsis	Web/network	Fusion	New Amsterdam	Allure

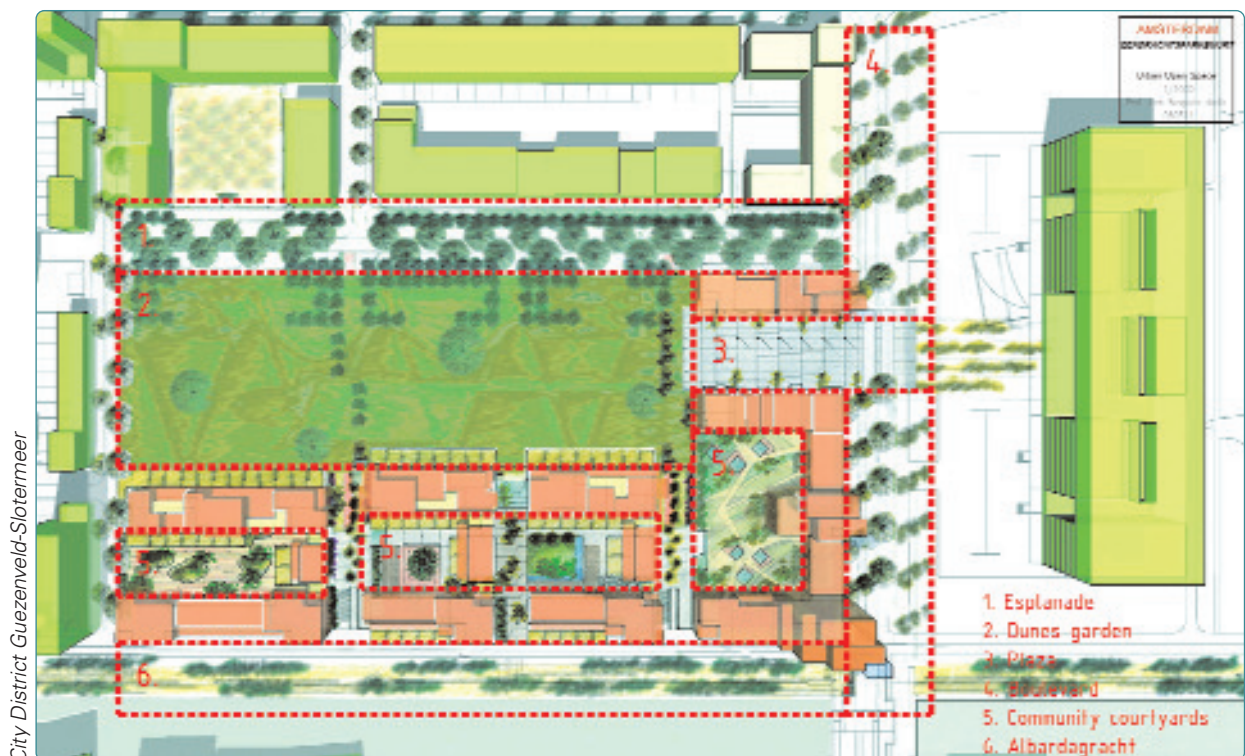
used as input for the third phase: the design process. The design was led by the Spanish urban designer and architect Joan Busquets. Busquets’ urban design office places identity at the heart of its use- and user-oriented design process. Visual concepts of the future neighbourhood identity and core values as listed in the matrix of Table 4.1 create together a specific interface. This interface can be used to specify the qualities and functions of individual spaces, which thereby become key components of the general layout of the urban plan. As part of this design process core values guide the interpretation of urban fabric.

To maximise citizen influence on the urban plan, two interactive workshops were organised during the design phase to discuss draft versions of the design. These meetings resembled traditional and familiar participation exercises. In the first workshop, the general public could give suggestions on the basis of the first sketches of the plan. The urban designer then went back

to the sketch-table to incorporate the suggestions into the plan wherever possible. In the second workshop, a more definitive design was presented and discussed. After the designers had included the last remarks within the design, the urban plan was completed.

As a result of the design process several distinctive urban spaces can be discerned in the urban plan of the Eendrachtsparkbuurt. The new neighbourhood is designed as a composition of:

- a public garden;
- a square (plaza);
- an esplanade;
- collective spaces;
- a boulevard; and
- the canalside.



**Above**

Individual spaces in the Eendrachtsparkbuurt plan  
(Joan Busquets)

All the elements of this composition should enhance 'Relaxed living in an active neighbourhood'. Under that heading, a City District leaflet dated April 2006 presented definite plans for the Eendrachtsparkbuurt to residents and other people involved. Visuals and accompanying text showed and explained what the new neighbourhood would look like, pointing out its mixed qualities: green spaces *and* an urban feel, commercial flats for sale and rent *and* social housing. It would be a whole new place with some historical echoes, compared with the existing 288 post-war, medium-rise flats that would soon be demolished.

After the publication of the final draft the statutory participation process began, including a six-week public consultation period on the official plan. No formal complaints about the plan were put forward during this period. This simple fact could be interpreted as a successful result of the time, energy and commitment that all participants, residents and professionals alike put into the process. When the District Council approved the plan in July 2006 it was then able to start building the new Eendrachtsparkbuurt, which is now well under way.

## 4.7 Conclusions – lessons learned

Looking back at the process, the overall conclusion about the participation process is positive. However, branding and 'participation' do not stop when the plans are approved. Whether the desired identity of the new Eendrachtsparkbuurt will actually be realised is a matter of staying focused on the core values and their translation into the public space, activities and facilities in the neighbourhood. A number of important lessons learned are worth recounting.

### 4.7.1 *New dynamics – political antagonisms are attenuated*

The essence of searching for the desired identity for a neighbourhood is that it approaches citizens in a new way: 'Planning starts with *your* experiences and opinions. We regard you as an important source of knowledge for the regeneration process.' This approach clearly creates a different group atmosphere, compared with most regular participation meetings, in which sometimes the only rational option seems to criticise a plan that is already prepared. Branding 'seduces' people to look at their environment in a different, new way. The general stance is less political, more open minded. Moreover, new dynamics in the participation process arise as

existing and future residents share their ideas about the future. Apart from bringing together residents, branding also improved the co-operation between the City District and the housing corporation.

### 4.7.2 *Diversity – possible, but only with substantial effort*

Above we raised the 'lack of interest dilemma' of citizen participation: without extra effort to reach other target groups only the 'usual suspects' are involved. In what way can we achieve a real diversity of input into the participation process? In the branding process explicit attention was given to this issue. The goal of diversity among the participants was achieved by asking youngsters to be neighbourhood reporters, after receiving training. Moroccan and Turkish women were personally invited to take part in participation training, in order to be able to join the identity sessions without feelings of discomfort and anxiety. This also resulted in a more mixed group of people who commented on the plans during the workshops, which were open to all interested residents. However, these results were achieved only after a distinct effort. If you want diversity, you have to invest time and money in it!

### 4.7.3 *Future residents*

How can we know the thoughts and feelings of future residents? This is a challenge, especially in neighbourhoods in transition, where the housing stock is transformed from 100% social housing to a mixture of social housing and private sector housing (both to let and for sale). There might be distinct differences in lifestyles and preferences between groups. In the case of the Eendrachtsparkbuurt, a lucky circumstance existed in the area under scrutiny: a number of new blocks had already been delivered. The residents in those homes – from different lifestyles, ethnic backgrounds and income groups – had a real interest in the new plan because they were actually facing the planning area. The composition of residents of those blocks could be expected to resemble the future composition of the new Eendrachtsparkbuurt. Without available 'new arrivals' to draw into the process, one would have to find other ways to incorporate these voices. In that case a second-best option might be focus groups with new residents from other parts of the city.

### 4.7.4 *Linking brand and design*

When the branding process started, the urban designers also made a start on preparatory work. The planning circumstances were such that the urban design process and the branding process were interwoven in a parallel, interactive (back and forth) manner. This is not

an ideal situation. Serial linkage might be preferable, in which case the identity session and its results precedes the urban designing process altogether. The outcome was good in Eendrachtsparkbuurt because the urban designers integrated identity themes in an organic way in their design process. To guarantee a proper connection, a number of meetings between the process moderators of the Holland Branding Group and the design team of Busquets were organised. As a final check, residents were invited to participate in two design workshops. This enabled them to comment on the plan. Nonetheless, a lesson learned is to start early with the common search for a desired identity, to maximise the input to the planning and designing process.<sup>5</sup>

#### **4.7.5 Conditions for success**

Branding is not cheap and easy. This way of organising the participation process is resource intensive, in terms of money, effort and co-ordination. Commissioning a specialised office that has both the knowledge and the skills to successfully organise a branding process involves a financial investment that one has to be willing to make. In the case of the Geuzenveld-Slotermeer City District, the question arises whether the same kind of process would be affordable in cases where the renewal area is far greater than the Eendrachtsparkbuurt.

A well conceived process plan – which metaphorically could be denominated as logical ‘process architecture’ – turned out to be an important factor for success. Branding was an important component of a larger process. This being the case, what was expected from participants had to be clear for all those involved, including residents with little education or schooling. It is a general truth that the goals they are moving towards and the rationale behind the set-up of different meetings or other activities have to be obvious to everyone.

#### **4.7.6 Follow-up – citizen involvement**

When residents get enthusiastic in meetings such as the identity sessions, it is very challenging to ‘keep things going’ – in other words, to translate the involvement of citizens as experienced into a more permanent neighbourhood network of active and responsible citizens. After the adoption of the urban plan of the Eendrachtsparkbuurt by the City District Council the decision was taken to make an effort to prolong the involvement of residents by setting up new meetings to inform and consult the public about the progress of

detailed designs of individual dwellings and detailed solutions to filling in the public spaces. The intention must be to sustain community involvement after completion of the plan.

#### **4.7.7 Branding – commercial trick or genuine historically rooted participation?**

Before starting the branding process, some professionals in the City District had doubts about whether a ‘tool’ like branding would be suitable. They sensed a danger that branding would serve predominantly the commercial interests of the real estate developer of the housing corporation – branding it in order to maximise sales. They envisaged a potential tension with the interests of current residents – their desire to have real influence on the design of the new neighbourhood. Fortunately, branding proved to be a valuable instrument in the process, and participants did not experience a conflict of interest. Perhaps contrary to expectations, after the process the housing corporation was not fully convinced of the usefulness of the brand as a specific marketing tool.

#### **4.7.8 Follow-up – brand management**

The production of a ‘brand book’ in which the collectively determined core values are described should not be seen as the end result. In the further development of the neighbourhood, core values have to be kept alive by ensuring that they inform new operational decisions and discussions with all relevant participants.

This might well entail different forms of ‘brand management’, in which elements of the brand are re-asserted or adapted to new circumstances and corresponding new points of view. It is notable that the new brand and identity picked up clues from the historical ambitions of the neighbourhood formed by van Eesteren’s original post-war plan, and this iteration is likely to continue through brand management for the neighbourhood. The process therefore re-contextualised historical ambitions by adapting to new societal challenges, and to this extent can be seen to have some roots in the history of Eendrachtsparkbuurt.

#### **4.7.9 In conclusion**

Formulating a threefold participation strategy, in which the adoption of a branding technique became a core element in the planning process, was a truly new experience for the City District. Through this experiment, new ways of engaging citizens emerged, and as a

<sup>5</sup> This, of course, relates to general points made in the APaNGO First Interim Report, in paragraph 2.2.4, about the timing of involvement

result new qualities could be incorporated in urban design. Of course, some elements could be improved as set out in the lessons above, thus providing the input for this report.

#### 4.8 Epilogue – bottom-up regeneration of Sloterveer

Geuzenveld-Sloterveer's second APaNGO demonstration project is related to the regeneration of Sloterveer, a neighbourhood of approximately 10,000 households covering almost half of the City District area. The Sloterveer regeneration programme began in December 2006. We decided to select participation in the Sloterveer area as our second APaNGO demonstration project. We cannot simply repeat the Eendrachtsparkbuurt participation process in a Sloterveer setting, although we can try to learn from the lessons it offers. The Sloterveer regeneration scheme affects a considerably larger area than the Eendrachtspark neighbourhood. Whereas participation in the Eendrachtsparkbuurt related to the design phase of a well progressed urban plan, in the Sloterveer example we are witnessing the onset of a new planning process.

Nonetheless, benefiting from the experiences and the insights achieved in the Eendrachtsparkbuurt means making informed decisions about:

- the 'architecture' of the whole participation process in relation to the planning targets – this will lead to greater complexity, because the targets are more comprehensive as they relate to a much larger regeneration area;
- the role of the urban identity of the Sloterveer area in the planning and participation process; and
- the appropriate network and outreach strategy to engage all resident communities and other interested parties.

As a result we identified a minimum of three phases in the regeneration process:

- The *first phase* concerns *process design and preparation*. In this phase strategic decisions are taken about the 'architecture' of the participation trajectory.
- The *second phase* consists of a *bottom-up community process*. This leads to the actual regeneration plan for the Sloterveer neighbourhood.

- The whole process is concluded by the *third phase*, in which the different elements of the plan are implemented and realised. We suspect that some regeneration schemes can be implemented quite soon; others, such as more comprehensive refurbishments and/or renovation, or even demolition and building of new houses (when required), will take many years.

##### 4.8.1 Learning from good practice – the 'Wijk aan het Woord'<sup>6</sup> conference

On 24 January 2007, the City District organised the APaNGO conference 'Wijk aan het Woord'. Apart from considering our own findings in the Eendrachtsparkbuurt, conference debate focused on the exemplary regeneration process that took place in the city of Enschede in the east of the Netherlands. In 2000 a fireworks factory in Enschede – located in the middle of a residential neighbourhood – exploded and destroyed an area of 42 hectares. Soon after this disaster – which took the lives of 23 residents, destroyed or damaged 650 houses and left 1,500 people homeless – politicians from local and national governments stressed the importance of involving the residents when rebuilding the neighbourhood.

Discussions on the Enschede case were triggered by a number of elements – the scope of citizen influence (residents selecting urban designers themselves); the involvement and input of children (thereby also giving opportunities to engage their parents); giving priority to a fully fledged residents' discussion on the regeneration agenda before professionals or councillors intervene; and the diversity of groups involved, such as artists, migrants, the elderly, entrepreneurs and young people. In Enschede this led to high approval rates for both the urban plan itself (327 votes in favour, 3 against) and the process that gave rise to it (87% were happy or very happy with the opportunity to discuss their ideas).

##### 4.8.2 Creating support within the organisation

Inspired by the APaNGO conference debates, the preparation and design phase of the planning process began with two City District meetings: the Ateliers Sloterveer. The purpose of the ateliers was to design a feasible bottom-up approach for participation in the Sloterveer regeneration process.

The first atelier focused on opportunities for and obstacles to a bottom-up approach. Lists of possible partners in the process were drawn up; the integration of the regeneration process

<sup>6</sup> Which can be translated as 'The neighbourhood speaks'

within ongoing activities in the area was analysed; and conditions and limitations to be explicitly communicated to all participants of the planning process were established.

The second atelier took place on the streets. To help gain support from external partners for the bottom-up approach, professionals from housing associations, community centres and youth work organisations, representatives from the police etc. joined City District planning and regeneration professionals in a number of walking tours through different parts of Slotermeer, in order to experience at first hand the positive and negative aspects of the neighbourhood.

Furthermore, the Amsterdam Trainee Pool, a group of young civil servants from the City of Amsterdam, carried out a 'sociale strooptocht' ('social raid'). Its objective was to identify key persons in the neighbourhood that should not be overlooked in the bottom-up regeneration process.

#### 4.8.3 Concluding the preparations phase – what will actually happen in Slotermeer?

The consultants responsible for designing and realising the community involvement in Enschede, Joop Hofman Allianties, were commissioned by the City District to provide similar assistance in engaging local communities in the Slotermeer neighbourhood.

Compared with the Eendrachtsparkbuurt a striking difference in the planning and development aims in Slotermeer is that they do not exclusively concern the built environment (renovation, demolition and rebuilding), but instead give high priority to improving the social and economic fabric of the neighbourhood. What facilities and activities are needed? What can be established by the community itself? Where is help needed from the local government, schools and other local organisations?

As a result of atelier discussions the participation process is divided into the following steps:

- **Step 1: Analysis** of existing sources of knowledge; meetings with key professionals working in the neighbourhood.
- **Step 2:** Final **process plan**, including making explicit the division of labour, mutual expectations etc.
- **Step 3:** Activation of the '**mobilising forces**' in the neighbourhood – both residents and

professionals with a large network of contacts who can help secure a high level of community involvement.

- **Step 4:** Determination of the **agenda of the neighbourhood** by organising (about 15) meetings in the neighbourhood at which residents discuss what is good about their environment, and what could or should be improved – with tailor-made activities for specific groups supplementing the geographical approach.
- **Step 5:** First response and discussion by **professionals** in order to confront residents' ideas and preferences with professionals' knowledge and experience – in this phase (which might occur alongside the agenda-setting phase), the first steps are taken towards a realisable strategy.
- **Step 6: First check** by the City District executive, housing association and other key stakeholders on whether the general direction still meets the condition set at the outset.
- **Step 7: Synthesis** of the residents' agenda(s), professionals' views and other input such as research results – with the aim of finding common ground.
- **Step 8: Expert meetings** with a selected group of experts, professionals, residents and others to bring forward creative solutions to obstinate problems.
- **Step 9: Three-day festival (the Slotermeer Carrousel)**, at which plans are presented and discussed and so 'brought to life'.
- **Step 10:** Production of a **draft masterplan**, ready for decision-making by the City District, also containing the first outline of an implementation strategy.

#### 4.8.4 The identity of Slotermeer – applying the lessons learned from branding the Eendrachtsparkbuurt

As described earlier in this chapter, a number of lessons were learned in the Eendrachtsparkbuurt. We have tried to make maximum use of the knowledge we have acquired from the Eendrachtsparkbuurt project within the regeneration process in Slotermeer:

- Start off with the experiences and ideas of residents, *not* with a preconceived and elaborated plan that cannot really be questioned. The Slotermeer process will explicitly start with resident's opinions and



desires, and will also aim to stimulate discussion among residents themselves. Only later in the process will residents' views be confronted with possible professional objectives.

- Diversity in the participants will be ensured by, on the one hand, actively inviting people from different target groups to join both the general sessions and the group-specific sessions attractive to the particular groups in the community; and, on the other hand, by using a lot of active working techniques, preferring visual means over textual ones.
- The neighbourhood agenda-setting (step 4 in the process list above) will be driven by the identity of the area, but will probably not result in a 'branded' specific urban design as in the Eendrachtsparkbuurt demonstration project. Several kinds of meetings and techniques will be used to conceptualise and visualise the future of the Sloterveer area. It is unlikely that all future elements can be summed up within a single 'brand' – something that the Eendrachtsparkbuurt experience shows was not achieved there either, as demonstrated by the housing association declining to use the 'brand book' as a marketing tool. In Sloterveer a section of the neighbourhood has been given the status of a 'Van Eesteren Museum' (named after Van Eesteren, the famous urban designer of the 'Western Garden Cities' of Amsterdam), and so this section is subject to strict rules prohibiting change to the layout of large sections of the area and preserving the architectural integrity of many individual building blocks. Thus both history and the neighbourhood agenda will contribute to any new emerging identity. At this stage it has not yet been decided how this new complex identity will be connected to the urban design phase of the planning process. It might well be the case that elements of the above described branding technique will be used at that stage, to ensure that a proper connection is established.

#### 4.8.5 Advice from the APaNGO partners

The above ten-step approach to the participation process, consisting of a network and outreach strategy and elements of an identity-led planning approach, was presented to the APaNGO Steering Group meeting of 2-4 July 2007. In the ongoing planning process the

following helpful comments made by the APaNGO partners will receive careful attention:

- **Develop an exit strategy:** An ambitious participation process creates high expectations among residents and other participants. This forces the organising party to make clear what will happen with participation outcomes, *and* what will happen after the process has ended.
- **Be explicit about responsibilities:** The City District and housing associations do not always share the same interests. It should be clear to residents and other participants who is finally responsible for decisions.
- **Keep a proper balance between the process budget and spending of direct benefit to residents:** Hiring a consultancy company to organise the process is necessary, but this should be matched with substantial budget for residents to decide upon. If not, people will find it hard to understand why a lot of money is spent on 'overheads', and so little to the benefit of neighbourhood residents themselves.
- **Look for quick wins:** When people see that ideas are realised quickly, they will see that participating actually makes a difference, and so will want to become more involved in the process.
- **Include residents in the steering committee:** See if the institutional partners will agree to invite residents onto the steering committee, thereby giving them real influence on strategic decisions.
- **Put real power in residents' hands:** For example, offer a group of residents the 'ownership' of a partial project.
- **Invest in residents' skills:** Ensure that residents have recourse to training and advice, so that they are and feel qualified to give informed opinions and make decisions.
- **Acknowledge the housing associations' enduring involvement:** Most housing associations have a long history of involvement in the areas in which they have real estate property. The City District should acknowledge this, thereby trusting the housing associations' real commitment to neighbourhood improvement.

# 5

## stichting sens unique and stevin huizenblok – two of the many stories about the eu presence in brussels

### APaNGO Demonstration Projects – Brusselse Raad voor het Leefmilieu

By Hilde Geens

#### 5.1 Introduction

Participation in the planning processes for the area in Brussels in which the main institutions of the European Union (the Council of Europe, the European Commission and the European Parliament) are located has been complex and challenging for all involved. This APaNGO demonstration project is designed to evaluate some of the major initiatives undertaken by community groups since the 1980s (supported by Bral, an APaNGO partner) to gain effective involvement in planning for this unique neighbourhood.

This chapter describes the very particular conditions in this locality, in which local community participation, and the interests of local residents, come into close proximity with developments of international importance and national, regional and local investment. The deeper evaluation of these activities will not be completed until September 2007, so this interim summary describes only two of the many local community initiatives that took place in the area, and identifies some interim conclusions.

#### 5.2 The European quarters in Brussels

The area in which the institutions of the European Union are located is less than one square mile in size and is largely situated in the Leopold district, just outside (to the east) of the historic heart of Brussels. This district was developed during the 19th century as a residential area for the affluent 'Brusselaar' (typical Brussels inhabitant). The original

buildings are stately mansions, some of which have been kept, but are still not protected. Two broad avenues connect the European district with the heart of Brussels: the Rue de la Loi and the Rue Belliard. The Leopold district itself is situated within the city limits of Brussels, but some of the European institutions (the European Parliament and some of the



Bral/vzw

#### Above

The EU institutions are situated in a 19th century neighbourhood in Brussels

Commission's buildings) have settled in the two neighbouring municipalities of Ixelles and Etterbeek.

From the very beginning, the development of the buildings for the EU institutions has lacked

a strategy and any planning by the Brussels and Belgian authorities, or by the institutions themselves. The result has been significant *ad hoc* development, often led by private developers.

Since the State reforms at the end of the 1980s, the responsibility for spatial planning in Brussels has been divided between three policy-making bodies: the Federal State, the Region of Brussels, and the 19 municipalities. The three main European institutions act autonomously and without mutual co-ordination. This fragmentation is an important element in the history of planning for the institutions and the districts in which they are located.

The greatest single cause of the lack of planning is embedded in the structure of the EU itself. While decisions regarding the location of the EU headquarters were still pending, a long-term strategy was impossible, and none of the institutions could act as principal in a construction contract. The Belgian Government was apparently very reluctant to act for the same reason. The result was that private developers took control and, through good contacts and lobbying, succeeded in tailoring their projects to the needs of the institutions. However, some masterplanning was attempted, including community participation. The process is described below, and has some important lessons for community participation in high-status circumstances such as these.

### 5.3 The first masterplan: 1986-87

The first masterplanning attempt was made by the Brussels Government during 1986-87: 'Ruimte Brussel Europa' or 'Espace Bruxelles Europe'. For over a year and a half all stakeholders worked on a masterplan to integrate the new European Council building and the existing Commission buildings in a quality environment. Around 30-35 people met regularly to develop the plan, including representatives of the European institutions, all levels of government, NGOs (including Bral) and local residents. The result was a whole series of measures at different levels, including programmes to make operational plans to renovate housing and to support the development of small businesses. The idea was to invest in the areas around the institutions and then establish buffer zones to stop their expansion. The residents' concerns were that the three European institutions (and associated developments) were all expanding and were likely to merge into each other and squeeze out the local community entirely.

One month before the end of the masterplanning process, leaks of a secret deal between the Brussels Government and a private developer were published in newspapers. This deal was said originally to be about building an International Congress Centre – the Belgian authorities could not be involved in building a Parliament in Brussels because there was as yet no EU political agreement to do so, although everyone knew the building was intended to be used for the European Parliament. This building was outside the masterplanning zone, on the far side of the buffer. One of the main purposes of the masterplan had been lost. There were even suspicions that the whole consultation exercise had been a smokescreen; certainly it became clear that the deal to focus on a site and building outside the masterplan area, beyond the buffer zone, had been on the table from about half way through the masterplanning process.

Local NGOs and communities fully supported the principle that Brussels should house the European Parliament and become a 'European Capital'. The voluntary and community bodies had put in an enormous amount of (almost entirely unpaid) time, had learned to manage and understand huge quantities of information, and had been committed to playing their part in what was seen as a very positive way forward. However, the perceived dishonesty of the participation process in which they had been involved left them feeling completely betrayed.

The masterplan was completed, in spite of the problems. However, there was still a lot of work for the public authorities to do to translate it into the necessary operational plans, and all the planning energy was diverted into the development of the EU Parliament building – outside the masterplan. As the development of the Parliament building continued, there were opportunities for public consultation on the formal planning applications. The requirements in order to obtain a building permit in Brussels are to publicise the application and allow anyone to examine the complete file and make recommendations and remarks, without having to prove or explain their personal interest, in an open meeting. Only then is a decision made.

Although this process guarantees a certain degree of publicity and the opportunity to respond, it remains a very passive and limited procedure. Residents and NGOs opposed some applications, and some were amended (although the extent to which local people's objections influenced those changes are not clear); but all the building permits were granted.

## 5.4 The concerns of the community

Over the years that the European institutions were expanding in the neighbourhood, the residents had the impression that their living conditions became less and less important considerations. Brussels had decided to integrate Europe within the city, instead of creating a new district outside the city as Luxembourg chose to do. But the community felt that in any conflict the European institutions were always given the highest priority. For example, in the 1970s several residential blocks next to the Berlaymont (Commission) building were expropriated to allow for possible expansion. Such expansion never occurred, but the indecision remained for years, blighting any chances of regeneration. The developments that did go ahead created increasing traffic and the building sites caused noise and dust – all of which were experienced mainly by the residents. The neighbourhood changed. More and more restaurants and bars came, rents went up, and with the EU came the whole international ‘court’ – lobby groups, press agencies, law firms. The EU was not integrating: it took over. The south of the area was still residential, but in the north the big houses were all taken over by lobbyists and the like. There has been some regeneration in the south and east, but the pressure remains to change family housing into offices and smaller, more expensive flats and apartments.

The various community groups wanted to be involved in the process. They wanted their basic rights and concerns to be taken into account – secure housing rights, the quality of their environment, local community facilities and shops. Their primary concern was not to influence the decision on a particular plan or project; they were demanding that the rapid change of their neighbourhood be guided and controlled under some sort of managed and strategic planning process, and that they would be recognised as one of the stakeholders in that process.

## 5.5 Community group access to and use of information

The formal creation of the Brussels Region, as part of wider Belgian State reform, was finalised in 1990. By that time, a lot of decisions had already been taken by the Federal Government and its administrations and the European institutions. Various community groups had started to collect detailed technical information about planning issues in the neighbourhood. Some information was collected at the time of a court case in the

early 1980s by local groups (including Bral) against Federal Government plans for a new European Council building in a residential area. Other material was collected as part of the masterplanning exercise in 1986-87. Very little of the information was provided officially; it all had to be researched or was provided by supporters. The community groups were made up of volunteers, and neither they nor the two NGOs supporting them (Bral and its French counterpart Ieb) ever received funding specifically for this work. Nevertheless, the groups were able to publish a whole range of well researched brochures and pamphlets on the issue.

## 5.6 What happened next?

In 1989, the new Brussels Government stated in its general policy declaration that it would confirm and execute the conclusions of Ruimte Brussel Europa. In practice, the larger follow-up committee (which included residents) held only one meeting, in 1991. At around this time, in the early 1990s, a new umbrella organisation was formed: Co-ordination Europe. This was essentially a federation of local community groups from the area affected by the masterplan and the two NGOs supporting them (Bral and Ieb).

In September 1994 Co-ordination Europe presented its *Assessment of a Forgotten Plan 1987-1994 (Bilan van een Vergeten Studie Ruimte Brussel Europa)*. This assessment described in detail what the conclusions of the masterplan had been, the actions that had been agreed, the results at that moment, and how the different public authorities had acted on it during the past years. The report was painfully negative: not only had not much happened to bring about the promised buffer zones, but there was negligence on other levels, and violations of the law had been tolerated. When the report was published, there was hardly any reaction from the authorities.

Co-ordination Europe decided that it was time to look forward again, and to work out a common programme for the future development of the European neighbourhood from the perspective of the residents.

In contrast to the defensive *ad hoc* responses that had been made during the formal consultation procedures (that were always ongoing), Co-ordination Europe decided to put forward a comprehensive plan in which the European institutions had their place, but which also respected the needs of the neighbourhood. It took a lot of discussions and negotiations

between the different groups to reach a consensus. The unions of the European civil servants were also involved and were co-authors of the resulting manifesto, which was published in three languages (French, Dutch and English) in 1996 as *Europe en Quartiers*, *Wijken voor Europa*, and *Europe: a Living Campus*. It was written and designed very carefully to reach a broad public and today still provides a good overview of a part of the history of the EU in Brussels as experienced by the residents.

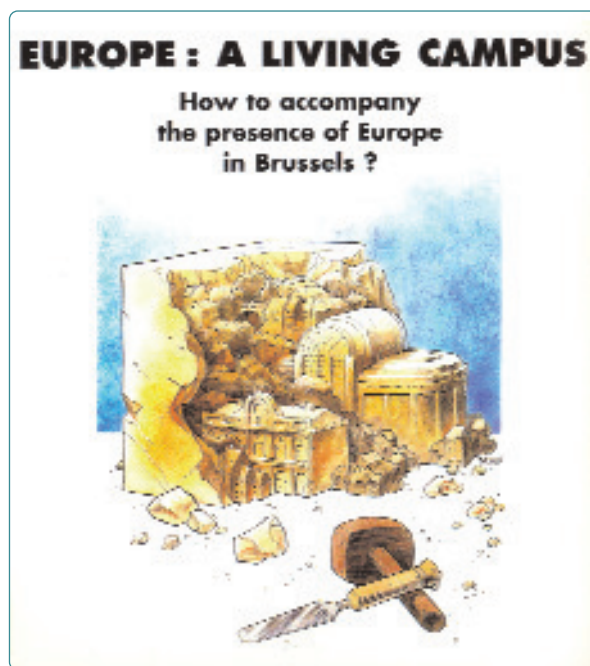
The main purpose of the manifesto was an invitation to the different public authorities involved to re-establish dialogue (which existed during work on *Ruimte Brussel Europa*) to develop a masterplan with all the elements included (and with no hidden agendas such as a European Parliament building agreed behind the scenes) and with all partners involved – the residents as well as the European institutions.

The reactions to *Wijken voor Europa* were friendly and polite. Several of the ideas were repeated later in official plans, but the invitation to work together was not taken up immediately. In the meantime, other activities were pursued, through Stichting Sens Unique and Stevin Huizenblok, both of which are described in detail below. In summary, in two different locations and with different goals, two groups of outsiders squatted on sites at a sensitive location in the neighbourhood. One (Stichting Sens Unique) put a circus tent on vacant lot next to the European Council, and the second (at Stevin Huizenblok) involved occupation of one block of the five blocks of expropriated buildings behind the Berlaymont (the European Commission building).

## 5.7 Stichting Sens Unique

The name Sens Unique (One Way) refers to the two main roads that link the European Quarter with the city centre, which are both busy one-way boulevards. The name also refers to the one-way, top-down decisions that always seem to be made about the European neighbourhood.

Various groups in Brussels from outside the EU neighbourhood – mainly young people (students, artists) – who were offended by the way things were going and wanted to express their disagreement in a public way. This was not the first time that such public protest had taken place. Two years before, a group had squatted in an empty hotel in the centre of the city and had repeated the action the next year. Following by then what was almost a tradition,



Above

The vision of Co-ordination Europe is still very relevant

another group set up Stichting ('Foundation') Sens Unique. A couple of months earlier a major local event had been held in the neighbourhood: 'Suite Jourdan Suite', involving local residents, civil servants from the European institutions and others working together to rehearse and put on concerts, join choirs, run events in private houses etc. All this built local networks and relationships so that the Sens Unique group was able to mobilise local interest more easily.

The trigger for the action was the announcement of the sale of several public buildings in the neighbourhood. The properties were all promised for housing but were to be sold at market value without restrictions.

In a very limited time, and after consultation with local groups, a campaign was launched. For one week (in January 1997) a circus tent was set up on one of the vacant sites that was to be sold. During that week, cultural happenings and debates around the subject took place inside and outside the tent. A small group of young people lived there for the whole week to draw attention to the properties that were squatted.

Two weeks earlier, the group had distributed empty boxes in the neighbourhood and asked people to 'do something' with the boxes that represented their feelings about the EU presence and return them later. They could paint them, draw on them, use them as scale models etc. It was not a huge success, but it gave a link to what was happening in the tent. The presence and activity in the tent were the

responsibility of the young people; the link with the overall issue and the extensive research that was available was made by Co-ordination Europe.

The action started with a press conference highlighting strong research documents that demonstrated that the public sale meant another set of broken promises. In the tent was a scale model of the neighbourhood made by Coordination Europe and illustrating the main themes of *Wijken for Europa*. The model itself was proved to be a useful instrument to start a discussion with visitors to the tent.

The overall goals of Sens Unique were:

- to bring about some form of overall co-ordinated comprehensive planning in the EU area – including through the appointment of a ‘Miss/Mister Europe’ (a person – or organisation – to co-ordinate the overall planning of the European quarter);
- to keep the public properties in the public domain;
- to achieve a long-term solution for block 3 (Stevin Huizenblok); and



Bral/vzw

**Above**

European Commissioner Liikanen is one of many to have visited Sens Unique

- to win political support for meeting the needs of the neighbourhood.

The physical and unusual presence on such a prominent site during that one week gained more public attention and political reaction than initiatives in all the years before. Several politicians from the Federal and Brussels Governments and the European Parliament visited the tent, questions were asked in the Brussels Parliament, and public promises were made. After a week of freezing in the tent the young people went back home. For Coordination Europe, the week led to months of work in following up all that had happened.

One of the results of the campaign was the formalisation of consultation between local residents groups, the local authorities and the European Commission, through the Comité de Suivi. This worked well for over two years, based mainly on personal goodwill. But after a while the public authorities started to drop out, and decisions were regularly made outside the consultation group. It became clear that there was no guarantee that anything the group decided would be implemented, and there was no feedback on what was done (or not done). The residents groups themselves started to experience consultation fatigue, and eventually the Comité de Suivi was no longer convened.

## 5.8 Stevin Huizenblok

The project on Stevin Huizenblok was a more practical immediate result of the Sens Unique action. It became possible because of the media and political attention won by Sens Unique and the follow-up by Co-ordination Europe, which brought in extra financial support.

The history of this residential block was already quite remarkable when the project started. As mentioned above, in the early 1970s five residential blocks were expropriated in case the expansion of the EU institutions took place in that area. The Brussels city authorities took over the management of the buildings, and residents were allowed stay in their homes if they wished. Those who did leave were replaced by others who were looking for cheap housing. They were never given a decent lease and were warned that they would have to leave at one month's notice if necessary. This situation lasted for several years. One block was demolished to create a car park and a park. In the early 1980s the tenants were given notice to leave on two occasions, and twice it was withdrawn after protest. In 1981 it was finally decided that expansion of EU institutions

would take place elsewhere, and the expropriation was cancelled. The city administration decided to sell two of the blocks, without restrictions on later use. Predictably, this led to speculation and the blocks remained empty for a long period (for several years). The buildings are now studios and flats.

Block 3 was never sold and became part of a real estate deal between the City of Brussels and the Federal Government involving the sale of the block along with several other properties in the city centre, which would then be renovated by a private contractor. However, problems arose, followed by a court case; the contractor lost interest and the city authorities did not receive the money it needed to close the deal with the Federal Government. Although the deal was made official by publication in the *Law Gazette*, it was never completely finalised. As a result, neither the city authorities nor the Federal Government would accept responsibility for the block. No serious maintenance had been done since the 1970s, and the homes were in poor condition. The tenants had no leases and no-one to help them. Putting an end to this situation that was one of the four goals of Sens Unique.

In the middle of 1997, the Woonbureau Stevin (the tenants group for the Stevin block) was accepted as a project by the Flemish local government body concerned with support for community groups, which meant that Bral could be funded to provide direct help to the group. The block had 37 homes. Some were empty, but 45 families (173 people) lived in 24 of them. A full-time member of staff worked on the project for over two years. The goals of the group were:

- to gain a clear decision about the ownership of the buildings and obtain normal leases;
- to bring about a formal decision on the need to renovate the buildings, including higher public financial support than normal; and
- to get the renovation started and provide a decent home within the block for every family that wanted to stay.

The first priority was to bring everybody together to try to find a collective solution for the problems. All residents became members of a new organisation in which all the decisions were discussed and taken collectively. It is always important to have an organised group of this sort to engage in a dialogue with the City or the Federal Government, or to win outside support or solidarity or media attention.



Bral vzw

**Above**

Many town houses in the last of the Stevin blocs are still awaiting renovation

The organisation worked on a scenario to relocate all the families in a decent home, preferably within the same block. All the possibilities of renovation with public support were investigated and discussed with every family on an individual basis. The families' need for space and their ability to rent or buy were taken into account. This scenario was discussed and refined at (at least) monthly meetings. Since costs were such an important issue, Bral helped the group to undertake its own very detailed financial analysis of the whole operation. Bral also started discussions with housing corporations to find out if they would be willing to invest in the block, and received positive responses on the condition that the owner agreed.

After feedback from the families, and with the support of housing corporations, the group was able to work out a plan to finance the renovation of the whole block, including the empty buildings, and to relocate all the families. All the families signed up to a charter which outlined the conditions and principles that would apply to the management of the buildings once the renovations were complete. The group asked the Federal Government for permission to use an empty building as a community centre (for group meetings, after school activities, computer training, a gym for mothers etc.), and that was agreed.

In the meantime, lobbying continued to try to force a decision about ownership, and finally, after a year, the city authorities took responsibility for ownership of the block. At the same time, agreement was reached to provide increased public financial support for renovations to the building. The residents group then formally presented their renovation scenario to the city authorities to allow them to get the renovation work started.

The day after the official presentation of the scenario, all the residents received notice to

leave the buildings within six months. The City, as the new owner, still planned to sell the block, as part of the same deal with the Federal Government that had been negotiated earlier. The timing could not have been worse; it was just before the summer holidays, when most of the families were leaving to visit their relatives in Morocco. Extensive political lobbying, discussions in the Brussels Regional Parliament and even the support of the unions had not been able to influence the city authorities. Even the use of the community centre was forbidden.

The City refused to recognise the residents organisation and wanted to negotiate only with individual families. Furthermore, the City was using a very old list of residents, and the people that had moved in over recent years were denied any financial support. The negotiations were slow and complex and required a lot of individual feedback to the families (many of whom were not able to fully understand the situation). Under pressure, the City agreed to discuss a possible sale to the residents, but the financial conditions were impossible. Over the following months, almost all the residents became discouraged and left. The buildings were sold at market value and renovated using the increased public support that the group had negotiated. Several of the homes are now studios and flats instead of the family homes that had originally been stipulated in the sales contract.

The whole process had lasted over three years. During the first two years the intensity of involvement was very high, with monthly and sometimes even weekly meetings. As long as a positive result was still a serious possibility, involvement stayed high; but once it became clear that all the effort would have no or even a negative result, the motivation disappeared.

## 5.9 Main findings

- **Local focus:** Both Sens Unique and Stevin had a local focus – on specific buildings in a relatively small neighbourhood. The initial focus for the campaigns was to stop the eviction of tenants and the sale of the buildings, but the wider issue was the lack of structured involvement of local people in the future of their neighbourhood. The local focus of the groups and the community campaigns was only part of the story though, because the buildings and the neighbourhood had wider importance: it was essentially a conflict between, on the one hand, the regional and even national importance of Brussels as the EU

headquarters and, on the other, the survival of a community in its local neighbourhood.

- **Depth of involvement:** Both campaigns were bottom-up: both were developed by local residents and their own local organisations. In Sens Unique, the local community initiative was supported by young people and artists from elsewhere in the city. In the Stevin campaign, all the residents were active members of the organisation and all decisions were made by consensus. Such an approach is very time-consuming for the support bodies, and can really only work on a relatively small, local scale.
- **Timing of involvement:** The timing was determined by the residents and their support organisations and their action to get decisions made or changed. The difficulty was that the City and Federal Governments were working to parallel programmes and timetables that were not shared.
- **Continuity of involvement:** Although Sens Unique was a time-limited campaign of just one week, it was based on activities carried out over previous years. The consultation



Bral/vzw

### Above

During five editions of Suite Jourdan Suite, residents and Eurocrats came together over music



with the public authorities and even with the EU that followed continued for over two years. In Stevin, it lasted for around three years. The continuity of involvement remained with the residents, and with Bral as the support organisation. Many individuals were involved throughout – unlike their counterparts in the public authorities, who tended to change jobs and were thus not often involved for very long.

- **Clarity:** The problem for all these community activities was that they fought for involvement, and although some consultation mechanisms were indeed put in place, the roles and limits of these mechanisms were never fully agreed between all parties – and certainly not kept to by the public authorities which entered into consultation with community groups but had then kept information hidden and held separate negotiations with others that completely undermined the consultation processes. Even when some public authorities appeared willing to negotiate with the residents, others did not, and it was never clear who would make the final decisions. There was essentially no transparency or openness throughout.
- **Who was or should have been involved:** In general, the neighbourhood around the EU institutions is a middle class area in which the residents mainly defended their interests without external support, always aiming to work in alliance with the EU civil servants. The Stevin block had become run down, with a community that was disadvantaged in terms of the legal security and condition of their housing, language difficulties and broader exclusion – not least as a result of years of uncertainty and bad management by the public authorities. Here, the strength of the action was based on the collective efforts of all residents working together and by consensus. Although actions were also community based in Sens Unique, there was an external trigger, bringing in new energy and providing a new impetus for further community action through the involvement of outsiders (the artists and young people).
- **Information available:** Sens Unique, the follow-up consultation and Stevin were provided with almost no official information to support their work. Bral and the residents nevertheless worked very hard to research information (often quite technical information) to support their campaign. For example, they gathered evidence that showed that the sale of two of the buildings was highly questionable, and the sale was

subsequently stopped. Information was also used to produce booklets and pamphlets to gain wider support, all of which took considerable time and money.

- **Supportive attitudes:** The public authorities were supportive in short bursts; they engaged in consultation, but it seems that they never had any intention of changing their original decision to sell the buildings for private development.
- **Resources:** All the residents groups were voluntary and had no paid staff. The two federations supporting them (Bral and Ieb) have professional staff, but initially no resources were available for this work under their existing funding arrangements. Later, Bral was funded to provide staff support to the group at Stevin, which was enormously useful.
- **Motivation of those involved:** For Sens Unique, the motivation was about improving the quality of life in the neighbourhood, and being involved in decisions about the management and future development of the area. In Stevin it was the basic survival of the community – a decent home with a normal lease after years of uncertainty. It was these powerful drivers that kept local residents involved for as long as there was a chance that they might achieve their goals.

## 5.10 Overall findings and preliminary conclusions

Some positive results were achieved by Sens Unique. The campaign was short, intense and unusual and won media attention. It was different from the usual press release or brochure: it demanded a reaction. With clearly defined goals (stopping the sale of the four buildings), an immediate result was possible. The sale did not proceed, but this was not a final result. When important things are at stake – real estate, property values etc. – the stakes change. Decisions are made behind closed doors and the general public does not have the same influence. The group was always aware that the different parties here were not at all equal, and sensed that some things may not be open to influence.

On the other hand, Sens Unique made an opening for a dialogue between the different partners involved. A 'Miss Europe' was appointed, although in practice she had only a supporting role in the Comité de Suivi rather being a strong co-ordinator with real responsibilities and power. The Comité de Suivi,

with its regular meetings between the Brussels and Belgian authorities, EU institutions (mainly the European Commission) and representatives of the residents, was formalised and received professional support from Miss Europe. After some months it was clear that this was not enough. Nobody had the authority to make sure that the partners would still attend the Comité, that the decisions were implemented, that everything at stake would be discussed in the Comité, or that some members would not undermine the collective agreements by making other decisions. In a complex situation, decision-making and implementation is difficult. When it is not clear when and how a decision will be taken and implemented, it is hard to organise participation.

In Stevin it was, at the start, a lack of respect for the people involved, combined with a lack of co-ordination between two public authorities, that made that the situation last all those years. In the end there was a clear political choice made to attract different people to that neighbourhood. Perhaps the scale was too small and the situation too particular to be able to gain enough support to change this specific political choice.

The lessons from all this activity will be fully identified when the evaluation by Bral is complete. At this stage it is already possible to draw some interim conclusions.

It is possible to get a community campaign like Sens Unique up and running and to achieve some short-term gains, including increased local enthusiasm and publicity. But there needs to be investment in following up these sorts of short-term actions. This follow-up is less exciting, is very demanding, and takes a lot of commitment to keep pushing and watching the situation. In a complex and long-term situation such as this, it is almost impossible to build on the initial flurry of activity and keep community action going – or to identify and achieve the

short-term goals and successes that are so important to community morale. It is very easy for groups to become disappointed and lose heart.

More specifically, it is extremely hard to consolidate the achievements of community action and build on them. When unions campaign for change, their activities are embedded in formal structures and legal agreements. Community groups have to start from scratch every time. There is legislation underlying planning laws about the provision of information to communities, but that is often interpreted at the most basic level. The groups have to constantly push for consultation, and have to be constantly vigilant to resist what has been agreed subsequently being withdrawn. For most people, this all has to be done in their spare time – when they have finished working, studying, caring for children or whatever. The slightest domestic problem can remove this time for community action entirely – in contrast to those professionals who are consulting communities as part of their paid daily work. Such inequalities are commonplace in community participation and are often overlooked, but they serve to increase the burden on the few people who do keep active, and they increase the risk of fatigue and burn-out.

In this case, the main attention and resources of the public authorities were invested in the needs of the EU and the way they could be met in Brussels. With the complexity of the Belgian situation and of the EU itself, and given the powerful position of the private sector, that was already a big task. The needs of the local community are different and need a different approach, based on a commitment to real, honest and transparent participation. Even the greater resources of the public authorities were not adequate in this case to achieve effective participation in this neighbourhood.

## 6

# community media as public space and social infrastructure

## APaNGO Demonstration Projects – Spectacle Productions

By Mark Saunders

Spectacle has a long history of establishing and supporting participatory community media workshops in areas of urban change.

Through Spectacle's workshop process, residents make their own videos, acquire skills and develop their own uses for media as a public space. The positive effects of Spectacle workshops during production occur behind and in front of the camera and, after production, through screenings and discussions.

By recording their neighbourhood participants not only contribute to the history of their neighbourhood and community but also, through screenings, participants positively intervene in the regeneration discourse. Both the production and viewing processes help to promote communal activities that cut across the usual divisions of age, ethnicity and religion and stimulate unmediated communication within communities. The use of media technology facilitates better engagement conditions through visually communication of the message across local and global boundaries.

Compared with the usual methodologies for stimulating participation that are generally based on meetings, video workshops provide an activity-based environment. It is our experience that people who may never attend a meeting will engage in video workshops. People who at the level of community politics may be oppositional to each other have participated and worked together in our workshops.

Spectacle's APaNGO demonstration projects explore the uses of media technology,

particularly by residents, in the context of participation in urban planning.

For the purpose of this chapter, there is a focus on four projects, but Spectacle worked in various locations and sites as part of the APaNGO project, including Ixelles and Rue Laeken in Brussels and Stockwell and the proposed Olympic site in London. Each is at a different point of development on the regeneration timeline. They represent a range of scales and levels of community empowerment. All form part of a regional plan.

### 6.1 Projects

#### 6.1.1 England

##### **Silwood Estate, London**



Silwood Estate is a Single Regeneration Budget<sup>1</sup> (SRB) scheme in Rotherhithe, South East London. Spectacle has been working with residents using video as a tool to document and influence the regeneration since 2001 when the Silwood Video Group was formed.

**SRB project start date:** 1999

**Spectacle's documentation start date:** Early 2001

**Finish date:** Ongoing

<sup>1</sup> This is a form of national funding for regeneration to assist low-income areas. The criteria for funding are less stringent than other forms of funding for regeneration and it attempts to develop local assets through local partnerships. The SRB is administered by Regional Development Agencies at the regional level (the London Development Agency in London)

### Marsh Farm, Luton



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Spectacle began working with this community in 1994, documenting Exodus's community initiatives for social regeneration on Marsh Farm Estate. Spectacle has made three broadcast documentaries about Exodus, the ground-breaking social direct action group, and has continued to work with residents of Marsh Farm up to the present day. Since 2002, the Marsh Farm Estate has been the focus of a £50 million project through the New Deal for Communities (NDC) regeneration scheme that includes ongoing masterplanning.<sup>2</sup>

In 2004, Spectacle established the Marsh Farm Video Group. It has already documented the masterplanning consultation and produced a video for neighbourhood renewal supported by the Luton Assembly. The project has been subject to various delays and will continue beyond the time scope of APaNGO.

**Project start date:** 2002

**Spectacle's documentation start date:** 1994

**Finish date:** Ongoing

### 6.1.2 Belgium

#### St Joost, Brussels



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Spectacle, together with PTTL (Plus Tôt Te Laat), started a video workshop group – the PTTL Video Group – in 2000 based in an unemployment office in St Joost, Brussels. The video group documented the resident consultation process of the 'Contrat du

Quartier,' or District Contract, for 2000-03.<sup>3</sup> Two films were produced – *Call me Josse* and *La Participation* – which have been screened extensively locally and internationally.

The PTTL Video Group has had its work broadcast, featured in festivals and screened at the Palais des Beaux-Arts, Brussels and the Institute of Contemporary Art in London.

**Project start date:** 2000

**Spectacle's documentation start date:** 2000

**Finish date:** Ongoing

#### Cité Administrative, Brussels



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This is a huge former government office complex in the centre of Brussels, and neighbouring St Joost, that is now empty and about to be developed. Spectacle started 'Open Workshops' on the site and continued them by integrating the group into the PTTL Video Group.

**Project start date:** 2004

**Spectacle's documentation start date:** 2004

**Finish date:** Ongoing

### 6.1.3 Community relationships

Spectacle had formed relationships with Marsh Farm residents before the regeneration project there commenced and with the Silwood community and Cité Administrative almost at project onset.

## 6.2 Local focus

Owing to the sheer size of London, its people are less acquainted with neighbourhoods where they do not reside. It is therefore socially and politically fragmented, and residents in one neighbourhood are unlikely to have much knowledge of the others. There

<sup>2</sup> The New Deal for Communities is a programme to reduce the income gap between Britain's poorest communities and the rest of the country. There are five social ailments that the programme attempts to remedy: poor job prospects, high levels of crime, educational under-achievement, poor health, and problems with housing and the physical environment. The NDC is part of the National Strategy for Neighbourhood Renewal

<sup>3</sup> The 'Contrat du Quartier' (District Contract) is a revitalisation programme initiated by the Region of Bruxelles-Capitale that works in partnerships with local communities. The programme consists of nine months of preparation, a four-year implementation, and then a subsequent two-year follow up phase

tends to be obscure and inaccessible layers between residents and decision-makers.

A feature of Brussels, compared with England, is how near the local power structures and people are to the residents. This has been accomplished even though Brussels is a complex place politically. Within Brussels, there are French and Flemish-speaking communities, and it is subject to local, regional, national and European levels of decision-making.

### 6.2.1 Silwood Estate

The Silwood SRB<sup>4</sup> scheme is a small part of the massive regional Thames Gateway plan and a more substantial focus of the Lewisham and Deptford regenerations.

It is also squeezed between two commercially-driven developments in Surrey Quays (docklands) and the proposed Millwall Football Club schemes.

One drawback of the project is that the residents were not consulted and were often ignorant about the larger over-arching schemes. The community was only made aware of Millwall's plans through the local press, even though they are going to be significantly affected. It is a private development, and there does not seem to be any consultative mechanisms in place.

### 6.2.2 Marsh Farm

As the major working class district in a still industrial town (home to Vauxhall Cars and Luton Airport), Marsh Farm and its future has a major influence on the housing situation in the region. A top-down masterplan that reflected this agenda was roundly rejected by the community. The struggle between the community, who have a highly developed

bottom-up regeneration scheme of their own, and the council, which has become the main implementation agency for a top-down masterplan, has been a source of delays affecting our project to set up and support a Marsh Farm Video Group.

It has been remarkable to witness how the £27 million already spent by the NDC has scarcely been able to benefit the community.

### 6.2.3 St Joost

A feature of St Joost, which was the object of a very local Contrat du Quartier regeneration scheme, was the presence and accessibility of the mayor and his councillors in the neighbourhood. However, like the Silwood scheme, St Joost is a small square in a much bigger grid.



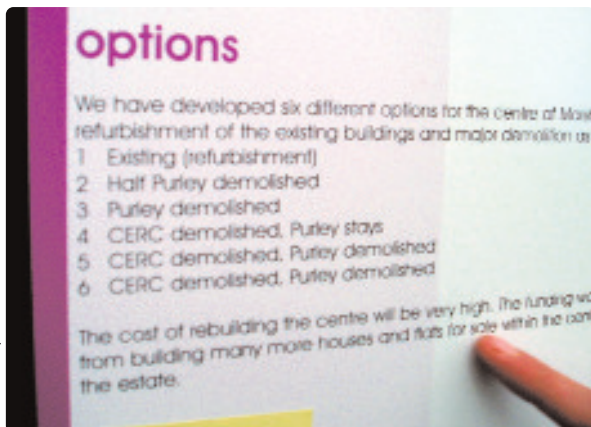
Left

St Joost – false impression of the plan's flexibility

The community's aspirations were hopelessly let down. In the end, 'back room deals' and horse-trading side-stepped the temporary 'participation' of residents in the scheme.

In Brussels St Joost is famous for its well documented history of mayoral 'clientalism'. The wishes expressed by residents through the participation process were either ignored or unilaterally 'interpreted' by the mayor. As final decision-maker, the mayor, a jazz lover, installed a jazz organisation in one District contract building and interestingly a video project from outside St Joost in the 'community centre'.

Some residents complain that the Contrat du Quartier actually served as an exhausting diversion from plans being hatched in the neighbouring European Quarter that would negatively impact their neighbourhood. In our film *La Participation* (see the Spectacle catalogue at [http://www.spectacle.co.uk/catalogue\\_index.php](http://www.spectacle.co.uk/catalogue_index.php)), the community representatives expressed total 'participation fatigue'. However, the video project revitalised the group. Spectacle and PTTL have the intention to follow this up with a new film during 2007/08.



Above

Masterplanner's choice reflected in 'options' 5 and 6

<sup>4</sup> Single Regeneration Budget, a UK government scheme to tackle the physical and social decline of impoverished urban areas through direct funding of physical infrastructure

**6.2.4 Cité Administrative**

This is a functional government office complex built in the 1960s that is no longer in use. At the start of the project the main issues were: who will make decisions on its future, on which masterplan, and who should be consulted.

The initiative is in the hands of the regional government. The private owners (Dexia bank and Breevast) are of course also involved. Because of its size and its central location a change of use of this empty complex could create all kinds of potential, including a finger park extending from the Botanique Park to the Cathedral.



© www.spectacle.co.uk

**Above**

Cité Administrative gardens

The complex consists primarily of offices and a few shops. Lower down the hill and nearer the centre are a few social housing blocks, but the area was designed for and used by commuting bureaucrats.

St Joost, the biggest nearby residential area, is one of Brussels' poorest and densest and lacks open or green spaces. The majority of the young people who used the Cité Administrative gardens and fountain areas in the summer evenings and at weekends resided in St Joost. The site also had one of the biggest public open spaces in Brussels, with a magnificent view across the city that attracted some tourists; however, skateboarders were the most persistent users.

The Cité Administrative therefore is a project of great concern and interest, but with no clearly defined constituency. In August 2004 Spectacle, together with our Brussels partner PTTL, ran a series of workshops on the site including the week-long 'Open Workshop' as part of the PleinOpenAir04 film festival event. There was a great diversity in the workshop – 19 attendees spoke 17 languages between them. The film *Cité Admin* (see the Spectacle

catalogue at [http://www.spectacle.co.uk/catalogue\\_index.php](http://www.spectacle.co.uk/catalogue_index.php)) grew out of this workshop.

**6.3 The model used for workshops: Silwood**

The Silwood Housing Estate Video Project proposal detailed below is the basic model used in all of the Spectacle workshops. One key factor, essential to the success of participation, is the extent to which the project is supported by the residents.

The proposal is based on the experience and knowledge gained through Spectacle's successful pilot project and proposes a partnership between Spectacle Productions, Groundwork Thames Gateway London South, the Silwood Single Regeneration Budget Team, London Borough of Lewisham, and the community.

The main project goals are listed below.

**The Video Project**

**Project aim**

To train residents to film and edit video footage and through this, capture the changing physical and human face of the estate.

Through the pilot, it has been recognised that the scheme has considerable potential to help tackle some of the issues prevalent on the estate and thus incorporates these within its aims:

- **Eliminate barriers between residents across ethnic, generational and socio-economic lines:**

Significant tensions currently exist between different groups on the site. Racism is unfortunately experienced by some residents. A sense of community will not be created without first breaking down



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**Above**

Silwood Video Goup editing



Above

Stockwell Video Goup

some of this resistance and encouraging greater interaction between different generations and ethnic groups.

Through training workshops, residents of all ages and backgrounds will learn to film and edit video footage. As well as directly working and interacting together at the workshops, part of their duties will be to interview residents and 'officials' working on the estate. A young person may interview an elderly person to understand life on the estate when it was built; a black person may interview a Vietnamese to gain their perspective. Another resident may interview the Head of Regeneration at the council or their local councillor.

As this continues throughout the life of the project, Spectacle hopes to encourage people to interview people removed from their normal social interaction. This will create some understanding and recognition between the different groups.

- **Provide a voice for people's thoughts, opinions and concerns:**

While the majority of residents support the development of the estate, there are currently few outlets for residents from marginalised groups to express either their excitement about the development of a new estate or to grieve for the loss of their old way of life in a suitable way. Many people are being uprooted from their homes, and understandably are concerned at the prospect of great change. The video gives people the opportunity to express their thoughts and concerns.

The video also acts as a conduit to convey ideas and opinions in a relaxed way. Many people do not participate in more traditional consultation methods, such as public meetings and questionnaires. Even those that do attend may not feel comfortable articulating their thoughts in front of an audience.



Above

Marsh Farm residents interview Marsh farm residents

The video provides a mechanism to interview people informally on their own terms, perhaps in the local café or on the street. This can be a much more effective way for people to feel able to voice their opinions. As the interviews will often be undertaken by another resident, this may also create greater empathy and understanding than if interviewed by a stranger.

The video footage taken by participants will then be screened at regular public events on the estate. This will enable all residents to view the work and spark debate in a way that more traditional consultation techniques often cannot achieve. As individuals have a natural interest in seeing themselves and friends on film, attendance levels at such events are much higher.

- **Confidence and self-esteem development:**

Through the ongoing training and interview process, the video project will give people more genuine participation in the regeneration scheme and will support them in building their confidence, co-operation and interpersonal skills. As most people have no experience using video, it is also a great 'leveller', allowing everyone to take part, without fear of lack of ability.

It is envisaged that as the project progresses, participants will acquire greater control over the project and its management. At the beginning, the scheme requires a lot of input from external agencies for capacity-building and training; as participants gain in confidence and ability, it is hoped they will be able to run the project with minimal external assistance, apart from technical training.

For those individuals wishing to progress beyond the scope of the project, they will be supported to pursue further skills and qualifications in associated areas of work.



Above

Silwood Video Group – passing on skills

- **Create a social history document:**

The video will provide a permanent archival document highlighting the regeneration process over seven years. The video will be available for regeneration practitioners and residents alike.

### Project delivery

The project will incorporate the following elements:

- **Scheme promotion:**

Ongoing outreach and promotion of the video project will attract residents to take part. It is envisaged that a core group of participants will develop, maintaining a constant involvement throughout the scheme's life. Other people will join and leave as appropriate to their level of interest and life stage, and this natural turnover is inevitable in any long running scheme.

- **Training workshops:**

Throughout the duration of the project there will be regular workshops to train participants in both technical and interview skills. Technical components will include use of the video camera, ensuring quality sound and lighting and editing footage. Training in interview techniques will help participants build confidence to deal with a wide range of interviewees and gain skills in drawing out individual concerns and issues.

- **Community interviews:**

Armed with their skills developed in the training workshops, participants will interview a wide variety of community members and officials. There will be opportunities for young people to interview older people; community members to interview partner agencies and each other. Some residents will be interviewed regularly throughout the project to chart changes in personal feelings as the regeneration programme progresses.

- **Video documentation:**

As well as interviews, residents will film the estate and the surrounding area to



Above

Stockwell Video Goup interview

illustrate the changing physical state. In its entirety, the film will carry the viewer through demolition phases to the building phase and through to the completed and new estate. Footage will also be taken of the public meetings and other estate events such as local football matches, fun-days or youth club sessions to illustrate the interaction of the community with the development.

- **Public screening events:**

Throughout the filming process, regular public screening events will be held so that all residents can view the footage, make comments and suggest where edits can be made. As well as promoting the video scheme to new participants, these events will help raise awareness of the progress of the estate, consult residents and encourage participation in all aspects of the regeneration programme. Through the video interviews, residents' concerns will also be highlighted to partner agencies, such as the housing associations.

- **Production of archival video:**

After the final edit and at the completion of the project, a high quality, professional video will be made freely available to community members, key regeneration partners, local libraries, universities and schools.

The value of video is in its flexibility as a medium. This project is part of a response to many different factors, not least the regeneration programme itself and the views of residents. As development progresses, the project can easily adapt and respond to changing conditions, perhaps by increasing the number or type of sessions and events offered. This plan therefore can be seen as a 'working' tool and will respond as circumstances evolve.'

*Submitted by Groundwork TGLS*



## 6.4 Lessons learned

### 6.4.1 Implications for project continuation when funding has ceased

One of our strategies has been to continue a project even when funding may have finished. This is in the belief that funding will follow a flourishing project and that activity sustains a group. Although this is not sustainable over long periods of time, it is a strategy that accounts for the long duration of our workshop projects.

Most of the groups have succeeded in attracting funding beyond the original funding period, normally in the form of project funding. However, in Brussels the PTTL Video Group has effectively created a cultural enterprise whereby its activities have led to work being commissioned and broadcast. Operating in a smaller city means there is a great deal of cross-over. PTTL's resource base has now moved from St Joost to Midi, from one side of central Brussels to another. While in London this would seriously affect the demographic of attendees, in Brussels it appears not to have affected attendance or participation.

The success of Spectacle projects is greatly increased when there is support on the ground in the form of either a physical base or a key video person, as there is with PTTL in Brussels. A group can survive for a long time simply through the demand and activity of residents. Without this kind of support, such as on the Silwood project after the Cyber Centre closed and local funding stopped, the project becomes dependent on Spectacle's active input at every level to function, and this is only sustainable in sporadic bursts.

Silwood Video Group has been sustainable through Spectacle's direction and contribution of resources to the development of the group. For instance, when commissioned to make a

fund-raising video about LOOP (Lifestyles Opportunities for Older People), Spectacle instead ran workshops and made a video *with* LOOP members. For Spectacle it was an extension of our outreach work on the Silwood project, where many of our group members were also LOOP members.

Spectacle has given work placements and part-time employment to residents of the estate – a priority aim of the regeneration process. Silwood Video Group members filmed two conferences organised by the Marsh Farm group, and Spectacle took both these groups to Brussels to work with the PTTL group. It is important for us to find ways to provide some continuity, a strategy that has sustained the Silwood and PTTL groups for the past six years.

In fact, Spectacle has seen a constant changing of regeneration personnel on the Silwood project. Spectacle has been the most constant and enduring community activity on the estate. The work is highly visible; the Silwood Video Group and/or Spectacle have tried to document most of the monthly community regeneration meetings.

Spectacle's activities continue today, and recently the Silwood Youth Project commissioned Spectacle to run a series of music video workshops with Silwood rappers – one participant remembers Spectacle from when he was 14. The Silwood Youth Project is seeking additional funding.

### 6.4.2 Relationship-building

The building of relationships between Spectacle as 'outsiders' and residents is important for the success of the projects. While it clearly requires that Spectacle is funded to support the group, our relationship to the participants needs to operate beyond and outside of client/provider economics. In reality, funding for video projects is rarely at a level where survival can occur without unpaid or voluntary work. As a means to help bridge the gap between those roles, Spectacle operates open accounting, which is to say that we actively encourage workshop participants to understand and help make decisions about the economics. Open accounting helps to acknowledge and value the unpaid contributions of participants through its definition of the 'other' – what must be paid for, how much and to whom.

We are trying to fight the perception that professionals are involved solely because they are paid. It is important that our scope can last beyond the two- to six-month time frame of funded activities. Unpaid project development,



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Above

LOOP video project

which also thrives better with open accounting, is a necessary part of the 'real world' situation of small independent production companies. We have often involved our users in preparing funding applications.

We are striving to create self-sufficient community media groups: we therefore want all the people involved to take ownership of the project and the work that comes from it. It is in editorial group discussions that issues of boundaries, transparency and openness arise. For residents, the video project is often a tool for exploring those boundaries.



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**Above**

Silwood, Marsh farm and P TTL Video Groups on live radio in Brussels

For instance, on numerous occasions participants have interviewed regeneration project managers, or have interviewed planners at public exhibitions and events. The presence of a camera and being 'on the record' often serves to clearly define what can and what cannot be said. There is a need to be more precise and avoid casual verbal promises. The response of decision-makers involved in regeneration schemes to residents with cameras often reflects the level of their real ability to participate in meaningful debate and a possible lack of openness and transparency.

It is often the case that councils tend to view video as public relations; something to be managed and kept 'on message'. For Spectacle and our participants it is about having a voice; about those not attending meetings having the chance to express themselves.

These points are made to illustrate that a video project can be a success on almost any social criteria, producing numerous excellent 'outputs'. However, that is dependent on those in control understanding that not having a voice is social exclusion. Community media should be seen as social infrastructure, not about

making films, or the content of any particular film. It is about media as a public space. The more people who participate, the better it works. As Spectacle originally proposed, it should be a partnership.

### 6.4.3 Addressing social exclusion

Addressing social exclusion is a major aspect of Spectacle's agenda in facilitating workshops. We actively go out to work where the socially excluded or less mobile are found. All activities are free to participants, another reason such work needs to be funded.

Spectacle ensures that regular meeting times are in the evenings and at a time most people can attend. Once a group is established, we will negotiate meeting and workshop times with residents. Activities occur at different times throughout the week, which means most people can find a time that suits them to become actively involved in filming or editing.

Spectacle ensures that participants rotate the role of chair and minute-taker at every meeting. This breaks down the difference between new and old members since rotation occurs frequently. No-one is left to endure a tiresome role for an extended period. During a production period there may be ten hours of planning and editorial meetings or screening discussions in a week. This strategy is extremely effective in helping to bond a group of otherwise disparate people.

Spectacle ensures that groups are not *exclusively* made up of the socially excluded, as this would simply continue the problem. To ensure the mix, it is assumed that the most socially mobile will find us through our publicity and the internet, and conversely we target under-represented groups; we seek out older people or other groups who may have a technophobia or inverted bias, thinking it only for 'other people'.



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**Above**

Mixed group at a workshop



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Above

Marsh Farm Video Goup record masterplanning event



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Above

PTTL Video Group explore Rue Laeken

Spectacle works a lot on the streets to boost visibility among the community. People see us in operation and see that other local people are operating the cameras or conducting interviews.

At the Marsh Farm Master Planning Day, three of our five young camera operators were on the point of having Anti Social Behaviour Orders and were considered by many local people as 'impossible to work with'. Contrary to what was perceived about the youths, they took care of expensive video equipment and did excellent filming all day, showing great commitment and concentration, filming long discussions between planners and residents. At Marsh Farm, Spectacle held a series of workshops with young people where two of the principal participants were ankle-tagged and at 7 pm would have to leave the workshop to get home in time for their curfew.

Spectacle does not see this work as rehabilitation, youth crime diversions or social work but as community-building. By prioritising social inclusion, Spectacle can bring all residents together through the workshops. There is remarkable diversity in project groups. Silwood Video Group has an age range of 16-66; and the Cité Administrative Open Workshop attracted many immigrants and ethnic minorities: there were 19 people who spoke 17 languages between them. Most regeneration projects aim to address social exclusion. It is disappointing that so little interest or support is given to projects that give people a voice, as this is the essence of social exclusion.

In Brussels there seems to be a more engrained notion that a condition of democracy is in accepting a range of diverse opinions and that people have a right to express them.

Participants in our video workshops are engaged in discussion about planning issues. However, it is often the case they are not particularly interested in planning at the outset. Going out on the streets with a camera (the technique of 'dérive with camera'<sup>5</sup>) is an essential part of our workshops process. It means that people not only have an engagement with their surroundings and the other residents, but they also become very knowledgeable.

This community expertise and knowledge base is an important aspect of Spectacle's work. Not only is there much pooling of information, but new information is produced. Ideas that are often inspiring get disseminated and developed. The Active Archive part of the demonstration project is addressing how to best use digital media technology and computer convergence to usefully service and support this community level of networked information across national borders and linguistic divides.

Recently the Active Archive provided several hours of visual history of the now largely demolished Midi area of Brussels from 2002-03 for use in the film *Dans 10 Jours ou dans 10 Ans...* by Gwenaël Breës, a resident. At its first major screening, it attracted more than 150 local people and stimulated a very animated discussion about an issue considered 'dead and a lost cause'. Other users include Bral, the University of Caen and a variety of international PhD students. Spectacle has also provided Grenoble University Architectural School with a range of material for its distant learning planners' course.

#### 6.4.4 The acquisition of skills

For many, the attraction to the workshops is the acquisition of skills, particularly where opportunities are thin on the ground. Spectacle

<sup>5</sup> In philosophy, a *dérive* is a French concept meaning an aimless walk, probably through city streets, that follows the whim of the moment. 'Derive with camera' allows people to explore their environment through the camera lens without preconceptions, to understand their location in the city better, and therefore their existence



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Above

Brussels resident using the Active Archive

takes care to create a social space and tries to make it a happy and creative environment. Residents are stimulated and motivated to keep attending exactly because they get to meet a range of people – perhaps people who they might otherwise never meet.

One elderly white woman got to meet her long-time neighbour, a young black woman with a family who lived immediately above her on the next floor, through the video workshops.

People have a whole range of uses of video and information technology, ranging from wedding or birthday videos, to the production of music videos or show-reels, to video for the internet or transferring their family home movies to DVD format. The video workshop, especially if it can establish some kind of resource on the estate, will be a very popular and widely used facility.

**6.4.5 Potential of cultural production**

There is also potential for cultural production and even occasional cultural enterprise. For example, the films produced by our workshops in Rue Laeken and Ixelles have been broadcast in Brussels. One film, *Quand les Papiers Arrivent...*, an Ixelles spin-off project, has been broadcast nationally. Like Silwood Video Group, PTTL Video Group have had work shown in festivals all over North West Europe. All the films address citizen participation in planning.

**6.4.6 Progressive social thinking**

On the Marsh Farm Estate, PRP, the masterplanners, had a budget of over a million pounds. The Marsh Farm Video Group filmed the masterplanning event as part of our series of workshops (total budget a few thousand pounds). Spectacle filmed many interviews on the day and produced a DVD. The sentiments and ideas that came across from residents



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Above

£1.1 million spent on the masterplan

interviewing other residents reflected their objection to the main principle of the proposed and imposed masterplan. Two years later, the PRP plan was rejected and the community's own, long fought-for alternative plan was eventually taken on.

This is a classic case of almost limitless resources being put into trying to persuade a community to accept a council-devised scheme by presenting a narrow range of options 'for consultation'.

The conference 'Swimming against the Tide: Regen: From the conventional to the inspirational', that was organised by Marsh Farm Outreach and filmed by Spectacle and Silwood Video Group (see the Spectacle archive at [http://www.spectacle.co.uk/catalogue\\_index.php](http://www.spectacle.co.uk/catalogue_index.php)) was about how poverty on estates can be addressed by self-help and plugging the economic 'leaks', where money flows out of the estate when, for instance, there are no local shops or entertainment or social venues. The idea is that a flurry of investment followed by an investment drought does not seem to be a sensible approach to urban renewal, even if it was all being spent on developing and investing in the long-term future of the area.

This and other forms of progressive social thinking are also ideas that Spectacle wishes to help make available via the Active Archive.

## 6.5 Conclusion

Definite advantages have emerged from the use of the technique employed by Spectacle to facilitate community participation in the planning process.

The use of media was able to bypass obstacles usually faced by officials that attempt to involve residents in decision-making. Spectacle's work on participatory media is about more than simply making films; it is the basis for social networking, community capacity-building and cohesion. Its starting point is that media is a public space and should be part of social infrastructure.

Oftentimes community groups are not represented proportionally at conventional public hearings. Diversity in participants was a goal, and the atmosphere of openness created a less intimidating environment.

Spectacle video projects address social exclusion and under-representation behind and in front of the camera. Behind the camera they create inclusive, non-hierarchical, socially relaxed work environments. In front, they seek out under-represented voices and the socially excluded. Spectacle actively tries to recruit into the group everyone we meet through our media work.

Spectacle attempts to accommodate the schedules of residents, but one potential barrier to broad involvement is that participants will have to commit more time than if they were to simply attend a community engagement meeting. Video production is time consuming, and those who work long hours to support a family or work night shifts might find it difficult to allocate time to participate in such activity. However, they have the opportunity to contribute to the project in front of the camera or to input into editorial decision-making by home viewing of indexed rushes or simply by attending a screening and discussion.

When the film is complete, it can reach a wide audience. If everyone involved in its making invites just a few friends and family to a local screening, it is quite possible to get audiences of 50-100 people together to discuss the planning issues of the neighbourhood – in a discussion un-mediated by outsiders and professionals, and outside of any existing local political or social frameworks (that may be perceived as exclusionary or cliques).

Video has the capacity to allow people to speak in their mother tongue, and it can be translated and subtitled or over-dubbed. As a visual language, video can often express meaning to those who may not understand all the verbal content of a film.

The creation of films and other media projects also fosters a sense of communal ownership. Participants finish with a concrete product that is the result of their time, energy and passion. This sense of accomplishment is also supplemented by the fact that they have contributed a body of information to community history. If participation is fostered and continued, then a new channel for community participation has been created and will hopefully be sustainable. Additionally, materials created can be consulted by other communities that wish to embark on a similar project or learn about how communities are affected by regeneration projects.

It is hoped that local officials are open to this new kind of community engagement. There is no way to predict how the films produced will be received or if the information delivered through them will be utilised. Residents should ensure that they are being properly made use of by decision-makers.

Residents should be informed about regeneration as a whole. They should be told what is 'good practice' and be provided with good, clear and current information. They should have a clear idea of the parameters and limitations on their ability to make or influence decisions. They should have the opportunity to meet with other residents and discuss a range of other successful regeneration projects. It might be useful to have an independent one-stop information source to advise residents on their rights and obligations, the processes and technicalities, such as section 106 agreements,<sup>6</sup> and perhaps provide a 'good ideas library'.

Community media is both a public space and social infrastructure. To exist, it needs a little funding support, space for dissent, and greater respect and power given to a community's ability to help themselves and those around them.

How to do this for the 'greater good' should be the subject of urban planning and social development. That is what Spectacle believes is the purpose of participation and the regeneration process.

<sup>6</sup> Section 106 of the England and Wales Town and Country Planning Act 1990 allows a local planning authority to enter into a legally-binding agreement or planning obligation, with a land developer over a related issue. Section 106 agreements can act as a main instrument for placing restrictions on the developers, often requiring them to minimise the impact on the local community and to carry out tasks, which will provide community benefits

## 7

# analysis of common themes across apango projects

Edited by Gideon Amos and Diane Warburton

## 7.1 Introduction

The four APaNGO demonstration projects in community participation in planning described in the preceding chapters were all significant (city-wide or regional scale) plans and developments in which the engagement of communities by local and regional authorities was practised to a greater or lesser extent. Beyond this the projects were very different, operating on different timescales and using different techniques. In summary:

- Bral is a Brussels-wide NGO that provides community development support and resources for community groups working on planning issues across the city (in association with their French counterpart Ieb). Their APaNGO demonstration project is an evaluation of community-led campaigns in the neighbourhood in Brussels in which the European Union is located.
- The City District Geuzenveld-Slotermeer Amsterdam local authority (Statsdeel Geuzenveld-Slotermeer) used 'branding' to create community identity and participation in the Eendrachtsparkbuurt neighbourhood. The neighbourhood had poor-quality housing and multiple social problems among a very culturally diverse population with little experience of participation.
- Spectacle is a London-based NGO that works internationally on projects using community-controlled media (especially video) for creating, supporting and documenting community participation in regeneration. Their demonstration project included work with communities in regeneration areas in South London and Luton in England and St Joost and the Cité Administrative in Brussels.
- Planning Aid for London (PAL) is an independent NGO that provides support and advice on planning issues free or at low cost to community and voluntary groups and

individuals. Their APaNGO demonstration project was the development and use of a toolkit for the Greater London Authority to support community participation in the Sub-Regional Development Frameworks of the London Plan.

Each of these demonstration projects has provided a very rich set of data that raise as many questions as they answer. Their diversity means that any attempt to make comparisons or identify good practice has to take context into account. The APaNGO partners therefore worked to identify common issues that emerged across the four demonstration projects, and explored these emerging issues at two symposia with academics and others with experience and knowledge of community participation in planning.

This chapter summarises these common themes, drawing on the written case studies and the symposia discussions that were informed by the APaNGO First Interim Report. The Interim Report presented the findings from desk research and a questionnaire survey of the legislative and regulatory frameworks for community participation in planning in seven countries in North West Europe (Belgium, France, Germany, Luxembourg, the Netherlands, the Republic of Ireland, and the UK). It also identified the techniques being used for community involvement in planning in those countries and the infrastructure of support provided by public, private and voluntary bodies to those communities that want to participate.

The following themes form the basis for this chapter:

- Who is involved?
- Local focus.
- Complexity of 'community' and communities of time'.

- Levels of involvement.
- Timing of involvement.
- Linking participation and decision-making.

The final chapter of this report then identifies some overall conclusions of the APaNGO project, drawing on the research for the APaNGO project as a whole.

## 7.2 Who is involved?

The APaNGO demonstration projects identified some common concerns about who should participate in planning, in particular related to the interests of democracy and ensuring the poorest and most disadvantaged have a voice.

In practice, the APaNGO projects found that both ethics and the need for effective practice required planning processes that were fair, open and transparent. Only in this way can all sectors of society be included and the resources of all brought together to contribute to better planning outcomes.

The promoters of all the APaNGO projects shared a belief in approaching development questions from the point of view of the existing interests and motivations of local people in order to encourage them to see the relevance of becoming involved.

### 7.2.1 Approaches to involvement

A variety of approaches to participation were adopted in the APaNGO demonstration projects:

- Bral used community campaigns that were initiated at least in part by, and always run in partnership with, local people. Local residents decided what the campaigns should try to do and were the main activists, with Bral (and Ieb) providing support and advice. Bral worked primarily with local residents, but outsiders also had a role, including young people and artists from elsewhere in the city. The residents also established good working relationships with the civil servants in the offices of the European institutions in the area. All these rather unusual alliances proved very powerful.
- City District Geuzenveld-Slotermeer also ensured that participation started where people were, by investigating (with local people) their experiences and opinions rather than starting with a draft plan or set of ideas for them to comment on.

### 7.2.2 Reaching the hard-to-reach

All the APaNGO projects found innovative ways of reaching out to the different sectors within their local communities:

- City District Geuzenveld-Slotermeer struggled with who should participate in their planning for regeneration as some of the existing residents were being moved out and may or may not have been returning to the regenerated area. They targeted specific groups of residents identified as frequently excluded from planning processes. For example, they provided video cameras for a group of young residents so they could 'report' on the neighbourhood and the plans for regeneration. They also provided training in participation for Turkish and Moroccan women in the area. This was in addition to working with the main committees for local residents. The City District Geuzenveld-Slotermeer project found that getting a diversity of community groups to participate took a lot of effort and investment but was very worth while in reaching a better cross-section of local people than traditional approaches of simply providing publicity and general invitations.
- Spectacle found it a particular problem (common to many community programmes) to get small businesses to participate alongside residents in their St Joost project in Brussels. They have generally tackled the issue of achieving diversity of participation by choosing to work in areas where socially excluded and less mobile people are found – taking the participation to them, in ways and at times that suit. They have found that working on the street keeps the project visible and continues to generate community interest. Spectacle also found that the potential to learn media skills and techniques attracted different people to become involved in projects, including young people and people with problems of literacy or language. Their approach included making video films but also holding screenings and discussions as an integral part of their work. They found that visual communications can cross traditional and sometimes entrenched cultural barriers and divisions. Video can capture the experience and create a history both of place and process. It also consolidates skills, confidence and self-esteem through the product (a video film), which becomes a permanent record. Spectacle found that people gain in confidence and take part in wider participatory activities once they start to be involved, even in a small way.

- PAL found that the most effective way of reaching the 'silent majority' as well as 'hard-to-reach' groups in their work on the London Plan was to use existing voluntary, community and public authority networks to reach individuals and groups, and then work with different participation techniques with the different target groups.

### 7.2.3 Innovative media, culture and the arts

Other APaNGO projects have also used cultural activities to draw people in initially. Bral worked with the Sens Unique campaign of artists and young people, and built on the Jordan Suite music festival in the neighbourhood, both of which helped establish local networks and relationships that made building community campaigns much easier. City District Geuzenveld-Slotermeer used community art by linking residents' ideas on the future of the neighbourhood with a range of work in different media by three artists that aimed to articulate those ideas in various ways and demonstrate those ideas through screenings locally. Some groups in Bral's client communities used elements of street theatre to make their point.

The City District Geuzenveld-Slotermeer's idea of 'branding' is also a cultural activity, creating a positive, collective identity for the neighbourhood to be regenerated through creating a shared vision and shared purpose. All the APaNGO projects found cultural and creative activities very useful in attracting people to participatory community projects, for developing skills and confidence, and for creating and maintaining a positive mood and style for the work they do.

### 7.2.4 Findings from tackling exclusion

In tackling the challenging problem of exclusion the APaNGO projects have found that:

- Regeneration programmes can target involvement activities at the most disadvantaged communities **in ways that further exclude them** by establishing separate participatory processes from mainstream decision-making.
- Participation in planning is often conducted in very **formal settings** that can disadvantage less experienced individuals and groups (often the most disadvantaged already) who are unable to respond in the required manner and within the relatively short timescales.
- For many hard-working people in disadvantaged communities, the slightest domestic problem can remove **time for community action** entirely, and groups in

disadvantaged communities can rarely survive if key individuals drop out.

- Participation exercises run the risk of being tokenistic if privileged access to decision-making by influential actors bypasses consultative structures. It is therefore important that rules are maintained to ensure all representation made in planning processes are on the record.

Although an important element of protest remains, Bral at least detected a move towards participation and away from protest in the Brussels communities.

The APaNGO projects demonstrated that although people may have different backgrounds and experience of community politics, they can still be brought together to create positive relationships and work productively for better local outcomes.

## 7.3 Local focus

### 7.3.1 Local focus versus regional planning

The initial APaNGO research showed that community participation in regional and national spatial planning was becoming more important in policy and legislation, but that the main focus for participation in planning in practice remained at the local level.

The APaNGO demonstration projects reflected this complexity. All were identified because they were regional scale planning issues, but all focused on the day-to-day work on local participatory activities. They showed that, in order to involve local people and local communities, issues often need to be translated to a local scale to show local relevance. However, all the APaNGO projects linked to wider spatial issues and structures and showed the extent to which local, regional, national and international issues and decision-making are deeply intertwined.

The work by Bral in the international quarter of Brussels provided a clear example of these complexities. Bral found that the living conditions in this neighbourhood and the way decisions were made about them were fundamentally affected by the impact and influence of international institutions.

### 7.3.2 Findings from local work on regional planning

The projects found that:

- In London, PAL and Spectacle found that high-prestige projects (landmark buildings on key sites by famous architects with access



to huge budgets) had apparently led to **'participation by stupefaction'** – with minimal involvement by local people and businesses in developments that dazzle public authorities and private investors. The scale of interventions by European institutions in Brussels could be said to have had a similar effect.

- APaNGO projects also found that, for local communities, identifying the decision-makers was complex at the regional level, where it was not always clear who made key decisions and where accountability lay. This complex picture made it very hard for communities and NGOs to identify the appropriate 'targets for influence' when they did participate.
- Working at regional level was found to be about working in a fundamentally different way rather than simply at a bigger scale. The PAL project showed some of the particular difficulties of working at regional and sub-regional levels. For example, the issues crossed the traditional geographical boundaries by which some communities defined themselves and were often **beyond the remit of individual local organisations but were too specific for national bodies**.
- On the topic of working at a regional scale of involvement, PAL contacted over 500 voluntary and community groups for their project, all with very different interests. Even with such extensive outreach, they found it very hard to generate a high degree of community and public interest in key elements of the strategic plan for London. They also found that regional participation required very different techniques from local involvement (hence the development of their toolkit). The need for **different techniques at different spatial levels of involvement** may need to become part of the analytical and practical toolkits used by planners developing participatory working in future.

## 7.4 Complexities of 'community' and 'communities of time'

### 7.4.1 Community complexities

The City District Geuzenveld-Slotermeer project experience challenged the easy assumption that a defined neighbourhood also has an easily identifiable 'community'. Local communities in neighbourhoods targeted for regeneration are frequently very mixed, with diverse groups within these communities rooted in a different way in their neighbourhood (with many residents new to the country as well as to the

neighbourhood). Associated language and cultural differences need to be addressed as part of the participation processes. The complexity of local community structures can be compounded by regeneration plans when one community is moved out and may or may not return. Here, there are different 'communities of time' as well as different cultural communities within the local neighbourhood.

### 7.4.2 'Communities of time'

The concept of 'communities of time' goes beyond simple changes in individual residents or businesses over time. The importance of considering the interests of future generations is another element of the concept if plans and proposals are intended to meet the principles of sustainable development. Communities embody complex elements of time, space and social relationships.

### 7.4.3 Findings from working with communities over time

The projects found that:

- The shared and individual histories of local people (wherever they come from) in the neighbourhood, as well as the history of previous experiences of participation, form part of 'community memory'. The City District Geuzenveld-Slotermeer project recognised the importance of local history and found that using **'branding'** as a technique could express a better shared understanding of community memory and identity and so help to create a new identity for an area as well as a shared view of the area's future.
- 'Community memory' was also influential in the ways in which communities approached participation. PAL found that in one project where there had been previous poor participatory practice by another agency, any new participatory initiatives had to demonstrate their independence and difference to gain the trust of local people. Both PAL and Bral experienced these problems, and worked explicitly to **build trust** as part of their participatory activities.
- **Planners had a unique role in this area because they could bring considerations of the interests of different communities over different timescales to a project.** They could also ensure that processes took into account the interests of different communities of time, and even the interests of future generations. Part of the purpose of participation should be to openly articulate issues that would not otherwise come to the surface because of differences in timescales but which can fundamentally affect the

success of any proposed plan, development or regeneration programme.

- Projects also emphasised that effective participation design should ensure that all the assumptions about how communities could or should change over time (for example the aim of creating mixed communities) should be examined openly and honestly, from as many varied perspectives as possible.

## 7.5 Levels of involvement

### 7.5.1 Levels of involvement across North West Europe

In the seven North West European countries studied, the APaNGO First Interim Report found that, whether through design or from a lack of resources, the great majority of community participation in planning takes place at the 'lowest' level of the participation spectrum (see: [www.apango.eu](http://www.apango.eu) for the First Interim Report) – with information provision and minimal consultation frequently the norm. In contrast there was a wide recognition among respondents to the APaNGO research that these very limited techniques do not engage communities effectively. The research found that there is also very often a lack of clarity about the specific purpose of particular participation processes in planning, including about what can or cannot change as a result of participation. This creates uncertainty and a lack of motivation among those invited to participate.

There are significant variations between the countries reviewed in the initial APaNGO research, with the Netherlands, Luxembourg and Belgium more likely to work 'collaboratively' with local communities. However, the major differences in the focus, legal structures, processes and systems for participation in planning in different countries need to be taken into account in assessing the depth and effectiveness of participation.

In the Netherlands, for example (and in France and Belgium to some extent), the planning system relates to legally protected interests on land use, which therefore affects the aims and objectives of individual and institutional participants in the planning process. In the UK, the planning system aims to facilitate and place conditions on various development processes, which has different implications for participation. There are also differences in the extent to which plans can be varied once they are agreed (for example in Belgium, France and the Netherlands, land use plans can only be varied by applying to the courts). These

differences affect the depth of participation that can be achieved at different stages in the planning process.

The APaNGO First Interim Report also outlined the importance of a strong NGO infrastructure of support that provides expert advice, support, information and sometimes access to funding for participatory projects. Three of the four APaNGO partners (Bral, Planning Aid for London and Spectacle) are part of this infrastructure of support, and their work (as shown in the examples in this report) provides evidence of the importance and value of this support to extending the depth and effectiveness of participation.

The relationships between NGOs and communities can have a particular quality – perhaps because NGOs tend to be acting either in direct support of communities or as intermediaries (as Planning Aid for London does in some projects) – to help improve relationships and participatory working between authorities and communities. These relationships thus tend to be much closer to the empowerment end of the participation spectrum and tend to be longer term.

The APaNGO demonstration projects show some of the ways in which this type of support work has contributed to community capacity-building – helping groups and individuals develop skills and confidence that they can use immediately and later. Part of this learning is about increasing understanding of how planning processes work and who to try to influence to achieve the changes that communities want to see.

Information provision, although seen as a 'low' level of participation, is a vital element of all participation in planning. When Bral found that the official information provided on planning and development issues in the neighbourhood in which they were working was minimal, they supported groups to research, collect and use a wide range of information (including technical and legal materials) to make their case on specific developments.

Research and information provision on planning and development issues has never been simple for NGOs or communities. The City District Geuzenveld-Slotermeer project found that professionals and communities had different 'worlds of understanding' which affected the information provided by officials and how it could be understood by communities. The problem PAL found was that it took a long time to get information to percolate out, even when making the effort to do so and even through

existing networks of contact – they concluded that at least three months was needed for any such process. Like City District Geuzenveld-Slotermeer, they also identified the importance of information being produced for non-planning specialists, and that there needed to be access to further and more detailed information if groups wanted to follow issues up.

### 7.5.2 Findings from the levels of involvement

The projects found that:

- The research, writing, publicity and dissemination skills that groups develop can also be used in future participation activities and as **useful skills in other areas of people's lives**.
- As well as a tool for social and political education, use of **community media provided education** in terms of developing technical and generic skills which were transferable to a range of other areas of life.
- **Community media provides a powerful tool** that communities can control themselves and use to develop their own picture and record of planning and regeneration processes.
- Community media, like other community support work, is more likely to be successful if there is a **physical base, or person employed** for the task – that sort of structure has been essential in Spectacle's projects. This sort of capacity-building contributes significantly to deeper and more effective participation in planning.
- Systems with built-in **legal guarantees** and better access to a more **varied representative political landscape** (as in Belgium and the Netherlands) may have the advantage of delivering better chances of serious commitment to the outcomes of participation processes.
- The APaNGO First Interim Report's overall conclusions showed that there was growing and strong commitment to deepening community participation in planning in most member states, with particular interest in closer joint-working, collaboration and partnership. There was also evidence of significant **innovation and creativity in the development of new techniques** that create more effective and positive community participation in planning, such as 'co-production' of planning solutions in the Netherlands and citizens' juries in the UK. The APaNGO First Interim Report identified these and various other innovative techniques being

developed across North West Europe which have the potential for much wider application.

## 7.6 Timing of involvement

### 7.6.1 'Communities of time' and demonstration projects

The local focus of much current community participation in planning is therefore much more complex than it appears at first glance. The focus may be the neighbourhood but, in a globalised world, and especially in the highly developed cities of North West Europe, there are much wider sets of interests within relatively small geographical areas. Communities span different cultures and time – and **change over time** much more rapidly and extensively than in the past, as people move in and out. This is in addition to the basic range of varied and often conflicting interests and priorities that always exist even in the most apparently settled homogeneous community. The APaNGO projects identified some innovative ways of reaching out to many of the different interests within the communities in which they have worked (as outlined above) which aim to respect these complex differences.

The APaNGO First Interim Report found that much community participation in planning takes place when the preliminary work has been completed, and communities can then merely comment on highly developed plans or proposals. Involving communities at this point tends to generate negative responses rather than positive proposals. The same was found in relation to continuity of community participation, with communities often receiving little or no feedback on their involvement in planning processes, and with that involvement tending to be in the form of *ad hoc*, one-off events rather than the development of sufficiently long-term relationships with communities.

The APaNGO demonstration projects provide evidence of the move to the longer-term participation identified in the APaNGO First Interim Report. Elements of the City District Geuzenveld-Slotermeer project were perhaps the most time-limited of the demonstration projects as their focus was on developing community participation in the initial planning and design stage of their regeneration programme. However, one positive outcome of the participation process is that contact is maintained with those involved as the City District Geuzenveld-Slotermeer programme moves into the implementation phase and as the City District Geuzenveld-Slotermeer, as a local body, is bound into an overarching long-term relationship with its community.

The other three APaNGO demonstration projects were all led by NGOs, and all aspired to build long-term relationships with communities across projects and programmes. Bral are still working with some communities 20 years after their initial contact. Spectacle continue, wherever possible, to work with groups after funding for projects has finished so they can maintain structures of involvement longer-term with media production, creating a continuing public space. They find that this has enabled more positive community input to regeneration programmes than is often the case with conventional participation techniques.

Unfortunately, all the participation in planning work done by the APaNGO partners has tended to be funded project by project, so longer-term development work often has to be managed with very limited resources and on the fringes of other work.

The approach across all the APaNGO demonstration projects has been to try to find ways of overcoming the problems of one-off, shallow and reactive consultation in planning at a point in the process where it is too late for communities to make any positive input. However, as Bral found in particular, it is relatively easy to get community action and campaigns started, and to encourage local groups to participate in consultation meetings, but very difficult to keep activity going in the longer term.

NGOs involved in planning and local authorities often find their involvement inevitably continuous, whatever the structures or lack of them, as they often feel that the need to monitor the threats to their local communities, or to campaign for positive change, does not end. When community input is entirely voluntary, such constant vigilance can be extremely time-consuming and demanding, which puts pressure on those few individuals who continue to do this work. These people often either 'burn out' through exhaustion, or they may become professional and highly skilled activists – and they may then be characterised by public authorities as the 'usual suspects'. All these problems make it very difficult to maintain voluntary community input to ongoing participation over the long term, and requires constant support for the groups that are involved.

However, in spite of the difficulties, all the APaNGO research showed that communities and NGOs do want long-term participation and feel that this is the most effective way to keep communications open and relationships maintained.

## 7.6.2 Findings from community involvement over time

The projects found that:

- When an appropriate and continuous infrastructure existed to enable communities to participate effectively and at the right times, participation in planning became more manageable and meaningful for all concerned and contributed to better-quality planning.
- The production of community **media projects can create an enduring public space** for communities, in addition to more traditional forums and meeting places.
- **Longer-term investment in voluntary sector infrastructure** by government or by major voluntary bodies can allow more capacity-building with communities on a longer-term basis and can support greater continuity and effectiveness of participation in planning.
- **Communities change over time** frequently and sometimes dramatically, and so participation efforts need to retain checks and balances with planners and elected authorities to reflect enduring groups or interests as well as those that 'come and go'.

## 7.7 Linking participation and decision-making

### 7.7.1 Dilemmas of participation and representation

The APaNGO First Interim Report identified the major shifts that have occurred in the legislative structures for planning across North West Europe in recent years to encourage greater participation. That report also identified a significant gap between policy and practice, which it attributed to these changes still being relatively new.

While the APaNGO demonstration projects provide examples of good practice in participation in planning that can be seen as narrowing that gap between policy and practice, the gap remains most clearly apparent where participatory working meets decision-making structures. This is because the ways that decisions are made too often fail to take account of the results of community participation, which in turn puts at risk the efforts to achieve effective participation.

While there is broad recognition in both the APaNGO First Interim Report and among the demonstration projects that participatory

working needs to feed into a strong representative democratic structure, much depends on the elected authorities responding to this participatory working and their willingness to sustain a 'culture' of participation and involvement.

One approach identified in the APaNGO demonstration projects to the problems of linking community participation to decision-making is to establish and work within formal consultative structures that provide a mechanism for continuing dialogue between communities, NGOs and authorities. These have worked very effectively in some circumstances. The APaNGO experience shows, however, that there is little value in such consultative structures if they are bypassed when important decisions are made.

Both Bral and Spectacle found this to be the case in their separate projects in Brussels, with formal consultations taking place and then decisions on the issues being taken in secret with no links to the formal consultation with communities. Bral in particular found that there was no way of legally embedding the conclusions of community participation as the process progressed (unlike negotiations between unions and employers). This risked either party – developer or elected authority as representative of the community – going back on previous commitments or agreements at any time. Several APaNGO projects have recognised the different pressures on individuals within formal structures and outside where, on reflection, agreements reached cannot be kept to. Openness and transparency in these processes (as referred to above) have been found to be useful in these circumstances, but generally the only effective tool is continuous honest communication between the different parties.

The problem in the Brussels cases was not that the decision was taken outside the consultative forum or process (although it would be a problem if working at a co-production level), but that there were no clear links or communications between the consultation exercise and the decision-making. The structure of decision-making therefore did not respect the consultation process.

There were implications for community participation in the future in these cases: Bral found that where consultation structures had no influence (no potential to change things), they gained little involvement of local people. Spectacle addressed these issues by using video to try to equalise the positions of the various parties as noted above.

The interface between participation and representative democratic structures drew attention to the very different roles of authorities, NGOs and communities in ensuring that participation was representative. Increasing understanding between different sectors of the community was one of the positive results of participatory processes that brought together a wide range of people from different backgrounds and with different interests. However, NGOs and community groups usually have no specific responsibility for representing the broad views of the community: they tend to represent the interests of their members, who may be interested in a geographical area or in aspects of the subject such as wildlife or pollution. This is very different from the role of democratically elected representatives in mediating between conflicting interests and making decisions in the interests of the whole community, now and for future generations.

City District Geuzenveld-Slotermeer identified this difference and described it as a participation-representation dilemma. They proposed that it is possible to measure the success of participation through assessing the influence of the process on the plans, measured through the lack of any formal complaints. This approach may provide only a bare minimum of evidence of a satisfactory participatory process, but does attempt to assess success in a field where quantifiable measurements are hard to come by. More broadly, it was clear from the APaNGO demonstration projects that unless participation led to influence that contributed to action or change, it had little value to participants.

It is sometimes forgotten that, for communities, the action that follows planning is the most important motivation for their involvement: a plan is merely the vehicle for achieving the desired community, neighbourhood or development. Bral found that years of consultation with no implementation led to extensive consultation fatigue, while the City District Geuzenveld-Slotermeer planning project was followed by action and development on the ground that put the plan into practice. Here, the authorities included the values, principles and conclusions of the community in the design of the scheme.

The APaNGO demonstration projects clearly showed some significant innovation and achievement in reaching a wide range of people through their activities. The problems arose when the results of these participation exercises came up against decision-making structures that were not designed to respond to community input. Frequently local authorities and other

decision-making bodies are uncertain how to respond, or how to integrate community input with conventional research and with the parallel decision-making of elected representatives.

The APaNGO demonstration projects showed the need for much greater capacity-building on all sides of the development process, and the City District Geuzenveld-Slotermeer project demonstrated how a willingness to build the authority's capacity to engage with their communities resulted in much more effective planning processes.

### **7.7.2 Findings from decision-making experience**

The APaNGO demonstration projects found:

- Much depends on the elected authority responding to community participation work and their **willingness to sustain a 'culture'** that is receptive to such input.

- Unless participation led to influence that contributed to action or change, it had little value to participants.

As communities and NGOs continue to grow in skills, confidence and capacity for effective participation, the APaNGO projects' experience suggested that there is likely to be a parallel growth in demand for similar skills to be developed within public bodies and private companies. The development of skills is then only likely to be effective if there is also a major cultural shift in decision-making within institutions to enable them to respond positively to this new level of community participation. The experience of the City District Geuzenveld-Slotermeer project showed how effectively this can be done when delivered with the appropriate skills and a real willingness to listen to and consider community input.

## 8

# conclusions and recommendations

Edited by Gideon Amos and Diane Warburton

The detailed findings from the APaNGO demonstration projects set out above, alongside the conclusions from the APaNGO First Interim Report, suggest that there are six key conditions for successful participation in planning. These form the basis of the project's conclusions and recommendations and can be summarised as follows.

## 8.1 The need for appropriate support and techniques

The APaNGO research suggests a continuing and growing need for investment in the infrastructure of support and in appropriate techniques for community participation in planning.

The APaNGO projects showed the value of such support being independent from decision-making processes, so that the focus can be on empowering communities. Such support processes can be provided effectively by public authorities, but it is also essential that there should be more long-term investment in this infrastructure with the voluntary sector providing support, advice and expertise to communities to support their participation in planning.

### Recommendation 1

**The APaNGO partnership therefore recommends that both voluntary sector bodies and government should recognise a responsibility to provide independent resources for community participation in planning in all major development areas.**

Appropriate support requires investment in capacity-building by NGOs, working with communities, to enable local people to better understand planning and political systems and to participate more effectively. Capacity-building is also needed within public authorities so that they can better understand the principles, processes and value of community participation in planning – both in terms of improved quality of plans, developments and programmes and

in terms of strengthening democratic systems through greater public involvement.

The APaNGO research showed the value of particular techniques and approaches, including community development, cultural and creative activities, the use of community media to support and develop participation, 'branding' to create an identity for a neighbourhood, and long-term consultative structures. These techniques bring some new opportunities for creative and positive community participation in planning. New techniques will always be needed and are being developed to meet the changing needs and structures of society.

### Recommendation 2

**The APaNGO partnership therefore recommends wider take-up of the use of community media, branding techniques and street-based and cultural activities where communities judge these appropriate or helpful.**

As with all participatory techniques, the main success factor is to use a technique that is appropriate both to the purpose and to the context of the participatory process. This obviously requires clarity about the objectives of the participatory process, what it is trying to achieve and the context and history within which it will operate. The demographic make-up of community and its previous experience of participating in the planning process will be important factors in making this judgement. Techniques are merely tools to achieve a particular outcome and should never be the first decision in designing any participatory process.

## 8.2 Cultural change in decision-making bodies

As the APaNGO projects have demonstrated, a key problem currently lies in the interface between participatory processes and decision-making structures.

In practice, the problem is largely about lack of understanding and recognition of the value of participatory 'products', whether they are ideas from communities, video films, alternative proposals, contributions to visioning events or comments on draft plans and strategies. Current representative democratic structures are not designed to recognise or integrate community input in the variety of forms in which it may be presented. They are more commonly-used to dealing with input from elected representatives or in the form of analysis and recommendations from professionals and academics.

A key condition for successful participation in planning is a cultural change so that a community's input is supported through enabling participation in planning and its views are welcomed and valued as highly, and taken as much account of, as professional guidance from officers and academic research. Each of these may have particular value in providing data on different elements of the final political decision. Communities may be able to provide valuable input on community history, lay knowledge, public values and opinions; officers may be able to provide information on technical issues, precedents and wider policy considerations; and academic research may provide insights from experience elsewhere or new experiments with new techniques. Neither community, nor professional, nor academic input can escape inevitable flaws, and none should be regarded as inherently more valuable.

New methods of assessing and integrating these different sorts of data from different sources can be found if there is a willingness in public institutions to do so – it is there that the cultural change is needed if future participation is to be effective.

### Recommendation 3

**The APaNGO partnership therefore recommends that public authorities appreciate the value of community views which are generated in various ways through the participation services it supports. As a result government bodies should better integrate community input in its different forms in the decision-making process.**

## 8.3 Rights and legal recognition of agreements

Agreements reached between communities and authorities as a result of participatory processes need to be formally recognised so

that they cannot be ignored if they become inconvenient later (possibly through legal formalities such as those developed in the Netherlands). There should always be the potential for re-negotiation but that should be done on the basis that there is an agreement that needs to be renegotiated. Statutory rights in any planning process are a fundamental part of building trust in development decisions. This approach allows communities to trust agreements when they are made, and move on to more positive activities rather than simply watching to check if previous agreements are being ignored. These rights significantly contribute to increasing trust and respect between authorities, communities and NGOs.

### Recommendation 4

**The APaNGO partnership therefore recommends that statutory rights in planning for those most affected should be maintained and that agreements on development with communities should be legally recognised wherever possible.**

## 8.4 Open, transparent, challenging and fair processes

Participatory processes need to be clear, open, transparent, and fair to those involved and the rest of the (possibly uninvolved) population. Ideally, processes need to be able to challenge both the explicit proposition being considered and the underlying assumptions about the benefits of the final outcomes, although not all processes should or could always cover every related issue. The key condition for success here is the need for clarity about the boundaries of the participation, and what it is (and it is not) possible to change as a result of the participation. Much of the frustration among participants in planning processes from communities and NGOs is about lack of clarity, and a sense that they have been mis-led about what the participation is supposed to achieve and what the limits of their role are.

## 8.5 Linking participation to action

There is no point having a participatory process if nothing is going to change and nothing is going to happen. Action may require communities themselves to do something, or it may be that public authorities or private developers are going to carry out development. The main motivation among participants in any participatory process is that they will be able to influence or change these outcomes for the better. The alternative, just talk, is unlikely to inspire communities or NGOs to take part.



**Recommendation 5**

**The APaNGO partnership therefore recommends that responsible authorities in charge of community participation set out as a priority what can and cannot be changed as a result of the dialogue of participation or involvement.**

**8.6 Representation**

Community groups, NGOs, business groups and other specific lobby groups rarely represent whole communities; nor is that usually their role. They can take part in a process that aims to be representative of all local interests, but that process is the responsibility of those running it. A political decision then has to be made in the interests of the whole community (whether at local, regional or national level). Representative processes that value the interests of minority groups are key for effective participation in planning as whole communities are affected by planning decisions. It is a key role for planners and for local government decision-makers and it can be achieved with appropriate techniques and clear responsibility for the balance of interests represented at different points in the process.

**Recommendation 6**

**The APaNGO partnership therefore recommends that all those engaged in participation in planning and development should recognise that decision-makers must consider evidence which represents best the variety of interests of current and future communities, including taking into account representations from specific interest groups with particular knowledge.**

**8.7 Conclusion**

The APaNGO partners consider these conditions and recommendations to be essential for effective participation in planning, both in terms of creating better-quality planning decisions and outcomes, and in terms of principles of fairness and transparency – all of which are essential in supporting the contribution of planning to sustainable development.

## APaNGO project partners

The project involved five partners, with the TCPA in the lead role:



The **Town and Country Planning Association** (TCPA) is an independent charity campaigning for decent homes in well-designed neighbourhoods, community empowerment and a sustainable future. It works to inspire government, industry and campaigners to put social justice and the environment at the heart of the debate about planning policy, housing and energy supply and use. [www.tcpa.org.uk](http://www.tcpa.org.uk)



The **Brusselse Raad voor het Leefmilieu** (Brussels Environmental Association – Bral) is a non-profit, independent network of residents' committees and active citizens interested in helping to shape their city. Its members have a broad interest in the environment, mobility and urban renewal. [www.bralvzw.be](http://www.bralvzw.be)



**Planning Aid for London** (PAL) is a registered charity that provides free and independent town planning related advice for individuals and groups unable to afford professional consultants. It assists people in drawing up their own planning applications or helps them to comment on other people's applications. It also offers advice on fund-raising strategies, community development and consultation methods. [www.pafl.org.uk](http://www.pafl.org.uk)



**Spectacle Productions Ltd** is an independent, London-based television production company specialising in documentary and community-led investigative journalism. The company distributes independent videotapes, provides facilities for independent producers, and runs training workshops on media studies, production and community-based media. [www.spectacle.co.uk](http://www.spectacle.co.uk)



**Stadsdeel Geuzenveld-Slotermeer** (City District Geuzenveld-Slotermeer) is one of the 14 city district authorities in Amsterdam. Established in 1990, it has around 40,000 inhabitants and has recently initiated a large regeneration project. To address various problems and to meet new challenges for city life, it aims to improve the environment in which people live and work, create incentives to stimulate social and economic activities, and work together with housing corporations to provide a large variety of new homes. [www.geuzenveld.amsterdam.nl](http://www.geuzenveld.amsterdam.nl)



APaNGO was supported by the UK Department for Communities and Local Government and the EU INTERREG IIIB funding programme. Its aim was to establish a North West European network of skills and resources to aid community engagement in regional planning processes. The three-year project began in April 2005 and was completed in October 2007.

**For further information or if you need a larger-text version of this report, visit [www.apango.eu](http://www.apango.eu)**



**tcpa**

**Town and Country  
Planning Association  
17 Carlton House Terrace  
London SW1Y 5AS**

**t: +44 (0) 20-7930 8903  
tcpa.org.uk**

## **ATTACHMENTS**

21. Natural Gas Storage Licence granted to Marathon Oil Ireland Limited  
<http://www.cer.ie/CERDocs/cer06101.pdf>

Cer/06/101

**NATURAL GAS STORAGE LICENCE**

**GRANTED TO**

**[MARATHON OIL IRELAND LIMITED]**

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**PART I: TERMS OF THE LICENCE**

1. The Commission for Energy Regulation (hereinafter referred to as the "Commission"), in exercise of the powers conferred by Section 16(1)(c) of the Gas (Interim) (Regulation) Act 2002 (hereinafter referred to as "the Act of 2002") hereby grants to Marathon Oil Ireland Limited and any permitted assignee (hereinafter referred to as the "Licensee") a licence to operate a natural gas storage facility for the purposes of a storage business (both terms as defined hereafter) in at the locations specified in Schedule 1 during the period specified in paragraph 3, subject to the Conditions (hereinafter referred to as the "Conditions") set out in Part II.
2. The Conditions are subject to modification or amendment in accordance with their terms or with Section 16(16) (b) of the 2002 Act. The licence hereby granted (hereinafter referred to as "this licence") is further subject to the terms as to revocation specified in Schedule 2.
3. This licence shall come into force on 31<sup>st</sup> May 2006 and, unless revoked in accordance with the provisions of Schedule 2, shall continue in full force and effect until determined by not less than 5 years' notice in writing given by the Commission to the Licensee, with such notice not to be served earlier than the 5<sup>th</sup> anniversary of the date which this licence comes into force.
4. For the purposes of paragraph 1, "permitted assignee" means a person to whom this licence has been assigned in accordance with the Conditions (so far as relevant).

Sealed with the common seal of the Commission for Energy Regulation on 31<sup>st</sup> May 2006.

Chairperson

**PART II: CONDITIONS OF THE LICENCE**

**Condition 1: Interpretation and construction**

1. Unless the contrary intention appears:
  - (a) words and expressions used in the Conditions or the Schedules shall be construed as if they were in an enactment and the Interpretation Act 1937 applied to them; and
  - (b) references to an enactment shall include, without limitation, primary and subordinate legislation and in both cases any modification or re-enactment thereof and any successor or replacement legislation thereto after the date when this licence comes into force.
2. Any word or expression defined in the Act for the purposes of any provision of the Act shall, unless the contrary intention appears, have the same meaning when used in the Conditions or in the Schedules.
3. In the Conditions and in the Schedules, unless otherwise specified or the context otherwise requires:

<b>“the Act of 1999”</b>	means the Electricity Regulation Act, 1999
<b>“the Act of 2002”</b>	means the Gas (Interim) (Regulation) Act, 2002;
<b>“Environmental Laws”</b>	means those European Union and Irish laws which are from time to time in force, whose purpose is the protection of the environment, which includes, but is not limited to, the protection of human health, flora, fauna and the eco-systems on which they depend, and for the avoidance of doubt shall include but shall not be limited to the Environmental Protection Act, 1992, the Waste Management Acts, 1996 to 2005 and all legislation relating to the assessment of environmental impacts, and the protection of air, land and waters.
<b>“Holding Company”</b>	means a holding company within the meaning of Section 155 of the Companies Act, 1963;
<b>“Information”</b>	shall include, without limitation, any documents, records, accounts, estimates, returns or reports (whether or not prepared specifically at the request of the Commission) of any description,



whether oral or written, and in any format specified by the Commission;

- “Levy Order”** means an order made pursuant to paragraphs 16 and 17 of the Schedule to the Act of 1999 as amended by Section 22 of the Act of 2002
- “Licensee”** means Marathon Oil Ireland Limited;
- “Modification”** includes, without limitation, addition, omission, amendment and substitution, and cognate expressions shall be construed accordingly;
- “Natural Gas Legislation”** means any or all of the Gas Acts 1976 to 2002 (as relevant in the context);
- “Related Undertaking”** in relation to any person means any undertaking having a participating interest in that person or any undertaking in which that person has a participating interest as defined in Regulation 35 of the European (Companies: Group Accounts) Regulations, 1992 (S.I.201 of 1992);
- “Relevant Authority”** means the Minister for Communications, Marine and Natural Resources (or any successor thereof) or any other authority designated by the Commission for the purposes of this Condition and notified to the Licensee by the Commission;
- “Relevant Safety Requirements”** means the requirements relevant to the safe operation of the Storage Business set by any relevant authority; and
- “Separate Business”** means each of the businesses of supply, storage, distribution and transmission of natural gas taken separately from one another and from any other business of the Licensee, but so that where all or any part of such business is carried on by an affiliate or related undertaking of the Licensee such part of the business as is carried on by that affiliate or related undertaking shall be consolidated with any other such business of the Licensee (and of any other affiliate or related undertaking) so as to form a single Separate Business;

Notwithstanding the foregoing, none of the following activities shall constitute a Separate Business for the purpose of this licence:

- (i) the production of natural gas
- (ii) Processing of natural gas for 3<sup>rd</sup> parties
- (iii) the purchase of natural gas for storage and subsequent resale.
- (iv) the shipping of natural gas
- (v) the supply of wholesale customers

**“Storage Business”** means the injection, storage and withdrawal of natural gas from any source on behalf of customers, using the Storage Facility in accordance with the terms of the Standard Storage Agreement.

**“Standard Storage Agreement”** means the agreement setting out the terms and conditions (excluding commercial terms) under which the Licensee and its customers will contract for the provision of a natural gas storage service, as provided for in Condition 3 of this licence

**“Transporter”** means a person who operates one or more transmission or distribution pipelines.

Unless otherwise specified:

- (a) any reference to a numbered Condition or to a numbered Schedule is respectively a reference to the Condition or the Schedule being that number in this licence;
- (b) any reference to a numbered paragraph is a reference to the paragraph bearing that number in the Condition or Schedule in which the reference occurs; and
- (c) (without prejudice to any provision which restricts such variation, supplement or replacement) any reference to any agreement, licence (other than this licence), code or other instrument shall include, without limitation, a reference to such

agreement, licence, code or other instrument as varied, supplemented or replaced from time to time.

5. The heading or title of any Part, Condition, Schedule or paragraph shall not affect the construction thereof.
6. Where any obligation of the Licensee is expressed to require performance within a specified time limit that obligation shall continue to be binding and enforceable after that time limit if the Licensee fails to perform that obligation within that time limit (but without prejudice to all rights and remedies available against the Licensee by reason of the Licensee's failure to perform within the time limit).
7. The provisions of Section 4 of the Act of 1999 shall apply for the purposes of the delivery or service of any document, direction or notice to be delivered or served pursuant to this licence and directions issued by the Commission pursuant to any Condition shall be delivered or served as aforesaid.
8. Unless otherwise specified, where a Condition requires, or makes provision for or reference to:
  - (a) any communication from or by the Commission to the Licensee (including, without limitation, any notification, direction, approval, consent or agreement to be given by the Commission); or
  - (b) any communication from or by the Licensee to the Commission (including, without limitation, any notification, application or provision of information by the Licensee),

such communication shall be in writing.

**Condition 2: General Duties of Licensee**

1. The Licensee shall comply with the following obligations as required by Section 16 (13) of the Act of 2002 as amended by Regulation 10 of S.I. No. 452 of 2004.
  - (a) operate, maintain and develop under economic conditions such secure reliable and efficient facilities or systems as required for the purpose of operating the Storage Facility with due regard to the environment and public safety,
  - (b) not discriminate between system users or classes of system users particularly in favour of related undertakings,
  - (c) provide any natural gas undertaking to whose system its Storage Facility is connected with sufficient information to ensure that transport or storage of natural gas may take place in a manner compatible with the safe, secure and efficient operation of the natural gas system,
  - (d) without prejudice to any legal obligation to disclose information, preserve the confidentiality of commercially sensitive information obtained in the course of carrying out its business,
  - (e) provide all documents, records, accounts, estimates and other information, whether oral or written, requested from time to time by the Commission, in the form and at the times specified by the Commission, for the purpose of verifying that the holder of the license is complying with the Conditions of the licence, or as may be required by the Commission in the performance of its duties or functions,
  - (f) provide system users with the information they need for efficient access to the Storage Facility.

**Condition 3: Access to and use of the Storage Facility**

1. The Licensee shall, if requested by the Commission after this licence has come into force, prepare and submit to the Commission generic contract conditions (the “Standard Storage Agreement”) and any such request will take account of the fact that the Commission has already concluded that access to the Storage Facility specified at schedule 1 does not satisfy the ‘technically and / or economically necessary’ test provided for in Article 19.1 of Directive 2003/55/EC as transposed into Irish law by S.I no. 320 of 2005 and is not, therefore, subject to the provisions on third party access described therein. The Commission may issue directions from time to time in relation to these generic contract conditions, acting reasonably and taking into account the Commission’s earlier conclusions that the Storage Facility does not satisfy the “technically and/or economically necessary test”, and the Licensee shall comply with such directions. Any such direction shall be without prejudice to the contractual rights and obligations of the Licensee and its customers prevailing at the date of the direction.
2. In order to ensure openness in the market for energy supply, the Licensee shall not contract with any one party for access to the Storage Facility for a period longer than three years without the prior approval of the Commission.
3. The Licensee shall not contract with any one party for access to more than 75 percent of the capacity of the Storage Facility without the prior approval of the Commission. The remaining 25 percent of the Storage Capacity may be made available to other parties including, subject to the prior approval of the Commission, a party already contracted for some or all of the 75 percent. In this latter event, any Commission approval shall not extend to a contract period exceeding 12 months. This Condition will not operate to prevent the Licensee from contracting with any one party for access to 100 percent of the capacity for the gas year 2006/07.

**Condition 4: Interaction with other natural gas undertakings**

1. The Licensee shall:
  - (a) furnish to other natural gas undertakings to whose systems its Storage Facility is connected, in such manner and at such times as may reasonably be required, such information as may be reasonably required by such undertakings in order to ensure the safe, secure and efficient operation, co-ordinated development and inter-operability of the Storage Facility and such systems; and
  - (b) negotiate in good faith with other natural gas undertakings to whose systems its Storage Facility is connected, with a view to entering into such agreements as are required and perform such other acts as are required, and in the time periods required, to ensure the safe, secure and efficient operation, co-ordinated development and inter-operability of the Storage Facility and such systems.
  - (c) co-operate with the Network Emergency Manager, who has been appointed by the Commission to direct other natural gas undertakings to take such action as is necessary to prevent or end an emergency as the case maybe.

**Condition 5: Confidentiality and restriction on use of certain information**

1. Without prejudice to any legal duty to disclose information, the Licensee shall preserve the confidentiality of commercially sensitive information obtained in the course of carrying out its business.
2. The Licensee shall not abuse commercially sensitive information obtained from third parties in the context of providing or negotiating access to the Storage Facility.
3. Without prejudice to the generality of paragraphs 1 and 2 of this Condition, the Licensee shall ensure that no information relating to, or derived from, the Storage Business is disclosed for the benefit of, or used for the purposes of, any other Separate Business. This paragraph shall not apply in so far as:
  - (a) The Commission so consents;
  - (b) The Licensee is expressly permitted or required to disclose that information under the terms of any agreement or arrangement with the relevant person to whose affairs such information relates;
  - (c) The information is in the public domain (otherwise than as a consequence of a contravention of any Condition of this Licence);
  - (d) The information has been published or is to be disclosed:
    - (i) pursuant to any Condition of this Licence; or
    - (ii) in compliance with any requirement imposed on the Licensee by or under any natural gas legislation or any other requirement of law; or
    - (iii) the information is disclosed pursuant to any judicial or other arbitral process or tribunal of competent jurisdiction.
4. The Licensee shall provide the Commission with any information or access to information the Commission may reasonably deem necessary in relation to the compliance by the Licensee with this Condition.
5. The Licensee shall (and shall procure that its affiliates and related undertakings shall) comply with any directions as may from time to time be issued by the Commission requiring the Licensee (or its affiliates and related undertakings) to take such steps or desist from such action as the Commission reasonably considers appropriate to secure compliance with this Condition.

**Condition 6: Provision of information to the Commission, records and reporting**

1. The Licensee shall keep records of its operation of the Storage Business and, in such form as may be directed by the Commission from time to time.
2. The Licensee shall, as required by the Commission in writing from time to time, provide to the Commission the records or reports relating to the operation of the storage business.
3. The Commission acknowledges its duty to act reasonably in issuing directions or requests for information pursuant to this Condition.



**Condition 7: Separate accounts**

1. The Licensee shall comply with the accounting and reporting requirements provided for in Section 17 of the Act of 2002, as amended by Regulation 11 of S.I. No. 452 of 2004 relating in particular to the preparation and keeping of internal accounts for the Storage Business and showing the financial affairs of the Storage Business.
2. The Licensee shall deliver to the Commission a copy of the audited accounts and the accounting statements as soon as reasonably practicable, and in any event not later than six months after the end of the financial year to which they relate.

**Condition 8: Safety Framework**

1. Without prejudice to the obligations of the Licensee under or pursuant to any relevant safety requirement, the Licensee shall, at a time decided by the Commission after this licence has come into force and taking account of future changes in legislation with regard to responsibility for safety of offshore storage facilities, produce and thereafter maintain, in a form approved by the Commission, a document to be known as the Safety Framework.
2. The Safety Framework shall set out the Licensee's criteria, systems and procedures for ensuring that, so far as applicable to the Licensee in carrying out the Storage Business the Licensee applies the practices applied by, and achieves the standards achieved by, a prudent natural gas undertaking.
3. The Licensee's obligations under this Condition shall include, without limitation:
  - (a) compliance with all applicable laws and regulatory consents, and directions given or conditions imposed under and/or pursuant to such applicable laws or regulatory consents including, without limitation the natural gas legislation, the Foreshore Act 1933, the Petroleum and Other Minerals Development Act 1960 and the Continental Shelf Act 1968 and any regulatory consents or approvals granted under and/or pursuant to those Acts; and
  - (b) the application and observance of all relevant and applicable practices and standards, whether deriving from the recommendations or requirements of a relevant authority or from best practice in the natural gas industry.

**Condition 9: Environment**

1. The Licensee shall comply with:
  - (a) its duties and obligations under all applicable Environmental Laws;
  - (b) in the case of offshore storage facilities, the requirements of any regulatory consents or conditions imposed under and/or pursuant to such regulatory consents including, without limitation any regulatory consents or approvals granted under and/or pursuant to the natural gas legislation, the Foreshore Act 1933, the Petroleum and Other Minerals Development Act 1960 and the Continental Shelf Act 1968; and
  - (c) any direction issued to it for the purposes of this Condition by the Commission or any appropriate body designated by the Commission for these purposes.

Cer/06/101

**Condition 10: Competition Law**

1. The Licensee shall ensure that the Storage Business is operated at all times in compliance with EU and Irish competition law.

Cer/06/101

**Condition 11: Payment of levy**

1. The Licensee shall pay to the Commission any amounts specified in, or determined under, a Levy Order, in accordance with the provisions of such Levy Order.

**Condition 12: Assignment and change of control**

1. The Licensee shall not, without the prior consent of the Commission, assign this licence to another person (the “**assignee**”).
2. The Licensee shall not, without the prior consent of the Commission, transfer to another person (the “**transferee**”) all or part of the Storage Business.
3. Any consent of the Commission to assignment of this licence shall be subject to the Commission being satisfied that the assignee will be a fit and proper person to hold this licence, and may be subject to compliance by the Licensee or assignee with any conditions imposed by the Commission, including, without limitation, the modification of this licence where deemed necessary by the Commission.
4. Any consent of the Commission to a transfer of all or part of the Storage Business may be subject to the transferee being granted or holding a natural gas licence to operate the Storage Facility and may be subject to compliance by the Licensee or transferee with any conditions imposed by the Commission, including, without limitation, the modification of this licence where deemed necessary by the Commission.
5. Nothing in this Condition shall prevent the Licensee transferring all or part of the Storage Business to an assignee where the Commission has consented to the assignment provided that such transfer is effected as soon as practicable after such consent has been given.
6. The Licensee shall, as soon as practicable following it becoming aware of the relevant circumstances, notify the Commission of any change in control of the Licensee.
7. For the purposes of paragraph 6 there is a change in control of the Licensee whenever a person gains control of the Licensee who did not have control of the Licensee when this licence was granted.

Cer/06/101

**SCHEDULE 1: Storage Facility which the Licensee is authorised to operate under the licence**

Those parts of the Kinsale facilities (including the Southwest Kinsale reservoir and wells, offshore platforms, pipelines, compression, processing plant and the shore terminal) used from time to time to inject, store and withdraw natural gas.

**SCHEDULE 2: Right of Commission to revoke the licence**

1. The Commission may at any time revoke this licence by not less than 30 days' notice in writing to the Licensee:
  - (a) if the Licensee agrees in writing with the Commission that this licence should be revoked;
  - (b) if any amount payable under a Levy Order is unpaid 30 days after it has become due and remains unpaid for a period of 14 days after the Commission has given the Licensee notice in writing that the payment is overdue, provided that no such notice shall be given earlier than the 16th day after the day on which the amount payable became due;
  - (c) if the Licensee fails to comply with a direction under Section 16 of the Act of 2002, a direction under Section 24 of the Act of 1999, a determination under Section 25 of the Act of 1999 or an order under Section 26 of the Act of 1999 and (in respect of any of these cases) such failure is not rectified to the satisfaction of the Commission within such period as the Commission may determine, after the Commission has given notice of such failure to the Licensee, provided that in respect of a direction under Section 24 of the Act of 1999, no such notice shall be given by the Commission before the expiration of the period within which representations or objections under Section 24 of the Act of 1999 could be made questioning a direction under Section 24 of the Act of 1999 or before the proceedings relating to any such representations or objections are finally determined;
  - (d) if the Licensee fails to comply with any order made by the Minister under Section 21 of the Act of 2002;
  - (e) if the Licensee is, has been, or is likely to be in breach of a relevant safety requirement and the Commission is satisfied that, as a result, the Licensee is no longer a fit and proper person to hold this licence;
  - (f) if the Licensee:
    - (i) is unable to pay its debts (within the meaning of Section 214 of the Companies Act 1963) or if it enters into any scheme of arrangement (other than for the purpose of reconstruction or amalgamation upon terms and within such period as may previously have been approved in writing by the Commission); or
    - (ii) has a receiver or an examiner within the meaning of Section 1 of the Companies (Amendment) Act, 1990, of the whole or any material part of its assets or undertaking appointed; or



- (iii) passes any resolution for winding up other than a resolution previously approved in writing by the Commission; or
    - (iv) becomes subject to an order for winding up by a court of competent jurisdiction; or
    - (v) is dissolved, declared bankrupt or being of unsound mind;
  - (g) if:
    - (i) there is a change in the control of the Licensee for the purposes of Condition 18 (Change in control of Licensee); and
    - (ii) the Commission is satisfied that, as a result of that change in control, the new shareholder does not have adequate technical, financial or managerial strength, taking into account the size of its shareholding in the Licensee; and
    - (iii) the Commission serves notice on the Licensee stating that the Commission proposes to revoke this licence in pursuance of this paragraph unless such further change in control of the Licensee as is specified in the notice takes place within the period of two months beginning with the date of service of the notice; and
    - (iv) that further change does not take place within that period; or
  - (h) if the Licensee fails to notify the Commission of a change in control of the Licensee as required by Condition 18 (Change in control of Licensee)
2. For the purposes of paragraph 1(f)(i) of this Schedule, Section 214 of the Companies Act, 1963 shall have effect as if for "€1,269.74" there was substituted "€65,000" or such higher figure as the Commission may from time to time determine by notice in writing to the Licensee.

## **ATTACHMENTS**

22. Kerry County Development Plan – “Appendix G” – “Other Areas of Ecological Importance”. <http://www.kerrycoco.ie/planning/devplan03.asp>

## Appendix 1(g)

### Other Areas of Ecological Importance

<b>Number</b>	<b>Location</b>	<b>Notes</b>
1	Derrymore Island and Tralee Bay	
2	Killarney Valley	
3	Derrycunihy and Galwey's Wood	
4	Muckcross Woods	National Park
5	Tomies Wood	National Park
6	Killarney Lakes	National Park
7	Newfoundland Bog	National Park
8	Ross Island	National Park
9	Lough Crincaum	National Park
10	Doogary Wood	
11	Mangerton Mountain	National Park
12	Boughil and Lough Barfinney	
13	Carrigawaddra Woods	
14	Church Hill	
15	Cromane Point to Roscullen Point	
16	Dooneen Wood	
17	Kilgarvan Wood	
18	Lough Acoose	
19	Mucksna Wood	
20	Roughty River	
21	Doo Lough	
22	Inch Spit and Mudflats	
23	Inistearaght	
24	Torc Waterfall	National Park

- 25 Little Skellig
- 26 Brandon Mountain
- 27 Great Skellig
- 28 Inch-Annascaul

<b>Number</b>	<b>Location</b>	<b>Notes</b>
29	Puffin Island	
30	Ballaghisheen Bog	
31	Barrow Harbour	
32	Beginnish Island	
33	Coomasaharn Lake	
34	Fahamore	
35	Fermoyle	
36	Inishvickillane	
37	Lough Yganavan	
38	Magharee Islands	
39	Parkmore Point	
40	Puffin Sound - Horse Island Cliffs	
41	Slea Head	
42	Ballylongford Bay	
43	Carhoo West	
44	Church Hill	
45	Dohilla Quarry	
46	Glanlead Wood	
47	Illaunabarnagh and Mucklaghmore Island	
48	Inishnabro	
49	Inishtooskert	
50	Great Blasket	
51	Kenmare River Island	
52	Doulus Head / Cooncrone	
53	Sybil Point / Carrigbrean	

54	Valentia Island Cliffs	
55	Horse Island	
56	Valentia River Estuary	
57	Akeragh Lough	
58	Cashen River Estuary	
59	Beal Point	
60	Tarbert Bay	
61	Anna More Bog	Raised Bog of Regional Importance
<b>Number</b>	<b>Location</b>	<b>Notes</b>
62	Moanveanlough Bog	Raised Bog of Regional Importance
63	Imlagh Bog	Peatland Site of Archaeological Interest
64	Loughadon	Peatland Site of Archaeological Interest
65	Scarriff Island	
66	Deenish Island	

## **ATTACHMENTS**

23. “Water Quality in Ireland 2006 – Key indicators of the Aquatic Environment” – Environmental Protection Agency, Ireland.

<http://www.epa.ie/downloads/pubs/water/indicators/name,23540,en.html>

WATER QUALITY IN IRELAND 2006  
Key Indicators of the Aquatic Environment

Compiled by  
JOHN LUCEY

Aquatic Environment  
Office of Environmental Assessment

Environmental Protection Agency  
An Ghníomhaireacht um Chaomhnú Comhshaoil

Johnstown Castle  
Wexford  
Ireland

Telephone: +353 53 916 0600

LoCall: 1890 33 55 99

Fax: +353 53 916 0699

Email: [info@epa.ie](mailto:info@epa.ie)

Web site: [www.epa.ie](http://www.epa.ie)

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**WATER QUALITY IN IRELAND 2006**  
Key Indicators of the Aquatic Environment

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## INTRODUCTION

This report is the second in the series of annual summary statistics to be published, by the Agency, on the latest information regarding water quality in Ireland. It sets out in a concise way some core indicators for water quality, based on the most up-to-date data available. These indicators are the key statistics that summarise a particular water quality issue. Collectively, their value is in delivering timely, scientifically sound information on water quality to decision makers in particular as well as to the wider general public. The first report in the series was for 2005 (Lucey, 2006).

This indicator report focuses on a specific issue: the quality of aquatic ecosystems. As such it complements the national environmental indicator reports, in which integrated assessment is usually guided by, *driving forces, pressures, state, impact and response* (DPSIR). The latest such report by the Agency was published as *Environment in Focus 2006: Environmental Indicators for Ireland* (Environmental Informatics and Reporting Unit, 2006). In order to avoid unnecessary duplication, the series on the quality of the aquatic environment contain only those that can be described as direct environmental indicators. In other words only those indicators of *impact* or *state* are considered. Because of the importance of phosphorus as an enriching nutrient in the Irish aquatic environment it has been decided to include this element as an indicator for rivers.

The report concentrates on what are perceived to be the main indicators of ambient water quality in Ireland, which are 11 in total for present purposes. As well as giving the current situation, regarding the state of the aquatic resource, the report also includes analyses of trends over time. Only by including historical information can improvement or deterioration be discerned and programmes of measures for remediation instituted. In Ireland biological data on river quality are gathered over a three-year cycle and the present report coincides with the end of the latest such period, i.e. 2004-2006. Similarly, although collected annually, information on estuarine and coastal waters as well as lakes and groundwaters is reported in this rolling manner but with the former assessment over a five-year interval. All indicators include information for 2006.

The style of presentation is that the indicators have been set out in a 'stand alone' fashion, of two-page maximum length including graphics, so that a concise assessment is available for each of the 11 indicators.

In the most recent European Environment Agency (EEA) report, the country's perspective regarding water quality was summarised as follows: 'Eutrophication of rivers, lakes and tidal waters continues to be the main threat to surface waters with agricultural run-off and municipal discharges being the key contributors' (EEA, 2005). As will be seen from the present report, this could again aptly describe the current position with the addition that the first of these pressures also poses the greatest threat to the quality of the groundwater resource.

The European Commission (EC) has produced an atlas showing the extent of nutrient pollution, i.e. nitrogen and phosphorus, in Europe, which identifies Ireland, along with The Netherlands, Belgium, Denmark, France and Italy, with the highest levels of nutrient pressure. A close link between increased nutrient pressures on the environment and high-density livestock production was identified. The study shows that excess nutrient loss is often due to practices such as over-fertilization, which should, *ipso facto*, make prevention straightforward. The pan-European study found that applications of nitrogen fertilizers were, at times, as much as twice as high as crop needs (Mulligan *et al.*, 2006). Clearly there is a need for improved practices for fertilizer use, both manure and of mineral origin, right across the European region with economic savings as a spin-off.

A small increase in unpolluted channel of the Irish river system is again recorded for the period 2004-2006. There still remains, however, 28 per cent of the total length unsatisfactory to some degree. Similarly, while the proportion of lakes in a satisfactory condition shows some improvement, 15 per cent were classified as being less than satisfactory. Groundwater, on the other hand, is the only system showing a trend of decline in water quality and more stringent management of that resource is now urgently required.

The challenge, under the Water Framework Directive (WFD) (2000/60/EC), is to have all waters, both surface and groundwater, in good or higher status by 2015.\* The recorded annual incremental improvement in surface water quality, based on that occurring between 2005 and 2006 and indeed for the three-year period since 2004, would, if maintained, leave Ireland potentially falling short of the WFD target in the time left for remediation; unless an all-out effort by all, stakeholders and policy makers, involved in the process was invested in a co-operative approach, in applying programmes of measures, to retrieve the situation. A recent study concluded that if current land uses continue unchanged, it will be very difficult to meet the demands of the WFD (Donohue *et al.*, 2006). However, with the type of pollution occurring in Ireland, chiefly nutrient enrichment, there is a relatively short recovery time for aquatic ecosystems and thus the objective of good quality status for all water bodies should be achievable.

## References

Donohue, I., McGarrigle, M.L. and Mills, P. 2006. Linking catchment characteristics and water chemistry with ecological status of Irish rivers. *Water Research* **40**, 91-98.

EEA (European Environment Agency), 2005. *The European Environment: State and Outlook*. EEA, Copenhagen.

Environmental Informatics and Reporting Unit (Comp.), 2006. *Environment in Focus 2006: Environmental Indicators for Ireland*. EPA, Wexford.

Lucey, J. (Comp.), 2006. *Water Quality in Ireland 2005: Key Indicators of the Aquatic Environment*. EPA, Wexford.

Mulligan, D., Bouraoui, F., Grizzetti, B., Aloe, A. and Dusart, J. 2006. *An Atlas of Pan-European Data for Investigating the Fate of Agrochemicals in Terrestrial Ecosystems*. EC, Luxembourg.

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\* The aims of the WFD are to maintain high status of waters where it exists, prevent any deterioration in the existing status of waters and achieve at least good status in relation to all waters by 2015.

## SUMMARY

The 11 indicators used in this report, to reflect ambient water quality conditions in 2006 and preceding years, may be summarised as follows:

- Quality in the 13,200 km of river and stream channel assessed in 2004-2006 showed some improvement, over the 2001-2003 period, with 71.4 per cent unpolluted, 18.1 per cent slightly polluted, 10.0 per cent moderately polluted and 0.6 per cent seriously polluted.
- Nitrate levels in 11 large rivers showed differences across the country with the highest values recorded in the south-east. With the exception of two, all of these rivers have significantly increased nitrate levels in 2006 as compared with when first sampled in the late 1970s or early 1980s.
- Phosphate levels in 11 large rivers showed differences across the country. An example which illustrates the variation between river basins is that the annual median value for the Barrow was more than six-times that of the Shannon. Just five of these large river sites would meet the target of the Phosphorus Regulations in 2006. A brief overview of the Regulations, particularly regarding the situation for 2006, is included.
- Quality in the 1014 km<sup>2</sup> of lake surface area examined in 2004-2006 showed a slight improvement, since the previous period (2001-2003), with 91.9 per cent oligotrophic or mesotrophic (unpolluted), 4.6 per cent eutrophic and 3.5 per cent hypertrophic. The number of lakes assessed was 449, of which 66 were less than satisfactory.
- In 2006 there were 34 reported fish kills compared with 45 the previous year. This annual rate, albeit reduced compared with some previous years, is unacceptably high as each fish kill represents catastrophic environmental disturbance to aquatic life.
- Quality in 69 water bodies from 21 estuarine and coastal areas in 2002-2006 showed that 25 (36.2%) were unpolluted, 29 (42.1%) intermediate, 2 (2.9%) potentially eutrophic and 13 (18.8%) eutrophic. This represents a slight decline in status compared with the most recent previous period but with the overall number of water bodies in the eutrophic or potentially eutrophic classes remaining the same.
- In 2006 the quality of shellfish waters showed 25 per cent of sites were Class A (Highest Quality) and 56 per cent Class B (Intermediate Quality) with none in Class C (Low Quality). This can be compared with the situation in the previous two years when 30 per cent were A and 54 per cent B in 2005 and 30 per cent were A, 59 per cent B and 2 per cent C in 2004.\*
- In 2006 there were 44 pollution-at-sea incidents, comprising approximately 77 per cent oil spillage and 23 per cent other substances, e.g. algae or unidentified blooms. This number shows a slight reduction compared with the 46 incidents for the previous year.
- Quality at the 131 bathing waters in 2006 showed almost 97 per cent of sites complying with EU minimum mandatory limit values and 90 per cent with the stricter guide values. Compared with 2005 this represents respectively an increase and decrease of one per cent.
- In the 2004-2006 period 57 per cent of groundwater monitoring locations had faecal coliforms in at least one sample (an increase of 8% from the previous reporting period 2001-2003), with 32 per cent of the sites having greater than 10 faecal coliforms in at least one sample (an increase of 1% per cent from the previous reporting period).
- Approximately 25 per cent of groundwater locations exceeded the mean guide nitrate concentration for drinking water (an increase of 2% from the previous reporting period 2001-2003), with two per cent breaching the mandatory limit (the same proportion as in the previous reporting period).

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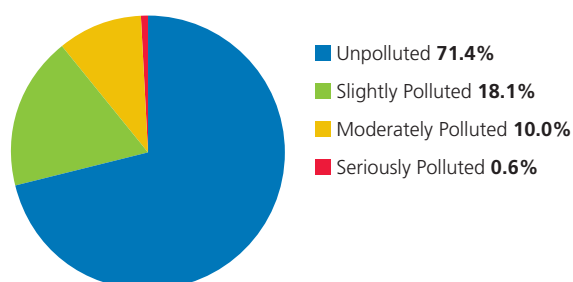
\* It should be noted that in this classification of shellfish waters, the percentages do not necessarily add up to 100 as areas with sites having more than one class are omitted.

## INDICATOR 1: RIVER QUALITY

The water quality situation in the 13,200 km of river and stream channel surveyed by the EPA, using a biological assessment method, is regarded as a representative indicator of the national status of such waters and to reflect any overall trends in conditions. The data are collected on a three-year cycle with the latest such period ending in 2006.

The total river length surveyed in 2004-2006 falling into the four biological water quality classes is shown in Figure 1a. This shows that some 71 per cent of channel length to be satisfactory, indicating an improvement of two per cent since the 2001-2003 monitoring cycle. Less than one per cent (0.6%), the same as in the previous cycle, was again classed in the most polluted condition.\*

*Figure 1a River Quality 2004-2006 – Percentage Channel Length in each Class*



Source: EPA (K. Clabby, J. Lucey and M. McGarrigle)

Under the Regulations (S.I. No. 722 of 2003) implementing the Water Framework Directive (WFD) seven of the eight river basin districts (RBDs) or international RBDs (IRBDs), into which the island of Ireland is divided for water management purposes, fall wholly or partly within the South. The following tabulation gives the latest quality breakdown of the proportion of channel length in each district with the corresponding percentage for the previous period (2001-2003) shown in parentheses.

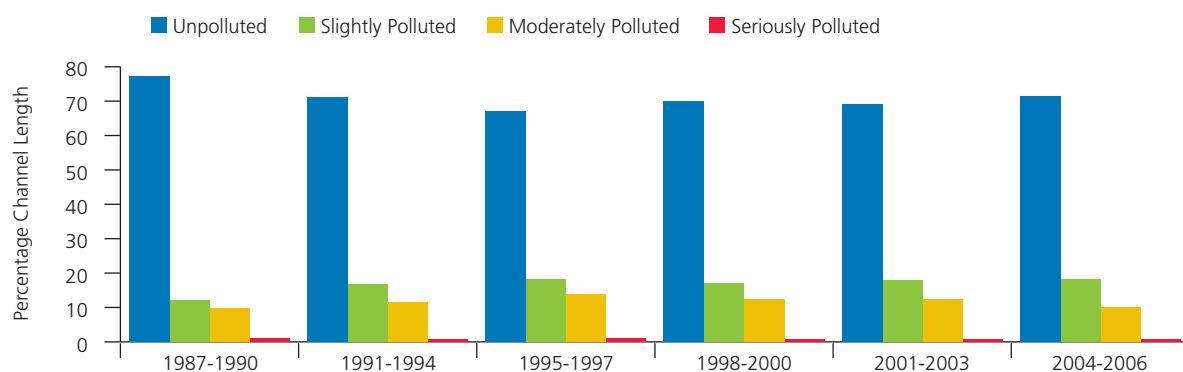
As would be expected, the less densely populated and less developed, as well as less intensely farmed, regions have the higher proportions of unpolluted channel. At RBD level, recent improvements, i.e. increase in unpolluted length, are noted in four (South Western, Shannon, South Eastern and Eastern).

Region	Unpolluted	Slightly Polluted	Moderately Polluted	Seriously Polluted
South Western RBD	90% (89%)	8% (8%)	2% (3%)	0.2% (0.1%)
Western RBD	84% (84%)	10% (11%)	5% (5%)	0.1% (0.3%)
North Western IRBD (South)	71% (76%)	15% (10%)	13% (12%)	0.5% (0.8%)
Shannon IRBD	67% (63%)	22% (21%)	11% (15%)	0.7% (0.6%)
South Eastern RBD	62% (58%)	26% (28%)	12% (13%)	0.4% (0.6%)
Eastern RBD	54% (41%)	27% (28%)	18% (30%)	1.2% (1.9%)
Neagh Bann IRBD (South)	49% (55%)	30% (15%)	20% (30%)	0.6% (0.1%)

\* The following rivers and streams had seriously polluted stretches: 2004 – Bredagh, Brown's Beck Brook, Conawary (Upper), Corravaddy Burn, Erne, Glory, Greenhill Stream, Maggy's Burn, Milltown (Kerry), Owenalondrig, Roosky, Tubbercurry and Tubbercurry Stream; 2005 – Ahavarraga Stream, Brosna, Camac, Clodiagh (Tullamore), Clodiagh (Portlaw), Deel (Newcastle West), Garranacool Stream, Kilcullen Stream, Jiggy (Hind), Roechrow, Tolka, Tullamore and Ward; 2006 – Borrisoleigh Stream, Clarinbridge, Fane, Gowran, Ownahinchy, Triogue and Tully Stream.

Figure 1b shows the trends in river quality between 1987 and 2006. The proportion of river and stream channel length with an overall satisfactory water quality status has increased by more than two per cent in the latest period (71.4%) compared to the previous period of assessment (69.2%). There was a reduction (-2.3%) in the moderately polluted length but a small increase in the proportion of slightly polluted channel (+0.2%). In contrast the overall proportion of seriously polluted channel has remained unchanged between the two periods.

*Figure 1b River Quality 1987-2006 – Percentage of Channel Length*



Source: EPA (K. Clabby, J. Lucey and M. McGarrigle)

## INDICATOR 2: NITRATES IN RIVERS

The concentration of nitrate in rivers is a key quality indicator because of its enriching effect as a nutrient and because of the potential health implication of high nitrate concentration in river waters abstracted for potable supplies.

The EU Nitrates Directive (91/676/EEC) requires member states to take specific measures to protect surface waters and groundwater from nitrate contamination from agricultural activities. The Irish Regulations implementing the Directive, and incorporating the action plan, were enacted and published as the European Communities (Good Agricultural Practice for Protection of Waters) Regulations 2006 (S.I. No. 378 of 2006).<sup>\*</sup> In addition direct waste discharges, such as sewage, may also contribute to such contamination and the EU Directive on urban wastewater treatment (91/271/EEC) provides for the removal of nitrogen from such waste in certain circumstances.

Nitrate can be reported as N or NO<sub>3</sub> but there is a four-fold difference in numerical terms between the two expressions (See also Indicator 11: Nitrates in Groundwater). The EU maximum and guideline limits for nitrate in abstracted water for human consumption are respectively 11.30 and 5.65 mg/l N. In the Irish classification scheme for tidal waters a dissolved inorganic nitrogen (DIN) level of 2.6 mg/l N has been given as one element of a set of criteria above which tidal fresh waters can be defined as eutrophic or enriched; however, criteria for chlorophyll and dissolved oxygen must also be breached before an area is thus defined (See also Indicator 6: Estuarine and Coastal Water Quality).

Figure 2 shows annual median nitrate levels at downstream locations on each of 11 large rivers over the last 24-27 years. From this, it is apparent that, with the exception of the Erne at Belturbet, there is an increase in concentration from west to east. A positive correlation between nitrate levels and the proportions of ploughed land in their catchments has been shown for the rivers in the south-east. While most rivers in that region comply with the EU maximum value of 11.30 mg/l N many, e.g. some tributaries of the Barrow among others, exceed the guideline value of 5.65 mg/l N.

Because of its toxicity to some aquatic organisms a maximum level of 2 mg/l N has been deemed appropriate for protecting the most sensitive freshwater species. However, a lower level, i.e. <1.7 mg/l N, has been suggested nationally as the quality requirement for sustainable pearl-mussel water bodies. This protected species, *Margaritifera margaritifera*, a sensitive indicator of water quality, has become extinct in the Barrow and Suir in the past 25-30 years and occurs in depleted numbers in parts of the Nore, Slaney and Blackwater while its current status in the Moy is quite unknown but it is likely to be still living in that river since first recorded there in the late nineteenth century. The Nore population is under great threat of extinction and not thought to be sustainable, due to enrichment, and there is a further upward trend in the nitrate level apparent since 2003 adding to the other pressures. A similar trend is noticeable for the Boyne, which does not harbour this mussel, within the same period.

This indicator clearly shows the contrast between the regions with levels in the south-east much higher than those in the west. It is also clear, from Figure 2, that all the river locations, except the Erne and Moy, have significantly increased nitrate levels in 2006 as compared with when first sampled. In decreasing order the highest median values measured in 2006 at the selected locations were: Slaney, Barrow+Nore, Blackwater, Suir, Boyne, Clare, Shannon, Moy+Corrib and Erne. An example, which illustrates the variation in nitrate levels between river basins, is that the annual median value for the Slaney, in the previous year 2005, was more than an order of magnitude higher than that of the Erne.

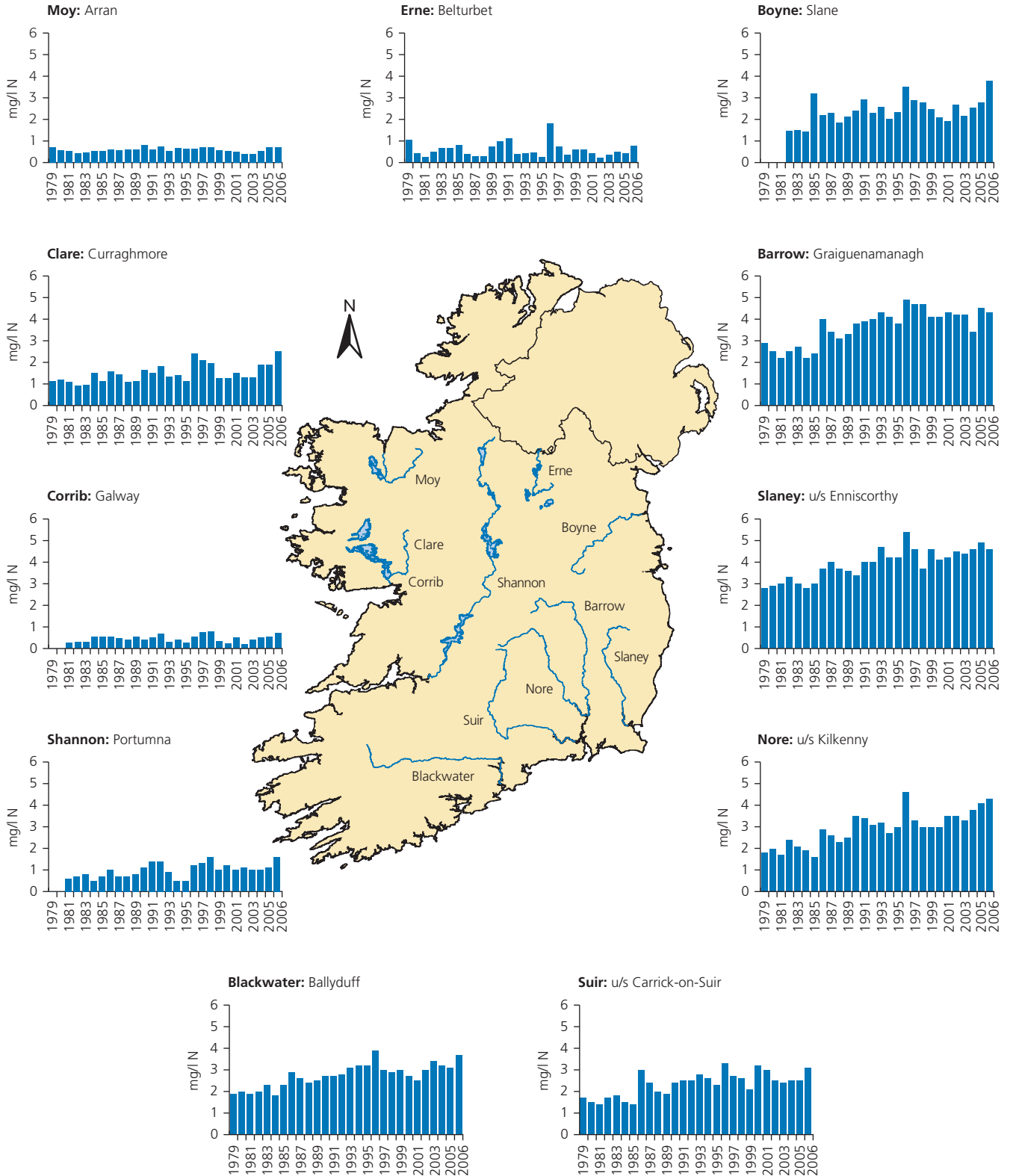
### Sources

Neill, M., 1989. Nitrate concentrations in river waters in the south-east of Ireland and their relationships with agricultural practice. *Water Research* **23**, 1339-1355; Convention on the Conservation of European Wildfowl and Natural Habitats Standing Committee, 2000. *Action Plan for Margaritifera margaritifera in Europe*. Council of Europe, Strasbourg; Moorkens, E.A., 2000. Conservation Management of the Freshwater Pearl Mussel *Margaritifera margaritifera*. Part 2: Water Quality Requirements. *Irish Wildlife Manuals*, No. 9; EPA, 2001. *An Assessment of the Trophic Status of Estuaries and Bays in Ireland*. Prepared for the Department of the Environment and Local Government. EPA, Wexford; Camargo, J.A., Alonso, A. and Salamanca, A. 2005. Nitrate toxicity to aquatic animals: a review with new data for freshwater invertebrates. *Chemosphere* **58**, 1255-1267. Neill, M., 2006. *River Water Quality in South-East Ireland, 2005*. A Report Commissioned by the County Councils of Carlow, Kilkenny, Laois, Tipperary (N&S), Waterford & Wexford and by Waterford City Council. EPA, Kilkenny.

<sup>\*</sup> These Regulations revoke, and re-enact with amendments, the European Communities (Good Agricultural Practice for Protection of Waters) Regulations, 2005 (S.I. No. 788 of 2005).



Figure 2 Annual Median Nitrate Values (mg N/litre) in Rivers 1979-2006



Source: EPA (M. Neill, M. Quinn and R. Smith)

## INDICATOR 3: PHOSPHATES IN RIVERS

The concentration of phosphate in rivers is a key quality indicator – because of its enriching effect as a nutrient – particularly in fresh water. Nutrients, such as phosphorus and nitrogen, are essential for plants and animals but if present in excessive amounts they can lead to a significant decrease in water quality. Phosphates can be introduced into the aquatic environment through industrial, sewage and animal wastes as well as from fertilizers or other agrochemicals leading to enrichment of waters (eutrophication).

Phosphate is routinely measured in the rivers monitoring programme and Figure 3 shows annual median levels at downstream locations on each of 11 large rivers over the past 23-27 years. While there appears not to have been significant increases in phosphate, in all of these rivers since 1979, there has been an increase in filamentous algal growth recorded in some during the growing season and large biomasses are produced in the rivers in the south-east annually which die-off in the winter. As phosphate is normally the limiting nutrient for plant growth in fresh waters it is freely removed from the water and in summer especially, the analysis of this parameter alone is not sufficient to gauge enrichment in rivers.\* Nonetheless, as is the case with nitrate (See Indicator 2: Nitrates in Rivers), the contrast between the western and eastern river phosphate content is apparent and, although not scientifically derived, it would seem that the increase in phosphate levels in the rivers of the south-east had taken place before sampling began in 1979. Biological monitoring, using the resident flora and fauna of rivers as indicators, has been in place since 1971. The Nore, where the freshwater pearl mussel is under threat (See Indicator 2: Nitrates in Rivers), exhibited very high phosphate levels in 1990 and 1991, caused mainly by an agri-based industrial source, that were some three-times those measured when sampling began in 1979 (Figure 3).

### Phosphorus Regulations

Phosphorus Regulations (S.I. No. 258 of 1998) were introduced in Ireland as part of a strategy to combat eutrophication and to implement, in part, the Dangerous Substances Directive (76/464/EEC). In the case of rivers, the Regulations prescribe interim quality standards that must be met by achieving the target biological quality rating (Q-value) or the target median molybdate-reactive phosphorus (MRP) concentration while for lakes the targets are set as either trophic status classification or average total phosphorus (TP) concentration.

In the Regulations the target MRP median concentration for rivers is 0.03 mg/l. See *Appendix: Phosphorus Regulations Update 2006*, for an overview of the Phosphorus Regulations and compliance.

An example which illustrates the variation in phosphate levels between river basins is that the annual median value for the Barrow was more than six-times that of the Shannon. In decreasing order the highest median values measured in 2006 at the selected locations were: Barrow, Nore, Blackwater, Erne, Boyne, Suir, Clare, Slaney, Moy, Corrib and Shannon. Only the last five would currently reach the target, based on median phosphate level, of the Phosphorus Regulations. One of these, the Slaney, however, would have breached the standard in 13 of the years since 1979.

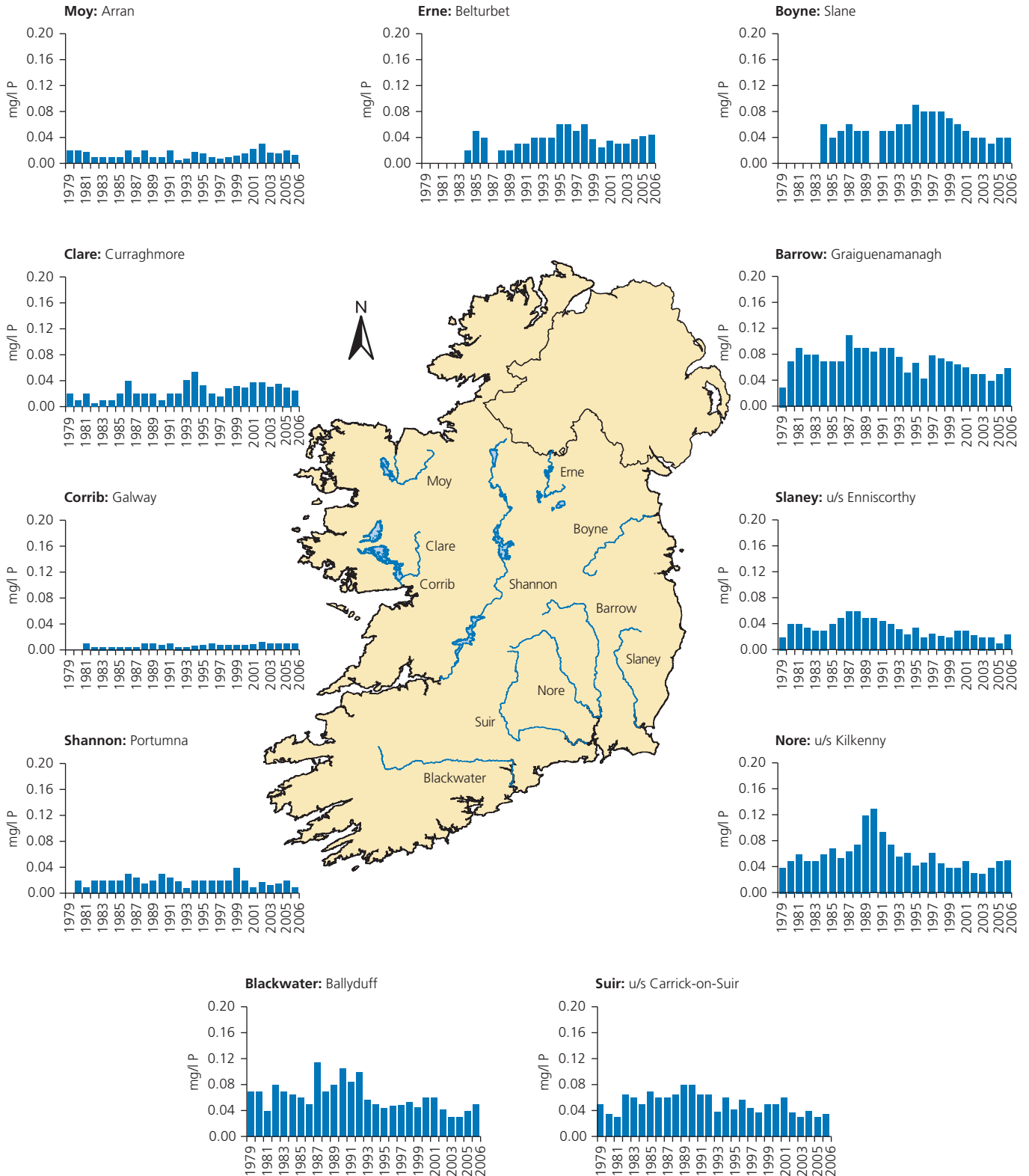
### Sources

W.A. House and F. H. Denison., 1998. Phosphorus dynamics in a lowland river. *Water Research* **32**, 1819-1830; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. and Quinn, R., 2005. *Water Quality in Ireland 2001-2003*. EPA, Wexford; Unpublished EPA biological monitoring survey data; Neill, M., 2006. *River Water Quality in South-East Ireland, 2005*. A Report Commissioned by the County Councils of Carlow, Kilkenny, Laois, Tipperary (N&S), Waterford & Wexford and by Waterford City Council. EPA, Kilkenny.

\* Also unlike nitrate, dissolved inorganic phosphorus interacts strongly with sediments which can also act as a sink for this nutrient particularly in summer.

Figure 3 Annual Median Phosphate Values (mg P/litre) in Rivers 1979-2006

Note that there were no data available for the Boyne in 1990 and the Erne in 1987 both of which rivers were first sampled in 1984



Source: EPA (M. Neill, M. Quinn and R. Smith)

## INDICATOR 4: LAKE QUALITY

Nutrient enrichment, resulting in eutrophication, is the principal pressure on lake quality in Ireland. This form of pollution is caused by inputs of nutrients, especially compounds of phosphorus and to a lesser extent nitrogen, either directly to lakes or more commonly via inflowing rivers, at concentrations in excess of natural levels. These nutrient inputs result in plant growth in lakes, particularly planktonic algal forms, whose presence is quantified by a measure of the algal pigment chlorophyll. Lake trophic status is determined by a consideration of the annual maximum chlorophyll values, according to a modified version of a scheme developed by the OECD.

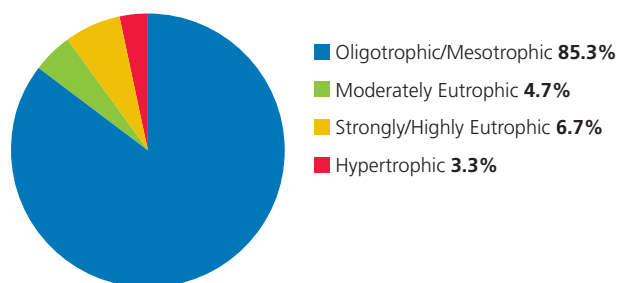
The number of lakes assessed in the period 2004-2006 was 449. The following gives a breakdown of water quality classification of the lakes by number and surface area.

Lake Quality 2003-2006		
Trophic Status	Number of Lakes	Surface Area km <sup>2</sup>
Oligotrophic	275 (61.2%)	346.3 (34.2%)
Mesotrophic	108 (24.1%)	585.5 (57.7%)
Moderately Eutrophic	21 (4.7%)	23.0 (2.3%)
Highly Eutrophic	11 (2.5%)	10.6 (1.0%)
Strongly Eutrophic	19 (4.2%)	13.2 (1.3%)
Hypertrophic	15 (3.3%)	35.4 (3.5%)

The majority (383 or 85.3%) of the lakes examined in the period 2004-2006 were of satisfactory water quality, i.e. oligotrophic or mesotrophic in status (Figure 4a). The water quality of the remaining 66 lakes was less than satisfactory. Of these 15 lakes were classified as hypertrophic, i.e. most enriched status.\* The surface area of the 449 lakes examined amounted to 1014 km<sup>2</sup>. Lakes accounting for 931.8 km<sup>2</sup> (91.9%) were in the unenriched oligotrophic/mesotrophic categories. A further 46.8 km<sup>2</sup> (4.6%) were classified as eutrophic and 35.4 km<sup>2</sup> (3.5%) were assigned to the hypertrophic category.

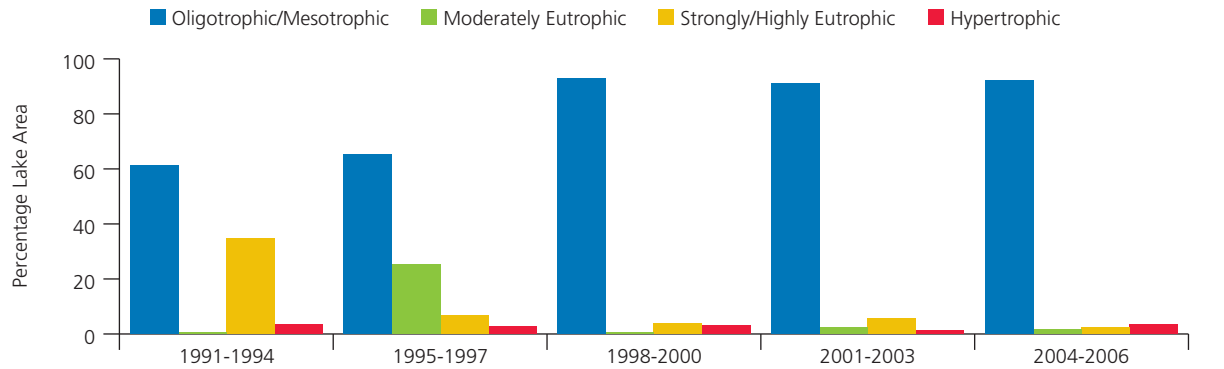
The proportion of lakes with an overall satisfactory water quality status has increased in the latest period (85.3%) compared to the previous period of assessment (82%). Likewise, the proportion of lake surface area (Figure 4b.) categorised as oligotrophic/mesotrophic for the period 2004-2006 (91.9%) is slightly higher than that for the period 2001-2003 (91%).

Figure 4a Lake quality 2004-2006 – Percentage of Water Bodies in each Class



Source: EPA (D. Tierney)

\* The 15 lakes classed as hypertrophic in the period 2004-2006 were: Allua (Co. Cork); Cluhir (Co. Cork); Derrygooney (Co. Monaghan); Drumgole (Co. Monaghan); Funshinagh (Co. Roscommon – note this is a turlough and was almost dry at time of sampling); Gangin (Co. Leitrim); Gowna (Co. Cavan); Inner (Co. Monaghan); Monalty (Co. Monaghan); Muckno (Co. Monaghan); Mullagh (Co. Cavan); na Glack (Co. Monaghan); Oony (Co. Monaghan); Oughter (Co. Cavan); Peters (Co. Monaghan).

Figure 4b Lake Quality 1991-2006 – Surface Area (km<sup>2</sup>)

Source: EPA (D. Tierney)

## Sources:

EPA (D. Tierney); OECD, 1982. *Eutrophication of Waters. Monitoring, Assessment and Control*. OECD, Paris; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. and Quinn, R., 2005. *Water Quality in Ireland 2001-2003*. EPA, Wexford.

## INDICATOR 5: FISH KILLS

The presence of healthy fish stocks, particularly salmon and trout, in rivers and lakes is considered to be an indicator of good water quality. The demise of these fish, on the other hand, is a very striking manifestation of serious pollution. Very low or zero oxygen concentration in water is the principal cause of fish kills in Ireland. These conditions can be brought about by anthropogenic inputs of organic matter to water or may result from excessive plant growth.

Data on fish kills in Ireland are compiled annually by the Central Fisheries Board, based on returns from the Regional Fisheries Boards. In 2006, 34 fish kills were reported. Based on investigations carried out by fisheries board environmental staff the following causes were attributed:

Agriculture	Industry	Local Authority	Eutrophication	Other	Unknown	Total
5	2	7	5	10	5	34

As well as resulting from agricultural, industrial and sewage wastes entering water bodies, fish can be killed by other causes, such as civil works, as can be seen from the following regional example. In the South Western Regional Fisheries Board area, covering Cork and Kerry, eight fish kills were recorded in 2006. Investigations confirmed the cause in four of these (two each by agricultural discharges and in-stream drainage works) with three others suspected to have resulted from agriculture, civil works and poaching respectively while the remaining one could not be attributed to any cause.

A marked upsurge in fish kills had occurred in Irish rivers in the 1970s coinciding with the intensification of agriculture. In response to this situation, a nationwide public information campaign was launched and an enforcement strategy was put in place by the Regional Fisheries Boards and Local Authorities.

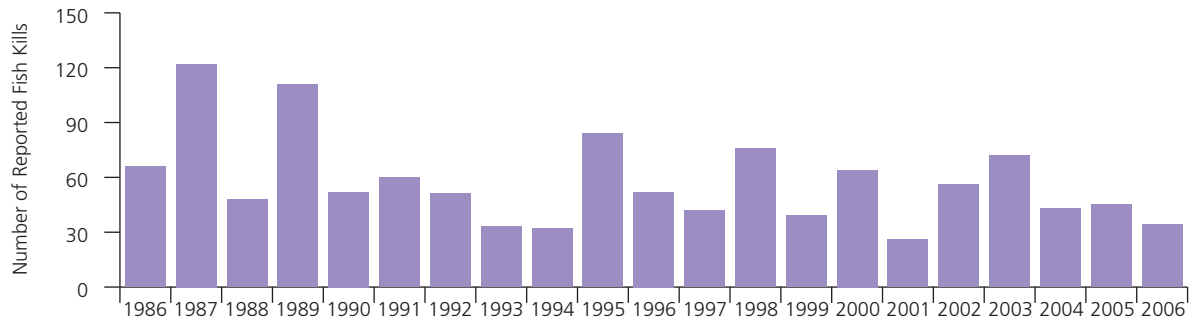
The trend in fish kills over the past 21 years (Figure 5) shows that the years 1987 and 1989 were the worst with in excess of 100 fish kills reported while 2001 had the least number. The number of such events in 2006 shows a reduction relative to 2004 and 2005 when 43 and 45 respectively were recorded.

The number of fish kills includes recurring deaths of fish in the Avoca River due to acid mine leachate which in 2006 accounted for half of the kills allocated to the 'Other' category in the above tabulation. A pilot treatment plant has been commissioned to help alleviate the problem in the lower reaches of the Avoca River due to discharges from the copper mines that have been occurring for over 200 years.

A fish kill is a sign of catastrophic ecosystem disruption and, while the situation appears to have stabilised somewhat, the number of reported fish kills remains unacceptably high.

### Sources

Regional Fisheries Boards data as collated by the Central Fisheries Board; South Western Regional Fisheries Board, 2007. *Annual Report 2006*. South Western Regional Fisheries Board, Macroom.

*Figure 5 Fish Kills 1986-2006*

Source: Regional Fisheries Boards

## INDICATOR 6: ESTUARINE AND COASTAL WATER QUALITY

As with fresh waters, increased nutrient loading resulting in eutrophication is an increasing pressure on Irish estuarine and coastal waters.

The trophic status of 69 water bodies from 21 estuarine and coastal areas around Ireland was assessed for the period 2002-2006. The assessment of these estuarine and coastal water bodies shows that 13 (18.8%) were classed as eutrophic, two (2.9%) as potentially eutrophic, 29 (42.1%) as intermediate and 25 (36.2%) were unpolluted.

The status of tidal waters in Ireland is generally unchanged from the period 1999-2003. In comparison to the assessment carried out for 2001-2005, seven water bodies have shown a decline in status for the latest rolling five-year period. Three of these, Lower Slaney estuary, Upper Blackwater estuary and Wexford Harbour are now classified as eutrophic, while Dungarvan Harbour, Sligo Harbour, Lower Lee (Tralee) estuary and Youghal Harbour are now in the intermediate category having previously been classed as unpolluted.

Three estuaries, Lough Mahon, Fergus and the freshwater tidal stretch of the Shannon have shown an improvement in quality status. The status of the latter two water bodies has improved from intermediate in the 2001-2005 period to unpolluted in the latest assessment. Lough Mahon, which is categorised as intermediate, has shown a substantial gradual improvement in recent years having been previously classified as eutrophic in the period 1999-2003 and then potentially eutrophic in 2001-2005. The observed improvement in the water quality status of this water body is likely to be a result of the newly commissioned urban wastewater treatment plant (Cork Main Drainage) at Little Island, though further investigation is required before this can be confirmed.

Data from the Marine Institute's winter nutrient monitoring programme, in coastal waters of the western Irish Sea and southern Celtic Sea, indicate no instances of excessive nutrient enrichment.

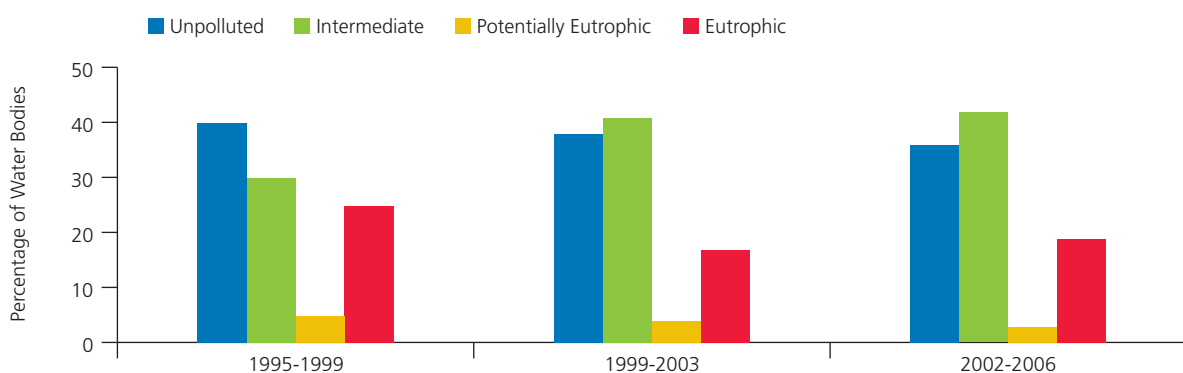
All 10 water bodies classified as eutrophic in the period 2001-2005 remain so and as indicated above an additional three water bodies are similarly classified in the present assessment. The percentage of water bodies being classified as eutrophic shows an initial decrease followed by a slight increase during the past decade: from 25 per cent in 1995-1999 to 17 per cent in 1999-2003 and almost 19 per cent in the period up to 2006 (Figure 6a).

The location and latest classification of the individual estuarine and coastal water bodies is shown in Figure 6b, which also gives a breakdown of the overall quality status.

### Sources

EPA (S. O'Boyle, G. McDermott and R. Wilkes); EPA, 2001. *An Assessment of the Trophic Status of Estuaries and Bays in Ireland*. Report prepared for the Department of the Environment and Local Government. EPA, Wexford; McGovern, E., Monaghan, E., Bloxham, M., Rowe, A., Duffy, C., Quinn, Á., McHugh, B., McMahon, T., Smyth, M., Naughton, M., McManus, M. and Nixon, E., 2002. Winter nutrient monitoring of the Western Irish Sea – 1990-2000. *Marine Environment and Health Series No. 4*, 2002. Marine Institute, Dublin.

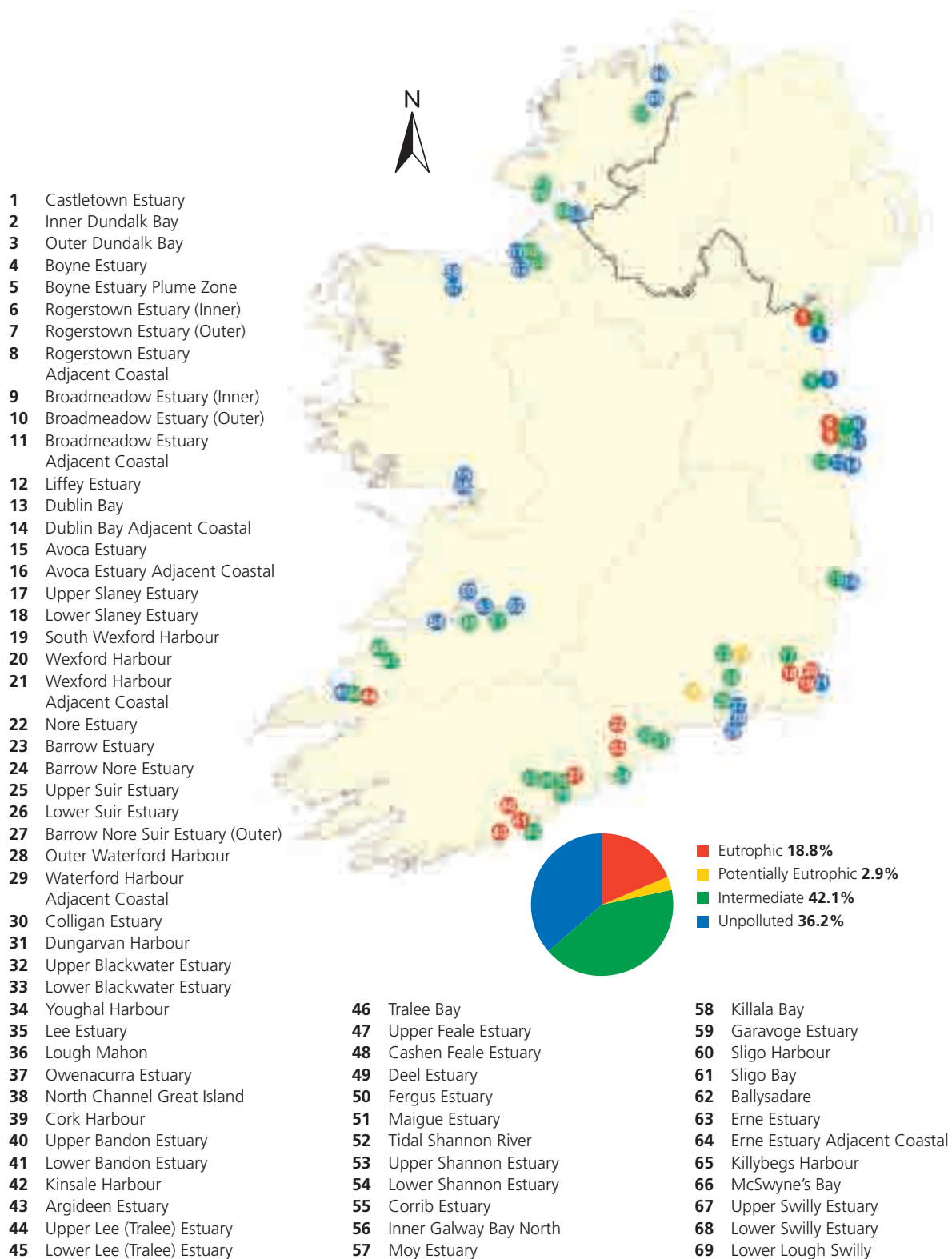
Figure 6a Estuarine and Coastal Water Quality – Percentage of Water Bodies in each Class 1995-2006



Source: EPA (S. O'Boyle, G. McDermott and R. Wilkes)



Figure 6b Estuarine and Coastal Water Quality 2002-2006



Source: EPA (S. O'Boyle, G. McDermott and R. Wilkes)

## INDICATOR 7: QUALITY OF SHELLFISH WATERS

In order to ensure the quality of shellfish for human consumption, controls are placed on the waters used for shellfish cultivation and harvesting. These controls were, up until 2006, driven by the EU Directive 'laying down the health conditions for the production and the placing on the market of live bivalve molluscs' (91/492/EEC) and by 1996 Irish Regulations (S.I. No. 147 of 1996) implementing the directive. From 1 January 2006, these were replaced by EC Hygiene Regulations 'laying down specific rules for food of animal origin' (Nos. 852/853/854 of 2004). The Department of Communications, Marine and Natural Resources (DCMNR) is the competent authority in Ireland for classifying shellfish production areas.\*

A shellfish sanitation monitoring programme, based on a number of parameters including microbiological criteria, for classifying shellfish-growing waters had been in operation in Ireland since 1985. The scheme of classification has three categories, corresponding with the criteria and conditions as laid down in the older directive/new regulations and may be summarised as follows:

- A** Shellfish can be sold for direct human consumption
- B** Shellfish can be sold for human consumption following purification in an approved plant for two days
- C** Shellfish can be sold for human consumption following relaying in clean seawater for at least two months

Figure 7 shows the number of shellfish sites, as a percentage of total, in the three classes between the 1991-94 period and 2006. It should be noted that percentages do not necessarily add up to 100 as sites with more than one class are omitted.\*\*

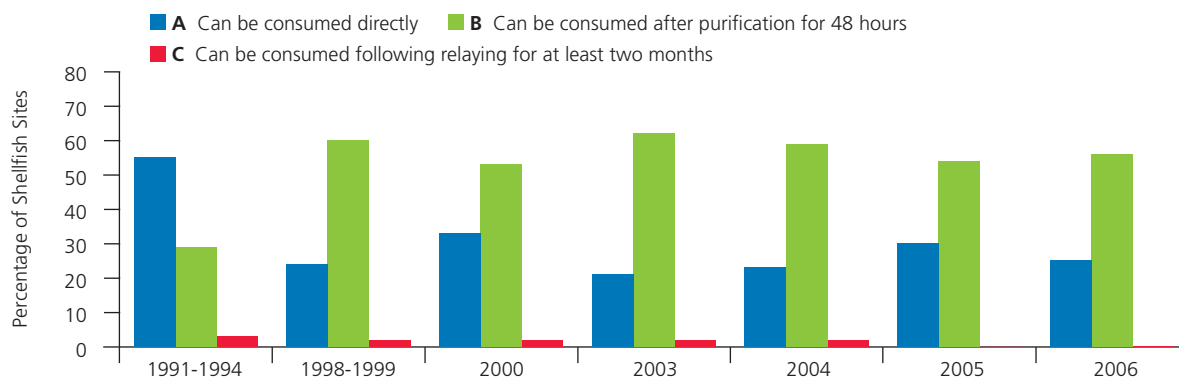
In addition the shellfish production areas are monitored, on a weekly or monthly basis, for the presence of phytoplankton and marine biotoxins as part of a national monitoring programme operated by the Marine Institute on behalf of the Food Safety Authority of Ireland (FSAI). As well as causing illness in humans who consume affected shellfish some Harmful Algal Blooms (HABs) can directly (through toxicity) or indirectly (through deoxygenation) kill shellfish and other marine life. In July-August 2005 an exceptional bloom of a dinoflagellate, not of direct human health significance, had caused substantial stock losses to producers as shellfish died off as a direct toxic effect on the fish and shellfish. With the exception of the south-west coast waters the extent and intensity of toxic phytoplankton in Irish waters was much reduced in 2006, compared with previous recent years resulting in lower levels of toxins observed in fewer areas. The intense localised protracted toxicity present in the south-west region in 2006 caused severe impact and large-scale economic losses there. The most probable reason for the difference between the two years was wind climatic conditions. Where biotoxins are detected, the production area is closed and harvesting prohibited until the danger of toxicity has passed. Closures of shellfish-growing areas, as a result of biotoxin contamination, are common in the summer and autumn when toxic algae are present.

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\* The independent statutory Sea-Fisheries Protection Authority (SFPA) was set up on 1 January 2007 (S.I. No. 376 of 2006). The Authority will enforce sea-fisheries law generally and food safety law relating to fish or fishery products and will therefore be responsible for implementing the EU hygiene regulations. Shellfish production areas are classified under these regulations.

\*\* In 2006, 25 per cent of sites were Class A waters compared to 30 the previous year but this is much less than the proportion in the 1991-94 period (55%). The downward trend in Class A waters appeared to have halted in 2004 with a slight upward swing in the following year but was down again in 2006. There were no Class C waters recorded in the past two years but a part of one shellfish harvesting area, in Wexford Harbour, was in this category.

Figure 7 Classification of Shellfish Areas



Source: Department of Communications, Marine and Natural Resources (J. Carney)

In accordance with another Directive (79/923/EEC), on the quality required of shellfish waters, seawater samples are taken from designated shellfish waters (S.I. No. 268 of 2006) twice annually and analysed for trace metals and organohalogens. In 2006 all pesticide and polychlorinated biphenyl (PCB) results were below limits of detection. The metal results varied substantially, as would be expected for seawater, and individual results for lead and zinc in some samples exceeded the national standard set for all tidal waters (S.I. No. 12 of 2001).\*\*\* However, no samples exceeded the Imperative values (maximum allowable concentrations) for shellfish waters (S.I. No. 268 of 2006). These substances are also monitored annually in shellfish flesh as this provides a better indicator of overall water quality than low frequency spot sampling of water. This monitoring typically shows Irish shellfish growing waters to be of high quality with respect to the substances monitored.

## Sources

Department of Communications, Marine and Natural Resources (J. Carney); Marine Institute unpublished data [Test reports for trace metal and organochlorine substances in seawater sampled from designated shellfish growing areas, summer and winter 2006]; Lyons, D. and Doré, B., 2006. *Shellfish Microbiology – Implementation of the Hygiene Regulations and Good Practice Guide*. Proceedings of the 7th Irish Shellfish Safety Workshop, Galway, 30th November 2006, 4-7. Organised by the Marine Institute, Food Safety Authority of Ireland and Bord Iascaigh Mhara; Moran, S., Silke, J., Gallardo-Salas, R., Chamberlain, T., Lyons, J. and Shannon, S., 2006. *Review of Phytoplankton Monitoring 2006*. Proceedings of the 7th Irish Shellfish Safety Workshop, Galway, 30th November 2006, 30-36. Organised by the Marine Institute, Food Safety Authority of Ireland and Bord Iascaigh Mhara.

\*\*\* Individual results in themselves do not imply a breach of the standards as these standards apply as annual average concentrations.

## INDICATOR 8: POLLUTION AT SEA INCIDENTS

Responsibility for the investigation of pollution incidents at sea rests with the Irish Coast Guard (IRCG), a division within the Department of Transport, as part of its role in developing and co-ordinating an effective regime for marine pollution response. The IRCG's functions regarding pollution incidents are mandated through Government policy, national legislation (e.g. Sea Pollution Acts, 1991 and 1999), EU Directives and International Conventions. In 2006 Ireland was invited to become a contracting party to the Bonn Agreement for Cooperation in Dealing with Pollution of the North Sea by Oil and Other Harmful Substances. The IRCG provides a response to marine pollution incidents or threat of pollution from ships and offshore platforms within the Irish Exclusive Economic Zone (EEZ) which covers an area (approx. 200,000 km<sup>2</sup>) stretching to 200 miles off the west coast and to the median line between Ireland and the UK in the Irish and Celtic Seas.

The number of reported annual pollution incidents in the six-year period 2001-2006 is given in Figure 8.

The total number of incidents reported by category of pollution in the EEZ in 2006 was:

Mineral Oil	Garbage	Sewage	Chemicals	Other	Total
34	1	–	1	8	44

Analysis of the 44\* incident reports for the year indicates that the reported pollution comprised approximately 77 per cent oil spillage and 23 per cent other substances, e.g. algae or unidentified blooms. Diesel and gas oils were the most frequently identified polluting substances. The overall geographical pattern indicates that the majority of oil discharges occurred in the smaller harbours and their surrounding areas. Clusters of slicks were identified in bays and near shore waters with 29 per cent reported in open sea. The small percentage of slicks reported in open sea, however, should be treated cautiously as the IRCG relies on reports from shipping and commercial air traffic for such incidents.

The distribution of received reports\* of pollution in 2006 by marine environmental zone within the EEZ was:

Open Sea	Tidal River/ Estuary	Bay/Nearshore Waters	Beach/ Shore	Port/ Harbour	Total
15	9	6	5	17	52

The Coast Guard's role in marine casualty incidents is to oversee, control, intervene and exercise ultimate command and control to prevent/reduce the threat to the marine environment or the safety of the vessel or crew. During 2006 the IRCG intervened in a number of marine casualty incidents and closely monitored other incidents, which posed a threat of marine pollution. For example, 14 ships ranging from 3,000 to 17,000 tonnes experienced mechanical difficulties off the coast while on average three fishing vessels per month required assistance due to engine failure, fouled propellers or were taking water. In terms of pollution, these occurrences can be classed as mostly minor in nature, which are prevented from developing into more serious incidents.

\* A total of 52 incidents were reported; however, in eight cases either no pollution was found or the threat of pollution was averted.

Work is being carried out to draft the national oil spill contingency plan (NCP) and nine of 19 port contingency plans have been submitted to the IRCG for approval in accordance with the Sea Pollution (Amendment) Act, 1999. The IRCG had issued oil spill contingency plan guidelines to all maritime county councils who were instructed to draw up contingency plans for the prevention and minimisation of damage arising out of oil and other spillages on the coast. The Coast Guard also reviews and approves oil spill contingency plans for mobile offshore drilling platforms intending to carry out drilling work within the EEZ. Review and approval of these plans is ongoing.

## Source

Irish Coast Guard (E. Clonan).

*Figure 8 Pollution at Sea 2001-2006*



Source: Irish Coast Guard (E. Clonan)

## INDICATOR 9: BATHING WATER QUALITY

Local authorities are responsible for bathing water quality in their areas and for making information available to the public during the summer season. The EPA collates the results of monitoring which are forwarded to the European Commission for inclusion in the compendium report published annually by the EU. The EPA also publishes an annual national bathing water report, which is released prior to the start of the following bathing season.

The primary legislation is set out in Regulations (S.I. No. 155 of 1992) and subsequent amendments giving effect to the EU Directive (76/160/EEC) concerning the quality of bathing water. The Regulations set more stringent limits for some parameters than the Directive.

The number of designated bathing areas is 131 including both seawater (122) and freshwater (9) sites. Results for 2006 show that the quality of bathing water in Ireland is relatively good, with 77 per cent (101 of 131) of sites complying with the National Limit Values.

### 2006 Bathing Water Quality Areas: Compliance with EU and National Limit Values

	Compliant	Non-Compliant	Total
<b>Seawater</b>			122
Guide	111	11	
Mandatory	118	4	
National	95	27	
<b>Freshwater</b>			9
Guide	7	2	
Mandatory	9	0	
National	6	3	
<b>Overall</b>			131
Guide	118	13	
Mandatory	127	4	
National	101	30	

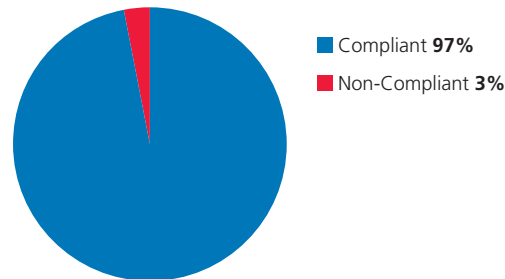
Source: EPA (K. Nolan, G. McHugh, G. Smith and T. Stafford)

Assessing compliance using the European Commission's approach shows almost 97 per cent (127 of 131) of sites complying with the minimum mandatory limit values specified in the Directive (Figure 9a) and 90 per cent (118 of 131) of sites with the stricter guide values. These guide values can be regarded as quality objectives that all bathing sites should aim to achieve.

The overall quality of bathing waters in Ireland remains quite good with the number of sites complying with EU mandatory values in 2006\* showing an increase of almost one per cent when compared with 2005. However, guide compliance has decreased by the same percentage in the same period (Figure 9b). There was also a five per cent decrease in the compliance rate with National Standards in 2006 when compared with 2005.

\* The four bathing areas that failed to comply with the minimum mandatory EU standards in 2006 were: Balbriggan and Malahide in Dublin; Clifden in Galway; Dunmore East (Main Strand) in Waterford. Those failing in 2005 were: Merrion Strand and Sutton Beach in Dublin; Na Forbacha and Clifden in Galway; Ardmore in Waterford.

Figure 9a Bathing Water Quality – Compliance of Areas in 2006 with EU Mandatory Values



Source: EPA (K. Nolan, G. McHugh, G. Smith and T. Stafford)

The Bathing Water Directive (76/160/EEC) was 30 years old when, in February 2006, a new Directive (2006/7/EC) was adopted which comes into force in 2008. The revised Directive will offer an opportunity to improve management practices at bathing water sites and to standardize the information provided to bathers across Europe. In comparison with some other European countries the number of designated bathing areas in Ireland is relatively low and the EPA has called for the number of sites to be increased, from 131 to 160, to ensure the adequate protection of those using bathing places.

Figure 9b Bathing Water Compliance 1996-2006



Source: EPA (K. Nolan, G. McHugh, G. Smith and T. Stafford)

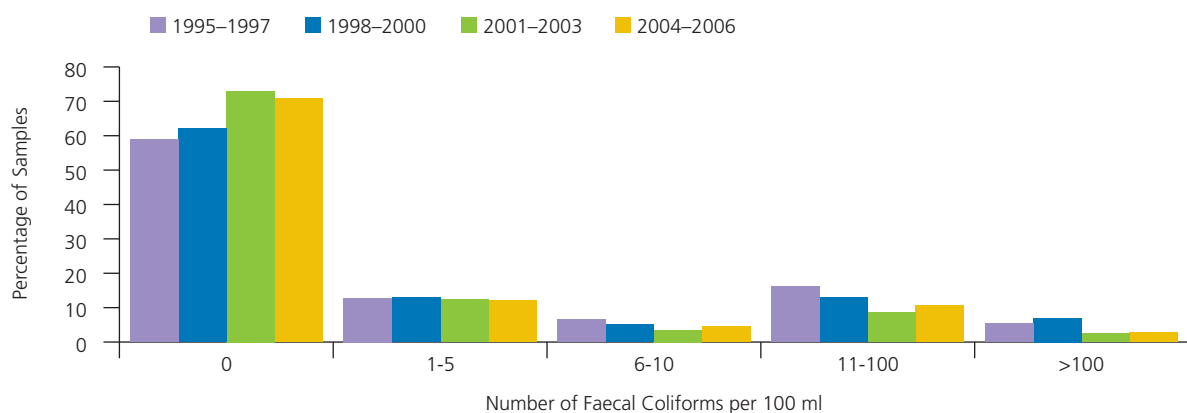
## Source

EPA, 2007. *The Quality of Bathing Water in Ireland: A Report for the Year 2006*. EPA, Wexford.

## INDICATOR 10: FAECAL COLIFORMS IN GROUNDWATER

Groundwater is a valuable resource in Ireland, used in food and industrial processing as well as being an important source of drinking water. Groundwater and springs account for approximately 26 per cent of the total drinking water supplied in Ireland while the proportion rises to 75 per cent in some counties. Although treated public water supplies and public group water schemes account for approximately 82 per cent of the total drinking water supplied in Ireland, the actual number of private group water schemes and small private supplies far exceeds that of public supply schemes. Private group water schemes and small private supplies account for approximately 17 per cent of the total drinking water supplied. The majority of the private group schemes and small supplies are reliant on groundwater and spring sources and often have inadequate treatment or, in many cases, no treatment at all. Therefore, to protect private supplies, and possibly reduce the risk of pollution of public supplies, there needs to be adequate protection of groundwater as a resource.

*Figure 10a Faecal Coliforms in Groundwater*



Source: EPA (M. Craig)

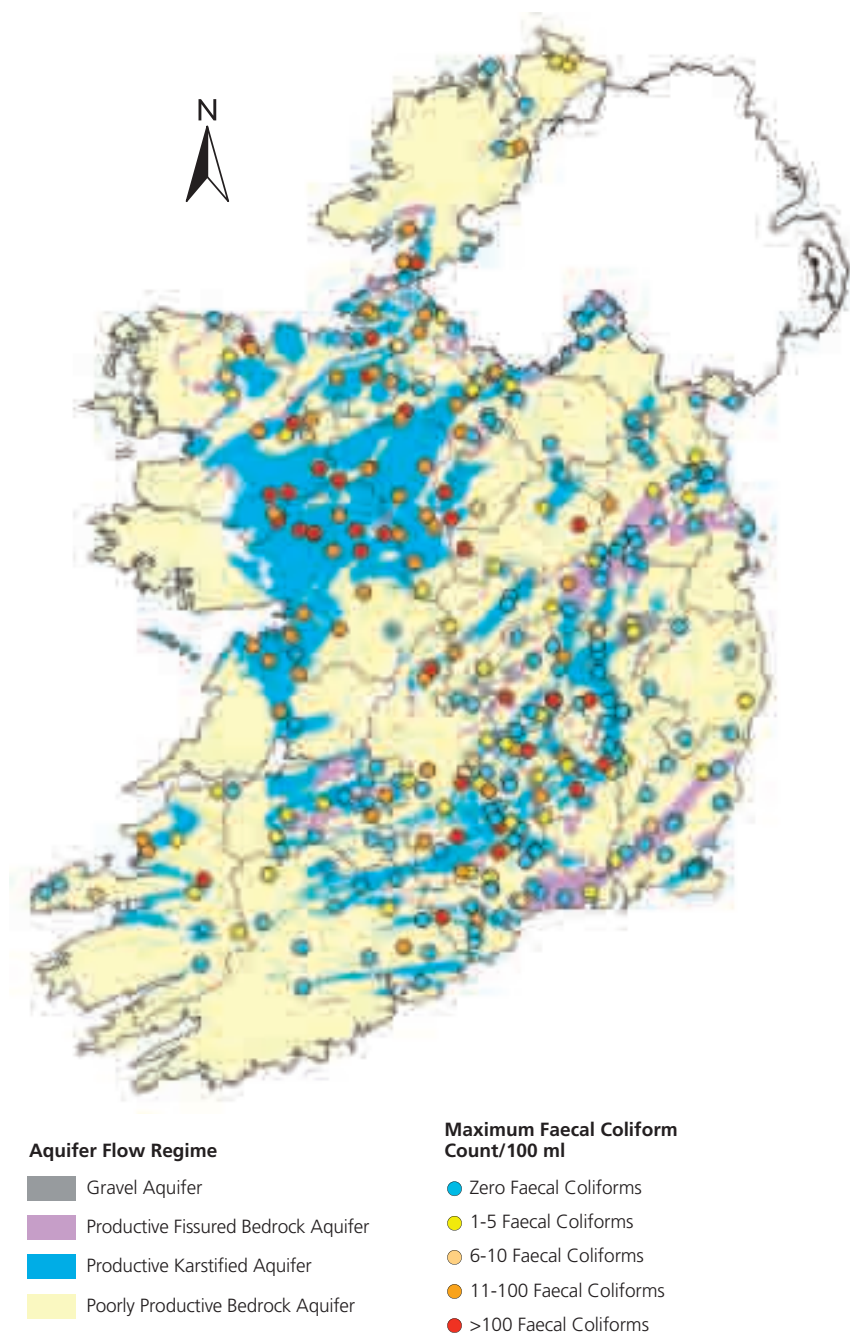
The EPA's national groundwater monitoring network includes sampling at some locations that are also used for the abstraction of drinking water. Faecal coliforms originate in human and animal waste. Their presence in water is taken as proof of faecal contamination and they provide a strong indication that pathogens, i.e. the actual disease-causing organisms, may be present. The presence of a single faecal coliform in a drinking water supply is a breach of the Drinking Water Regulations (S.I. No. 439 of 2000) in Ireland.

Between 2004 and 2006, the EPA sampled groundwater and springs as part of its national groundwater monitoring programme. The number of groundwater and spring samples with zero faecal coliforms declined slightly when compared with the previous reporting period (See Figure 10a). Approximately 29 per cent of the 1,591 samples taken between 2004 and 2006 tested positively for faecal coliforms and 13 per cent of the samples had greater than 10 faecal coliforms/100 ml. During this reporting period 57 per cent of all EPA monitoring locations had faecal coliforms in at least one sample (an increase of eight per cent from the previous reporting period), with 32 per cent of all EPA monitoring locations having greater than 10 faecal coliforms in at least one sample (an increase of one per cent from the previous reporting period).

The groundwater monitoring locations in karst limestone areas show the greatest degree of pollution (See Figure 10b). This reflects the vulnerable nature of the more dynamic flow systems to pollution. Since many private supplies are untreated and the factors influencing the water quality are unknown, or are beyond the control of the owner of the supply, general improvements in well design, knowledge of source protection and good land use practice are essential if the risk to these supplies are to be reduced and improvements in water quality are to be seen.



Figure 10b Maximum Faecal Coliform Count/100ml during 2004-2006



Source: EPA (M. Craig)

## Sources

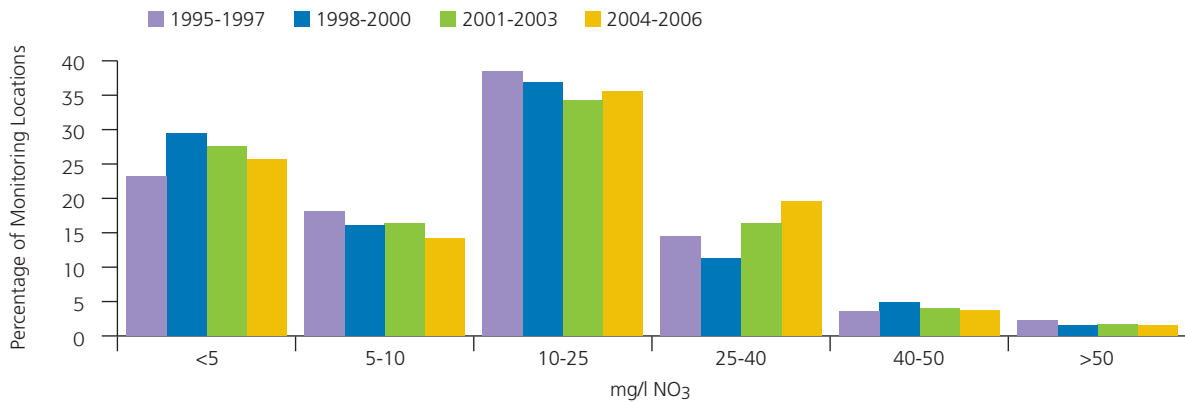
EPA (M. Craig); Page, D., Wall, B. and Crowe, M., 2006, *The Quality of Drinking Water in Ireland. A report for the year 2005*. EPA, Wexford; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. and Quinn, R., 2005. *Water Quality in Ireland 2001-2003*. EPA, Wexford.

## INDICATOR 11: NITRATES IN GROUNDWATER

Relatively low concentrations of nitrate are found in unimpacted groundwater. Higher nitrate concentrations are usually indicative of organic or inorganic inputs to groundwater. Organic sources can include waste disposal, e.g. animal waste spreading, or leaching from septic tanks, whilst inorganic sources can include the spreading of artificial fertiliser. If a significant proportion of surface water flow is derived from groundwater, then increased nitrate concentrations in groundwater may contribute to eutrophication in surface waters.

The EPA's national groundwater monitoring network includes sampling at some locations that are also used for the abstraction of drinking water. The presence of high nitrate concentrations in drinking waters may induce methaemoglobinaemia (blue baby syndrome) in bottle-fed infants if the nitrate converts to nitrite and reacts with blood haemoglobin.

Figure 11a Nitrate in Groundwater



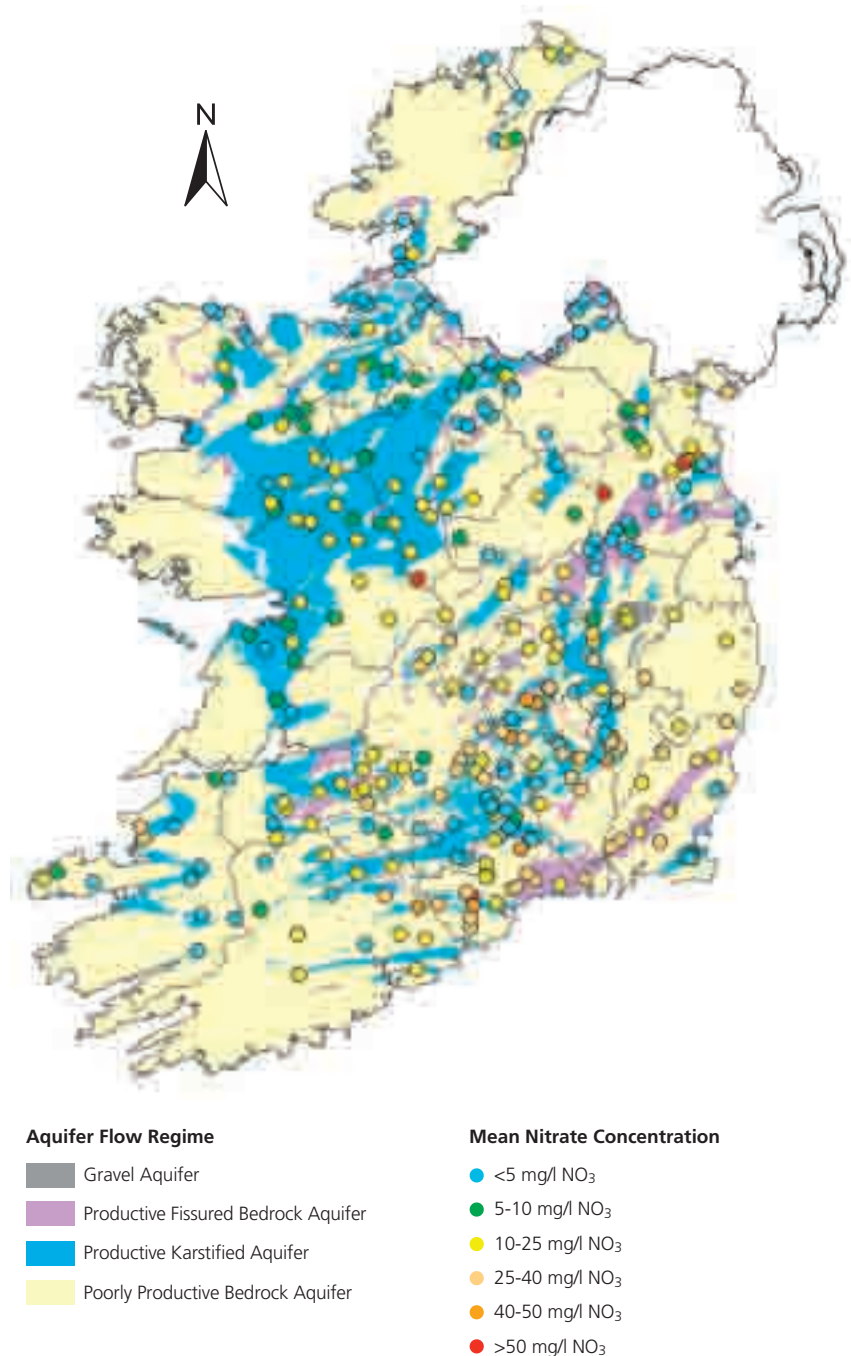
Source: EPA (M. Craig)

Between 2004 and 2006, the mean nitrate concentration exceeded the Drinking Water Regulations (S.I. No. 439 of 2000) guide concentration of 25 mg/l NO<sub>3</sub> at approximately 25 per cent of all EPA monitoring locations and exceeded the Maximum Admissible Concentration (MAC) of 50 mg/l NO<sub>3</sub> at approximately two per cent of all EPA monitoring locations.\* Since 1995 there has been a general increase in the percentage of groundwater samples with nitrate concentrations between 25-40 mg/l NO<sub>3</sub> (Figure 11a) and there has also been a decrease in the percentage of samples with nitrate concentrations between 0-10 mg/l NO<sub>3</sub>. The south-east of the country has the greater proportion of monitoring locations with elevated nitrate concentrations (See Figure 11b). See also Indicator 2: Nitrates in Rivers.

Elevated nitrate concentrations may be observed in monitoring points that are in close proximity to potential point source waste discharges. However, the spatial distribution of monitoring locations with elevated nitrate concentrations relates to areas with more intensive agricultural practices, which suggests that diffuse, agricultural sources are the cause. In recent years an increasing trend is seen in the number of monitoring locations with concentrations greater than 25 mg/l NO<sub>3</sub>, suggesting a gradual deterioration in groundwater quality, particularly in the more intensive agricultural areas of the south and east of the country. This will be examined further as part of the implementation of the Water Framework Directive.

\* Nitrate can be reported as N or NO<sub>3</sub> but there is a four-fold difference in numerical terms between the two expressions (See also Indicator 2: Nitrates in Rivers).

Figure 11b Mean Nitrate Concentrations during 2004-2006



Source: EPA (M. Craig)

## Sources

EPA (M. Craig); Flanagan, P.J., 1988. *Parameters of Water Quality*. Environmental Research Unit, Dublin; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. and Quinn, R., 2005. *Water Quality in Ireland 2001-2003*. EPA, Wexford.

## APPENDIX: PHOSPHORUS REGULATIONS UPDATE 2006

### Prepared by the Office of Environmental Enforcement

The Phosphorus Regulations, (S.I. 258 of 1998) is a legislative measure aimed at reducing eutrophication in rivers and lakes. The targets set by the Phosphorus Regulations are designed to prevent deterioration of waters of good quality and to improve waters of unsatisfactory quality to a specified standard. The Regulations require that each local authority submit an Implementation Report to the Agency every two years detailing measures it is taking to meet the specified standards. The Agency has published a number of national reports on implementation of the Regulations and on progress towards meeting the targets.

The Phosphorus Regulations require that water quality be maintained or improved by reference to the baseline biological quality rating (rivers) assigned by the Agency in the 1995-1997 review period or at the first occasion thereafter. Water quality targets set in the Regulations must be met by 2007 at the latest for waters surveyed by the EPA in the 1995-97 period and within a maximum of ten years for waters first surveyed after 1997.

Current monitoring from the 2004-2006 period indicates that, in the case of rivers, the water quality at 69.5 per cent of the monitoring stations nationally is compliant with the Phosphorus Regulations, i.e. the water quality at these river stations meets the biological and/or the molybdate reactive phosphorus (MRP) targets in the Phosphorus Regulations (Figure A1). This represents an increase of 6.1 per cent in compliance from the previous monitoring period (2001-03). This may be accounted for by a substantial and continuing increase in MRP monitoring of water quality.

Local authorities with a relatively high level of compliance (> 70 per cent of river stations compliant) with the Regulations are Roscommon, Wicklow, Dublin City,\* North Tipperary, Cavan, Meath, Kerry, Cork and Wexford. Local authorities with a relatively low level of compliance (< 50 per cent of river stations compliant) with the Regulations are Donegal and Fingal. Marked increases in compliance from the 2001-03 periods are apparent in Wicklow, Dun Laoghaire-Rathdown, Limerick, Meath, Monaghan, North Tipperary, Offaly, Kilkenny, Roscommon and Wexford. These increases are partly due to increased monitoring for MRP and in some cases overall reductions of MRP levels in rivers.

The review of river water quality carried out here, under the Phosphorus Regulations, is based on the approach of using either biological Q value data or MRP data to determine compliance. While trends in overall compliance may be attributed in part to increased levels of MRP monitoring, the assessment of compliance with the biological targets of the Regulations probably gives a better indication of trends in overall water quality status. A total of 59.3 per cent of river stations meet the biological targets of the Regulations. This represents an increase of 3 per cent in the number of stations meeting the biological targets of the Regulations from the 2001-2003 period.

Counties with a relatively high percentage of stations meeting the biological targets (>60 per cent) include Carlow, Cork, Galway, Kerry, Limerick, Mayo, Roscommon, Sligo, Waterford and Wexford. Counties with a relatively low percentage of stations meeting the biological targets (<40 per cent) include Cavan, Dun Laoghaire-Rathdown, Donegal, Fingal, Louth, Monaghan and Westmeath.

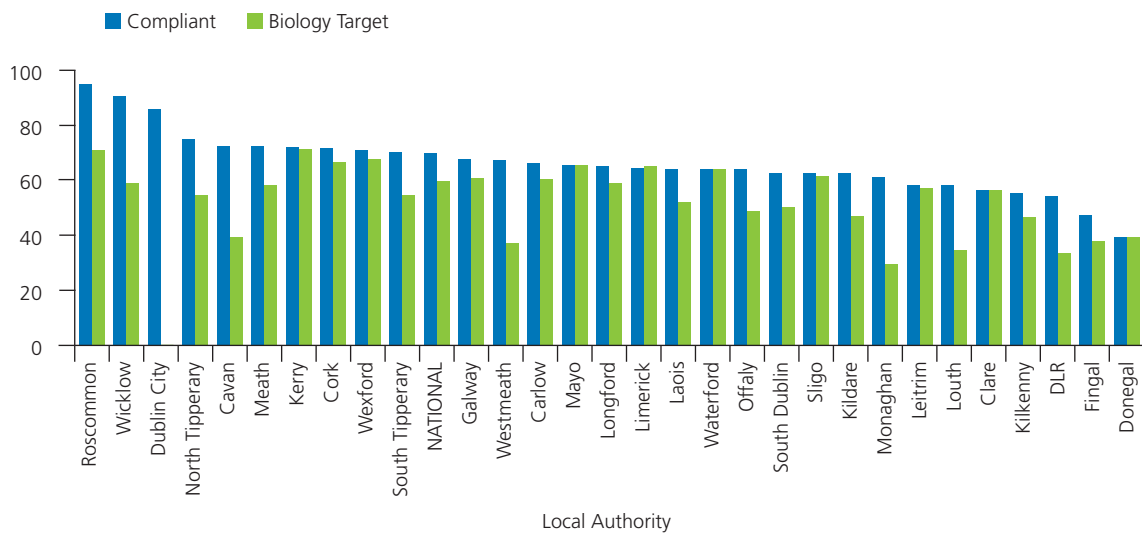
Significant improvements in biological water quality (>10 per cent) have been achieved in Dun Laoghaire-Rathdown, Limerick, Longford, Meath and Westmeath. This is most likely due to the implementation of catchment specific measures by these local authorities. However, a significant decline in compliance with the Regulations is apparent in Donegal. Reductions in compliance are most likely due to water quality decline particularly characterised by a continuing loss of high quality Q5/Q4-5 stations.

---

\* Percentage changes in compliance at monitoring stations of the Dublin local authorities (i.e., Dublin City, Dun Laoghaire-Rathdown, Fingal and South Dublin) must be treated with some degree of caution, as there are very few monitoring stations in their functional areas (<20). Thus changes in water quality at a few stations can result in large percentage changes.

The Local Authorities have proposed and or implemented a wide range of measures aimed at protecting and improving water quality. There have been some local improvements in water quality due to measures implemented. Current monitoring results indicate that significantly increased efforts will be required to meet the water quality targets of the Regulations (and indeed the more stringent targets of the Water Framework Directive).

*Figure A1 Percentage of local authority river stations compliant with the Phosphorus Regulations in 2004-06 and percentage of local authority river stations meeting biological targets of the Regulations*





ENVIRONMENTAL PROTECTION AGENCY  
PO Box 3000, Johnstown Castle Estate,  
Co. Wexford, Ireland

**t** +353 53 916 0600 **f** +353 53 916 0699  
**e** [info@epa.ie](mailto:info@epa.ie) **w** <http://www.epa.ie>



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# CÁILÍOCHT UISCE IN ÉIRINN 2006

Príomhtháscairí den Timpeallacht Uisceach

# AN GHNÍOMHAIREACTH UM CHAOMHNÚ COMHSHAOL

Is í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) comhlachta reachtúil a chosnaíonn an comhshaoil do mhuintir na tíre go léir. Rialaímid agus déanaimid maoirsiú ar ghníomhaíochtaí a d'fhéadfadh truailliú a chruthú murach sin. Cinntímid go bhfuil eolas cruinn ann ar threochtaí comhshaoil ionas go nglactar aon chéim is gá. Is iad na príomh-nithe a bhfuilimid gníomhach leo ná comhshaoil na hÉireann a chosaint agus cinntiú go bhfuil forbairt inbhuanaithe.

Is comhlacht poiblí neamhspleách í an Gníomhaireacht um Chaomhnú Comhshaoil (EPA) a bunaíodh i mí Iúil 1993 faoin Acht fán nGníomhaireacht um Chaomhnú Comhshaoil 1992. Ó thaobh an Rialtais, is í an Roinn Comhshaoil agus Rialtais Áitiúil a dhéanann urraíocht uirthi.

## ÁR bhFREAGRACHTAÍ

### Ceadúnú

Bíonn ceadúnais á n-eisiúint againn i gcomhair na nithe seo a leanas chun a chinntiú nach mbíonn astuithe uathu ag cur sláinte an phobail ná an comhshaoil i mbaol:

- áiseanna dramhaíola (m.sh. líonadh talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- diantalmhaíocht;
- úsáid faoi shrian agus scaoileadh smachtaithe Orgánach Géinathraithe (GMO);
- mór-áiseanna stórais peitreal.

### Feidhmiú Comhshaoil Náisiúnta

- Stiúradh os cionn 2,000 iniúchadh agus cigireacht de áiseanna a fuair ceadúnas ón nGníomhaireacht gach bliain.
- Maoirsiú freagrachtaí cosanta comhshaoil údarás áitiúla thar sé earnáil – aer, fuaim, dramhaíl, dramhuisce agus caighdeán uisce.
- Obair le húdarás áitiúla agus leis na Gardaí chun stop a chur le gníomhaíocht mhídhleathach dramhaíola trí chomhordú a dhéanamh ar líonra forfheidhmithe náisiúnta, díriú isteach ar chiontóirí, stiúradh fiosrúcháin agus maoirsiú leigheas na bhfadhbanna.
- An dlí a chur orthu siúd a bhriseann dlí comhshaoil agus a dhéanann dochar don chomhshaoil mar thoradh ar a ngníomhaíochtaí.

## Monatóireacht, Anailís agus Tuairisciú ar an gComhshaoil

- Monatóireacht ar chaighdeán aeir agus caighdeán aibhneacha, locha, uiscí taoide agus uiscí talaimh; leibhéil agus sruth aibhneacha a thomhas.
- Tuairisciú neamhspleách chun cabhrú le rialtais náisiúnta agus áitiúla cinntí a dhéanamh.

## Rialú Astuithe Gáis Ceaptha Teasa na hÉireann

- Cainníochtú astuithe gáis ceaptha teasa na hÉireann i gcomhthéacs ár dtiomantas Kyoto.
- Cur i bhfeidhm na Treorach um Thrádáil Astuithe, a bhfuil baint aige le hos cionn 100 cuideachta atá ina mórghineadóirí dé-ocsaíd charbóin in Éirinn.

## Taighde agus Forbairt Comhshaoil

- Taighde ar shaincheisteanna comhshaoil a chomhordú (cosúil le caighdeán aeir agus uisce, athrú aeráide, bithéagsúlacht, teicneolaíochtaí comhshaoil).

## Measúnú Straitéiseach Comhshaoil

- Ag déanamh measúnú ar thionchar phleananna agus chláracha ar chomhshaoil na hÉireann (cosúil le pleananna bainistíochta dramhaíola agus forbartha).

## Pleanáil, Oideachas agus Treoir Chomhshaoil

- Treoir a thabhairt don phobal agus do thionscal ar cheisteanna comhshaoil éagsúla (m.sh., iarratais ar cheadúnais, seachaint dramhaíola agus rialacháin chomhshaoil).
- Eolas níos fearr ar an gcomhshaoil a scaipeadh (trí cláracha teilifíse comhshaoil agus pacáistí acmhainne do bhunscoileanna agus do mheánscoileanna).

## Bainistíocht Dramhaíola Fhorghníomhach

- Cur chun cinn seachaint agus laghdú dramhaíola trí chomhordú An Chláir Náisiúnta um Chosc Dramhaíola, lena n-áirítear cur i bhfeidhm na dTionscnamh Freagrachta Táirgeoirí.
- Cur i bhfeidhm Rialachán ar nós na treoracha maidir le Trealamh Leictreach agus Leictreonach Caite agus le Srianadh Substaintí Guaiseacha agus substaintí a dhéanann ídiú ar an gcrios ózón.
- Plean Náisiúnta Bainistíochta um Dramhaíl Ghuaiseach a fhorbairt chun dramhaíl ghuaiseach a sheachaint agus a bhainistiú.

## Struchtúr na Gníomhaireachta

Bunaíodh an Gníomhaireacht i 1993 chun comhshaoil na hÉireann a chosaint. Tá an eagraíocht á bhainistiú ag Bord lánaimseartha, ar a bhfuil Príomhstíúrthóir agus ceithre Stíúrthóir.

Tá obair na Gníomhaireachta ar siúl trí ceithre Oifig:

- An Oifig Aeráide, Ceadúnaithe agus Úsáide Acmhainní
- An Oifig um Fhorfheidhmiúchán Comhshaoil
- An Oifig um Measúnacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáide

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag ball air agus tagann siad le chéile cúpla uair in aghaidh na bliana le plé a dhéanamh ar cheisteanna ar ábhar imní iad agus le comhairle a thabhairt don Bhord.



# CÁILÍOCHT UISCE IN ÉIRINN 2006

Príomhtháscairí den Timpeallacht Uisceach

Tiomsaithe ag  
SEÁN Ó LUASAIGH

Timpeallacht Uisceach  
An Oifig um Measúnacht Comhshaoil

An Ghníomhaireacht um Chaomhnú Comhshaoil  
Environmental Protection Agency

Caisleán Bhaile Sheonach  
Loch Garman  
Éire

Teil: +353 53 916 0600

Lóghlao: 1890 33 55 99

Facs: +353 53 916 0699

R.phost: [info@epa.ie](mailto:info@epa.ie)

Láithreán gréasáin: [www.epa.ie](http://www.epa.ie)

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Cé go ndearnadh gach iarracht le cruinneas an ábhair san fhoilseachán a chinntiú, ní féidir cruinneas iomlán a ráthú. Ní ghlacann an Gníomhaireacht um Chaomhnú Comhshaoil ná an t-údar le haon fhreagracht ar bith as cailliúint nó damáiste a tharla, nó a éilíodh gur tharla, mar iarmhairt, i bpáirt nó go hiomlán mar gheall ar ghníomhú aon duine nó mainneachtain chun gníomhú, mar thoradh ar ábhar a fhaightear san fhoilseachán seo. Is féidir an foilseachán ar fad nó cuid de a chóipeáil gan tuilleadh cead, ar choinníoll go n-admhaítear an foinse.

CÁILÍOCHT UISCE IN ÉIRINN 2006

Príomhtháscairí den Timpeallacht Uisceach

Arna fhoilsiú ag an  
nGNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL, ÉIRE

Dearadh le first**impression**

## BUÍOCHAS

Is mian leis an tiomsaitheoir buíochas a ghabháil leis na comhghleacaithe EPA seo a leanas as ucht a gcuid cabhrach le heolas a sholáthar, nó fáil eolais a éascú don tuarascáil: Jim Bowman, Kevin Clabby, Matt Craig, Donal Daly, John Feehan, Dara Lynott, Georgina McDermott, Martin McGarrigle, George McHugh, Michael Neill, Kirsty Nolan, Shane O’Boyle, Ciarán O’Donnell, Gerard O’Leary, Cara O’Loughlin, Maeve Quinn, Gavin Smith, Ray Smith, Tom Stafford, Larry Stapleton, Deirdre Tiy agus Robert Wilkes. Ina theannta gabhtar buíochas leis na baill foirne hidriméadacha seo a leanas san EPA, ar son Donal Daly agus Matt Craig, as ucht sonraí screamhuisce a bhailiú: John Agnew, Michael Bourke, Michael Browne, Albert Curran, Pat Durkin, Martin Kerr, Brendan Magennis, Margaret Maher, Hugh McGinley, Matt Morgan, Jim Penny, Donal Quinn, John Rigney, Joe Reilly, Jim Ryan agus Michael Stapleton.

Tá buíochas faoi leith ag dul dóibhsean ó ghníomhaireachtaí eile a sholáthraigh eolas, i. An Bord Lárnach Iascaigh (T. Champ); An Roinn Cumarsáide Mara agus Acmhainní Nádirtha (J. Carney); Gardaí Cósta na hÉireann (E. Clonan); Foras na Mara (E. McGovern, E. Joyce agus J. Silke); Boird Iascaigh Réigiúnaigh (Fisheries and Senior Fisheries Environmental Officers) a sholáthraigh buneolas staitisticiúil ar shlad éisc, .i. Bord Iascaigh Réigiúnaigh an Deiscirt (P. Kilfeather, D. McNly agus F. O’ Donoghue), Bord Iascaigh Réigiúnaigh an Iardheiscirt (P. O’Connor agus M. McPartland), Bord Iascaigh Réigiúnaigh na Sionainne (M. Fitzsimons agus C. Kerins), Bord Iascaigh Réigiúnaigh an Iarthair (K. Rogers), Bord Iascaigh Réigiúnaigh an Iarthuaiscirt (S. Neylon agus H. Neary), Bord Iascaigh Réigiúnaigh an Tuaiscirt (B. Maguire agus A. Ní Shúilleabháin); Bord Iascaigh Réigiúnaigh an Oirthir (B. Beckett, D. Byrne, G. Hannigan, M. Kirrane agus N. McGloin).

Soláthraíodh bunsonraí uisce snámha don EPA (K. Nolan, G. McHugh, G. Smith agus T. Stafford) ag na húdaráis áitiúla seo a leanas: Comhairle Contae an Chláir (P. O’ Brien); Comhairle Contae Chorcaí (D. Sheehan); Comhairle Contae Dhún na nGall (P. Gallagher); Comhairle Cathrach Bhaile Átha Cliath (K. Callanan); Comhairle Chontae Dhún Laoghaire Ráth an Dúin (P. O’Keefe); Comhairle Chontae Fhine Gall (E. Whyte); Comhairle Cathrach na Gaillimhe (S. Kennelly); Comhairle Contae na Gaillimhe (C. Sullivan agus A. Dolan); Comhairle Contae Chiarraí (D. Lenihan); Comhairle Contae Liatroma (A. Reynolds); Comhairle Contae an Lú (B. Gallagher); Comhairle Contae Mhaigh Eo (K. Donnelly); Comhairle Contae na Mí (G. Duggan); Comhairle Contae Shligigh (P. Bergin); Comhairle Contae Loch Garman (A-M. Casey agus K. Mazur); Comhairle Contae na hIarmhí (A. Bonner); Comhairle Contae Loch Garman (S. Casey); Comhairle Contae Chill Mhantáin (E. Dillon).

Soláthraíodh sonraí breise uisce i lochanna i. sa bhreis ar na sonraí úd a bhailigh an EPA (D. Tierney, C O’Loughlin, E. Greenan, M. Neill agus R. Smith), uathu seo a leanas: An Bord Lárnach Iascaigh (T. Champ agus J. Hennelly); Comhairle Contae an Chabháin (C. O’Callaghan); Comhairle Contae an Chláir (T. Duffy); Comhairle Contae Chorcaí (D. Sheehan); Comhairle Contae Dhún na nGall (P. Casey agus G. McGinley); Comhairle Cathrach Bhaile Átha Cliath (D. Morrissey agus A. Boylan); Comhairle Contae na Gaillimhe (M Ní Chionna, D. Connell, A. Dolan agus C. Sullivan); Comhairle Contae Chiarraí (D. Lenihan); Comhairle Contae Liatroma (A. Reynolds agus E. Gibbons); Comhairle Contae Luimnigh (C. Gleeson); Comhairle Contae Longfoirt (A. Brady agus A. Skelly); Comhairle Contae an Lú (S. O’Callaghan); Comhairle Contae Mhaigh Eo (M. Sweeney agus H. Neary); Comhairle Contae na Mí (V. Collins); Comhairle Contae Mhuineacháin (B. O’ Flaherty agus G. Kelly); Bord Iascaigh Réigiúnaigh an Tuaiscirt (C. Glennon); Bord Iascaigh Réigiúnaigh an Iarthuaiscirt (H. Llyod agus B. Maguire); Comhairle Contae Uibh Fháilí (T. Mitchell agus C. Magee); Comhairle Contae Ros Comáin (J. Duggan); Comhairle Contae Shligigh (P. Bergin); Comhairle Contae Thiobraid Árann Thuaidh (P. J. Phelan); Comhairle Contae Thiobraid Árann Theas (M. Graham); Comhairle Contae Loch Garman (P. Carroll); Comhairle Contae na hIarmhí (A Marshall, M. Connolly); Comhairle Contae Loch Garman (T. Griffin agus J. Sexton).

Faoi dheireadh, Go raibh maith agat lenár gcomhghleacaí san EPA Micheál MacCárthaigh as ucht athbhreithniú a dhéanamh ar an aistriúchán Gaeilge.

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## RÉAMHRÁ

Is í an tuarascáil seo an dara tuarascáil i sraith staitisticí achoimre bliantúla a d'fhoilsigh an Ghníomhaireacht, ar an eolas deireanach maidir le cáilíocht uisce in Éirinn. Leagann sé amach ar bhealach cruinn roinnt príomhtháscairí do cháilíocht uisce, bunaithe ar na sonraí is nuashonraí atá ar fáil. Is iad na táscairí seo na príomhstaitisticí a thugann achoimre ar shaincheist cáilíochta uisce. Le chéile, is é an luach atá orthu ná go dtugann siad eolas tráthúil, atá daingean go heolaíoch ar cháilíocht uisce do lucht ceaptha beartais ach go háirithe chomh maith leis an bpobal i gcoitinne. Ba le haghaidh 2005 ab ea an chéad tuarascáil sa tsraith (Lucey, 2006).

Díríonn an tuarascáil táscaire seo ar shaincheist: cáilíocht éiceachóras uisceach Mar sin comhlánaíonn sí na tuarascálacha táscaire náisiúnta comhshaoil, ina bhfuil measúnú comhtháite treoraithe de ghnáth ag, *cinn tiomána (driving force)*, *brúnna (pressures)*, *staid (state)*, *tionchar (impact) agus freagairt (response)* (DPSIR). Foilsíodh an tuarascáil dheireanach den sórt sin leis an nGníomhaireacht mar *Environment in Focus 2006: Environmental Indicators for Ireland* (Environmental Informatics and Reporting Unit, 2006). Le dúbailt nach gá a sheachaint, níl sa tsraith ar cháilíocht na timpeallachta uiscí ach na táscairí ar féidir cur síos orthu mar tháscairí díreacha timpeallachta. I bhfocail eile ní dhéantar ach na táscairí ar *thionchar* nó *staid* a mheas. Mar gheall ar an tábhacht a bhaineann le fosfar mar chothaitheach saibhríthe i dtimpeallacht uisceach na hÉireann socraíodh an ghné seo a chur san áireamh mar tháscaire d'aibhneacha.

Díríonn an tuarascáil seo ar na táscairí a mheastar gurb iad na príomhtháscairí iad ar cháilíocht uisce thimpeallaigh in Éirinn, tá 11 acu san iomlán chun na críocha reatha. Chomh maith leis an staid reatha a thabhairt maidir le staid na hacmhainne uiscí, áiríonn an tuarascáil freisin anailís ar threochtaí thar am. Ní féidir feabhas nó meath a aithint agus cláir beart a chur i bhfeidhm ach trí eolas stairiúil a chur san áireamh. In Éirinn bailítear sonraí bitheolaíoch ar cháilíocht aibhneacha thar shraithchúrsa trí bliana agus tagann an tuarascáil ag an am céanna le deireadh na tréimhse dheireanach den sórt sin, i. 2004-2006 Ar an gcaoi chéanna, cé go mbailítear go bliantúil é, tugtar tuairisc ar eolas ar uisce inbhearach agus cósta chomh maith le lochanna agus screamhuisce ar an mbealach rollach sin ach tá an measúnú roimhe thar eatramh cúig bliana. Áiríonn gach táscaire eolas do 2006.

Is í an stíl láithreachais ná go bhfuil na táscairí leagtha amach ar bhealach 'seasaimh aonair', agus uasfhad de dhá leathanach acu lena n-áirítear grafaic, ionas go bhfuil measúnú cruinn ar fáil do gach ceann de na 11 táscaire.

I dtuarascáil dheireanach Ghníomhaireacht Eorpach an Chomhshaoil (EEA), rinneadh achoimre ar dhearcadh na tíre maidir le cáilíocht uisce mar seo a leanas: 'Is é eotrófú aibhneacha, lochanna agus uiscí taoide fós an phríomhbhagairt i gcás uiscí dromchla agus is iad sileadh de bharr talmhaíochta agus ó bheartaíocht bhardasach is mó is siocair leis. (EEA, 2005). Mar a fheictear ón tuarascáil reatha, d'fhéadfadh sé seo cur síos go cruinn ar an staid reatha, ach a chur leis go bhfuil an chéad cheann de na brúnna seo ar an mbagairt is mó do cháilíocht an acmhainn screamhuisce.

Rinne Coimisiún na hEorpa (EC) atlas a léiríonn oiread an truaillithe cothaithe, i. níotráit agus fosfar, san Eoraip, a aithníonn Éire, i dteannta leis an Ísiltír, an Bheilg, an Danmhairg, an Fhrainc agus an Iodáil, leis na leibhéil is airde brú cothaitheach. Aithníodh dlúthnasc idir brú méadaithe cothaitheach ar an timpeallacht agus táirgeadh beostoic ardlúis. Léiríonn an staidéar go minic go gcailltear cothaitheigh bhreise mar gheall ar chleachtais mar ró-thoirchiú, rud a cheart, *ipso facto*, cosc a shimpliú. Léirigh an staidéar uile-Eorpach go raibh úsáid leasachán níotráite, dhá uair chomh hard le riachtanais na mbarraí, uaireanta. (Mulligan *et al.*, 2006). Is léir go bhfuil gá le cleachtais feabhsaithe d'úsáid leasachán, leasachán le fréamhacha aoiligh agus mianra araon, ar fud réigiún na hEorpa ar fad agus coigiltis eacnamaíochta mar thoradh air.

Taifeadadh méadú beag arís ar fhad cainéal neamhthruaillithe chóras aibhneacha na hÉireann don tréimhse 2004-2006. Ach fós, tá 28 faoin gcéad den fhad iomlán míshásúil go méid áirithe. Ar an gcaoi chéanna, cé go léiríonn an céatadán de lochanna i riocht sásúil roinnt feabhais, measadh go raibh 15 faoin gcéad níos lú ná sásúil. Ar an taobh eile den scéal, is é screamhuisce an t-aon chóras a léiríonn treocht laghdaithe ar cháilíocht uisce agus tá bainistíocht níos géire na hacmhainne sin ag teastáil go práinneach.

Is é an dúshlán faoin gCreat-treoir Uisce (WFD) (2000/60/EC), ná go mbeadh na huiscí ar fad, uisce dromchla agus screamhuisce aron, i stádas maith nó níos airde faoi 2015.\* D'fhéadfadh an feabhas incriminteach bliantúil taifeadta ar cháilíocht uisce dromchla, bunaithe ar an bhfeabhas a tharla idir 2005 agus 2006 agus don tréimhse trí bliana ó i 2004, dá gcoimeádfaí é, Éire a fhágáil taobh thiar den sprioc WFD san am atá fágtha le feabhsú; mura n-infheistíonn gach duine, geallchoimeádaíthe agus lucht déanta beartais, a bhfuil baint acu leis an bpróiseas, iarracht glan amach i gcur chuige comhoibritheach, i gcláir beart a chur i bhfeidhm, leis an staid a aisghabháil. Thóg staidéar le déanaí faoi deara mura n-athraíonn úsáid reatha talún mar an gcéanna go mbeidh sé an deacracht éilimh an WFD a fhreagrú (Donohue *et al.*, 2006). Ach, agus an chineál truaillithe atá ag tarlú in Éirinn tógtha san áireamh, saibhriú cothaitheach den chuid is mó, níl ach am aisghabhála réasúnta gearr d'éiceachórais uisceacha agus mar sin ba cheart go mbeadh an chuspóir de stádas cáilíochta maithe do gach corp uisce indéanta.

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\* Is iad aidhmeanna an WFD ná stádas ard uiscí a choimeád áit a bhfuil sé ann, aon mheath ar stádas reatha uiscí a sheachaint agus stádas maith ar a laghad a bhaint amach do gach uisce faoi 2015.

## ACHOIMRE

D'fhéadfaí achoimre a dhéanamh ar na 11 táscaire a úsáidtear sa tuarascáil seo leis na coinníollacha uisce thimpeallaigh i 2006 agus sna blianta roimhe a léiriú, mar seo a leanas:

- Léirigh cáilíocht sa mheasúnú ar na 13,200 km de chainéal aibhneacha agus sruthanna i 2004-2006 roinnt feabhais, i gcomparáid leis an tréimhse 2001-2003, agus 71.4 faoin gcéad neamhthruaillithe, 18.1 faoin gcéad ábhairín truaillithe, 10.0 faoin gcéad measartha truaillithe agus 0.6 faoin gcéad truaillithe go dona.
- Léirigh leibhéal níotráite in 11 abhainn mór difríochtaí ar fud na tíre agus na leibhéal is airde taifeadta san oirdheisceart. Tá leibhéal níotráite méadaithe go suntasach ag na haibhneacha seo ar fad, ach amháin dhá abhainn, i 2006, i gcomparáid leis an uair a tógadh samplaí uathu den chéad uair go deireanach sna 1970í nó sna 1980í luatha.
- Léirigh leibhéal fosfair in 11 abhainn mór difríochtaí ar fud na tíre. Sampla a léiríonn éagsúlacht idir abhantraigh ná go raibh an luach airmheáin bliantúil don Bheará níos airde ná an tSionainn faoi shé. Ní bhainfeadh ach cúig cinn de na suíomhanna móra aibhneacha seo sprioc na Rialachán Fosfaire amach i 2006. Tá forbhreathnú ar na Rialacháin, go háirithe maidir leis an staid do 2006, san áireamh.
- Léirigh cáilíocht san achar dromchla locha de 1014 km<sup>2</sup> a scrúdaíodh i 2004-2006 feabhas beag ón tréimhse roimhe (2001-2003), agus 91.9 faoin gcéad olagatrófach nó méiseatrófach (neamhthruaillithe), 4.6 faoin gcéad eotrófach agus 3.5 faoin gcéad hipeatrófach. Ba é an líon lochanna a measúnaíodh ná 449, agus bhí 66 acu seo níos lú ná sásúil.
- I 2006 tuairiscíodh 34 shlad ar éisc i gcomparáid le 45 shlad sa bhliain roimhe. Tá an ráta bliantúil seo, cé go bhfuil sé laghdaithe i gcomparáid leis na blianta roimhe, ag leibhéal ard nach bhfuil inghlactha toisc gur cur isteach tubaisteach ó thaobh an chomhshaoil de ar bheatha uisceach atá i ngach slad ar éisc.
- Léirigh cáilíocht i 69 gcorp uisce ó 21 cheantar inbhearach agus cósta i 2002-2006 go raibh 25 (36.2%) neamhthruaillithe, bhí 29 (42.1%) idirmheánach, d'fhéadfadh 2 (2.9%) bheith eotrófach agus bhí 13 (18.8%) eotrófach. Léiríonn sé seo laghdú beag ar stádas i gcomparáid leis an tréimhse dheireanach roimhe ach d'fhan an líon iomlán corp uisce sna haicmí eotrófacha nó eotrófach féideartha mar an gcéanna.
- I 2006 léirigh an cháilíocht uiscí sliogéisc go raibh 25 faoin gcéad de shuíomhanna in Aicme A (Stádas is Airde) agus bhí 56 faoin gcéad in Aicme B (Cáilíocht Idirmheánach) agus ní raibh aon suíomhanna in Aicme C (Cáilíocht Íseal). Is féidir é seo a chur i gcomparáid leis an staid sa dhá bhliain roimhe nuair a bhí 30 faoin gcéad in A agus 54 faoin gcéad i B i 2005 agus bhí 30 faoin gcéad in A, 59 faoin gcéad i B agus 2 faoin gcéad i C i 2004.\*
- I 2006 bhí 44 eachtra truaillithe san fharraige, ina raibh doirteadh ola i gceist i thart ar 77 faoin gcéad acu agus ábhair eile, m.sh. algaí nó blásanna neamhaitheanta i gceist i 23 faoin gcéad. Léiríonn an líon leo laghdú beag i gcomparáid leis na 46 eachtra don bhliain roimhe.
- Léirigh cáilíocht ag na 13 uisce snámha go raibh beagnach 97 faoin gcéad de shuíomhanna ag comhlíonadh íosluchanna teorann éigeantach an AE agus go raibh 90 faoin gcéad ag comhlíonadh leis na luachanna teoracha níos déine. I gcomparáid le 2005, léiríonn sé seo méadú agus laghdú d'aon faoin gcéad faoi seach.
- Sa tréimhse 2004-2006 bhí bachaillíní drólannacha faecacha in ar a laghad sampla amháin i gcás 57 faoin gcéad de shuíomhanna monatóireachta screamhuisce (méadú 8% ón tréimhse tuairiscithe roimhe 2001-2003), agus bhí níos mó ná 10 mbachaillín drólannach faecach ag 32 faoin gcéad de na suíomhanna (méadú 1 faoin gcéad ón tréimhse tuairiscithe roimhe).
- Sháraigh thart ar 25 faoin gcéad de shuíomhanna screamhuisce meán-chomhchruinniú níotráite na teorach d'uisce óil (méadú 2% ón tréimhse tuairiscithe roimhe 2001-2003), agus sháraigh dhá faoin gcéad an teorainn éigeantach (an céatadán céanna agus a sháraigh sa tréimhse tuairiscithe roimhe).

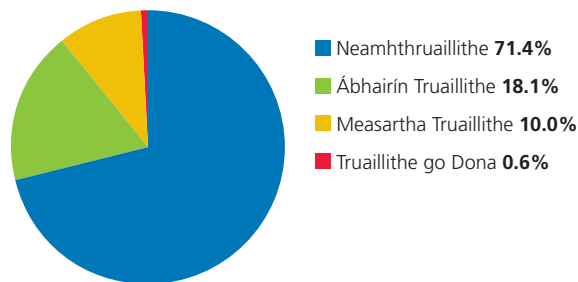
\* Ní hionann é seo is a rá go bhfuil 100 sna ceatadán san iomlán san aicmiú sin uiscí sliogéisc toisc go bhfágfar amach ceantair le suíomhanna a bhfuil níos mó ná aicme amháin acu.

## TÁSCAIRE 1: CÁILÍOCHT AIBHNEACHA

Breathnaítear ar an staid cáilíochta uisce sa 13,200 km de chainéal aibhneacha agus sruthanna a ndearna an EPA suirbhé air, agus úsáid á baint as modh measúnaithe bhitheolaíochta, mar táscaire ionadach ar stádas náisiúnta uiscí den sórt sin agus meastar go léiríonn sé aon treochtaí iomlána i gcoinníollacha. Bailítear na sonraí ar shraith trí-bliana agus chríochnaigh an tréimhse dheireanach den sórt sin i 2006.

Léirítear fad iomlán na n-aibhneacha a ndearnadh suirbhé air i 2004-2006 agus atá sna ceithre rang caighdeán uisce bhitheolaíochta i bhFigiúr 1a. Léiríonn sé seo go bhfuil 71 faoin gcéad de fhad cainéil sásúil, léiríonn sé sin feabhas dó faoin gcéad ó shraith mhonatóireachta 2001-2003. Rangaiodh níos lú ná aon faoin gcéad (0.6%), mar a bhí amhlaidh sa tsraith roimhe, sa choinníoll is truailithe.\*

Figiúr 1a Cáilíocht Aibhneacha 2004-2006 – Céatadán fad cainéil i ngach Rang



Foinse: EPA (K. Clabby, J. Lucey agus M. McGarrigle)

Faoi na Rialacháin (I.R. Uimh. 722 de 2003) a chuireann an Chreat-treoir Uisce (CTU) i bhfeidhm tá seacht gceantar abhantraí (RBD) as na hocht gceantar abhantraí nó RBDs idirnáisiúnta ina bhfuil oileán na hÉireann roinnte chun críche bainistíochta uisce, laistigh den Tuaisceart go hiomlán nó i bpáirt. Tugann an táblú seo a leanas an miondealú deireanach ó thaobh cáilíochta de ar an gcuid de fhad cainéil i ngach ceantar leis an gcéatadán comhfhreagrach don tréimhse roimhe (2001-2003) atá léirithe idir lúbíní.

Mar a bheifí ag súil leis, bíonn na codanna níos airde de chainéal neamhtruailithe ag na réigiúin nach bhfuil chomh a gcuid daonra chomh dlúth agus nach bhfuil chomh forbartha chomh maith leis na réigiúin nach ndéantar feirmeoireacht chomh dian iontu. Ag leibhéal RBD, tugtar feabhsúcháin le déanaí faoi deara, i. méadú ar fhad neamhtruailithe i gceithre acu (Thiar Theas, An tSionainn, Thoir Theas agus Thoir).

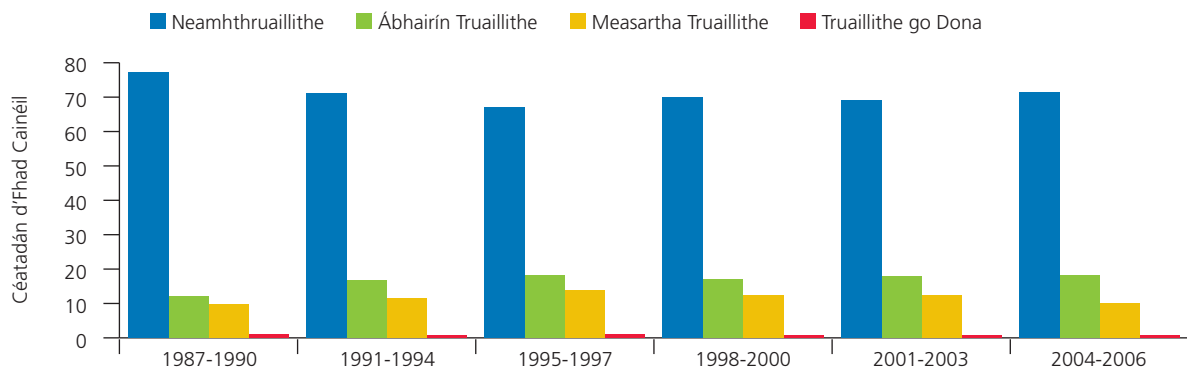
Réigiún	Neamh-thruailithe	Ábhairín Truailithe	Measartha Truailithe	Truailithe go Dona
RBD Thiar Theas	90% (89%)	8% (8%)	2% (3%)	0.2% (0.1%)
RBD Thiar	84% (84%)	10% (11%)	5% (5%)	0.1% (0.3%)
IRBD Thiar Thuaidh (Deisceart)	71% (76%)	15% (10%)	13% (12%)	0.5% (0.8%)
IRBD na Sionainne	67% (63%)	22% (21%)	11% (15%)	0.7% (0.6%)
IRBD Thoir Theas	62% (58%)	26% (28%)	12% (13%)	0.4% (0.6%)
RBD Thoir	54% (41%)	27% (28%)	18% (30%)	1.2% (1.9%)
IRBD na Banna Neagh Bann IRBD (Deisceart)	49% (55%)	30% (15%)	20% (30%)	0.6% (0.1%)

\* Bhí stráicí truailithe go dona ag na haibhneacha agus na sruthanna seo a leanas: 2004 – Bredagh, Brown's Beck Brook, Conawary (Uachtair), Corravaddy Burn, An Éirne, Glory, Sruthán Greenhill, Maggy's Burn, Baile an Mhuilinn (Ciarraí), Owenalondrig, Rúscaigh, Tobar an Choire agus Sruthán Thobar an Choire; 2005 – Sruthán Ahavarraga, Brosnach, Camac, An Chlóideach (Tulach Mhór), An Chlóideach (Port Lách), Deel (An Caisleán Nua), Sruthán Garrnacool, Sruthán Chill Chuillinn, Jiggy (Hind), Roechrow, Tolka, Tulach Mhór agus; 2006 – Sruthán Bhuirios Ó Luigheach, Droichead an Chláirín, Átha Féan, Gabhrán, Ownahinchy, Sruthán Triogue agus an Tulach.



Léiríonn Figiúr 1b na treochtaí i gcáilíocht uisce idir 1987 agus 2006. Mhéadaigh an chuid de fhad cainéal aibhneacha agus sruthanna le stádas cáilíochta uisce sásúil ar an iomlán ag breis is dó faoin gcéad sa tréimhse dheireanach (71.4%) i gcomparáid leis an tréimhse measúnaithe roimhe (69.2%). Tháinig laghdú (-2.3%) ar an bhfad measartha truailithe ach tháinig méadú beag ar an gcuid de chainéal ar bheagán truailithe (+0.2%). Mar chodarsnacht níor athraigh an chuid iomlán de chainéal truailithe go trom idir an dá tréimhse.

*Figiúr 1b Cáilíocht Aibhneacha 1987-2006 – Céatadán Fad Cainéil*



Foinse: EPA (K. Clabby, J. Lucey agus M. McGarrigle)

## TÁSCAIRE 2: NÍOTRÁITÍ IN AIBHNEACHA

Príomhtháscaire cáilíochta atá sa tíuchan níotráite in aibhneacha mar gheall ar a éifeacht saibhrithe mar chothaitheach agus mar gheall ar thionchar féideartha a bheadh ag tíuchan ard níotráite in uiscí aibhneacha as a mbítear ag baint uisce le haghaidh soláthair uisce inólta ar shláinte.

Éilíonn Treoir Níotráití an AE (91/676/EEC) ar bhallstáit bearta sonracha a ghlacadh le huiscí dromchla agus screamhuisce a chosaint ó éilliú níotráite ó ghníomhaíochtaí talmhaíochta. Achtaíodh agus foilsíodh Rialachán na hÉireann a chuireann an Treoir i bhfeidhm agus a áiríonn an plean gnímh, mar Rialachán Chomhphobal na hEorpa (Cleachtas Maith Talmhaíochta um Uiscí a Chosaint) 2006 (I.R. Uimh. 378 de 2006).\* Ina theannta d'fhéadfadh scaoileadh díreach dramhaíola, mar shéarachas, rannchur le héilliú den sórt sin agus forálann Treoir an AE i leith cóireála fuíolluisce uirbeach (91/271/EEC) do níotráit a bhaint amach ó dhramhaíl den sórt sin ar chúinsí áirithe.

Is féidir Níotráit a thuairisciú mar N nó NO<sub>3</sub> mar tá difríocht ceithre-fhillte i dtéarmaí uimhriúla idir an dá slonn (Féach freisin Táscaire 11: Níotráití i Screamhuisce). Is iad uasteorannacha agus teorannacha treorach an AE do níotráit in uisce bainte le hól ag daoine ná 11.30 agus 5.65 mg/l N faoi seach. I scéim rangaithe na hÉireann d'uiscí taoide tugadh leibhéal níotráite neamhorgánaí tuaslagtha (NNT) de 2.6 mg/l N mar ghné amháin i sraith critéar ar féidir uiscí úra taoide a shainiú mar eotrófach nó saibhrithe thairisti; ach, ní mór go mbeadh clóraifill agus ocsaigin tuaslagtha sáraithe sula sainítear ceantar amhlaidh (Féach freisin Táscaire 6: Cáilíocht Uisce Inbhearaigh agus Cósta).

Léiríonn Figiúr 2 leibhéal airmheáin bhliantúla níotráite ag ionaid a imíonn le sruth tharstu ar gach ceann de na 11 abhainn mhór thar na 24-27 mbliana seo caite. Ó seo, is léir, ach amháin i gcás na hÉirne ag Béal Tairbirt, go bhfuil méadú ar thiúchan ón iarthar go dtí an t-oirthear. Léiríodh comhghaolú deimhneach idir leibhéal níotráite agus comhréir na talún treafa ina ndobharcheantair d'aibhneacha san oirdheisceart. Cé go comhlíonann an chuid is mó d'aibhneacha sa réigiún sin le huasluch an AE de 11.30 mg/l N tá go leor acu, m.sh. cuid de chraobhaibhneacha na Bearú i measc aibhneacha eile, thar an luach treorach de 5.65 mg/l N.

Mar gheall ar a tocsaineacht do roinnt orgánach uisceach measadh go bhfuil uasleibhéal de 2 mg/l N cuí leis na speicis fíoruisce is íogaire a chosaint. Ach, moladh leibhéal níos ísle, i. <1.7 mg/l N, go náisiúnta mar an riachtanas cáilíocht do choirp uisce diúilicín péarla inbhuanaithe. Chuaigh an speiceas cosanta sin, *Margaritifera margaritifera*, táscaire íogair ar cháilíocht uisce, in éag sa Bhearú agus sa tSiúr le 25-30 bliain anuas agus feictear líon ídithe de i gcodanna den Fheoir, den tSláine agus den Abhainn Mhór cé nach eol a stádas reatha sa Mhuaidh, ach is cosúil go maireann sé fós san abhainn sin ón uair a rinneadh é a thaifeadadh ansin ar dtús i ndeireadh an naoú aoise déag. Tá daonra na Feoire i mbaol mór dul i léig agus ní mheastar go bhfuil sé inbhuanaithe, mar gheall ar shaibhriú. Tá treocht aníos arís sa leibhéal níotráite soiléir ó 2003 i leith, rud a chuireann leis an mbrú. Tá gné chosúlach le tabhairt faoi deara don Bhóinn, nach dtugann tearmann don diúilicín sin, laistigh den tréimhse chéanna.

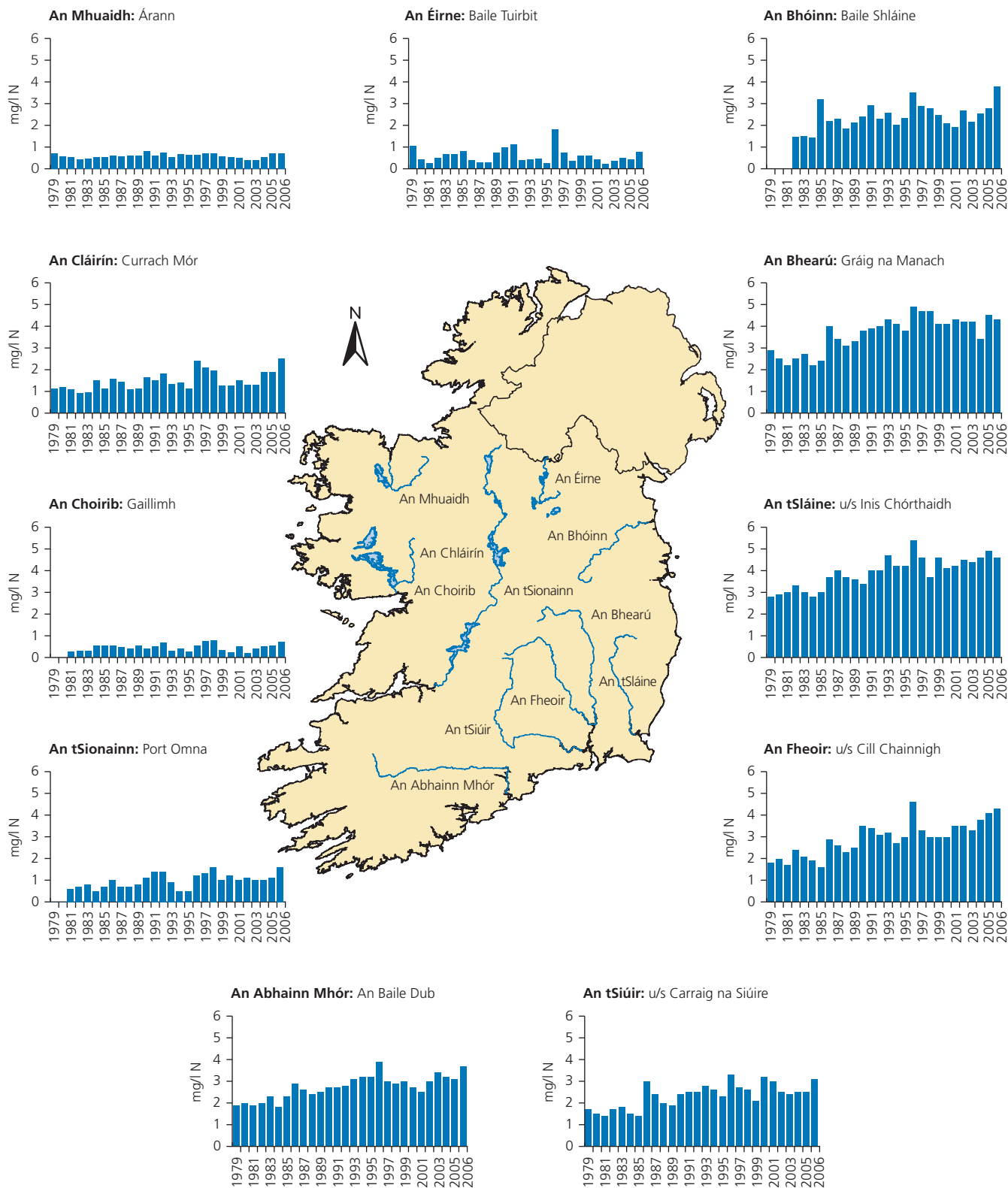
Léiríonn an táscaire seo an chodarsnacht idir na réigiúin agus leibhéal san oirdheisceart i bhfad níos airde ná leibhéal san iarthar. Is léir freisin, ó Fhigiúr 2, go bhfuil leibhéal níotráite méadaithe go suntasach ag na hionaid aibhneacha ar fad, ach amháin an Éirne agus an Mhuaidh, i 2006 i gcomparáid leis an uair a tógadh samplaí uathu ar dtús. In ord laghdaitheach ba iad na leibhéal airmheáin ab airde a tugadh tomhas orthu i 2006 ag na hionaid roghnaithe ná: An tSláine, An Bhearú+An Fheoir, An Abhainn Mhór, An tSiúr, An Bhóinn, An Chláirín, An tSionainn, An Mhuaidh+An Choirib agus an Éirne. Sampla a léiríonn an éagsúlacht i leibhéal níotráite idir abhantraigh ná go raibh an leibhéal airmheáin bliantúil don tSláine, sa bhliain roimhe 2005, níos airde ná an Éirne ag níos mó ná ord méadaíochta.

### Foinsí

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\* Déanann na Rialacháin seo cúlghairm ar, agus déanann siad ath-achtú le leasuithe, ar Rialacháin na gComhphobal Eorpach (Deachleachtas Talmhaíochta chun Uiscí a Chosaint) 2005 (I.R. Uimh. 788 de 2005).

Figiúr 2 Leibhéil Airmheáin Bhliantúla Níotráite (mg N/lítear) in Aibhneacha 1979-2006



Foinse: EPA (M. Neill, M. Quinn agus R. Smith)

## TÁSCAIRE 3: FOSFÁITÍ IN AIBHNEACHA

Príomhtháscaire cáilíochta atá sa tíuchan fosfáite in aibhneacha – mar gheall ar a éifeacht saibhrithe mar chothaitheach – i bhfíoruisce ach go háirithe. Tá cothaitheach, mar fhosfar agus nítrigin, riachtanach do phlandaí agus ainmhithe, ach má tá méid iomarcach díobh ann d'fhéadfadh laghdú suntasach teacht ar an gcallíocht uisce. Is féidir fosfáití a thabhairt isteach sa timpeallacht uisceach trí dhramhaíl tionscail, séarachais agus ainmhithe chomh maith le ó leasacháin nó agraicheimicí eile a mbíonn saibhriú uiscí (eotrófú) mar thoradh orthu.

Déantar fosfáit a thomhas mar ghnáthamh sa chlár monatóireachta aibhneacha agus léiríonn Figiúr 3 leibhéil airmheáin bhliantúla ag ionaid a imíonn le sruth tharstu ar gach ceann de na 11 abhainn mhór le 23-27 mbliana anuas. Cé gur cosúil nár tháinig méadú suntasach ar fhosfáit, i ngach abhainn ó 1979, tugadh taifead ar mhéadú ar fhás algaí filiméadacha i rith an séasúir fáis agus déantar bithmhaiseanna móra a éagann sa gheimhreadh sna haibhneacha san oirdheisceart go bliantúil. Toisc gur gnách gurb í fosfáit an cothaitheach a chuireann teorainn ar fhás plandaí i bhfíoruisce baintear amach go héasca ón uisce agus sa samhradh ach go háirithe, ní leor an anailís ar an bparaiméadar sin le saibhriú in aibhneacha a thomhas.\* Ainneoin é sin, mar is amhlaidh i gcás níotráite, as is (Féach Táscaire 2: Níotráití in Aibhneacha), tá an chodarsnacht idir ábhar fosfáite aibhneacha an iarthair agus an oirthir soiléir agus, cé nach dtóghtar ón eolaíocht é, is cosúil gur tháinig an méadú ar leibhéil fosfáite in aibhneacha an oirdheiscirt sular thosaigh sampláil i 1979. Tá monatóireacht bhitheolaíoch, úsáid á baint as flóra agus fána aibhneacha mar tháscairí, ar bun ó 1971. Léirigh an Fheoir, áit a bhfuil an diúilicín péarla fíoruisce i mbaol (Féach Táscaire 2: Níotráití in Aibhneacha), leibhéil an-arda fosfáite i 1990 agus 1991, arbh í an phríomhchúis leo ná foinse tionscail bunaithe ar thalmhaíocht, a bhí níos airde faoi thrí ná na leibhéil a tugadh tomhas orthu nuair a thosaigh sampláil i 1979 (Figiúr 3).

### Rialacháin Fosfáite

Tugadh Rialacháin Fosfáite (I.R. Uimh. 258 de 1998) isteach in Éirinn mar chuid de straitéis le dul in aghaidh eotrófaíthe agus leis an Treoir Substaintí Contúirteacha (76/464/EEC) a chur i bhfeidhm, i bpáirt. I gcás aibhneacha, forordaíonn na Rialacháin caighdeáin eatramhacha cáilíochta nach mór comhlíonadh tríd an ráta cáilíochta bitheolaíche sprice (Q-luach) nó an spriochthíuchan meánach de thiúchan fosfáite a imoibríonn le molabdáit (molybdate-reactive phosphorus) (MRP) a bhaint amach agus i gcás lochanna tá na spriocanna leagtha mar rangú stádaís thrófaigh nó mar meántíuchan fosfáite iomláine (FI).

Sna Rialacháin is é an tíuchan airmheáin MRP sprice d'aibhneacha ná 0.03 mg/l. Féach *Aguisín: Nuashonrú ar na Rialacháin Fosfair do 2006*, le forbheathnú ar na Rialacháin Fosfaire agus chomhlíonadh.

Sampla a léiríonn éagsúlacht idir leibhéil fosfáite idir abhantraigh ná go raibh an luach airmheáin bliantúil don Bhearú níos airde ná don tSionainn faoi shé. In ord laghdaitheach ba iad na luachanna airmheáin ab airde a ndearnadh tomhas orthu i 2006 sna hionaid roghnaithe ná: An Bhearú, An Fheoir, An Abhainn Mhór, An Bhóinn, An tSiúir, an Cláirín, An tSláine, An Mhuaidh, An Choirib agus an tSionainn. Ní bhainfeadh ach an cúig cinn deireanach amach an sprioc, bunaithe ar mheánleibhéal fosfáite na Rialachán Fosfair. Ach ní shárodh ach ceann amháin acusan, an tSláine, an caighdeán i 13 de na bliana ó 1979.

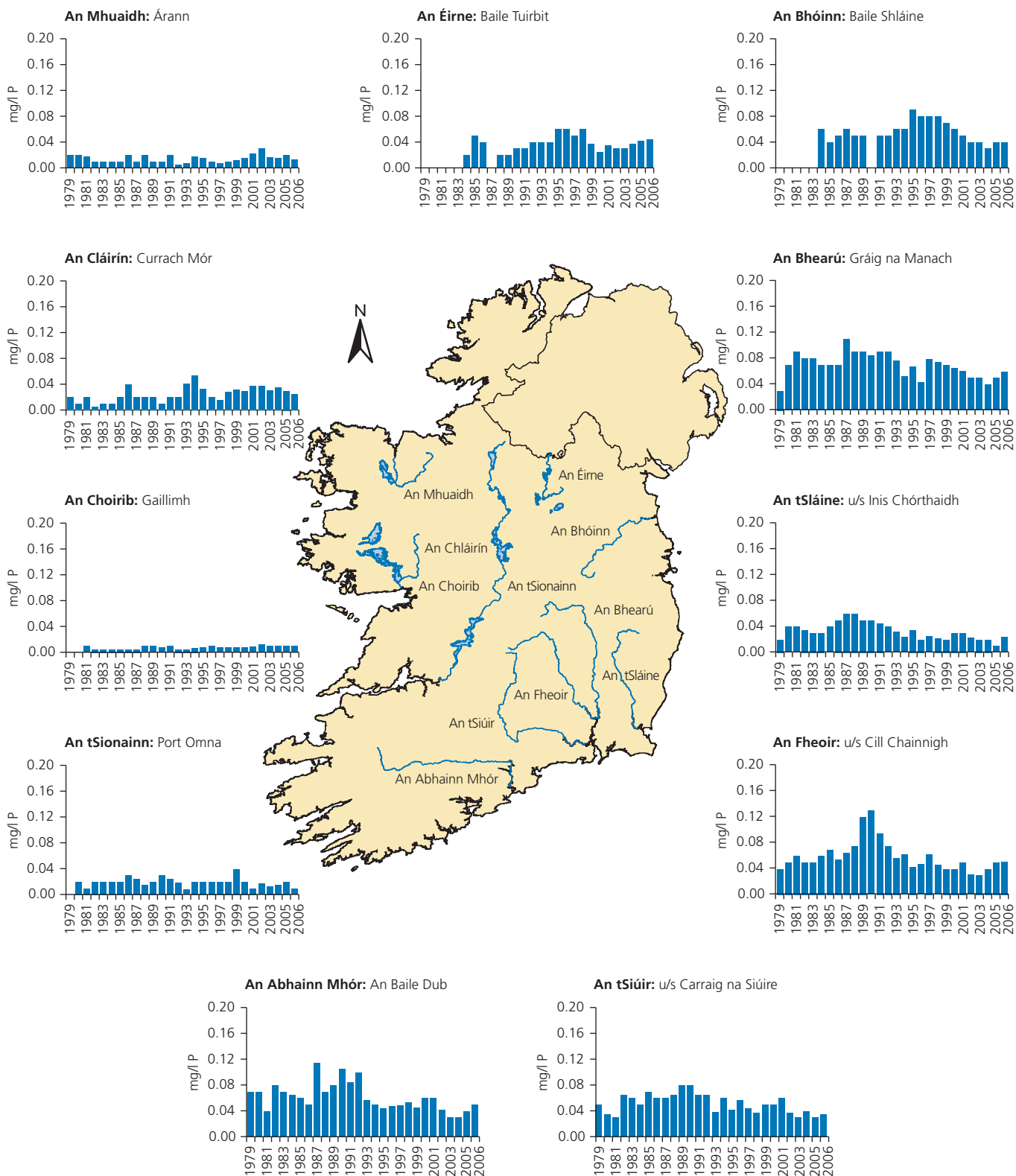
### Foinsí

W.A. House agus F. H. Denison., 1998. Phosphorus dynamics in a lowland river. *Water Research* **32**, 1819-1830; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. agus Quinn, R., 2005. *Cáilíocht Uisce in Éirinn 2001-2003*. EPA, Loch Garman; Sonraí shuirbhé monatóireachta bitheolaíoch EPA neamhfhoilsithe; Neill, M., 2006. *River Water Quality in South-East Ireland, 2005*. Tuarascáil Coimisiúnaithe ag Comhairle Contae Cheatharlaigh, Chill Chainnigh, Laoise, Thiobraid Árann (Thuaidh & Theas), Port Láirge & Loch Garman agus ag Comhairle Cathrach Loch Garman. EPA, Cill Chainnigh.

\* Rud eile faoi atá éagsúil ó níotráit, ná go n-idirghníomhann fosfar neamhorgánach tuaslagtha go láidir le dríodair, ar féidir leo feidhmiú mar shlogaíde don chothaitheach seo, sa samhradh go háirithe.

**Figiúr 3 Leibhéil Airmheáin Bhliantúla Fosfáite (mg P/lítear) in Aibhneacha 1979-2006**

Tabhair faoi deara nach raibh aon sonraí ar fáil don Bhóinn i 1990 ná don Éirne i 1987 tógadh samplaí ón dá abhainn den chéad uair i 1984



Foinse: EPA (M. Neill, M. Quinn agus R. Smith)

## TÁSCAIRE 4: CÁILÍOCHT LOCHANNA

Is é saibhriú cothaitheach, a mbíonn eotrófú mar thoradh air, an phríomhghné a chuireann brú ar cháilíocht lochanna in Éirinn. Is í an chúis leis an bhfoirm truaillithe sin ná ionchur cothaitheach, comhdhúlacha fosfáite ach go háirithe agus comhdhúlacha níotráite i méid níos lú, chuig lochanna go díreach nó trí aibhneacha insreafa níos minicí, ag tiucháin sa bhreis ar leibhéil nádúrtha. Is é an toradh a bhíonn ar na hionchuir cothaitheach seo ná fás plandaí i lochanna, foirmeacha planctónacha algaí ach go háirithe, a ndéantar a láithreach a chainníochtú tríd an clóraifill lí algaí a thomhas. Déantar stádas trófach lochanna a shocrú trí na huasluachanna bliantúla clóraifille a mheas, de réir leagan athraithe scéime a d'fhorbair an OECD.

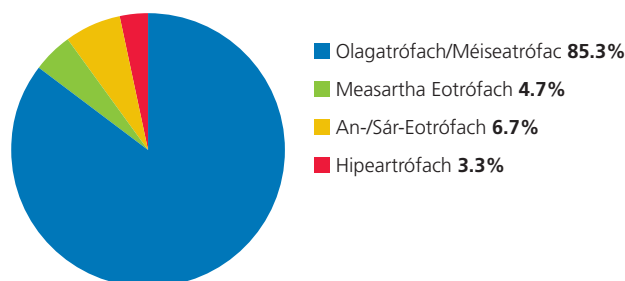
Ba é an líon lochanna a measúnaíodh sa tréimhse 2004-2006 ná 449. Tugann é seo a leanas miondealú ar rangú cáilíochta uisce na lochanna de réir líon agus achar an dromchla.

Cáilíocht Lochanna 2003-2006		
Stádas Trófach	Líon Lochanna	Achar Dromchla km <sup>2</sup>
Olagatrófach	275 (61.2%)	346.3 (34.2%)
Méiseatrófach	108 (24.1%)	585.5 (57.7%)
Measartha Eotrófach	21 (4.7%)	23.0 (2.3%)
An-Eotrófach	11 (2.5%)	10.6 (1.0%)
Sár-Eotrófach	19 (4.2%)	13.2 (1.3%)
Hipeatrófach	15 (3.3%)	35.4 (3.5%)

Bhí cáilíocht shásúil uisce ag tromlach (383 nó 85.3%) na lochanna a scrúdaíodh sa tréimhse 2004-2006, .i. stádas olagatrófach nó méiseatrófach (Figiúr 4a). Bhí cáilíocht uisce na 66 loch eile níos lú ná sásúil. As na lochanna sin rangáíodh 15 loch mar hipeatrófach, i. an stádas is mó atá saibhrithe.\* Ba é méid achar dromchla na 449 loch a scrúdaíodh ná 1014 km<sup>2</sup>. Bhí lochanna ab ionann 931.8 km<sup>2</sup> (91.9%) sna catagóirí olagatrófacha/méiseatrófacha neamhsaibhrithe. RANGAÍODH 46.8 km<sup>2</sup> eile (4.6%) mar eotrófach agus dáileadh 35.4 km<sup>2</sup> (3.5%) don chatagóir hipeatrófach.

Mhéadaigh an comhréir lochanna le stádas cáilíochta uisce sásúla ar an iomlán sa tréimhse dheireanach (85.3%) i gcomparáid le tréimhse na measúnaithe roimhe (82%). Ar an gcaoi chéanna, tá an comhréir achar dromchla lochanna (Figiúr 4b.) a chuirtear sa chatagóir don olagatrófacha/méiseatrófacha tréimhse 2004-2006 (91.9%) beagán níos airde ná an comhréir don tréimhse 2001-2003 (91%).

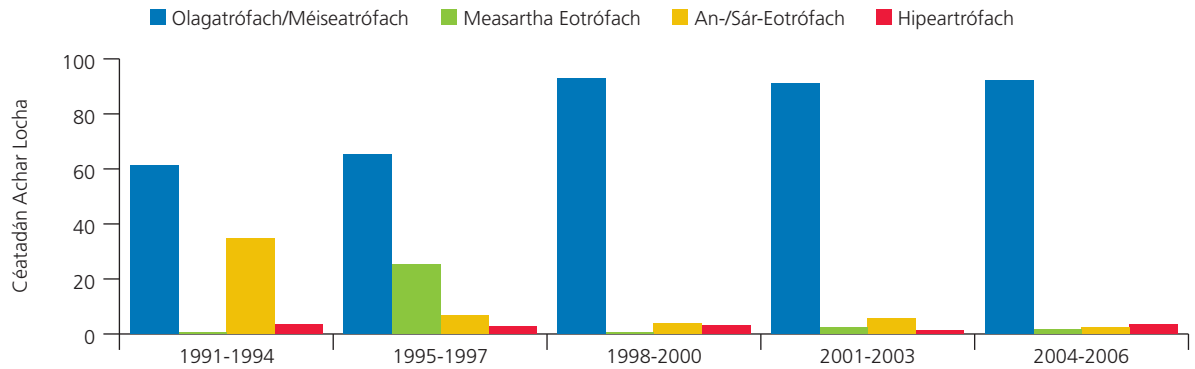
**Figióir 4a Cáilíocht lochanna 2004-2006 – Ceatadáin de Choirp Uisce i ngach Rang**



Foinse: EPA (D. Tierney)

\* Ba iad na 15 loch a rangáíodh mar hipeatrófach sa tréimhse 2004-2006 ná: Loch Lua (Co. Chorcaí); Cluhir (Co. Chorcaí); Derrygooney (Co. Mhuineacháin); Drumgole (Co. Mhuineacháin); Loch Fuinseann (Co. Ros Comáin – tóg faoi deara gur turlach é seo agus go raibh sé beagnach tirim aimsir na samplála); Gangin (Co. Liatroma); Loch Gamhna (Co. Chabháin); Inner (Co. Mhuineacháin); Monalty (Co. Mhuineacháin); Loch Mucnó (Co. Mhuineacháin); An Mullach (Co. Chabháin); na Glack (Co. Mhuineacháin); Oony (Co. Mhuineacháin); Loch Uachtair (Co. Chabháin); Peters (Co. Mhuineacháin)..

Figiúr 4b Cáilíocht Lochanna 1991-2006 – Achar Dromchla (km<sup>2</sup>)



Foinse: EPA (D. Tierney)

### Foinsí

EPA (D. Tierney); OECD, 1982. *Eutrophication of Waters. Monitoring, Assessment and Control*. OECD, Páras; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. agus Quinn, R., 2005. *Cáilíocht Uisce in Éirinn 2001-2003*. EPA, Loch Garman.

## TÁSCAIRE 5: SLAD AR ÉISC

Meastar gur táscaire ar cháilíocht uisce maith é stoic shláintiúla éisc, bradán agus breac ach go háirithe, in aibhneacha agus lochanna. Ar an taobh eile den scéal, comhartha an-soiléir de thruailliú trom é dul i léig na n-iasc seo. Is í an phríomhchúis le slad ar éisc in Éirinn ná tiúchan an-íseal ocsaigine nó gan aon tiuchán ocsaigine in uisce. D'fhéadfadh ionchur antrapaigineach ábhair orgánaigh san uisce bheith freagrach as na coinníollacha seo nó d'fhéadfadh siad tarlú mar thoradh ar fhá iomarcach plandaí.

Tiomsaíonn an Bord Lárnach Iascaigh sonraí ar shlad ar éisc in Éirinn go bliantúil, bunaithe ar thorthaí ó na Boird Iascaigh Réigiúnaigh. I 2006, tugadh tuairisc ar 34 slad ar éisc. Bunaithe ar fhiosrúcháin a rinne foireann comhshaoil bord iascaigh cuireadh i leith na gcúiseanna seo a leanas iad:

Talmhaíocht	Tionscal	Údarás Áitiúil	Eotrofú	Eile	Anaithnid	Iomlán
5	2	7	5	10	5	34

Chomh maith le tarlú mar thoradh ar dhramhaíol talmhaíochta, tionscail agus séarachais a dhul isteach i gcoirp uisce, d'fhéadfadh cúiseanna eile, mar oibreacha sibhialta, bheith freagrach as marú éisc, mar is féidir a fheiceáil ón sampla réigiúnach seo a leanas. I gceantar Bhord Iascaigh Réigiúnaigh an Iardheiscirt, a chlúdaíonn Corcaigh agus Ciarraí, tugadh taifead ar ocht slad ar éisc i 2006. Dheimhnigh fiosrúcháin an chúis i gceithre chás (dhá cheann mar thoradh ar scaoileadh talmhaíochta agus dhá cheann eile mar thoradh ar oibreacha draenála sa sruth) ceapadh gur tharla trí cinn eile mar thoradh ar thalmhaíocht, oibreacha sibhialta agus póitseáil agus ní rabhtas in ann an ceann eile a chur i leith aon chúise.

Tháinig méadú suntasach ar shlad ar éisc in aibhneacha na hÉireann sna 1970í ag an am céanna le dianú na talmhaíochta. Mar fhreagra ar an staid seo, sheol na Boird Iascaigh Réigiúnaigh agus na hÚdaráis Áitiúla feachtas eolais phoiblí ar fud na tíre agus chuir siad straitéis fhorfheidhmiúcháin ar bun.

Léiríonn an treocht i slad ar éisc le 21 bhliain anuas (Figiúr 5) gurbh iad 1987 agus 1989 na blianta ba mheasa nuair a tugadh tuairisc ar 100 slad ar éisc agus bhí an líon ba lú ag 2001. Léiríonn an líon tarlúintí den sórt sin i 2006 laghdú i gcomparáid le 2004 agus 2005 nuair a tugadh tuairisc ar 43 agus 45 faoi seach.

Áiríonn an líon sladanna ar éisc bás athfhillteach éisc in Abhainn Avoca mar gheall ar mhianach aigéid láisteáit a bhí freagrach i 2006 as leath den slad a dáileadh don chatagóir 'Eile' sa táblú thuas. Coimisiúnaíodh planda cóireála píolótach le cabhrú leis an bhfadhb a mhaolú i réimsí ísleAbhainn Abhóca mar gheall ar scaoileadh ó mhianaigh copair atá ag tarlú le breis is 200 bliain.

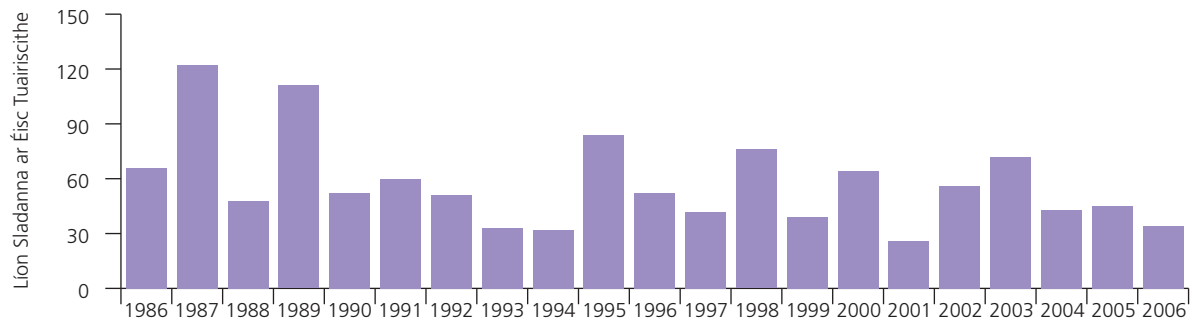
Comhartha de chur isteach tubaisteach ar éiceachóras atá i slad ar éisc agus, cé gur cosúil go bhfuil an staid éirithe seasta ar bhealach, tá an líon sladanna ar éisc tuairiscithe fós ag leibhéal an-ard nach bhfuil inghlactha.

### Foinsí

Sonraí Bhoird Iascaigh Réigiúnacha arna bhailiú ag an bPríomh-Bhord Iascaigh; Bord Iascaigh Réigiúnach an Iar-Dheiscirt, 2007. *Tuarascáil Bhliantúil 2006*. Bord Iascaigh Réigiúnach an Iar-Dheiscirt, Maigh Chromtha.



*Figiúr 5 Slad ar Éisc 1986-2006*



*Foinse: Boird Iascaigh Réigiúnacha*

## TÁSCAIRE 6: CÁILÍOCHT UISCE INBHEARAIGH AGUS CÓSTA

Mar is amhlaidh le fíoruiscí, cuireann lódáil méadaithe cothaitheach a mbíonn eotrófú mar thoradh air brú méadaitheach ar uiscí inbhearacha agus cósta na hÉireann.

Rinneadh measúnú ar stádas trófach 69 gcorp uisce ó 21 cheantar inbhearach agus cósta ar fud na hÉireann don tréimhse 2002-2006. Léiríonn an measúnú ar na coirp uisce inbhearacha agus cósta sin gur rangáíodh 13 acu (18.8%) mar eotrófach, rangáíodh dhá cheann (2.9%) mar eotrófach féideartha, rangáíodh 29 (42.1%) mar idirmheánach agus rangáíodh 25 (36.2%) mar neamhthruaillithe.

Go ginearálta níor tháinig athrú ar stádas uiscí taoide in Éirinn ón tréimhse 1999-2003. I gcomparáid leis an measúnú a rinneadh do 2001-2005, léirigh seacht gcorp uisce laghdú ar stádas don tréimhse rollach dheireanach cúig bliana. Tá trí cinn acusan, inbhear na Sláine, inbhear na hAbhann Móire uachtair agus Cuan Loch Garman rangaithe mar eotrófach anois, agus tá Cuan Dhún Garbháin, Cuan Shligigh, inbhear na Laoi Íochtair (Trá Lí) agus Cuan Eochaille a bhí rangaithe mar neamhthruaillithe roimhe sa chatagóir idirmheánach anois.

Léirigh trí hinbhear, Loch Machain, an Forghas agus stráice taoide fíoruisce na Sionainne feabhas ar stádas cáilíochta. D'fheabhsaigh stádas an dá chorp uisce deireanach ó idirmheánach sa tréimhse 2001-2005 go neamhthruaillithe sa mheasúnú deireanach. Léirigh Loch Machan, atá sa chatagóir idirmheánach, feabhas mór diáidh ar ndiaidh le blianta beaga anuas agus é rangaithe mar eotrófach sa tréimhse 1999-2003 agus ansin mar eotrófach féideartha i 2001-2005. Is cosúil gur tháinig an feabhas follasach ar stádas cáilíochta uisce an chorp uisce seo mar thoradh ar an bplanda cóireála fuíolluisce uirbhig nua-choimisiúnaithe (Cork Main Drainage) ag an Oileán Beag, cé go bhfuil tuilleadh fiosrúcháin ag teastáil sular féidir é sin a dheimhniú.

Comharthaíonn sonraí ó chlár monatóireachta cothaitheach geimhridh Fhoras na Mara, in uiscí cósta Muir Éireann thiar agus na Mara Ceiltí theas, nár tharla aon saibhriú iomarcach cothaitheach.

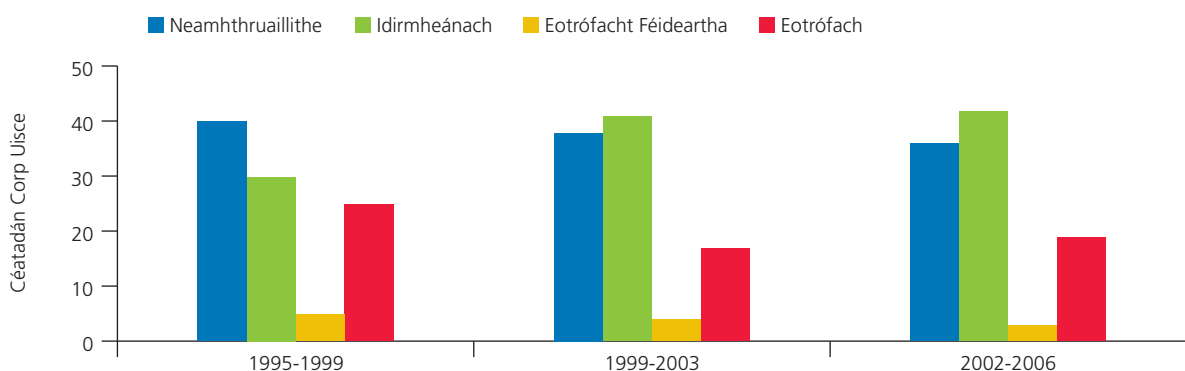
Tá na 10 gcorp uisce a rangáíodh mar eotrófach sa tréimhse 2001-2005 fós amhlaidh agus mar a comharthaíodh thuas tá trí chorp uisce breise rangaithe mar an gcéanna sa mheasúnú reatha. Léiríonn an céatadán de choirp uisce atá á rangú mar eotrófach laghdú tosaigh a tháinig méadú beag ina dhiaidh le deichniúr anuas: ó 25 faoin gcéad i 1995-1999 go 17 faoin gcéad i 1999-2003 agus beagnach 19 faoin gcéad sa tréimhse suas go dtí 2006 (Figiúr 6a).

Tá ionad agus an rangú is déanaí ar na coirp aonair uisce inbhearaigh agus cósta i bhFigiúr 6b, a thugann miondealú freisin ar an stádas cáilíochta iomlán.

### Foinsí

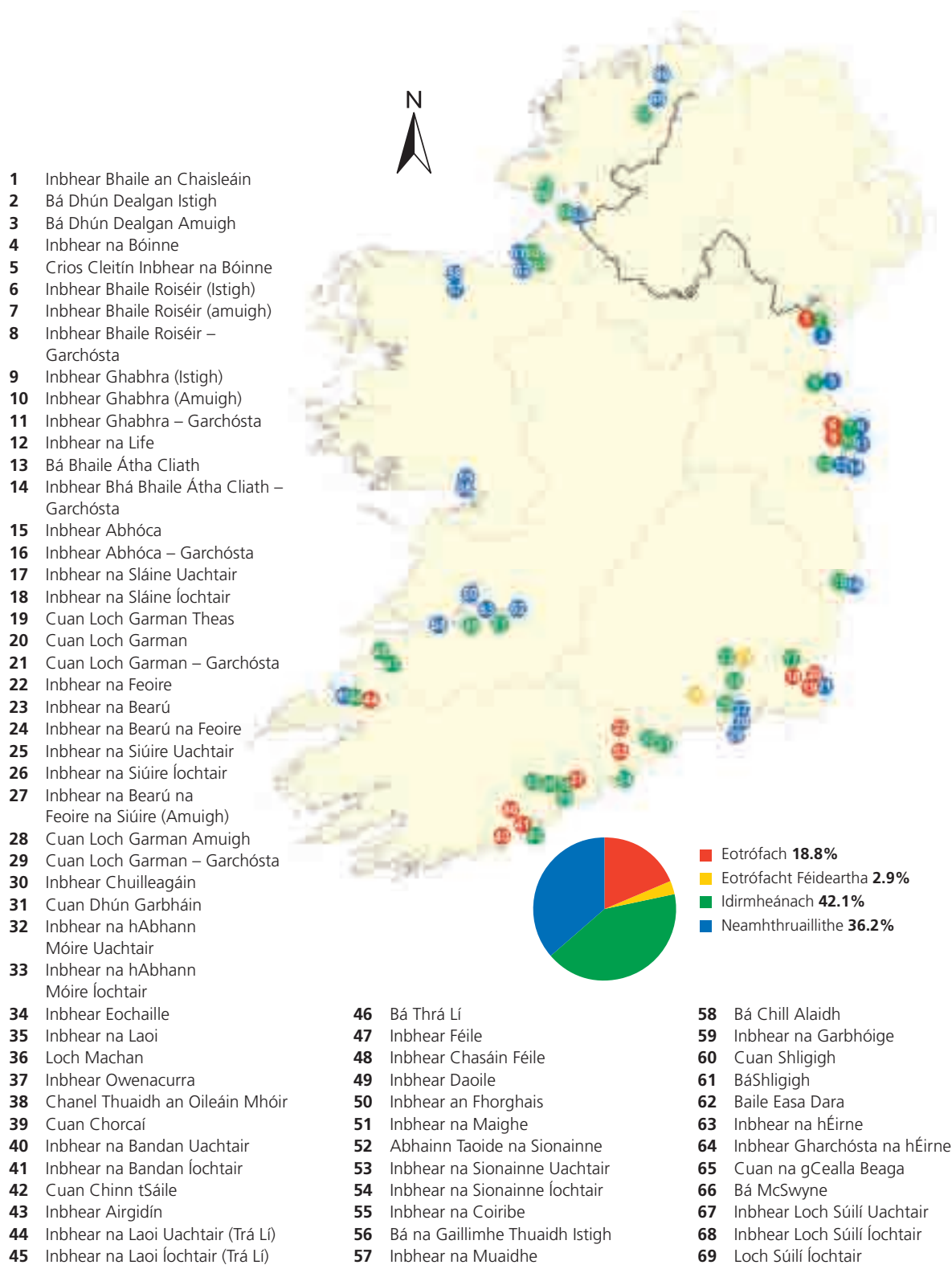
EPA (S. O'Boyle, G. McDermott agus R. Wilkes); EPA, 2001. *An Assessment of the Trophic Status of Estuaries and Bays in Ireland*. Arna réiteach don Roinn Comhshaoil agus Rialtais Áitiúil. EPA, Loch Garman; McGovern, E., Monaghan, E., Bloxham, M., Rowe, A., Duffy, C., Quinn, Á., McHugh, B., McMahon, T., Smyth, M., Naughton, M., McManus, M. agus Nixon, E., 2002. Winter nutrient monitoring of the Western Irish Sea – 1990-2000. *Marine Environment and Health Series Uimh. 4*, 2002. Foras na Mara, Baile Átha Cliath.

Figiúr 6a Cáilíocht Uisce Inbhearaigh – Céatadán Corp Uisce i nGach Rang 1995-2006



Foinse: EPA (S. O'Boyle, G. McDermott agus R. Wilkes)

Figiúr 6b Cáilíocht Uisce Inbhearaigh agus Cósta 2002-2006



Foinse: EPA (S. O’Boyle, G. McDermott agus R. Wilkes)

## TÁSCAIRE 7: CÁILÍOCHT UISCÍ SLIOGÉISC

Le cáilíocht sliogéisc le hithe ag daoine a chinntiú, cuirtear rialuithe ar na huiscí a úsáidtear le sliogiasc a shaothrú agus a bhaint. Suas go dtí 2006, bhí na rialuithe seo treoraithe ag Treoir an AE ‘laying down the health conditions for the production and the placing on the market of live bivalve molluscs’ (91/492/EEC) agus ag Rialacháin na hÉireann 1996 (S.I. Uimh. 147 de 1996) a chuir an treoir i bhfeidhm. Ó 1 Eanáir 2006, chuaigh Rialacháin Sláinteachais an AE ‘laying down specific rules for food of animal origin’ (Uimh. 852/853/854 de 2004) ina n-áit. Is é an Roinn Cumarsáide, Mara agus Acmhainní Nádirtha (DCMNR) an t-údaras cumasach in Éirinn le limistéir táirgthe sliogéisc a rangú.\*

Tá clár monatóireachta sláintíochta sliogéisc, bunaithe ar roinnt paraiméadar lena n-áirítear critéir mhicribhitheolaíochta, le huiscí fais sliogéisc i bhfeidhm in Éirinn ó 1985. Tá trí chatagóir ag an scéim rangaithe, a chomhfhreagraíonn do na critéir agus do na coinníollacha mar atá leagtha síos sa treoir níos sine/sna rialacháin nua agus is féidir achoimre a dhéanamh orthu mar seo a leanas:

- A** Is féidir sliogiasc a dhíol le hithe go díreach ag daoine
- B** Is féidir sliogiasc a dhíol le hithe go díreach ag daoine tar éis ionaithe i bplanda ceadaithe le haghaidh dhá lae
- C** Is féidir sliogiasc a dhíol le hithe ag daoine tar éis iad a athsheachadadh in uisce farraige ar feadh dhá mhíosa ar a laghad

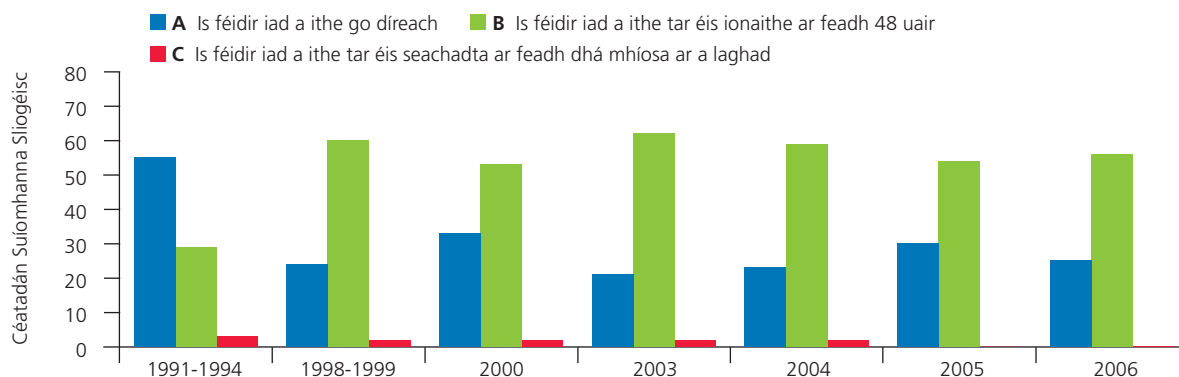
Léiríonn Figiúr 7 an líon suíomhanna sliogéisc, mar cheatadán den iomlán, sna trí rang idir an tréimhse 1991-94 period agus 2006. Ba cheart tabhairt faoi deara nach ionann agus 100 na ceatadán ar fad le chéile toisc go bhfuil suíomhanna le níos mó ná rang amháin fágtha amach.\*\*

Ina theannta déantar monatóireacht ar na limistéir táirgthe sliogéisc, ar bhonn seachtainiúil nó míosúil, le haghaidh fíteaplanctóin agus bithocsainí mara mar chuid de chlár monatóireachta náisiúnta a fheidhmíonn Foras na Mara ar son Údarás Sábháilteacha Bia na hÉireann (FSAI). Chomh maith le bheith freagrach as tinneas i ndaoine a itheann sliogiasc atá buailte leo d’fhéadfadh roinnt Blás Algach Díobhálach (BAD) sliogiasc agus beatha mara eile a mharú go díreach (trí thocsaineacht) nó go hindíreach (trí dhí-ocsaiginiú). In Iúil-Lúnasa 2005 bhí blas eisceachtúil dinea-lascnaidigh, nach bhfuil suntasach go díreach ó thaobh sláinte an duine de, freagrach as caillteanas suntasach stoc do tháirgeoirí mar a d’éag sliogéisc mar thoradh ar éifeacht thocsaineach díreach ar na héisc agus na sliogéisc. Laghdaíodh méid agus déine fíteaplanctóin thocsainigh go leor i 2006, ach amháin uiscí cósta an iardheiscirt, i gcomparáid leis na blianta deireanacha roimhe agus mar thoradh air tugadh faoi deara go raibh leibhéal níos ísle toscainí i níos lú ceantar. Bhí tionchar trom ag an tocsaineacht dhian áitiúil fhadaithe ar réigiún an iardheiscirt i 2006 agus bhí sé freagrach as caillteanais eacnamaíocha ar scála mór ansin. Is mó is cosúil gurbh í an chúis leis an difríocht idir an dá bhliain ná coinníollacha aeráide gaoithe. Áit a mbraitear bithocsainí, dúntar an limistéir táirgthe agus cuirtear cosc ar bhaint go dtí go bhfuil an baol tocsaineachta imithe. Tarlaíonn dúnadh limistéir saothraithe sliogéisc, mar thoradh ar éilliú bithocsainí, sa samhradh agus san fhómhar nuair atá algaí tocsaineacha ann.

\* Bunaíodh an tÚdaras Cosanta Iascach Mara (SFPA) neamhspleách reachtúil ar 1 Eanáir 2007 (I.R. Uimh. 376 de 2006). Cuirfidh an tÚdarás an dlí maidir le hiascaigh mhara i bhfeidhm go ginearálta chomh maith le dlí sábháilteacha bia maidir le hiasc nó táirgí éisc agus mar sin bheidh sé freagrach as rialacháin sláinteachas an AE a chur i bhfeidhm. Tá limistéir táirgthe sliogéisc rangaithe faoi na rialacháin sin.

\*\* I 2006, uiscí Rang A a bhí i 25 faoin gcéad de shuíomhanna i gcomparáid le 30 faoin gcéad an bhliain roimhe ach tá sé sin i bhfad níos lú ná an chuid sa tréimhse 1991-94 (55%). Is cosúil gur tháinig stad leis an treocht thíos in uiscí Rang A i 2004 agus aistriú beag thuas sa bhliain dár gcionn ach bhí sé thíos arís i 2006. Níor tugadh taifead ar aon uiscí Rang C le dhá bhliain anuas ach bhí cuid de limistéir bainte sliogéisc amháin, i gCuan Loch Garman, sa chatagóir sin.

Figiúr 7 Rangú Limistéar Sliogéisc



Foinse: An Roinn Cumarsáide, Mara agus Acmhainní Nádurtha (J. Carney)

De réir Treorach eile (79/923/EEC), ar an gcáilíocht atá ag teastáil in uisce sliogéisc, tógtar samplaí uisce farraige ó uisce sliogéisc ainmnithe (I.R. Uimh. 268 de 2006) dhá uair sa bhliain agus déantar anailís orthu do rianmhianraí agus organohalogen. I 2006 bhí gach toradh loitnaicídide agus défeinil polaclóirínithe (polychlorinated biphenyl (PCB)) faoi leibhéil braite. Bhí éagsúlacht mhór idir na torthaí mianra, mar a bheifí ag súil leis i gcás uisce farraige, agus bhí torthaí aonair do luaidhe agus shinc i roinnt samplaí thar an gcaighdeán náisiúnta leagtha do na huiscí taoide ar fad (I.R. Uimh. 12 de 2001).\*\*\* Ach ní raibh aon samplaí thar na luachanna Ordaitheacha (uastiucháin incheadaithe) d'uisce sliogéisc (I.R. Uimh. 268 de 2006). Déantar monatóireacht ar na substaintí seo go bliantúil freisin i bhfeoil sliogéisc toisc go soláthraíonn sé sin táscaire níos fearr ar cháilíocht uisce ar an iomlán ná spot-shampláil minicíocht ísle uisce. Go tipiciúil léiríonn an mhonatóireacht sin go bhfuil cáilíocht ard ar uisce saothraithe sliogéisc na hÉireann maidir leis na substaintí a ndearnadh monatóireacht orthu.

## Foinsí

An Roinn Cumarsáide, Mara agus Acmhainní Nádurtha (J. Carney); Sonraí neamhfhoilsithe Fhoras na Mara [Tuarascálacha tástálacha i gcomhair substaintí rianmhianraí agus orgánaclóirín in uisce sáile sampláilte ó cheantair sannta fás sliogéisc, samhradh agus geimhreadh 2006]; Lyons, D. agus Doré, B., 2006. *Shellfish Microbiology – Implementation of the Hygiene Regulations and Good Practice Guide*. Imeachtaí an 7ú Ceardlann sábháilteachta Sliogéisc, Gaillimh, 30ú Samhain 2006, 4-7. Arna eagrú ag Foras na Mara, an tÚdarás um Shábháilteacht Bia agus Bord Iascaigh Mhara; Moran, S., Silke, J., Gallardo-Salas, R., Chamberlain, T., Lyons, J. agus Shannon, S., 2006. *Review of Phytoplankton Monitoring 2006*. Imeachtaí an 7ú Ceardlann sábháilteachta Sliogéisc, Gaillimh, 30ú Samhain 2006, 30-36. Arna eagrú ag Foras na Mara, an tÚdarás um Shábháilteacht Bia agus Bord Iascaigh Mhara.

\*\*\* Ní thugann torthaí aonair iontu féin le fios gur sáraíodh na caighdeáin toisc go mbaineann na caighdeáin seo mar mheántiucháin bhliantúla.

## TÁSCAIRE 8: TEAGMHAIS TRUAILLITHE SAN FHARRAIGE

Tá Gardaí Cóta na hÉireann (IRCG), rannóg laistigh den Roinn Iompair, freagrach as teagmhais truailithe san fharrage a fhiosrú, mar chuid dá ról i gcóras éifeachtach do fhreagra ar thruaillíú mara a fhorbairt agus a chomhordú. Déantar feidhmeanna an IRCG maidir le teagmhais truailithe a shainordú trí pholasaí Rialtais, reachtaíocht náisiúnta (m. sh. Na hAchtanna Truailithe Mara S, 1991 agus 1999), Treoracha an AE agus Coinbhinsiún Idirnáisiúnta. I 2006 tugadh cuireadh d'Éirinn bheith ina páirtí conartha do Chomhaontú Bonn um Chomhoibriú i bPlé le Truaillíú na Farrage Thuaidh ag Ola agus Substaintí Díobhálacha Eile. Soláthraíonn an IRCG freagra ar theagmhais truailithe mara nó baol truailithe ó loing agus ardáin amach ón gcósta laistigh de Chríos Eacnamaíochta Eisiach (CEE) na hÉireann a chlúdaíonn achar (thart ar. 200, 000 km<sup>2</sup>) a shíníonn go 200 míle amach ón gcosta thiar agus go dtí an meánlíne idir Éire agus an RA i Muir na hÉireann agus sa Mhuir Cheilteach.

Tugtar an líon teagmhas truailithe bliantúla sa tréimhse sé-bliana 2001-2006 i bhFigiúr 8.

Ba é an líon iomlán teagmhas a tuairiscíodh sa chatagóir truailithe sa CEE i 2006 ná:

Ola Mhianra	Dramhail	Séarachas	Ceimicí	Eile	Iomlán
34	1	–	1	8	44

Comharthaíonn anailís ar na 44\* thuirisc teagmhas don bhliain go raibh doirteadh ola freagrach as 77 faoin gcéad den truaillíú tuairiscithe agus go raibh substaintí eile, m.sh. algaí nó blasanna neamhaitheanta freagrach as 23 faoin gcéad de. Ba iad díosal agus ola gáis na substaintí ba mhinicí a aithníodh do thruaillíú. Comharthaíonn an pátrún geografach iomlán gur tharla an chuid is mó den doirteadh ola sna cuain níos lú agus ina gceantair máguaird. Aithníodh braislí leonna i mbánna agus in aice le huisc cladaigh agus tuairiscíodh 29 faoin gcéad san fharrage oscailte. Ach ba cheart breathnú le cúram ar an gcéatadán beag leonna a tuairiscíodh san fharrage oscailte toisc go mbrathann an IRCG ar thuiriscí ó thrácht loingseoireachta agus thrácht tráchtála aeir do theagmhais den sórt sin.

Ba é an dáileadh tuairiscí faighte\* ar thruaillíú i 2006 de réir crios timpeallachta mara laistigh den CEE ná:

Oscailte Farrage	Abhainn Taoide/ Inbhear	Bá/In Aice le Uiscí Cladach	Trá/ Cladach	Port/Cuan	Iomlán
15	9	6	5	17	52

Is é ról na nGardaí Cóta i dteagmhaisí taismeach mara ná maoirseacht a dhéanamh, rialú, agus ceannas agus rialú deireanach a chleachtadh leis an mbaol don timpeallacht mhara nó do shábháilteacht an árthaigh ná an chriú a sheachaint/a laghdú. I rith 2006 rinne an IRCG idirghabháil i roinnt teagmhas taismeach mara agus rinne sé dlúthmhonatóireacht ar theagmhaisí eile, a raibh bagairt truailithe mara i gceist leo. Mar shampla, d'fhulaing 14 long idir 3,000 agus 17,000 tona deacrachtaí meicniúla amach ón gcósta agus bhí cúnamh ag teastáil ó thrí ártach iascaireachta ar an meán in aghaidh na míosa mar gheall ar theip innill, liáin screabhaithe nó uisce a thógáil isteach. Maidir le truaillíú, is féidir na tarlúintí seo a rangú mar mhiontarlúintí ó thaobh nádúir de, agus is féidir iad a choimeád ó éirí níos troime.

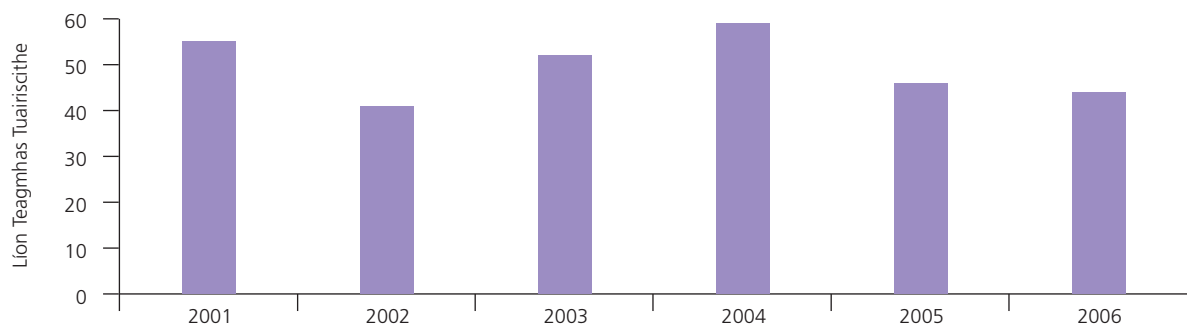
\* Tuairiscíodh 52 theagmhas san iomlán; ach in ocht gcás ní bhfuarthas aon truaillíú nó seachnóidh an baol truailithe.

Tá obair á déanamh leis an bplean teagmhasachta náisiúnta um doirteadh ola (NCP) a dhréachtú agus tá naoi bplean as na 19 bplean teagmhasachta poirt curtha isteach don IRCG le ceadú de réir an Achta um Thruailliú na Fharraige (Leasú), 1999. D'eisigh an IRCG treoirlínte ar phlean teagmhasachta um doirteadh ola do gach comhairle contae mara agus tugadh treoir dóibh pleananna teagmhasachta a dhréachtú le dochar ag éirí as doirteadh ola agus doirteadh eile ar an gcósta a sheachaint agus a íoslaghdú. Freisin déanann na Gardaí Cónsta athbhreithniú ar agus céadaíonn siad pleananna teagmhasachta um doirteadh ola d'ardáin druileála soghluaiste amach ón gcósta a bheartaíonn obair druileála a dhéanamh laistigh den CEE. Tá athbhreithniú agus ceadú na bpleananna seo ar bun.

## Foinse

Na Gardaí Cónsta (E. Clonan).

*Figiúr 8 Truailliú San Fharraige 2001-2006*



*Foinse: Irish Coast Guard (E. Clonan)*

## TÁSCAIRE 9: CÁILÍOCHT UISCE SNÁMHA

Tá údaráis áitiúla freagrach as cáilíocht uisce snámha ina gceantair agus as eolas a chur ar fáil don phobal i rith an séasúr snámha. Déanann an EPA torthaí na monatóireachta a chóimheas agus cuirtear ar aghaidh chuig Coimisiún na hEorpa iad le cur san áireamh sa tuarascáil de choimre staitisticí a fhoilsíonn an AE go bliantúil. Freisin foilsíonn an EPA tuarascáil bliantúil náisiúnta uisce snámha, a scaoiltear sula dtosaíonn an séasúr snámha dár gcionn.

Tá an phríomhreachtaíocht leagtha amach i Rialacháin (I.R. Uimh. 155 de 1992) agus leasuithe ina dhiaidh a thugann éifeacht don Treoir AE (76/160/EEC) maidir le cáilíocht an uisce snámha. Leagann an Rialacháin teorannacha níos déine do roinnt paraiméadar ná an Treoir.

Is é an líon limistéar snámha ainmnithe ná 131 lena n-áirítear suíomhanna uisce farraige (122) agus fíoruisce (9). Léiríonn torthaí do 2006 go bhfuil cáilíocht an uisce snámha in Éirinn réasúnta maith, agus 77 faoin gcéad (101 as 131) de shuíomhanna ag comhlíonadh leis na Luachanna Teorann Náisiúnta.

### *Limistéir Cáilíochta Uisce Snámha 2006: Comhlíonadh leis an AE agus le Luachanna Teorann Náisiúnta*

	Géilliúil	Neamhghéilliúil	Iomlán
<b>Uisce Farraige</b>			122
Treoir	111	11	
Éigeantach	118	4	
Náisiúnta	95	27	
<b>Fíoruisce</b>			9
Treoir	7	2	
Éigeantach	9	0	
Náisiúnta	6	3	
<b>Overall</b>			131
Treoir	118	13	
Éigeantach	127	4	
Náisiúnta	101	30	

Foinse: EPA (K. Nolan, G. McHugh, G. Smith agus T. Stafford)

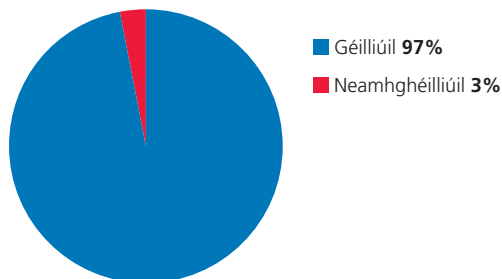
Léiríonn géilleadh agus úsáid á baint as cur chuige Choimisiún na hEorpa go bhfuil beagnach 97 faoin gcéad (127 as 131) de shuíomhanna ag comhlíonadh leis na híosluachanna teorann éigeantacha atá sonraithe sa Treoir (Figióir 9a) agus go bhfuil 90 faoin gcéad (118 as 131) de shuíomhanna ag comhlíonadh leis na luachanna teorach níos déine. Ba cheart breathnú ar na luachanna teoracha seo mar chuspóirí cáilíochta ar cheart go mbeadh sé d'aidhm ag gach suíomh snámha a bhaint amach.

Tá cáilíocht iomlán uisce snámha in Éirinn fós maith go leor agus an líon suíomhanna atá ag comhlíonadh le huasluachanna an AE i 2006\* ag léiriú méadú beagnach faoin gcéad nuair a chuirtear i gcomparáid le 2005 é. Ach tháinig laghdú ar chomhlíonadh leis an treoir ag an gcéatadán céanna sa tréimhse chéanna (Figióir 9b). Freisin tháinig laghdú cúig faoin gcéad ar an ráta comhlíonta le Caighdeáin Náisiúnta i 2006 nuair a chuirtear i gcomparáid le 2005 é.

\* Ba iad na ceithre limistéar snámha nár chomhlíon le híoschaighdeán éigeantacha an AE i 2006 ná: Baile Brigín agus Mullach Íde i mBaile Átha Cliath; An Clochán i nGaillimh; An Dún Mór (Príomhthrá) i bPort Láirge. Ba iad na cinn nár éirigh leo i 2006 ná: Trá Mhuirfean agus Trá Chill Fhionntain i mBaile Átha Cliath; Na Forbacha agus An Clochán i nGaillimh; An Aird Mhór i Loch Garman.



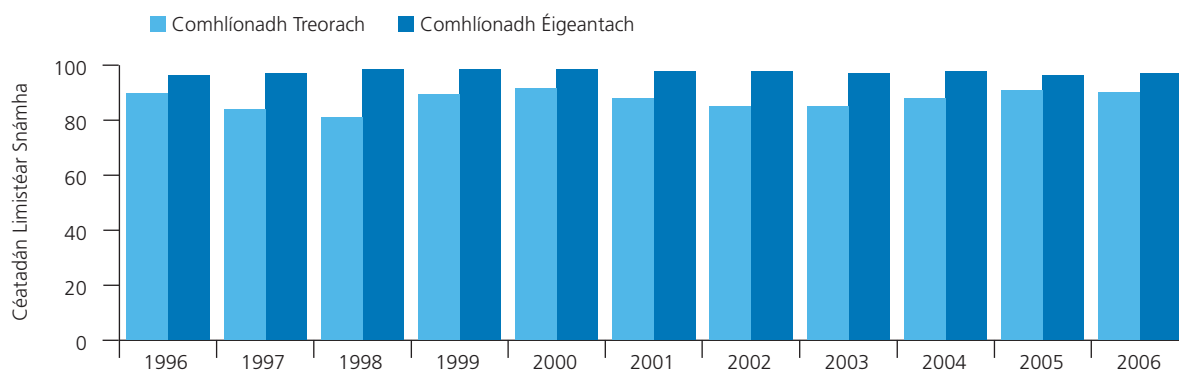
Figiúr 9a Cáilíocht Uisce Snámha – Comhlíonadh Limistéar i 2006 le Luachanna Éigeantacha an AE



Foinse: EPA (K. Nolan, G. McHugh, G. Smith agus T. Stafford)

Bhí an Treoir Uisce Snámha (76/160/EEC) 30 bliain d’aois nuair a glacadh le Treoir nua (2006/7/EC) i bhFeabhra 2006 a rachaidh i bhfeidhm i 2008. Tabharfaidh an Treoir athbhreithnithe deis cleachtais bhainistíochta ag suíomhanna uisce snámha a fheabhsú agus an t-eolas a chuirtear ar fáil do shnámhóirí ar fud na hEorpa a chaighdeánú. I gcomparáid le roinnt tíortha Eorpacha eile tá an líon limistéar snámha ainmnithe in Éirinn réasúnta íseal agus d’iarr an EPA ar an líon suíomhanna a mhéadú, ó 131 to 160, le cosaint dhóthanach iadsan a úsáideann na hionaid snámha sin a chinntiú.

Figiúr 9b Comhlíonadh Uisce Snámha 1996-2006



Foinse: EPA (K. Nolan, G. McHugh, G. Smith agus T. Stafford)

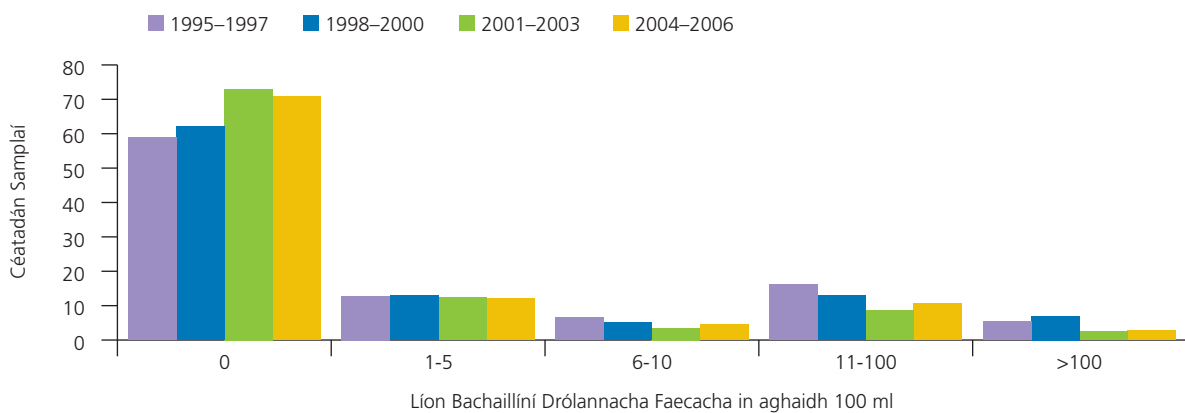
### Foinse

EPA, 2007. *The Quality of Bathing Water in Ireland: A Report for the Year 2006*. EPA, Loch Garman.

## TÁSCAIRE 10: BACHAILLÍNÍ DRÓLANNACHA FAECACHA I SCREAMHUISCE

Acmhainn luachmhar in Éirinn atá i screamhuisce, úsáidtear é i bpróiseáil bia agus tionscail agus is foinse tábhachtach uisce óil atá ann freisin. Tá screamhuisce agus fuaráin freagrach as thart ar 26 faoin gcéad den uisce óil iomlán a sholáthraítear in Éirinn agus méadaíonn an comhréir go 75 faoin gcéad i roinnt contaetha. Cé go bhfuil soláthair uisce phoiblí cóireálta freagrach as thart ar 82 faoin gcéad den uisce óil iomlán a sholáthraítear in Éirinn, tá an fiarlíon scéimeanna grúpa uisce príobháideacha agus soláthar príobháideach beag. Tá scéimeanna grúpa uisce príobháideacha agus soláthair bheaga phríobháideacha freagrach as thart ar 17 faoin gcéad den uisce óil iomlán a sholáthraítear. Braitheann formhór na scéimeanna grúpa príobháideacha agus na soláthar beag ar screamhuisce agus fhoinsí fuarán agus is minic nach mbíonn cóireáil dhóthanach acu, nó i go leor cásanna ní bhíonn aon chóireáil acu. Mar sin, le soláthair phríobháideacha a chosaint agus le laghdú féideartha a dhéanamh ar an mbaol truaillithe i soláthair phoiblí, ní mór go mbeadh cosaint dhóthanach screamhuisce mar fhoinse.

Figiúr 10a Bachaillíní Drólannacha Faecacha i Screamhuisce



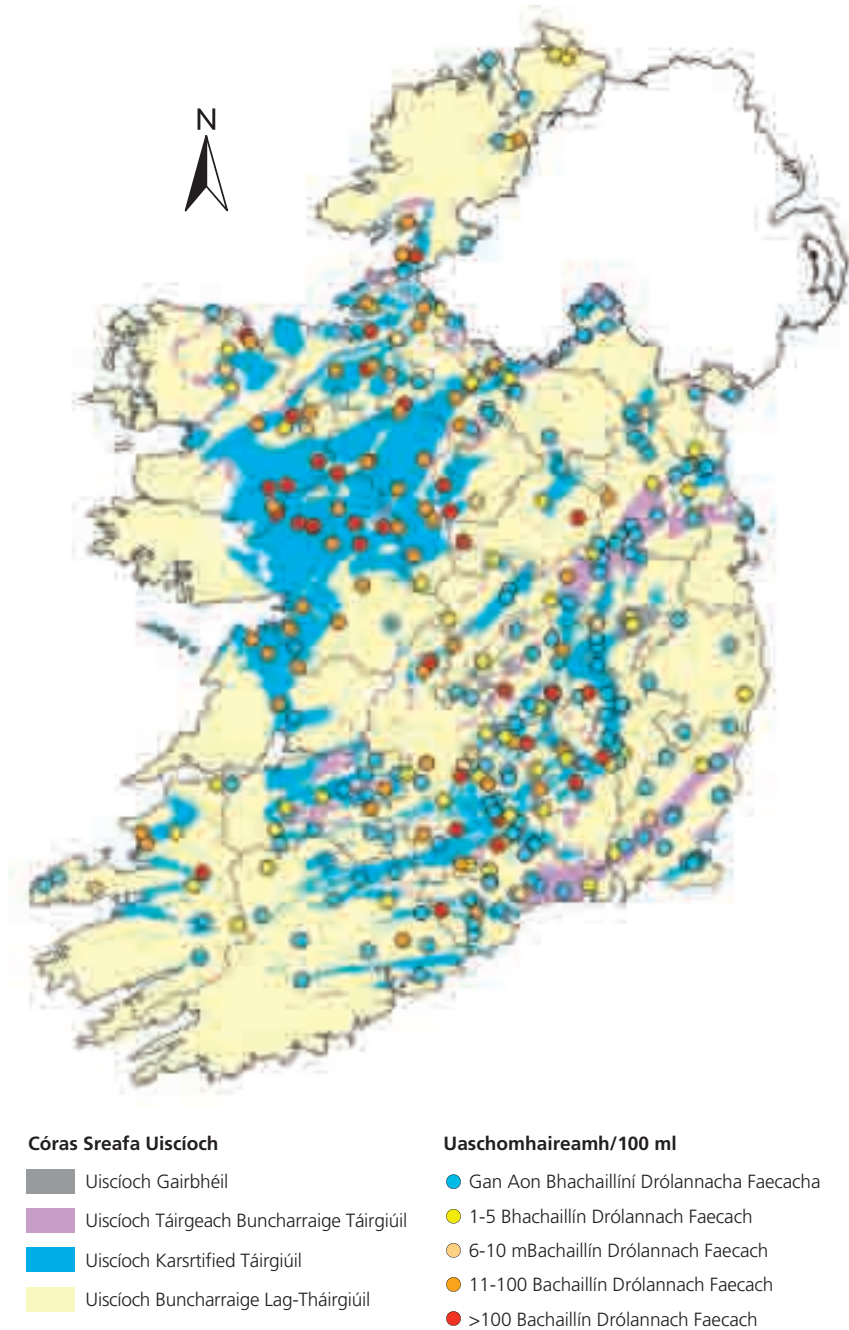
Foinse: EPA (M. Craig)

Áiríonn líonra monatóireachta screamhuisce náisiúnta an EPA samplaí ag roinnt suíomhanna a úsáidtear freisin le huisce óil a bhaint. Tagann bachaillíní drólannacha faecacha ó dhramhaíol daoine agus ainmhithe. Glactar lena láithreach in uisce mar chruthú ar éilliú faecach agus soláthraíonn siad comhartha láidir go bhféadfadh pataiginí, i. na horganáigh atá freagrach as galar, bheith ann. Sárú ar na Rialacháin Uisce Óil (I.R. Uimh. 439 de 2000) in Éirinn atá i láithreach bachaillín drólannach faecach amháin i soláthar uisce óil.

Idir 2004 agus 2006, thóg an EPA samplaí screamhuisce agus fuarán mar chuid dá chlár monatóireachta screamhuisce náisiúnta. Bhí laghdú beag ar an líon samplaí screamhuisce agus fuarán nach raibh aon bhachaillín drólannacha faecacha iontu nuair a cuireadh i gcomparáid é leis an tréimhse tuairiscithe roimhe (Féach Figiúr 10a). Fuarthas toradh dearfach do bhachaillíní drólannacha faecacha i thart ar 29 faoin gcéad de na 1,591 sampla a tógadh idir 2004 agus 2006 agus bhí níos mó ná 10 mbachaillín drólannacha faecach/100ml i 13 faoin gcéad de na samplaí. I rith na tréimhse tuairiscithe sin bhí bachaillíní drólannacha faecacha i sampla amháin ar a laghad i 58 faoin gcéad de na hionaid mhonatóireachta EPA ar fad (méadú ocht faoin gcéad ón tréimhse tuairiscithe roimhe), agus bhí níos mó ná 10 mbachaillín drólannach faecach i sampla amháin ar a laghad ag 32 faoin gcéad de na hionaid monatóireachta EPA ar fad (méadú aon faoin gcéad ón tréimhse tuairiscithe roimhe).

Léiríonn na hionaid monatóireachta screamhuisce i gceantair aolchloiche cairstí an leibhéal is mó truaillithe (Féach Figiúr 10b). Léiríonn sé sin nádúr leochaileach na gcóras sreafa níos dinimiciúla do thruaillíú. Ós rud é go bhfuil go leor soláthar príobháideach neamhchoireálta agus nach eol na fachtóirí a mbíonn tionchar acu ar chaighdeán an uisce, nó nach bhfuil siad faoi smacht úinéir an tsoláthair, tá feabhsúcháin ghinearálta ar dhearadh tobar, eolas ar chosaint foinsí agus cleachtas maith d'úsáid talún riachtanach leis an mbaol do na soláthair sin a laghdú agus feabhas a chur ar cháilíocht uisce.

Figiúr 10b Uaschomhaireamh Bachaillíní Drólannacha Faecacha/100ml i rith 2004-2006



Foinse: EPA (M. Craig)

## Foinsí

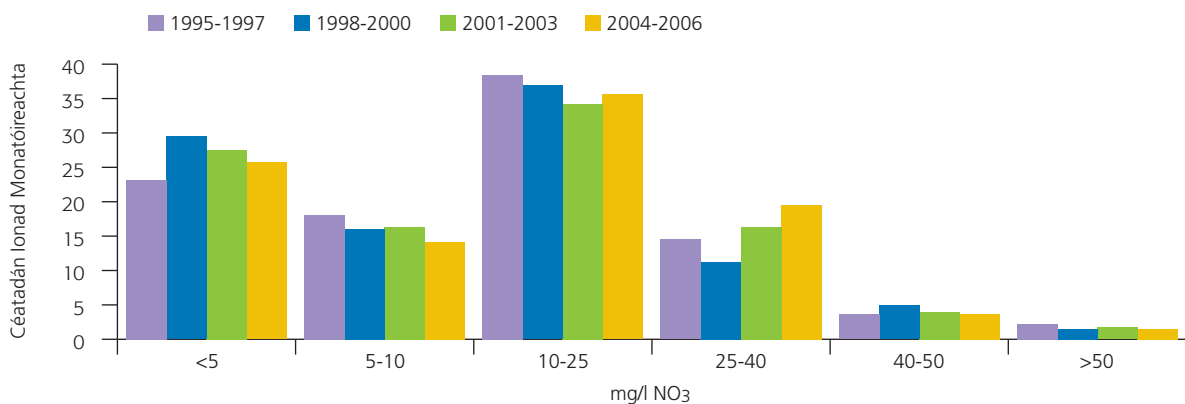
EPA (M. Craig); Page, D., Wall, B. agus Crowe, M., 2006, *Cáilíocht an Uisce Óil in Éirinn. Tuarascáil don bhliain 2005*. EPA, Loch Garman; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M. agus Quinn, R., 2005. *Cáilíocht Uisce in Éirinn 2001-2003*. EPA, Loch Garman.

## TÁSCAIRE 11: NÍOTRÁITÍ I SCREAMHUISCE

Faightear tiucháin reásúnta íseal níotráite i screamhuisce nach raibh aon éifeacht air. De ghnáth comharthaíonn tiucháin níos airde níotráite go raibh ionchur orgánach nó neamhorgánach ar screamhuisce. D'fhéadfadh foinsí orgánacha diúscairt dramhaíola a áireamh, m.sh. scaipeadh dramhaíola ainmhithe, nó láisteadh ó umair sheipteacha agus d'fhéadfadh foinsí neamhorgánacha mar scaipeadh leasacháin bhréagaigh. Má thagann cuid mhór den sreabhadh uisce dromchla as screamhuisce, mar sin d'fhéadfadh tiucháin mhéadaithe níotráite i screamhuisce cur le heotrófú in uiscí dromchla.

Áiríonn líonra monatóireachta screamhuisce náisiúnta an EPA sampláil ag roinnt suíomhanna a úsáidtear freisin le huisce óil a bhaint. D'fhéadfadh láithreach tiucháin arda níotráite in uiscí óil bheith freagrach as methaemoglobinaemia (blue baby syndrome) i naoináin a chothaítear le bhuidéil má athraíonn an níotráit go nítrít agus má imoibríonn sé le haemaglóbín fola.

Figure 11a Níotráite i Screamhuisce



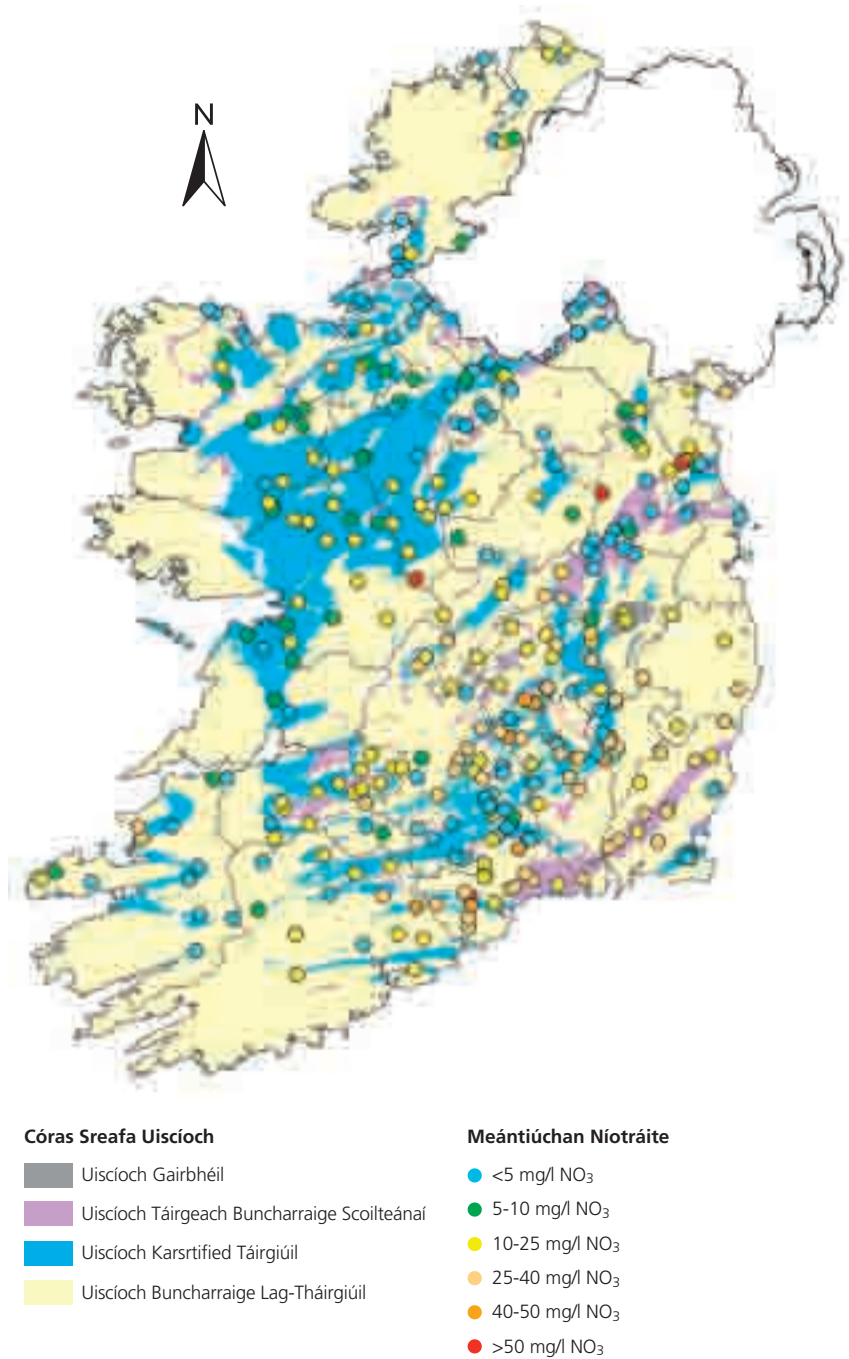
Foinse: EPA (M. Craig)

Idir 2004 agus 2006, bhí an meántiuchán níotráite thar thiúchan treorach na Rialacháin Uisce Óil (I.R. Uimh. 439 de 2000) de 25 mg/l NO<sub>3</sub> ag thart ar 25 faoin gcéad d'ionaid monatóireachta ar fad an EPA agus bhí sé thar an Uastíuchan Ceadaithe (MAC) de 50 mg/l NO<sub>3</sub> ag thart ar dhá faoin gcéad de na hionaid mhonatóireachta EPA ar fad.\* Ó 1995 tá méadú ginearálta ar cheatadán na samplaí screamhuisce le tiucháin níotráite idir 25-40 mg/l NO<sub>3</sub> (Figiúr 11a) agus bhí laghdú freisin ar an gcéatadán samplaí le tiucháin níotráite idir 0-10 mg/l NO<sub>3</sub>. Tá an chuid níos mó d'ionaid mhonatóireachta le tiucháin méadaithe níotráite ag oirdheisceart na tíre (Féach Figiúr 11b). Féach freisin Táscaire 2: Níotráití in Aibhneacha.

Is féidir tiucháin méadaithe níotráite a thógail faoi deara i bpointí monatóireachta atá gar do fhoinsí pointe féideartha scaoilte dramhaíola. Ach, baineann dáileadh spásúil ionad monatóireachta le tiucháin méadaithe níotráite le ceantair le cleachtais thalmhaíochta níos déine, a thugann le fios gurb iad foinsí talmhaíochta idirleatha is cúis leo. Le blianta beaga anuas feictear treocht méadaithe sa líon ionad monatóireachta le tiucháin níos mó ná 25 mg/l NO<sub>3</sub>, a thugann meath diaidh ar ndiaidh ar screamhuisce le fios, go háirithe i gceantair thalmhaíochta níos déine dheisceart agus oirthear na tíre. Déanfar tuilleadh scrúdú ar seo mar chuid de chur i bhfeidhm an Chreat-Treoir Uisce.

\* Is féidir Níotráit a thuairisciú mar N nó NO<sub>3</sub> mar tá difríocht ceithre-fhillte i dtéarmaí uimhriúla idir an dá slonn (Féach freisin Táscaire 2: Níotráití in Aibhneacha).

Figiúr 11b Méantiúcháin Níotráite i rith 2004-2006



Foinse: EPA (M. Craig)

## Foinsí

EPA (M. Flanagan, P.J., 1988. *Parameters of Water Quality*. An tAonad Taighde Comhshaoil, Baile Átha Cliath; Toner, P., Bowman, J., Clabby, K., Lucey, J., McGarrigle, M., Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MacCárthaigh, M., Craig, M agus Quinn, R., 2005. *Cáilíocht Uisce in Éirinn 2001-2003*. EPA, Loch Garman.

## AGUISÍN: NUASHONRÚ AR NA RIALACHÁIN FOSFAIR DO 2006

### Arna ullmhú ag an Oifig um Fhorfheidhmiúchán Comhshaoil

Is beart reachtúil iad na Rialacháin Fosfair, (I.R. 258 de 1998) atá dírithe ar eotrófu a laghdú in aibhneacha agus i lochanna. Tá na spriocanna atá leagtha amach ag na Rialacháin Fosfair deartha chun meath uiscí atá ar cháilíocht mhaith a sheachaint agus chun uisce nach bhfuil ar cháilíocht mhaith a fheabhsú go dtí caighdeán sonraithe. Éilíonn na Rialacháin go gcaithfidh gach údarás áitiúil Tuarascáil Fhorfheidhmiúcháin a chur isteach chuig an nGníomhaireacht gach dara bliain ina dtabharfar sonraí ar na bearta atá á ghlacadh acu chun na caighdeáin sonraithe a chomhlíonadh. D'fhoilsigh an Ghníomhaireacht roinnt tuarascálacha náisiúnta ar fhorfheidhmiúchán na Rialachán agus ar an dul chun cinn atá déanta ó thaobh na spriocanna a bhaint amach.

Éilíonn Rialacháin Fosfair go gcoinnítear nó go bhfeabhsaítear cáilíocht uisce trí thagairt a dhéanamh don rátáil cáilíochta bitheolaíochta bonnlíne (aibhneacha) a leag an Ghníomhaireacht síos sa tréimhse athbhreithnithe 1995-1997 nó ag an gcéad deis ina dhiaidh sin. Caithfear spriocanna cáilíochta uisce a leagadh síos sna Rialacháin a chomhlíonadh faoin mbliain 2007 ar a dhéanaí i gcás uiscí a ndearna an EPA suirbhé orthu sa tréimhse 1995-97 agus laistigh d'uathréimhse deich mbliana i gcás uiscí a rinneadh suirbhé orthu ar dtús tar éis 1997.

Tugann monatóireacht reatha ón tréimhse 2004-2006 le fios, i gcás aibhneacha, go dtagann an cháilíocht uisce 69.5 faoin gcéad sna stáisiúin monatóireachta go náisiúnta leis na Rialacháin Fosfair, .i. comhlíonann an cháilíocht uisce ag na stáisiúin aibhneacha seo na spriocanna bitheolaíochta agus/nó spriocanna molabdáite imoibríochta fosfair (MRP) atá leagtha síos sna Rialacháin Fosfair (Figiúr A1). Léiríonn sé seo méadú 6.1 faoin gcéad i ngéilliúntas ón tréimhse monatóireachta roimhe sin (2001-03). D'fhéadfadh sé gur tharla sé seo mar gheall ar mhéadú mór leanúnach i monatóireacht MRP ar cháilíocht uisce.

Is iad na húdaráis áitiúla a bhfuil leibhéal géilliúntais sách ard acu (>70 faoin gcéad de stáisiúin aibhneacha ag comhlíonadh na rialachán) leis na Rialacháin ná Ros Comáin, Cill Mhantáin, Cathair Bhaile Átha Cliath,\* an Mhí, Ciarraí, an Cabhán, Tiobraid Árann Thuaidh, Corcaigh agus Loch Garman. I measc na n-údarás áitiúla a bhfuil leibhéal géilliúntais sách íseal acu (<50 faoin gcéad de stáisiúin aibhneacha ag comhlíonadh na rialachán) leis na Rialacháin ná Dún na nGall agus Fine Gall. Is léir go bhfuil méaduithe móra i ngéilliúntas ó thréimhsí 2001-03 le feiceáil i gCill Mhantáin, Dún Laoghaire-Ráth Dúin, Luimneach, an Mhí, Muineachán, Tiobraid Árann Thuaidh, Uíbh Fhailí, Cill Chainnigh, Ros Comáin agus Loch Garman. Tharla na méaduithe seo i bpáirt mar gheall ar mhonatóireacht MRP níos mó agus i roinnt cásanna laghduithe foriomlána ar leibhéal MRP in aibhneacha.

Tá an t-athbhreithniú ar cháilíocht uisce aibhneacha a rinneadh anseo, faoi na Rialacháin Fosfair, bunaithe ar an gcur chuige maidir le sonraí luach bitheolaíochta Q nó sonraí MRP a úsáid chun géilliúntas a dhéanamh amach. Cé go bhféadfaí a rá go bhfuil na treochoita i ngéilliúntas foriomlán ann i bpáirt mar gheall ar leibhéal mhéadaithe de mhonatóireacht MRP, is dóigh go dtugann an measúnú ar ghéilliúntas le spriocanna bitheolaíochta na Rialachán léargas níos fearr ar threochoita sa stádas cáilíochta uisce iomlán. Comhlíonann 59.3 faoin gcéad ar an iomlán de stáisiúin aibhneacha spriocanna bitheolaíochta na Rialachán. Léiríonn sé seo méadú 3 faoin gcéad ar líon na stáisiún a chomhlíonann spriocanna bitheolaíochta na Rialachán ón tréimhse 2001-2003.

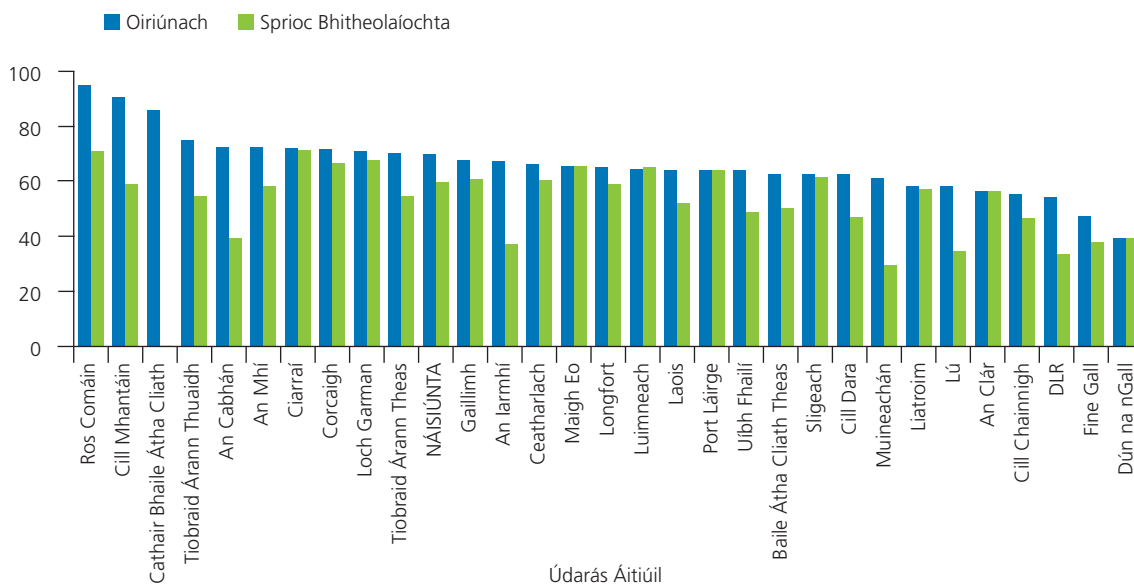
\* Caithfear athruithe i gcéatadán géilliúntais ag stáisiúin monatóireachta údarás áitiúla Bhaile Átha Cliath (.i., Cathair Bhaile Átha Cliath, Dún Laoghaire-Ráth an Dúin, Fine Gall agus Baile Átha Cliath Theas) a láimhseáil go cúramach, de bhí gur beag stáisiún monatóireachta atá ina gcuid limistéar feidhmíochta (<20). Mar sin bíonn athruithe céatadán mhóra mar thoradh ar athruithe i gcáilíocht uisce ag roinnt stáisiún.

I measc na gcontaetha a bhfuil céatadán sách ard de stáisiúin ag comhlíonadh na spriocanna bitheolaíochta iontu tá (>60 faoin gcéad) Ceatharlach, Corcaigh, Gaillimh, Ciarraí, Luimneach, Maigh Eo, Ros Comáin, Sligeach, Port Láirge agus Loch Garman. I measc na gcontaetha a bhfuil céatadán sách íseal de stáisiúin ag comhlíonadh na spriocanna bitheolaíochta iontu tá (<40 faoin gcéad) an Cabhán, Dún Laoghaire-Ráth an Dúin, Dún na nGall, Fine Gall, Lú, Muineachán agus an Iarmhí.

Tá feabhsúcháin mhóra bainte amach i gcáilíocht uisce bitheolaíochta (>10 faoin gcéad) i nDún Laoghaire-Ráth an Dúin, Luimneach, an Longfort, an Mhí agus an Iarmhí. Is dóigh gur tharla sé seo mar gheall gur chuir na húdaráis áitiúla sin bearta a bhain go sonrach le dobharcheantair i bhfeidhm. Is léir áfach meath mór a bheith tagtha ar ghéilliúntas leis na Rialacháin i nDún na nGall. Is dóigh gur tharla na laghduithe i ngéilliúntas den chuid is mó mar gheall ar mheath i gcáilíocht uisce a fheictear go háirithe le cailteanas leanúnach de stáisiúin Q5/Q4-5 ar ardchaighdeán.

Tá sé molta ag na hÚdaráis Áitiúla nó tá raon leathan bearta curtha i bhfeidhm acu atá dírithe ar cháilíocht uisce a chosaint agus a fheabhsú. Rinneadh roinnt feabhsúchán go háitiúil i gcáilíocht uisce mar gheall ar bhearta a cuireadh i bhfeidhm. Tugann torthaí monatóireachta reatha le fios go dteastóidh iarrachtaí i bhfad níos mó chun spriocanna cáilíochta uisce na Rialachán a chomhlíonadh (agus go deimhin na spriocanna níos déine atá sa Chreat-Treoir Uisce).

**Figiúr A1 Céatadán de stáisiúin aibhneacha de chuid an údaráis áitiúil a chomhlíon na Rialacháin Fosfair i 2004-06 agus céatadán de stáisiúin aibhneacha de chuid an údaráis áitiúil a chomhlíon spriocanna bitheolaíochta na Rialachán**





AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL  
PO Box 3000, Caisleán Bhaile Sheonach,  
Co. Loch Garman, Éire

**t** +353 53 916 0600 **f** +353 53 916 0699  
**e** [info@epa.ie](mailto:info@epa.ie) **w** <http://www.epa.ie>



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## **ATTACHMENTS**

24. .”Report Sheds New Light on LNG Blast in Algeria” – Alexanders Gas and Oil Connections, Volume 9 issue # 9, May 6<sup>th</sup> 2004

## Report sheds new light on LNG blast in Algeria

14-04-04 A newly released document provides important insights into the chain of events that led to the January explosion of a LNG facility in the African nation of Algeria. Several scientists who specialize in LNG research said the document indicates that a similar accident could occur at LNG plants like those proposed for Mobile Bay and elsewhere in the United States.

Initial reports blamed a faulty steam boiler for the massive explosion and fire at the government-owned Skikda, Algeria, plant. Those reports were incorrect, according to the new document presented by Sonatrach, owner of the destroyed LNG plant. A display titled "The Incident at the Skikda Plant: Description and Preliminary Conclusions" indicates, instead, that a large amount of liquid gas escaped from a pipe and formed a cloud of highly flammable and explosive vapour that hovered over the facility. The cloud exploded after coming into contact with a flame source.

The exact nature of the cloud is likely to be sharply debated as industry advocates and even a number of independent scientists have argued that an LNG vapour cloud, if it were to form, would be relatively small and would not explode. Most of the 27 people who died were killed by the force of the blast, according to the report. The report lists a "few casualties by fire," though the fire burned for eight hours.

The Sonatrach report was presented at an international LNG conference held in the Middle Eastern nation of Qatar in late March. Officials with the US Department of Energy (DOE), the Federal Energy Regulatory Commission (FERC) and ExxonMobil declined to discuss the document with the Mobile Register.

In the days after the accident, officials with the DOE, FERC and ExxonMobil, as well as Alabama Port Authority director Jimmy Lyons, stressed that the explosion seemed to be entirely related to a malfunctioning boiler. LNG plants in the United States, they argued, would not have boilers like the ones used at the plant in Algeria, so a similar accident could not occur at an LNG facility in America.

But several scientists who examined the new report told the Mobile Register that the type of accident described in it could occur at an LNG facility in this country, regardless of the type or number of boilers present. Almost any source of ignition, from a cigarette lighter to a pilot light, could have ignited a vapour cloud.

ExxonMobil and Cheniere Energy have both proposed building LNG facilities on the shores of Mobile Bay, close to residential neighbourhoods. Both companies said their facilities would not impact nearby residents, even in the event of a catastrophic accident. ExxonMobil would place its plant on land owned by the Port Authority at the former Navy home port; Cheniere would build on Pinto Island.

"I think this tells us that dealing with LNG is a tricky and dangerous business," said James Fay, professor emeritus at the Massachusetts Institute of Technology and one of the nation's leading LNG scientists. "It was apparently a very large gas leak that went on for a while before the explosion. That certainly doesn't give you a lot of faith in their gas detection equipment, with all this gas leaking out. I guess this means sometimes that equipment doesn't work."

Fay said the failure may have important implications for the siting criteria used by FERC when granting permits for new onshore LNG facilities. In particular, Fay said, FERC requires only that companies prove they can contain a vapour cloud and fire resulting from a 10-minute leak of LNG at the plant.

"The fire burned for eight hours, and that fact does seem unusual. I would have thought it would have burned up more quickly," Fay said. "Maybe there wasn't anyone to shut the equipment down. Maybe all of the workers perished in the blast, and the equipment just kept running, spewing LNG out so it just kept burning and burning. ... FERC's rules just say a company would have a 10-minute leak. That's it. But clearly this one kept leaking for a much longer time period."

Fay and others said the report is missing a critical piece of information: Whether the fuel that

leaked from the pipe at the plant was LNG or a LPG, such as propane, or some combination of both. LNG and LPG were present in some quantities at the Skikda plant, the report said, though the damage to the facility was so extensive, it may be impossible to know exactly what kind of gas formed the vapour cloud.

Few would be surprised if LPG proved to be the culprit -- the vapours are known to be highly volatile, and prone to explode when exposed to flame. Pure LNG -- which is almost 100 % methane -- usually is thought to explode only in confined spaces, such as a building or the hull of a ship, according to scientists.

In presentations made in Mobile by the DOE, FERC and ExxonMobil, officials stressed that "LNG does not explode." They also said that if an LNG vapour cloud formed and was somehow ignited, the flame would move through the cloud so slowly that a person simply could walk ahead of it and stay out of danger.

While some scientists agree that may be true of "pure" LNG, which would be entirely methane, the scientific literature suggests that much of the LNG shipped to facilities around the country typically is contaminated with some quantity of more explosive "LPG" gases, such as propane.

A 1980 Coast Guard study titled "LNG Research at China Lake," states that LNG imported into this country is often far from pure, and it reveals that vapour clouds made from "impure" LNG actually explode as readily as the highly volatile LPG. When natural gas is super-cooled and turned into a liquid, as much as 14 % of the total cargo shipped as LNG may actually be LPG or other hydrocarbon fuels, according to the Coast Guard report. Natural gas contains these other fuels when it is pumped from the ground.

LNG containing these so-called "higher hydrocarbons" is known as "hot gas" and has a higher energy content than pure methane. The Coast Guard report reveals that vapour clouds of LNG containing at least 13.6 % of these other fuels can detonate just like pure propane gas. The agency concluded in its report that this deserves "special consideration, as the commercial LNG being imported into the US East Coast has about 14 % higher hydrocarbons."

Several scientists said they were unaware of the Coast Guard's report. They also were unaware that LNG arriving in the United States sometimes contained significant quantities of other gases, such as propane, butane and ethane. They agreed that in light of the Skikda incident, statements made by the LNG industry and federal officials regarding the explosive potential of LNG vapour clouds may need to be re-examined.

"It's pretty clear that this was not sabotage," Fay said, discounting rumours that terrorists may have tried to damage the facility. "I think there is a strong suspicion that the explosion which occurred could have been an LPG explosion or an LNG explosion. If it were LNG, this would be the first major LNG explosion that occurred anywhere." It is also one of the largest vapour cloud explosions on record, according to scientists.

"The fact that there was a vapour cloud is huge," said Bill Powers, an engineer based in California who has studied LNG terminals, siting issues for both onshore and offshore proposals. "We don't know if it was an LNG vapour cloud or an LPG cloud or a mix of both, but, either way, it means it is the kind of accident that could happen here."

Powers pointed out that several terminals proposed for the United States would deal with both LPG and LNG. At the terminal proposed for Long Beach, California, for instance, Powers said the LPG tanks would be right next to the LNG facility. Powers also felt it was noteworthy that Halliburton had conducted a major renovation of the Skikda plant in 1999, updating all of the key safety equipment and computer systems.

A Halliburton website touts the revamped LNG terminal as a model of modern American workmanship.

"Halliburton is pleased to announce that its recently completed LNG Revamp Project at Skikda, Algeria, has passed all its performance tests," reads the company news release announcing the project's completion. "KBR's work included extensive revamp of the three LNG trains and associated utilities and auxiliaries and a complete revamp of the complex's electrical power and control systems. ... Over 9,000,000 construction man-hours were expended."

The three separate LNG regasification plants or "trains" that were revamped by Halliburton were destroyed in the explosion.

Powers said Halliburton's engineers had missed a weak link in their safety planning for the facility.

"That highlights the importance of putting these facilities in places where, no matter what,

people will not be at risk. If a company like Halliburton missed a scenario that could cause this, that tells us that we cannot account for all possible accident scenarios at LNG facilities," Powers said.

"Halliburton would have exhaustively checked out every possible accident chain of events and accounted for it, countered it," he said. "They would do that before they give it a clean bill of health. That's how they operate. They must have simply missed this accident possibility."

Source: Washington Times



**ATTACHMENTS**

25. Lloyd's Casualty Week, September 16<sup>th</sup> 2005

## More than half US Gulf oil output still shut

Hurricane recovery slow, writes Rajesh Joshi in New York — Tuesday September 13 2005

**A**BOUT 60% of the US Gulf's daily crude oil production, 38% of natural gas production and four major refineries representing 5% of national capacity were still shut at the weekend, exactly two weeks after Hurricane Katrina swept across the southeast coastline.

About 56 rigs were damaged, with 20 total losses. An estimated 122 out of 819 manned platforms and three out of 134 rigs in the region remained evacuated, according to the US Department of Energy.

Although the "shut-in" percentage of oil and gas production declined from 95% and 88% respectively immediately after the storm, the latest figures confirm a growing view that a return to normality would stretch into November.

### Decline

The only solace was in a reported 4% decline in US weekly gasoline consumption, as pump prices skyrocketed. However, experts advised circumspection on this figure, since it was not apparent whether shortages played a role.

The US Energy Information Administration's monthly short-term energy outlook for September noted: "Because of considerable uncertainty over the specific extent of damage, it is difficult to provide a single forecast for the upcoming winter."

Instead, the EIA offered three scenarios based on fast, medium and slow recovery.

Of the total US offshore crude oil production of 5.5m barrels a day, the Gulf of Mexico accounts for 1.56m bpd or about 18%. Of the total US crude imports of 10.75m bpd, the US Gulf total region accounts for 6.49 bpd or 60%. Ports in Louisiana, Mississippi and Alabama account for 23.5% of the imports, and the Louisiana Offshore Oil Port 8.5%.

Of the total US refinery capacity of 17m barrels a day, the US Gulf total region accounts for 8.06m bpd, or 47%.

The EIA projects that total US crude production in September will be 4.72m bpd, 4.58m bpd and 4.3m bpd in a fast, medium and slow recovery, respectively. A return to the August levels of 5.4m bpd is not projected until November.

The August refinery throughput of 16.33m bpd is projected to drop to 15.73m bpd, 15.5m bpd and 15.1m bpd in September based on the three recovery scenarios, and not return to "normal" until November.

### Non-availability

These figures underpin the rise to record levels in transatlantic product tanker rates, as European sellers fall over each other to cash in on arbitrage. However, brokers warn that practical problems – including the simple matter of non-availability of ships – would ensure that the US faces a so-called "gasoline shortage" for the near future.

There was no consensus on whether the drop in weekly gasoline demand to 9m barrels from the normal 9.4m barrels – a figure said not to include updated Labor Day statistics – would last into the autumn. One view was that the "drop" in demand actually reflected "shortages".

Indeed, the EIA has obliquely warned of such an outcome. The Colonial and Plantation petroleum product pipelines are back up to 100% of capacity. The Dixie pipeline, which supplies propane into the southeastern US, is at 95%-100%.

"Supplying these pipelines with products may become an issue as long as some of the refineries remain shut down or running at reduced rates," the EIA states.

According to figures available at the weekend, refineries with a combined 930,000 bpd capacity, or nearly 5% of US capacity, remained shut. The EIA said these would remain shut "for an extended period".

A premium is therefore being placed on supplying other refineries with extra crude. The US plans to release 30m barrels from its strategic stockpile to abet this process.

But even here, the recovery would be tied in to distribution issues, experts state.

Hopeful signs have emerged on this front. The Capline, a major crude oil pipeline that supplies crude oil from the Gulf Coast to some Midwest refineries, is past 90% according to operator Shell. The LOOP started operating two of its three berths last week and was understood to be approaching 100% utilisation at the weekend.

## Summary of Major Cases in this week's issue of Lloyd's Casualty Week

Vessel	Type	Flag	Class	GT	DWT	Bit	Casualty
<i>ANGLIAN SOVEREIGN</i>	tug	GBR	LR	2,263	1,000	2003	Ran aground at Oxna, Scalloway, Sep 3. Estimated 200 tonnes fuel oil spilled. 13 crew airlifted safely, refloated and proceeded back to Scalloway. Extensive damage to vessel. Skipper arrested.
<i>APACHE</i>	barge	USA	—	3,550	—	1989	Grounded in Plantation Key, Florida Keys, during hurricane "Katrina" Aug 26 after breaking free from tug <i>Crosby Skipper</i> . Hard aground Sep 6, awaiting salvage plan.
<i>AYGAZ 4</i>	lpg	TUR		2,609	3,133	1981	Reported major engine failure off Croatian coast Sep 2. Problem not reported to Croatian authorities until Sep 4. Towed to Malinska, Krk where repairs will be effected. Master to be fined.
<i>BALTIC CAPTAIN I</i>	chem/oil carrier	CYP	NV	23,235	37,418	2000	Ran aground at Pelican Island, Houston Ship Canal, Sep 2. LOF salvage contract signed with Titan Maritime. Refloated and delivered to its owners Sep 4.
<i>DONGJIN PHOENIX</i>	general	KOR	KR	3,098	4,345	1985	Fire broke out in hold in the Sea of Japan in about lat 34 16N, long 129 49E, Sep 4. A salvage contract signed with Japanese salvors, tug on scene and fire reportedly extinguished Sep 5. Vessel washed ashore Sep 6.
<i>KUK SA BONG 2</i>	general	PRK	—	670	850	1977	Vessel sank at No.3 berth of Dayaowan Bay, Dalian Sep 2. One sailor is missing. To be salvaged.
<i>KYRIAKOS M.</i>	bulker	CYP	AB ABS	20,083	34,368	1976	Ran aground at buoy No.5, Umm Qasr Sep 6. Salvage services rendered under LOF awarded to Tsavliris Salvage. Refloated Sep 9 and anchored, awaiting a berth to discharge cargo.
<i>LONG XUYEN</i>	general	VNM	—	5,470	6,929	1990	Ran aground in strong winds caused by typhoon "Nabi" while lying anchored at Pohang outer harbour Sep 6. All 22 crew members rescued.
<i>MOADDELI</i>	general	DMA	—	898	—	1989	Reported drifting in lat 19 19.3N, long 120E, Aug 24. Tug arrived on scene Sep 2 and taken vessel in tow bound Philippines. Still under tow Sep 6.
<i>PACIFIC HOPE</i>	bulker	PAN	NK	22,147	38,855	1991	Grounded at Km 454, River Parana Sep 2. Vessel is not reported to be obstructing navigation channel. Refloated Sep 3 assisted by tug <i>Alianza Rosario</i> .
<i>PACIFIC SKY</i>	passenger	GBR		46,087	6,135	1984	Experienced mechanical breakdown and drifted aground onto a reef off Isle of Pines, New Caledonia in lat 22 40S, long 167 25.4E, Sep 3-4. Two tugs were being sent from Noumea. Refloated Sep 4, no damage.
<i>PARKGRACHT</i>	general	NLD	LR	5,998	9,656	1986	In contact with Quay 1221 Vrasendock, Antwerp Sep 6. Vessel is making water but situation is stable, surveyor is en route. In port Sep 7.
<i>POLYHRONIS</i>	bulker	MLT	BV	23,386	37,901	1980	Ran aground on banks of the Mississippi, west of New Orleans in Hurricane "Katrina" about Sep 2. Salvage services rendered under Lloyd's Open Form by Wijsmuller Salvage.

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## The following reports are reprinted from Lloyd's List



### AALFJORD (Norway)

Trondheim, Sep 5 -- Understand from the managing owners of general cargo Aalfjord that no decision has yet been taken concerning the vessel. -- Lloyd's Agents.

### AIS NIKOLAS (Greece)

Port Said, Sep 1 -- Bulk Ais Nikolas sailed Suez Aug 31. -- Lloyd's Agents.

### ALLIANCE (Germany)

London, Sep 2 -- Understand research Alliance is still under repair at Genoa.

### ALPHASHIP (Bahamas)

See Aztec.

### ANGLIAN SOVEREIGN (U.K.)

London, Sep 5 -- A press report, dated Sep 4, states: Anchor handling tug/supply Anglian Sovereign (2263 gt, built 2003) ran aground yesterday evening, spilling an estimated 200 tonnes of fuel oil. The skipper was breathalysed and arrested after the incident and is due to appear at Lerwick Sheriff Court next week. The police inquiry is one of three under way into the incident. Pollution booms were set up around the Anglian Sovereign and another was deployed in Scalloway Harbour, while a diver was sent down to survey the damage. A Coastguard counter-pollution team from Southampton was sent to co-ordinate the operation. Fish farmers who have cages in the area were assessing whether any of the oil had affected their stocks. The Maritime and Coastguard Agency said there would be an investigation into how the vessel ran aground at Oxna in strong winds at 2045, UTC, yesterday. A Coastguard rescue helicopter from Sumburgh was called in after the vessel sent a Mayday. The 13-man crew on the vessel was airlifted to safety. The master then managed to refloat the vessel, despite extensive damage, and it proceeded back to Scalloway Harbour.

London, Sep 5 -- A press report, dated today, states: Pollution experts in Shetland estimate that they have recovered almost half of the fuel oil spilt following the grounding of an anchor handling tug/supply Anglian Sovereign. The vessel ran aground on Saturday (Sep 3) evening and about 200 tonnes of fuel leaked into the water at Oxna. Fish farmers on the west side of the islands have been assessing the spill and plan to carry out water samples on their sites. They have stopped feeding their stock and suspended harvesting until water samples have been taken. Three inquiries have been launched into the circumstances which led to the grounding of the emergency towing vessel.

London, Sept 5 -- A Maritime & Coastguard Agency press release, timed 1418, UTC, Sept 4, states: The Maritime and Coastguard Agency can confirm that at 2145 yesterday the Coastguard Emergency Towing vessel anchor handling tug/supply Anglian Sovereign ran aground on the Island of Oxna, 10 miles west of Scalloway. The vessel at present is alongside in Scalloway harbour. The vessel has sustained some damage and is undergoing an underwater inspection by divers to ascertain the extent of that damage. The vessel has also lost approximately 200 tons of marine gas oil. The tug is owned and operated under contract to the Maritime and Coastguard Agency by Klyne Tugs of Lowestoft. The Counter Pollution Branch has mobilised resources to Scalloway, Shetland Islands to work in cooperation with the relevant authorities to deal with this fuel spill. The Marine Accident Investigation Branch which is an independent body has been notified of the incident by the MCA and they will be investigating this incident. The vessel is currently surrounded by booms in Scalloway Harbour and mechanical equipment has been deployed to deal with the pollution. The Maritime and Coastguard Agency are working closely with all interested parties to minimise the pollution risk to the environment.

London, Sept 5 -- A Maritime & Coastguard Agency press release, timed 1252, UTC, today: Following the pollution incident in Scalloway Harbour, the Maritime and Coastguard Agency on behalf of the established Environment Group has issued precautionary advice to local shellfish and fish farmers, and inshore shellfish fishermen in the Scalloway area, not to fish, harvest or feed in areas of obvious oil pollution. Updates will be issued following the assessment of the aerial survey carried out yesterday by an MCA surveillance aircraft. Environmental Health Officers confirm that the clearance carried out in the harbour yesterday has been effective. However, there are sheens, which extend beyond the harbour boundaries. The location, extent and impact of these will be determined during the day. Fish farmers in the vicinity are monitoring the situation on the ground. They report no signs of any pollution affecting these sites and are taking any necessary precautions. Shellfish farmers are also monitoring the situation.

London, Sept 6 -- A press report, dated today, states: Fish-farmers suspended harvesting their stocks as a precaution yesterday while a pollution clean-up continued after the grounding of anchor handling tug/supply Anglian Sovereign. The 42-year-old master of the tug, who was breathalysed following Saturday night's incident, is expected to appear in court at Lerwick next week. He was detained after he managed to refloat the vessel and bring it into Scalloway. Pollution-

Receive immediate notice as soon as a Casualty occurs. For further information please contact Andrew Luxton on +44 (0) 20 7017 4625.



control booms were still deployed around the vessel in Scalloway harbour yesterday. More than half the diesel that spilled from its ruptured tanks was estimated to have been recovered.

#### **APACHE (U.S.A.)**

London, Sept 2 -- A press report, dated Aug 31, states: Tank barge Apache (3550 gt, built 1989) remains sitting just off Plantation Key after grounding Friday (Aug 26) after hurricane "Katrina" made landfall in the Keys. Efforts to move the barge are expected to require "weeks," officials said. "It's a problem because of how big it is and where it is," said Cheva Heck, communications director for the Florida Keys National Marine Sanctuary. The propane barge was empty when it broke free from its tug Crosby Skipper, late Friday. Even empty, the barge draws about 7 feet. The shallows where it grounded near Treasure Harbor "appear to be about 3 to 5 feet deep," Heck said. Resolve Marine Salvage company has been contracted to work on removing the barge. A preliminary salvage plan developed jointly by Coast Guard Sector Key West, Resolve Marine, Crosby Tug LLC of Golden Meadow, La., the marine sanctuary and the state Fish and Wildlife Conservation Commission indicates the tug will be left in place for several weeks. "It will take a few weeks to get the equipment they need down here," Heck said. Sea conditions had prevented an assessment of possible damage to the marine environment as of press time. The barge rests on a hardbottom area which had seagrasses and some soft corals. "Sanctuary divers will go out and look for other areas it might have hit on the way in," Heck said. "There are certain patch reefs that we are concerned about." The salvage plan seeks to remove the barge with as little environmental impact as possible. Since the barge was empty, no hazard exists to residents. To ensure safety, a firefighting safety team from Resolve Marine Salvage is on scene, and the Islamorada Fire Department has been involved in the response. The shipping company could face a legal case for damaging protected marine resources, including fines to cover restoration and recovery costs. A decision on legal action will be made when the barge is moved and complete environmental assessments are available.

Miami, Sep 6 -- Tank barge Apache was in ballast when it went aground off Plantation Key on Aug 23. The barge is still hard aground. The tug has been released. Resolve Marine were called in to free the barge, however, the Coast Guard is waiting for a salvage plan to be presented to them that would be agreeable by them, environmental interests and others before any efforts to free it will take place. -- Lloyd's Agents.

#### **ATHOS I (Cyprus)**

London, Sept 2 -- A press report, dated Sep 1, states: Claims ranging

from \$27 to replace an oil-stained tarp to \$6,300 for boat damage have been settled in connection with the crude oil tanker Athos I oil spill in the Delaware River nine months ago. Nearly \$200 million in claims are still awaiting processing. Two dozen claimants, ranging from individual property owners and recreational river users to state agencies and businesses on both sides of the river, have been awarded close to \$40,000 from the National Pollution Funds Center, an agency of the U.S. Coast Guard. Before it's over, up to \$187 million for 69 claims still pending will have to be considered, said Augusto Rios, chief of the damage claims branch for the Arlington, Va.-based agency. Four claims have been withdrawn and two have been denied to date, Rios said. "Claims are processed in the order they have been received," Rios said. "The larger claims have taken longer to arrive, because it takes a lot longer for the claimants to put together the information they need." Claims and cleanup costs were turned over to National Pollution Fund Center, which oversees the Oil Spill Liability Trust Fund, in February after vessel managers Tsakos Shipping & Trading decided to stop paying out cleanup and damage costs after spending more than double what they were required to pay under the federally regulated liability cap of \$45 million. Cleanup costs have exceeded \$167 million to date. Petty Officer Kimberly Smith, a Coast Guard spokeswoman, said the investigation into the spill has been completed and forwarded to the Atlantic Area Command in Portsmouth, Va., for review. The report will go to Coast Guard headquarters in Washington, D.C., for review before it is released to the public, Smith said. Results could be made public as early as next month. Rios said the center will not be permitted to consider the findings of the report in a claim the ship's management company is expected to make to recover money paid on cleanup costs. To recover all of the money it has paid for cleanup, Tsakos will have to prove that a either an act of God, an act of war or a third party was responsible for the damage caused by the spill, Rios said. A natural resources damage assessment, meanwhile, is still being compiled to determine a cost of environmental damage caused by the spill.

#### **AYGAZ 4 (Turkey)**

London, Sep 7 -- Croatian authorities are to fine the master of lpg Aygaz 4 (2609 gt, built 1981) after he failed to report a major engine failure off the Croatian coast. The vessel was sailing from Rijeka when its engine failed on Friday (Sep 2). However, it did not report the problem to local maritime authorities until late on Sunday. Marina Haluzan, spokeswoman for the Croatian Sea and Transport Ministry, said: "We will be fining the master. He should have reported the engine failure immediately and he also did not report that he had anchored near

the island of Susac. We have yet to determine the size of the fine as we are still inspecting the vessel." The ministry fine came after the Croatian Sea Rescue Service reported the vessel's master to authorities after it was called to the Aygaz 4 on Sunday as it lay anchored near Susac off the central Croatian coast. The tanker has been towed to Malinska on the island of Krk, where it will have its engine repaired. (Note -- Aygaz 4 sailed Rijeka Sep 2 for Dortyol.)

#### **AZTEC (Greece)**

St. Petersburg, Sep 6 -- On Aug 28, the storage crude oil tanker Alfaship, was lying secured to four buoys (two forward and two aft) and anchored with two anchors at No.5 Anchorage Area off Kronshtadt, St. Petersburg. Mooring fenders were floating alongside. Crude oil tanker Aztec, in ballast, with the compulsory pilot onboard, and assisted with two tugs, was manoeuvring in way of the left side of Alfaship, in order to moor alongside the starboard side. At 1810 hrs, Aztec contacted the upper plate of starboard side of Alfaship in way of No. 79 Frame. Aztec sustained damage on its starboard side. The Lloyd's Register surveyor recommended to restore the broken welded seams within a period of two months. The ship was scheduled to complete the loading on Sep 2. Alfaship sustained damage on its port side. Based on our information Alfaship is still at St.Petersburg, while Aztec sailed from St. Petersburg on Sep 02, with cargo on board, for further repairs. Its port of her destination is not currently known. -- Lloyd's Agents.

St. Petersburg, Sep 8 -- Crude oil tanker Aztec sailed from St. Petersburg on Sep 2, bound for Rotterdam. -- Lloyd's Agents.

#### **BALTIC CAPTAIN I (Cyprus)**

London, Sep 2 -- Information received from Houston, dated today, states: Chemical/oil carrier Baltic Captain I (23235 gt, built 2000) is aground at Pelican Island, Houston Ship Channel. Lloyd's Standard Form salvage contract has been signed with Titan Maritime.

London, Sep 6 -- Chemical/oil carrier Baltic Captain I refloated after lightering and was delivered to its owners Sep 4. -- Titan Maritime.

#### **BHN PRODUCTION PLATFORM**

London, Sep 8 -- India's government-owned Oil & Natural Gas Corporation has slapped an insurance claim of Rs11.50bn (US\$260m) for the fire damage sustained by BHN Production Platform on Jul 27. "We had expected the ONGC claim to be in the region of the amount that has been filed," said M.K. Garg, chairman of the Chennai-based public sector undertaking United India Insurance, which insured the platform. "It is indeed the single largest claim ever filed in India by any company. However, we have sufficient reinsurance to cover the claim and it will not make a major dent in our profitability." It would appear that the

state-run United India had shared the risks for the ONGC oil platform with other state-owned and private sector general insurance companies, as well as with national reinsurer General Insurance Corporation of India. The platform was insured for \$750m, with the first \$20m deductible, which means ONGC will have to absorb losses up to \$20m on its own balance sheet. The state-run explorer-producer, which has the country's largest insurable assets, is believed to require around \$500m to repair the damaged platform.

#### **BRENTLAND (Norway)**

London, Sep 8 -- Following received from Stavanger RCC, timed 0900, UTC: General cargo Brentland (299 gt, built 1963) sustained engine failure and blackout and subsequently lightly grounded in lat 59 21.30N, long 05 57.20E at 0120, UTC, this morning. Support vessel Peter Henry Von Koss assisted in refloating the vessel. No damage or injuries sustained and vessel continued on voyage.

#### **CHENG CHING FENG (Taiwan)**

See "Somalia" under "Piracy".

#### **CHRISOPIGI LADY (Liberia)**

Singapore, Aug 29 -- Product tanker Chrisopigi Lady sailed Singapore 2330, Aug 27 for Mina al Ahmadi. -- Lloyd's Agents.

#### **CHUNG YI 218 (Taiwan)**

See "Somalia" under "Piracy".

#### **COSTA CLASSICA (Italy)**

London, Sep 3 -- Passenger Costa Classica arrived Corfu Sep 2 and sailed the same day.

#### **CROSBY SKIPPER (U.S.A.)**

See Apache.

#### **CSL TADOUSSAC (Canada)**

Troy, Michigan, Sep 5 -- Bulk CSL Tadoussac (20634 gt, built 1969) arrived in the Saginaw River early this morning to unload cement clinker at the Essroc Terminal in Essexville. While deploying its unloading boom, the brakes failed causing the boom to crash down to the dock. Reports indicated that at the time of the accident the brakes were "smoldering". The Master of the CSL Tadoussac radioed US Coast Guard Station Saginaw River to report the incident and asked them to inform other large vessels to transit the area at a very slow speed. No injuries were reported. -- Great Lakes and Seaway Shipping News.

Troy, Michigan, Sep 7 -- Bulk CSL Tadoussac was outbound the Saginaw River early Tuesday morning (Sep 6). It is unknown if it was able to offload its cargo at Essroc, or if it departed heavy. -- Great Lakes and Seaway Shipping News.

#### **DOCTOR HOOK**

See Quickcat.

#### **DONA RAMONA (Philippines)**

See "Philippines" under "Political & Civil Unrest".

#### **DONGJIN PHOENIX (South Korea)**

London, Sep 5 -- A press report, dated today, states: Fire broke out on board general cargo Dongjin Phoenix (3098 gt, built 1985) in the Sea of Japan yesterday but all 15 crew members were rescued unharmed, the Japan Coast Guard said. The vessel reported to the Coast Guard at around 1430 hrs that a fire had started in its hold and that it was still burning. The 15 crew members -- eight South Koreans and seven Chinese -- abandoned the vessel in lifeboats.

London, Sep 5 -- Following received from Japan Coast Guard, timed 0025, UTC: General cargo Dongjin Phoenix reported in lat 34 16N, long 129 49E, at 0600, JST, today. A salvage contract was signed with Japanese salvors; a tug is already on scene and the fire is reportedly almost extinguished. However, operations are being made more difficult by the approach of a typhoon, which is already generating heavy seas.

London, Sept 5 -- Following notice to mariners issued today: General cargo Dongjin Phoenix, on fire, adrift in lat 33 45.2N, long 129 21.7E at 1420, UTC, today.

London, Sep 6 -- Following received from Japan Coast Guard, timed 0015, UTC: General cargo Dongjin Phoenix was reportedly adrift in lat 33 23 08N, long 129 06 13W, at 2340, UTC, Sep 5. The fire is reportedly out.

London, Sept 6 -- Following notice to mariners issued today: Drifted unmanned general cargo Dongjin Phoenix washed ashore.

London, Sept 6 -- Following navigation warning issued today: Stranded general cargo Dongjin Phoenix exists in lat 33 00.9N, long 129 01.9E.

London, Sep 7 -- Following received from Japan Coast Guard, timed 0440, UTC: General cargo Dongjin Phoenix remains aground in lat 33 00.92N, long 129 01.92E.

London, Sep 7 -- The following press release was issued by Leonhardt & Blumberg, Hamburg, managers of c.c. NYK Prestige, dated today: Our vessel NYK Prestige, on route to Busan, rescued 14 Korean seamen from general cargo Dongjin Phoenix, which was on fire and sinking. NYK Prestige, under the command of Captain Bernd Jantzen, was sailing under time charter with NYK, Japan, from Osaka to Busan, when at 1440 hrs, Sep 4, a mayday message on VHF was received from Dongjin Phoenix, stating: "Distress, vessel on fire" and shortly after: "Vessel slowly sinking". The distance between the two vessels was about six nautical miles and the distance to Busan was about 50 nautical miles. Winds were force seven (near gale) and there was a high swell. Captain Jantzen communicated with the Korean Captain Kim Yeion Keun, and was advised that the crew of Dongjin Phoenix were to abandon their sinking vessel into lifeboats and liferafts. NYK Prestige diverted to towards the position of the distress.

Upon arrival at the scene, a rescue was effected. In just one hour and 42 minutes after receiving the first mayday message the 14 Korean seamen from the lifeboat and rafts were safely onboard NYK Prestige. However, one Korean seaman was missing. Our vessel started searching for this missing seaman, who was picked up 20 minutes later by helicopter. At 2030 hrs, Sep 4, all 14 seamen, rescued by our vessel, were brought, in a healthy condition, to the port of Busan.

Yokohama, Sep 8 -- General cargo Dongjin Phoenix had a fire in No 1 hold in lat 34 40N, long 130 02E, at 1400, Sep 4. Tug Koyo Maru was dispatched to assist but was unable to take the vessel in tow due to high seas. Dongjin Phoenix subsequently grounded in the Shughenjima shallows, near the Goto Islands. There were no injuries, and no oil spill has been observed. -- Lloyd's Agents.

#### **EISHO MARU 1 (Panama)**

Busan, Aug 31 -- General cargo Eisho Maru 1 arrived Masan Aug 30. -- Lloyd's Sub-agents.

#### **ELTSEN**

##### **(St. Vincent & Grenadines)**

Piraeus, Sep 2 -- General cargo Eltsen sailed Piraeus Sep 1. -- Lloyd's Agents.

#### **EUGENIO**

##### **(St. Vincent & Grenadines)**

London, Sept 2 -- Understand general cargo Eugenio grounded off Madagascar Aug 7 laden with approximately 100 containers of general cargo some of which was reefer cargo. Salvage services were rendered to the vessel under the terms of Lloyd's Open Form 2000 by Smit International. The vessel was successfully refloated Aug 18. During the refloating operation the vessel listed severely to starboard causing container lashings to break and as a result, 39 containers fell overboard, 26 full containers including one reefer and 13 empty containers. The vessel was subsequently towed to Durban. The shipowners have declared general average.

#### **FJALIR (Norway)**

London, Sep 5 -- Information received from Sandnes, dated today, states: Ro/ro Fjalir (646 gt, built 1974) experienced engine problems and grounded at 0840, local time, today during its arrival at Krakhella. There were no injuries to the 25 passengers on board. The vessel was refloated by local vessels after few hours. Following a diver's inspection, ferry "Svanoy will tow the vessel to a shipyard. Ferry Sunnfjord will replace the vessel.

#### **GALAXY II**

See Yinhe 2.

#### **GAS VISION (Panama)**

London, Sep 3 -- Lpg Gas Vision arrived Sakai Sep 1.

**GC 55**

See Kiperousa.

**GECO SAPPHIRE (Panama)**

Gdynia, Sep 6 -- Research Geco Sapphire, now renamed EDT Protea, is being repaired in a repair shipyard in Gdynia. Due to financial problem of the Greek shipowner, the repairs will last for about six months. -- Correspondents.

London Sep 7 -- Research Geco Sapphire now EDT Protea is not undergoing any repair, as we wrongly stated in yesterday's edition, but a major conversion. She was formerly known as a Seismic Survey Vessel and is in the process of being converted to a DP-III DSV, light construction and ROV support vessel. The vessel has been lengthened, added accommodation, engines, generators and thrusters. The conversion is scheduled to be completed just after the coming new year. We would like to apologise for our erroneous suggestion that the vessel's owner faced any kind of financial problems.

**GENERAL MEHMANDAROV (Azerbaijan)**

Baku, Sept 2 -- Product tanker General Mehmandarov is still repairing at Parkkommuna. -- Lloyd's Agents.

**GEORGE T. (St. Vincent & Grenadines)**

London, Sept 2 -- Bulk George T. arrived off port limits Gibraltar 2100, Aug 31 and left 2110, same day.

**GRANDE AMBURGO (Italy)**

Zeebrugge, Sep 2 -- Ro/ro Grande Amburgo (56738 gt, built 2003), bound Antwerp, grounded in the River Scheldt, near buoy 47, at 1930, local time, today. -- Lloyd's Sub-agents. (Note -- Grande Amburgo sailed Hamburg Sep 1 for Antwerp.)

Maassluis, Sep 2 -- Ro/ro Grande Amburgo grounded off Hansweert for unknown reasons at about 1930, local time, today. -- Lloyd's Sub-agents.

Zeebrugge, Sep 2 -- Ro/ro Grande Amburgo was reported afloat at 2130, local time, and subsequently passed buoy 55, on the River Scheldt, at 2143. -- Lloyd's Sub-agents.

London, Sep 2 -- Understand ro/ro Grande Amburgo was assisted under Lloyd's Open Form by URS and Multraship.

Maassluis, Sep 2 -- Ro/ro Grande Amburgo was refloated about 2130, local time, with help from four tugs of URS. After investigation the vessel will be able to enter the harbour. -- Lloyd's Sub-agents.

London, Sep 4 -- Ro/ro Grande Amburgo arrived Antwerp Sep 3.

Maassluis, Sep 5 -- Ro/ro Grande Amburgo sailed Antwerp Sep 4. -- Lloyd's Sub-agents.

**HANSEATIC (Bahamas)**

Trondheim, Sep 5 -- Passenger Hanseatic underwent temporary repairs to the bottom tanks, alongside at Nesna. The vessel sailed Sep 1 for Hamburg, ETA late Sep 5. -- Lloyd's Agents.

London, Sep 7 -- Passenger Hanseatic arrived Hamburg Sep 5.

**HI'IALAKAI (U.S.A.)**

London, Sep 1 -- A press report, dated today, states: The government research vessel Hi'ialakai (built 1984) is returning to Honolulu for repair to an engine, cutting short a 35-day voyage to the Northwestern Hawaiian Islands. On Monday (Aug 29), just three days into the trip and southwest of French Frigate Shoals, there was a small fire in the engine-room of the 224-foot vessel, said Sean Corson, of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. "My understanding is it was a small fire that was put out quickly," Corson said yesterday, adding that no one was hurt. The ship's crew shut down the engines to troubleshoot the problem and determined that the vessel needed to be repaired in port, Corson said. "It was very well handled and hasn't presented a problem other than its interrupted schedule," he said. Corson did not know yesterday what modifications might be made to the planned research cruise or how many scientists are aboard. He is acting reserve manager while the manager is off island at a conference. Typically, the Hi'ialakai has officers and crew of 24 and 22 scientist-passengers aboard, Capt. Scott Kuester explained while giving a tour of the vessel last month. The vessel served the Navy and Coast Guard before being renovated for scientific work for the National Oceanic and Atmospheric Administration. Its four diesel engines have a total of 1,600 horsepower. The vessel now is traveling at seven mph, about half its usual cruising speed, and probably will be back to its Snug Harbor berth this weekend (Sep 3/4), Corson said. A crew member said the fire was preceded by a small explosion, but the crew member did not elaborate on the cause, instead noting that "everyone is OK, and the fire was put out quickly."

**HSIN LIEN FENG 36 (Taiwan)**

See "Somalia" under "Piracy".

**HUAL TRAPPER (NIS)**

Durban, Sep 7 -- Vehicle Hual Trapper arrived Durban Sep 6. -- Lloyd's Agents.

**JAVA SEA (Singapore)**

Singapore, Sep 3 -- General cargo Java Sea is currently at Singmarine Floating Dock 1, Singapore. -- Lloyd's Agents.

**KAAWA (Uganda)**

See Kabalega.

**KABALEGA (Uganda)**

London, Sep 7 -- A press report, dated Sep 6, states: The joint concessioning of the Kenya-Uganda railways will continue in spite of the sinking of ro/ro Kabalega and the demobilisation of ro/ro Kaawa and ro/ro Pamba. However, the handover date had been extended to next March, the works minister, John Nasasira, said while receiving the report of enquiry into the sinking of the Kabalega. He said bidders requested

for more time to conclude financial arrangements. The Pamba and the Kaawa were out of service awaiting repairs and certification that would enable them to get insured. The minister said structural repairs on the two ferries were almost complete. He said funds were being mobilised to complete the maintenance work required to bring them to class and insurance before being put back in service. The Kabalega was not insured at the time it sank because it lacked the necessary maintenance.

**KIPEROUSA (Malta)**

London, Sept 6 -- A press report, dated today, states: Extensive damage to barge GC 55, brought to the Eastern Cape coast for the bulk Kiperousa salvage operation, is likely to cause another delay in the ill-fated operation, which is now becoming a race against the onset of further bad weather. The barge, 86m by 23m, arrived in East London at the weekend after being in tow by tug Zakher Delmon, from the United Arab Emirates for the past month. Several bad storms were encountered on the voyage. After personally inspecting the barge yesterday, South African Maritime Safety Association spokesman Captain Peter Kroon described the damage it sustained as "serious". He said the vessel, tied up on the East Bank, would be taken into the dry dock today for a more thorough assessment. "In my opinion the damage is serious, and I imagine the decision will simply be to either repair it, or tow it out to sea and sink it." He said the barge was insured for R400,000. "I cannot imagine that repairs will amount to much less than R1 million. That leaves the question of who will pick up the R600,000 tab for the balance," he added. Together with salvors SvitzerWijismuller's senior salvage master Captain Nick Sloane, Kroon on Thursday did an in loco inspection of the stranded Kiperousa. Both Kroon and Sloane confirmed that the ship was now a wreck. Wide cracks, right through the vessel, had opened up in the bow, amidships and through the stern accommodation section. Both marine experts are worried about more bad weather, with Kroon stressing that another storm, like the one at the end of August, was likely to rip Kiperousa apart. While an earlier salvage operation involving a helicopter and road transportation from Wesley had succeeded in transferring around 1,600 logs to East London, about 7,000 logs are still trapped in the ship's flooded holds. Sloane was last night still hoping that the GC 55 would be repaired and that, together with the Zakher Delmon, it would be put to work on the salvage operation.

London, Sep 7 -- Tsavliris Salvage has clarified why it is no longer handling a problem-plagued wreck operation off the South African coast. Tsavliris stressed that it had advised continued use of a heavy-lift helicopter in taking cargo off bulk Kiperousa, which had originally

experienced flooding in its engine-room after running aground on Jun 7 during a voyage from Durban to the Far East. Tsavlis said it had earlier de-watered the engine-room and removed all bunkers and other pollutants from the vessel. Under a first wreck removal contract, it also removed the vessel's deck cargo of up to 1,560 logs, about 6,000 tonnes. This was carried out in 15 days "by use of the most powerful helicopter available," the Greek firm said. It admitted the helicopter was a "more expensive method" than lightering by barge but was justified by the conditions. Tsavlis hired a Russian-built MI26 helicopter to remove the deck cargo from the log bulker, which has been stranded for three months, but said that its hopes of refloating the vessel in late July were dashed by bad weather which further damaged the vessel's hull and left all its holds flooded. This prompted the vessel's owners and P&I insurers to seek new tenders for removing the under-deck cargo. Saying it did not formally bid for the most recent stage of the operation, the Greek salvor said it had nevertheless "proposed" continued use of the helicopter, which was operational in bad weather, as it believed the vessel could break up before discharging by barges could be completed. "A number of companies tendered and we understand all of them, with the exception of one, included the use of the helicopter," Tsavlis said in a statement. It added that "the Club decided to entrust the operation to the only company that excluded the use of the helicopter." The salvage group said that reports it had abandoned the operation were "entirely wrong" and it had wished the insurers success in completing the project. It is understood that French insurer Axa provided coverage for the bulker's hull as well as P&I risks and it has been required to post a hefty guarantee with the South African authorities against damage from the vessel or cargo. The removal operation has been taken over by SvitserWijismuller. Last week, it was reported that the bulker had lost some of its logs as it began breaking up in fierce gales.

London, Sept 7 -- A press report, dated today, states: The salvage team removing an estimated 6 000 logs worth R65-million from grounded bulk Kiperousa have been unable to make use of a second larger barge (GC 55) after it was damaged in a storm in the Mozambique Channel. And if the barge, which arrived at the weekend from the Middle East, is not repaired in time, Kiperousa could come apart in bad weather. The barge being used in the salvage operation can only hold between 100 and 120 logs. The Middle Eastern barge, measuring 84 metres by 24 metres, accommodates between 400 and 500 logs, said Captain Nick Sloane, SvitserWijismuller's senior salvage master. The barge was taken to dry dock at East London's harbour yesterday and the extent of the

damage would be known only later today, said Sloane. To date, the smaller barge used in the salvage operation has taken four loads of logs from the ship. "The first of four holds has been cleared," said Sloane. Meanwhile, Kiperousa continues to present a challenge to the salvage team, after it shifted and was further damaged in a severe storm at the end of last month. "The ship is moving the whole time. Our crane is also moving," said Sloane. The crane, attached to the ship, towers 10 metres above the deck. "No one knows when it will break," said Sloane, who nevertheless is confident that, "without bad weather", the salvage operation will take a further six weeks. SA Maritime Safety Authority spokesman Peter Kroon said: "Another storm will definitely destroy the ship."

#### **KUK SA BONG 2 (North Korea)**

London, Sep 6 -- A press report, dated Sep 3, states: A cargo vessel of the Democratic People's Republic of Korea (general cargo Kuk Sa Bong 2 (670 gt, built 1977)) sank at the No. 3 berth of Dayaowan Bay in Dalian, Liaoning Province in north-east China, Friday night (Sep 2), leaving one sailor missing, the Dalian Maritime Bureau said Saturday. The 670-ton cargo vessel with 15 sailors on board, anchored at the Dayaowan bay, started to set sail at 2100 Friday, when the accident occurred. "The vessel body leaned to the right suddenly, overturned and sank in a few minutes," a witness said. Rescuers saved 14 sailors and are searching for the missing chief engineer, with the sea route closed. Investigation into the cause of the accident is under way.

Dalian, Sep 7 -- General cargo Kuk Sa Bong 2 sank at pier No.3 of Dalian Container Terminal (Dalian DCT Port) after discharge at 2130, local time, Sep 2. It maybe that the poor stowage of the goods (27 x 20' containers with full goods of about 700-800 tonnes) on board caused the sinking. The matter is being investigated by MSA, DCT and Carrier. Fourteen crew were rescued and one is missing. After investigation the salvage must be carried out. -- Lloyd's Agents.

#### **KYRIAKOS M. (Cyprus)**

London, Sep 7 -- Bulk Kyriakos M. (20083 gt, built 1976), cargo 34,000 tonnes rice, ran aground at buoy No.5, Umm Qasr, Sep 6. Salvage services awarded under Lloyd's Open Form to Tsavlis Salvage.

Piraeus, Sep 8 -- Bulk Kyriakos M. was refloated early this morning and is presently anchored, awaiting a berth to discharge its cargo. -- Tsavlis Salvage (International) Ltd.

#### **LONG XUYEN (Vietnam)**

See "Typhoon 'Nabi'" under "Weather & Navigation".

#### **MICHELLE (Antigua & Barbuda)**

London, Sep 3 -- Following received from Den Helder RCC, timed 0709, UTC: General cargo Michelle is still

lying in the same position. Preparations for salvage are continuing, and refloating operations are expected to commence tomorrow evening.

London, Sep 5 -- Following received from Den Helder RCC, timed 0930, UTC: General cargo Michelle remains in the same position with salvage operations continuing. A meeting between parties is scheduled for 1200. It is hoped the vessel will be lifted later today and then taken to Delfzyl/Eemshaven tomorrow.

London, Sep 6 -- Following received from Den Helder RCC, timed 1250, UTC: An attempt to lift general cargo Michelle failed yesterday after one of the three slings broke. The vessel is now back in the same position, with a list of 30 degrees.

London, Sep 7 -- Following received from Den Helder RCC, timed 1350, UTC: General cargo Michelle remains in the same position with salvage operations continuing.

#### **MOADDELI (Dominica)**

London, Sep 3 -- Following received from Hong Kong MRCC, timed 0315, UTC: General cargo Moaddeli (898 gt, built 1989), J7AT5, Ulsan for Singapore, reported drifting on Aug 24, following power blackout, in lat 19 19.3N, long 120 00E. A tug arrived on scene at 2230 hrs, yesterday, and has taken the vessel in tow. MRCC do not yet know which port the vessel will be towed to.

London, Sep 4 -- Following received from Hong Kong MRCC, timed 0317, UTC: General cargo Moaddeli is being towed to the Philippines, but the MRCC are unaware of the actual port to which it is being towed and its ETA.

London, Sep 6 -- Following received from Manila Coast Guard, timed 0030, UTC: Understand general cargo Moaddeli is still under tow by a Manila-based tug, bound Philippines.

#### **MONARCH OF THE SEAS (NIS)**

London, Sep 2 -- A press report, dated today, states: Three crew members were killed by an apparent methane gas leak on board passenger Monarch of the Seas (73937 gt, built 1991) in the port of Los Angeles today, a fire spokeswoman said. There were three fatalities and seven other people injured, Fire Department spokeswoman Melissa Kelley said. No passengers were involved, she said. Two of the injured were ship's physicians who had gone to aid the others. Two of the injured were being taken to hospitals. The other five were "walking," she said. The incident aboard Royal Caribbean's Monarch of the Seas was reported at 0915. Crew members were performing routine maintenance in the starboard propeller shaft when they came in contact with the gas, Kelley said. Firefighters discovered a five-gallon container of raw sewage that was the apparent source of the methane leak, she said. Passengers were allowed to remain aboard the vessel. The vessel is based in Los Angeles harbour and normally cruises to Baja California.

London, Sep 6 -- Passenger Monarch of the Seas sailed Los Angeles Sep 3.

#### **MSC FABIENNE (Panama)**

London, Sep 5 -- Information received from Kiel, dated today, states: On Aug 24, c.c. MSC Fabienne (54774 gt, built 2004) ran aground on the River Elbe when leaving Hamburg. Tugs tried to stop the ship but it ran aground on the beach close to Oevelgoenne. The ship was subsequently refloated. (Note -- MSC Fabienne sailed from Hamburg at 1645 hrs, Aug 24 and arrived at Bremerhaven at 0250 hrs, Aug 25. It sailed at 1755 hrs, Aug 25 and subsequently arrived at Piraeus on Sep 1.)

#### **MSC KATIE (Panama)**

Durban, Sep 7 -- C.c. MSC Katie sailed Durban Sep 6. -- Lloyd's Agents.

#### **NATIONAL PROSPERITY (Panama)**

Taipei, Sep 6 -- Bulk National Prosperity is still docked at China Shipbuilding, Kaohsiung, for repairs which are expected to be completed on or about Sep 10. -- Lloyd's Agents.

#### **NCC MADINAH (NIS)**

Singapore, Aug 29 -- Chem.tank NCC Madinah arrived Singapore 0825, Aug 28. -- Lloyd's Agents.

Singapore, Sep 3 -- Chem.tank NCC Madinah is currently at Singapore Tech North Pier West. -- Lloyd's Agents.

#### **NEEKIS (Canada)**

London, Sep 2 -- Fishing Neekis (131 gt, built 1978) ran aground near Hocking Point in Alberni Inlet, B.C. in lat 48 04.59N 124 50.21W at 0158, local time, today.

London, Sep 2 -- Following received from Coast Guard Victoria, timed 1950, UTC: Fishing Neekis is still aground with salvage operations in progress.

London, Sep 5 -- Following received from Victoria BC MRCC, timed 0100, UTC: Fishing Neekis was refloated by a commercial tug on Sep 3 after transshipping some of its cargo to another fishing vessel and it departed under its own power for Alberni for inspection.

#### **NEW GLORY (Dominica)**

Singapore, Aug 30 -- General cargo New Glory sailed Singapore 0810, Aug 29. -- Lloyd's Agents.

#### **NOBLESSE-C. (Netherlands)**

Maassluis, Sep 2 -- General cargo Noblesse-C. sailed Ymuiden Sep 2. -- Lloyd's Sub-agents.

#### **OIL AMBASSADOR (Liberia)**

See "United Kingdom" under "Port State Control."

#### **ORIENT BRILLIANCE (Panama)**

London, Sep 6 -- The following statement, dated today, was issued by Wallem Shipmanagement, Hong Kong, managers of bulk Orient Brilliance: Wallem Shipmanagement, managers of the bulk Orient Brilliance, which

touched a submerged rock while departing San Nicolas, Peru on Aug 29, report that repairs are proceeding to tanks open to the sea. A team of 12 divers, with workshop, has completed repairs to No.1 (S) DB tank and work is in progress to No.4 (S) DB tank in line with Class recommendations. Following completion and after DNV'S Response Team have checked vessel stability and stresses, they will request agreement for the Orient Brilliance to sail to Callao, some 240 miles north, which offers better water conditions for water repairs. At Callao, it is the intention to complete repairs prior to the vessel continuing on passage to its discharge port in China.

#### **PACIFIC HOPE (Panama)**

Buenos Aires, Sep 2 -- Bulk Pacific Hope (22147 gt, built 1991), San Lorenzo for Rosario loaded with soya pellets, grounded at Km 454, River Parana, at 0240, Sep 2. The vessel is not reported to be obstructing navigation in the channel. -- Lloyd's Agents.

Buenos Aires, Sep 6 -- Bulk Pacific Hope was refloated at 2240, local time, Sep 3, assisted by tug Alianza Rosario. -- Lloyd's Agents.

#### **PACIFIC SKY (U.K.)**

Wellington, Sep 5 -- Passenger Pacific Sky (46087 gt, built 1984) experienced mechanical breakdown and drifted aground onto a reef off the Isle of Pines, New Caledonia, over the weekend (Sep 3-4). Two tugs were being sent from Noumea to refloat the vessel and divers were to inspect for damage. -- Lloyd's Agents.

London, Sep 5 -- Following received from Australia RCC, timed 2340, UTC, Sep 4: Passenger Pacific Sky grounded in lat 22 40S, long 167 25.4E. It was refloated by tugs at 2115, UTC, Sep 4 and an inspection of the hull by divers revealed no apparent damage.

London, Sep 5 -- A press report, dated today, states: Passenger Pacific Sky, with more than 1,700 people on board, ran onto a reef in the south of New Caledonia over the weekend. Maritime authorities in Noumea said the vessel experienced engine problems and drifted onto the reef of Bayonnaise near the isle of Pines. Police divers checked the vessel and found it to be undamaged. The incident occurred in calm conditions and all persons on board are safe.

Sydney, Sep 5 -- Passenger Pacific Sky has been refloated after running onto a reef in the south of New Caledonia. According to maritime authorities in Noumea, the vessel experienced engine problems and drifted onto sand at Bayonnaise, near the Isle of Pines, at 1330, local time, yesterday. P&O Cruises Australia said the vessel was refloated around 0700, Sydney time, today. Company spokesman John Richardson said the vessel was at the Isle of Pines anchorage where a Lloyd's Register surveyor would inspect it today. All passenger services were available and a tender service to the island enabled

passengers to enjoy the facilities ashore today, he said. The vessel and passengers have, at all times, been safe. The Pacific Sky departed Brisbane on Thursday (Sep 1) on a nine-night South Pacific cruise with 1,289 passengers and 615 crew on board. Mr Richardson said the vessel's schedule would have to be revised as a result of the incident. It was due at Mystery Island today but, subject to the surveyor's report, was likely to sail there from the Isle of Pines and then on to Port Vila, missing a call at Wala. -- "Lloyd's List Daily Commercial News."

Noumea, Sep 5 -- Passenger Pacific Sky grounded near Ilot Bayonnaise Bayonnaise, near Isle of Pine, at 1430, local time, Sep 4. The 1,163 passengers and 601 crew members were not injured and no breach was found in the vessel's bottom hull. The vessel was refloated by two tugs at 0800 this morning, and is expected to arrive at Noumea at about 1600 hrs. The cost of the salvage is expected to be around US\$150,000. -- Lloyd's Agents.

Wellington, Sep 5 -- Passenger Pacific Sky has been refloated after running onto a reef in the south of New Caledonia. According to maritime authorities in Noumea, the vessel experienced engine problems and drifted onto sand at Bayonnaise, near the Isle of Pines, at 1330 yesterday. P&O Cruises Australia said the vessel was refloated at around 0700, Sydney time, this morning. Company spokesman John Richardson said the vessel was at the Isle of Pines anchorage where a Lloyd's Register surveyor would inspect it today. All passenger services were available and a tender service to the island enabled passengers to enjoy the facilities ashore today, he said. The vessel and passengers have, at all times, been safe. Pacific Sky departed Brisbane on Thursday (Sep 1) on a nine-night South Pacific cruise with 1,289 passengers and 615 crew on board. Mr Richardson said the vessel's schedule would have to be revised as a result of the incident. It was due at Mystery Island today, but subject to the surveyor's report, the vessel was likely to sail there from the Isle of Pines and then onto Port Vila, missing a call into Wala. -- Lloyd's Agents.

London, Sept 5 -- A press report, dated today, states: Passenger Pacific Sky, which ran onto a reef in New Caledonia at the weekend, has been pulled free by two tugs and led to an anchorage, marine authorities said. According to an initial inspection by approved New Caledonian divers Veritas, the ship had not sustained any damage from yesterday's accident apart from a block of coral wedged in a propeller shaft. An Australian team from Lloyd's Register arrived this evening on site for a thorough inspection. Subject to approval by the maritime authorities, the ship was expected to continue its cruise toward Vanuatu tonight, monitored by the experts remaining on board.

London, Sept 7 -- Passenger Pacific Sky was sea bound Brisbane at 1741, UTC, today.

#### **PARKGRACHT (Netherlands)**

Massluis, Sep 6 -- General cargo Parkgracht (5998 gt, built 1986) struck Quay 1221 at the Vrasendock, Antwerp, at 1030 today and is making water. At present, the situation is stable and a surveyor is en route to the vessel. -- Lloyd's Sub-agents.

Maassluis, Sep 7 -- General cargo Parkgracht remains in port at Antwerp. Crew are investigating causing of leak. Understand ballast tanks unable to cope with water ingress. -- Lloyd's Sub-agents.

#### **PHILADELPHIA (U.S.A.)**

See Yasa Aysen.

#### **POLARBORG II (Uruguay)**

Buenos Aires, Sep 6 -- Trawler Polarborg II is currently at San Antonio Este. -- Lloyd's Agents.

#### **POLYHRONIS (Malta)**

Ymuiden, Sep 5 -- Wijsmuller Salvage rendered services under Lloyd's Open Form to bulk Polyhronis (23386 gt, built 1980) aground on the banks of the Mississippi, west of New Orleans, Sep 2. Salvage staff from the Netherlands and United States have been tasked. -- Wijsmuller Salvage BV. (Note -- Polyhronis arrived Ama Anchorage Aug 21.)

#### **QUEEN OF CAPILANO (Canada)**

See Queen of Cowichan.

#### **QUEEN OF COWICHAN (Canada)**

London, Sep 2 -- A report from LaSalle, PQ, dated Sep 1, states: As BC Ferries break down almost every day, the ferry workers' union is demanding that the company face some scrutiny. Two more vessels broke down yesterday -- ro/ro Queen of New Westminster, on the Tsawwassen-Nanaimo run, and ro/ro Queen of Capilano (2855 gt, built 1991), on the Horseshoe Bay-Bowen Island route. They were just the latest in a series of mechanical problems that have hobbled the ferry fleet all summer. On Monday (Aug 28), ro/ro Queen of Cowichan was removed from service until the second week of September on the Nanaimo-Horseshoe Bay route. Ferry spokeswoman Deborah Marshall said that vessel was having a problem with its main gear. Now ferry workers union president Jackie Miller wants Premier Gordon Campbell to order the Auditor-General to look into how BC Ferry Services spends the \$130-million taxpayer subsidy it gets each year. "A wholly unrealistic mandate to compete against itself with an aging fleet, aging work force and ailing infrastructure make a public accounting of the Coastal Ferry Act a necessity," Mr Miller said at a news conference yesterday. The union says the Campbell government removed such oversight when it turned the Crown corporation into a private company. Mr Miller said the union is not trying to reverse the privatization,

but just wants some accountability. Captain Brian Hart, the head of the ships' officers' arm of the union, said with the unprecedented breakdowns this summer, the company has barely "limped through." This week, president David Hahn acknowledged the company has had a "brutal" summer for breakdowns, as two ferries were fixed on Monday and another was pulled out for repairs. Mr. Hahn said the company has no spare vessels at all at a time of year when passenger and vehicle traffic are at their highest. He said vessels have to "run flat out without even a day off." This summer has been troublesome for the ferry corporation fleet, which relies on some vessels that are more than 40 years old. However, company vice-president Mike Corrigan said yesterday that on-time performance is up and customer satisfaction levels are rising. "We're doing what we can to eliminate breakdowns and making the customers' travel experience as good as possible," he said. "I don't believe we're losing customers' confidence but they have every right to be concerned."

#### **QUEEN OF NEW WESTMINSTER (Canada)**

See Queen of Cowichan.

#### **QUEEN OF OAK BAY (Canada)**

London, Sep 2 -- A press report, dated today, states: BC Ferries says that due to mechanical problems, ro/ro Queen of Oak Bay (6969 gt, built 1981) is out of service this morning. The Queen of Oak Bay is on the Horseshoe Bay to Departure Bay route and the first sailings this morning had to be cancelled. Spokesperson Deborah Marshall said the problem is with an emergency generator and crews are working to fix it as soon as possible.

London, Sep 7 -- A press report, dated today, states: The damage and repair bill so far resulting from the ro/ro Queen of Oak Bay running aground at Horseshoe Bay on Jun 30 amount to \$3 million. A cotterpin, a hardware item that sells for less than a dollar, fell out and disabled a speed governor, knocking out the ferry's engines. The \$3-million number is tucked away in management's discussion and analysis of the latest quarterly financial report from B.C. Ferry Services Inc., now filed with financial regulators. The report said "a significant portion is expected to be recovered from third parties, including insurers." Damage to the ferry itself was minor. Part of the bill covers \$136,000 worth of gift certificates for the 544 people who were on Queen of Oak Bay during the crash and could not get off for hours. Each received a \$250 credit to spend on ferry fares or in the gift shops, said spokeswoman Deborah Marshall. The figure also includes settling with owners of 28 boats damaged or destroyed when Queen of Oak Bay ran into their marina beside the Horseshoe Bay terminal. That dollar figure is not specified. Marshall said claims for just three boats are outstanding. The ferry corporation is still in discussions with

owners or their insurance companies, over differences of opinion as to the value of the boats.

#### **QUICKCAT (New Zealand)**

Wellington, Sep 8 -- A press report, dated today, states: The death of a woman after a collision between ferry Quickcat and fishing Doctor Hook was due to the failure of both masters to keep a proper lookout, the Transport Accident Investigation Commission has found. The finding came in a report released today into the Jan 4 collision that killed Gisborne woman Moira Newman, 74. She was a passenger on the Doctor Hook, which was struck by the Quickcat, sailing from Waiheke Island to Auckland, and she died three weeks later. None of the 377 passengers or eight crew on the Quickcat was hurt. The commission found that the master of the Quickcat, Wayne Williams, did not have an additional look-out although visibility from the bridge was restricted by a cargo crane. Immediately before the collision, the owner and skipper of the Doctor Hook, Bruce Newbury, was on a cellphone and examining fishing gear, and failed to respond to warnings from his passengers, the report said. Williams has pleaded guilty to two charges under the Maritime Transport Act of operating a vehicle in a manner causing unnecessary danger or risk to other persons and operating a vehicle in a manner causing unnecessary risk to property, and will be sentenced in Auckland District Court on Sep 16. Newbury has denied the same charges and three others and a depositions hearing is scheduled for Dec 5 and 6. The additional charges include failure to keep a proper lookout. The report found Williams did not see the Doctor Hook until it was too late but did put the engines into neutral and turned to port, which may have reduced the impact. Newbury did not initially respond when his passengers asked if he had seen the ferry until one shouted at him and grabbed his arm. He then tried to turn to port. The report found he may have been suffering from fatigue, having worked two 15-hour days immediately before the day of the accident. The commission said Fullers had ordered a new crane to improve visibility and made it standard procedure to have at least two crew on the bridge at all times. -- Lloyd's Agents.

London, Sep 8 -- A press report, dated today, states: The lack of a ferry lane in a channel in the Hauraki Gulf is believed to have contributed to the fatal collision between ferry Quickcat and fishing Doctor Hook earlier this year. The Transport Accident Investigation Commission has found neither crew was keeping an efficient look-out. Investigator in Charge Captain Ian Hill says there was also no segregation of the different users in the channel. He says that meant there were a lot of vessels on a relatively small patch of water, with different priorities. Auckland's harbour-master has since established a ferry lane in the channel.

**RENA MARIE (U.S.A.)**

London, Sept 2 -- A press report, dated Sept 1, states: The air near the Swinomish Channel dock (Washington) still reeked of diesel fuel yesterday afternoon as dive crews and pollution control workers tried to contain fluids escaping from sunken fishing Rena Marie (141 gt, built 1984). But even as spill control work continued, many wondered who will foot the bill for the clean-up effort and when, if ever, the boat will be removed. Rena Marie began sinking late Tuesday night. By yesterday, the purse seiner rested unevenly on the bottom of the Swinomish Channel next to the dock to which it had been tethered. Much of the diesel fuel that had escaped the wreck had been corralled within booms encircling Rena Marie. A diver from Global Diving and Salvage occasionally surfaced inside the ring yesterday afternoon between trips down to inspect the boat and attempt to plug leaking fuel tanks. Although the boat had been mostly submerged for more than 12 hours, fuel and other oils continued to leak out of it unabated. Workers were able to pump out the vessel's fuel tanks by yesterday evening, removing more than 500 gallons of diesel, said Dick Walker, a spill response supervisor for the state Department of Ecology. Unfortunately for those hoping to see the vessel salvaged, the superstructure collapsed shortly after the tanks were drained, Walker said. "The boat is just a total wreck," he said. "Essentially the boat is falling apart at this point." The difficult work of containing the spill was costly, as would be a salvage operation to raise the boat, said Petty Officer Danielle Gohdes of the U.S. Coast Guard, the federal on-scene coordinator. Gohdes said it was not yet clear how much diesel fuel and other oils had escaped from the sunken boat. About 150 gallons had been mopped up by yesterday afternoon with oil-absorbing pads, and an unknown amount of fuel had escaped from the wreck before the ring of booms had been put in place. It hasn't been determined how much the clean-up will cost, or how it will be paid for, Gohdes said. Gohdes said the owner would be billed for the time of the federal workers and contractors, and for materials used to clean up the spills. "They're all financially liable if there are damages to the environment," she said. But if the owner can't pay the bill, the clean-up costs are paid through a federal trust fund dedicated to spill clean-up. The boat's owner, Les Kneeland, has met several times with government officials responding to the sinking. Officials involved in the clean-up said it's less clear how a salvage operation would be financed, if one occurs. Walker estimated that the cost of salvaging Rena Marie could run into six figures, in part because the superstructure of the boat has collapsed. Any threats to divers would have to be removed by crane before underwater work could begin. A state

fund exists that could reimburse La Conner or Skagit County if either local government paid for the salvage operation. But that could put the governments at risk of losing the money, said Tom Sheahan, director of the Skagit County Department of Emergency Management. Walker said workers with NRC Environmental Services will likely finish their work at Rena Marie later this week.

**RIO SOLIS (Uruguay)**

Montevideo, Sept 1 -- Understand "there was no fire on trawler Rio Solis, only some wire emitting smoke as a consequence of stormy weather suffered in the area on Aug 23." Class surveyor has already surveyed the vessel and it sailed today for high seas. -- Lloyd's Agents.

**RODANTHI (Greece)**

London, Sep 3 -- Passenger ro/ro Rodanthi arrived Samos Aug 15 and sailed the same day.

**ROSTOK (Russia)**

London, Sep 8 -- A Multraship Towage & Salvage press release, dated Aug 30, states: The heavy floodings in Romania have affected the work of the salvors of general cargo Rostok in the Sulina Channel. All diving operations on the last wreckpiece to be removed (comprising holds 1&2) had to be suspended. The unusual high water level, strong currents and floating debris in the river (such as large trees and logs floating on as well as under water) make it unsafe to carry out underwater works. The high water with strong currents also carries a substantially increased amount of sediments which will settle inside and around the wreck. This will further complicate the already very difficult wreck removal due to the unexpected mud levels and consistency combined with obstructing debris and rigging-materials that were left on the wreck after previous salvage attempts. The salvors intend to resume the diving operations as soon as conditions improve and will deploy all their expertise to continue preparations for lifting the final wreck piece and successfully deliver this to the dumpsite.

**SAGA MASCOT (Bahamas)**

London, Sep 5 -- A press report, dated today, states: Emergency clean-up crews were summoned to three Rio de Janeiro state beaches yesterday after about 2,000 litres of oil spilled from a vessel, authorities said. More than 50 truckloads of oil-contaminated sand had already been removed from the Boa Viagem, Flechas and Icarai beaches in Niteroi, a city facing Rio de Janeiro across the Guanabara Bay, Rio de Janeiro state's environmental agency, or Feema, said. The spill was under control, but the clean-up effort was not expected to end until today. About 80 people were working on the beaches. The oil leaked from a Bahamas-flagged vessel that suffered a small rupture on its hull in a minor accident on Saturday (Sep 3) as it

approached a shipyard. Niteroi city officials said the shipowners would probably be fined for the spill, local media reported. Feema officials were still checking if the spill had also reached sensitive mangrove swamps in Guanabara Bay.

Rio de Janeiro, Sep 5 -- At approximately 0100 hrs, Sep 3, there was a spillage of around 2,000 litres of fuel oil from general cargo Saga Mascot (30931 gt, built 1977), during berthing procedures at Enavi/Renave repairyard. This affected the beaches of Guanabara Bay. Clean-up operations are in progress. -- Lloyd's Agents.

London, Sep 5 -- Following statement issued by SMT Shipmanagement Ltd., of Limassol, Cyprus, managers of general cargo Saga Mascot, dated today: Saga Mascot came into contact with the dock at the Enavi/Renave Shipyard on Sep 2, resulting in the puncture of a bunker tank and spill of fuel oil. The incident happened at midnight on Friday, as the Saga Mascot was entering the ship repair yard for scheduled maintenance. At the time, the ship had a local pilot on board and was being assisted by four tugs. It is not clear, however, how the vessel came to strike the dock, nor how the bunker fuel tank was punctured. SMT Shipmanagement is working closely with the shipyard and local authorities to establish the cause of this unfortunate incident. Senior representatives of SMT Shipmanagement said that they were treating this incident with the utmost seriousness and that their focus was on supporting the efforts of the Ship Repair yard and the local authorities in doing everything possible to clean up any oil that may have been washed up on the beaches. A large workforce has been contracted by Enavi/Renave Shipyard to undertake the clean up operation of the affected areas. It is hoped that this work will be completed by tomorrow or Wednesday (Sep 7) of this week.

London, Sep 6 -- A press report, dated Sep 5, states: Clean-up crews worked today to contain an oil spill that fouled the white beaches of Niteroi, Rio's sister city just across Guanabara Bay. The spill occurred on Saturday night (Sep 3), when general cargo Saga Mascot cracked its hull in a minor accident as it approached a shipyard and leaked 530 gallons of oil into the bay. Jefferson Martins, the environmental secretary for the city of Niteroi, told reporters he believed the spill was larger than reported and had started leaking earlier. Rio de Janeiro state environmental officials denied it. More than 50 truckloads of oil-contaminated sand were yesterday removed from the upscale beaches of Boa Viagem, Flechas and Icarai beaches in Niteroi. Rio's beaches were not affected, but crews set up floating barriers in the bay in an effort to keep the oil slick from spreading. Federal police said they planned to charge those responsible for the leak with environmental crimes, punishable by up to four years in prison. In

statements to police, the vessel's master and shipyard officials blamed each other for the leak, police said.

London, Sep 8 -- A press report, dated Sep 7, states: At least 2,600 gallons of oil spilled into Guanabara Bay from general cargo Saga Mascot, which contacted a pier during docking manoeuvres on Saturday (Sep 3). Authorities first thought the oil spill was one-quarter of that size but, after inspecting the extent of the spill, they revised their estimate upwards. The bay borders two cities -- on its southwest shore is the city of Rio de Janeiro and on its south-east shore lies the city of Niteroi. The oil spilled by the Saga Mascote has come ashore on Niteroi beaches and authorities have halted fishing in the bay. In a preliminary report, technicians with the State Environmental Engineering Foundation (Feema) said that eight beaches along the Niteroi shoreline were affected by the oil. Most heavily hit was Icarai beach in Niteroi, where hotels line the shore and watersports like kitesurfing draw visitors from around the world. The white sand was thick with greasy oil that spread for several meters above the waterline, filling the air with the smell of petroleum. The vessel contacted a pier at the Enavi-Renave shipyard, on Conceicao Island, in Niteroi. The fuel tank was perforated in two places. Absorbent booms were placed around the spill and the shipyard transferred part of the fuel on board the Saga Mascote to another tank, preventing greater damage. The Z-8 Fishermen's Colony in Niteroi estimates that at least 3,000 fishermen were harmed by the oil that spilled into Guanabara Bay. Fishing has been prohibited in the area and a survey is under way to determine how many of the 12,000 fishermen associated with the colony work in the area affected by the accident. The secretary of the Z-8 Fishermen's Colony, Jose Pulgas, said that they were only awaiting the Feema and Federal Police reports on the accident in order to start negotiating compensation payments with the shipowners or their Brazilian representatives. "We want to discover who is responsible for the vessel and try to work out a settlement. This will be the first approach, before taking the case to court, since the indemnifications for these kinds of accidents never reach the fishermen," Pulgas said.

#### **SEA ELEGANCE (Vanuatu)**

Kolkata, Sep 6 -- Bulk Sea Elegance sailed Haldia at 0030, Sep 5. -- Lloyd's Agents.

#### **SEA SONS II (Canada)**

London, Sep 6 -- At 0805, UTC, today, fishing Sea Sons II (93 gt, built 1984) was reported in lat 49 07.36N, long 51 28.38W, taking on water and the ingress was gaining on the pumps.

London, Sep 6 -- Following received from Halifax RCC, timed 1810, UTC: Fishing Sea Sons II is reported to be proceeding to Harbour Grace, under

escort of fishing Silver Foam, ETA 0100, UTC, Sep 7.

#### **SEA STAR (Singapore)**

London, Sep 8 -- Chemical/oil carrier Sea Star arrived Onsan Sep 2 and sailed Sep 4.

#### **SEABOURN PRIDE (Bahamas)**

See "Republic Of Ireland" under "Port State Control."

#### **SHARK (Lebanon)**

Beirut, Sep 6 -- General cargo Shark is still lying sunk at Beirut. -- Lloyd's Agents.

#### **SUPER SHUTTLE FERRY 9 (Philippines)**

Manila, Sep 7 -- Owners of ferry Super Shuttle Ferry 9 advise that the vessel is still lying half-sunk in the original position and that no salvage/refloating operations have been carried out to date. -- Lloyd's Agents.

#### **VESTKAPP (Norway)**

Trondheim, Sep 5 -- Scrapping of fishing Vestkapp was completed on Aug 25. -- Lloyd's Agents.

#### **VLIBORG (Netherlands)**

London, Sept 2 -- General cargo Vliborg sailed Duluth 2141, Aug 26.

#### **VOC GALLANT (Antigua & Barbuda)**

Dubai, Sep 4 -- Bulk VOC Gallant arrived Dubai Sep 1, and is awaiting to discharge its cargo at Port Rashid. The vessel will then proceed to Dubai Dry Dock for repairs. -- Lloyd's Agents.

#### **WAREMBUNGAN (Indonesia)**

London, Sep 2 -- A press report, dated today, states: Product tanker Warembungan, operated by the state-owned Pertamina oil company in Aceh province, caught fire yesterday following an explosion in its engine-room, a company official said. The vessel's master was injured in the accident at the Ujung Blang seaport in North Aceh's capital of Lhokseumawe, company spokesman Adyatma Sarjito said. "The vessel was unloading gasoline at Lhokseumawe Port when an explosion from the engine-room was heard by its master," he said. "The master has been injured and has been taken to a local hospital." Smoke was still billowing from the vessel's engine-room but authorities said the vessel was in no danger of sinking. Mr Sarjito said the explosion appeared to be an accident.

#### **YAMAL (Russia)**

London, Sep 3 -- General cargo Yamal sailed Newport Sep 1.

#### **YASA AYSEN (Turkey)**

London, Sep 5 -- A press report, dated today, states: A US Navy submarine Philadelphia collided with bulk Yasa Aysen (30303 gt, built 2000) in the Persian Gulf early today, the US Navy reported. No one was hurt on either vessel. Philadelphia was

travelling on the surface when it hit Yasa Aysen at around 0200, local time, the US Navy 5th Fleet Headquarters in Bahrain reported in a statement. No sailors or merchant seamen were injured, the Navy said. Philadelphia was conducting surface operations on its way to Bahrain for a scheduled port visit, the Navy said. The submarine continued to Bahrain where inspectors will check it for damage. There were no immediate reports of damage to the Turkish ship. The Navy statement did not say exactly where the collision took place. Philadelphia is part of a fleet of US and allied navy vessels patrolling the Gulf, conducting what are called "maritime security operations" against weapons and drug smuggling.

London, Sept 5 -- A press report, dated today, states: "There is no serious damage to bulk Yasa Aysen and none of the crew members including the master were injured," said Mehmet Kayhan, the owner of the ship which was in collision with an U.S. submarine in the Persian Gulf early today. Yasa Aysen was sailing from Bahrain to United Arab Emirates to "load pebbles" when it collided with U.S. navy submarine Philadelphia, at around 0215 today in the Gulf. Kayhan said, "The ship returned to Bahrain for a check in a shipyard."

London, Sept 5 -- A press report, dated today, states: U.S. nuclear submarine Philadelphia collided with bulk Yasa Aysen in the Persian Gulf before dawn today, and spokesmen for both vessels said nobody was injured and damage was minor. Philadelphia was travelling on the surface of the Gulf when it was in collision with Yasa Aysen at about 0200 today, said a statement from the 5th Fleet Headquarters in Bahrain. Hours later, the vessels docked in Bahrain for a detailed assessment of the damage and repairs. The collision happened about 30 miles northeast of Bahrain, said the spokesman for the U.S. Navy 5th Fleet, Cmdr. Jeffrey Breslau. Philadelphia was conducting surface operations on its way to Bahrain for a scheduled visit, the Navy said. The submarine's nuclear-powered propulsion plant was not damaged in the crash, the Navy said. Breslau described the damage to the submarine as "superficial." Breslau said the Turkish ship sustained minor damage to its hull just above the waterline. It weighed anchor afterward and a U.S. Coast Guard vessel inspected the ship and found it to be seaworthy. When Yasa Aysen arrived in Bahrain, it berthed near the dry dock and was scheduled for repairs, three officials in the island state's harbour said. In Turkey, the general director of Yasa Aysen's owners, Ya-Sa Shipping, was quoted by the semi-official Anatolia News Agency as saying the firm had asked its lawyers in London to report on who was at fault and pursue damages accordingly. The general director, Mehmet Kayhan, confirmed that nobody on Yasa Aysen was hurt and that damage was minor. The ship,



with a crew of 20, had been carrying a cargo of small stones to the United Arab Emirates when the collision occurred, the news agency reported.

London, Sep 6 -- A press report, dated today, states: Bulk Yasa Aysen was in collision with US nuclear submarine Philadelphia in the Persian Gulf yesterday morning. The submarine and the ship are reported to have been slightly damaged in the accident in which there were no casualties. The accident that occurred in Bahrain's open sea is thought to have been caused by the failure of the Turkish ship's sonar's to locate the submarine. The submarine that hit the Turkish ship from port side caused some damage to 35 metres of the 190-metre ship. The estimated cost of the damage to the ship is about \$300,000. The accident reportedly occurred three hours after the ship departed from Asry shipyard in Bahrain. It is stated that the accident was caused by the sonar's failure to see the submarine. Authorities point out that the kind of dye called "kriyt" which is used on military ships makes it hard or totally prevents these ships' being noticed by sonar in commercial ships. Turkish Undersecretary for Maritime Affairs General Director for Maritime Transport Ali Kurumahmut, in a statement he made following the collision, said that no casualties were reported and that they received information that the ship entered Bahrain's Asry Shipyard for repair.

#### YINHE 2 (China)

London, Sep 2 -- A press report, dated today, states: Passenger Yinhe 2, a luxurious vessel of a Chongqing company, struck a rock in the Yangtze River in Changshou District, Chongqing, on its voyage from Yichang, Hubei Province to Chongqing at about 0100, yesterday morning. The river was heavily fogged when the accident happened. One hundred and sixty people had been all kept in the vessel until at about 0300 when they were helped out ashore. There were 98 passengers on the vessel, including three Chinese, two English and 93 Germans. All the 98 passengers were sent immediately to the city centre of Chongqing. A rescue plan is being made for the wrecked vessel in the river.

London, Sept 5 -- A press report, dated Sept 3, states: Investigators are still trying to determine how 76-metre cruise passenger Galaxy II (also reported as Yinhe 2) travelling in the Yangtze River on Thursday (Sept 1) ran aground near Chongqing. Salvage workers attempted yesterday to secure Galaxy II., a five-floor vessel originally with 163 passengers and crewmembers on board, and stop it moving into the middle of the river. Zhou Hongwu, an on-scene co-ordinator from a salvage company in Southwest China's Chongqing Municipality, said the ship might have veered away from the charted route due to improper operation. No casualties or injuries were reported, as the ship, now slightly listing, rests in

its bow with its bulk bending downward. In the early hours on Thursday, the ship, sailing from Yichang in foggy conditions, suddenly deviated from its cruise route and struck underlying rocks. "Its bulk was pierced and the passenger compartment was flooded in minutes, causing a thorough blackout and engine failure," Zhou said yesterday in a telephone interview. About 90 passengers, mostly from Germany, were evacuated in ships responding to the scene after Galaxy II sent signals for help. "Now the ship is almost scrapped," Zhou said. He also said the rocks are now visible as the water has receded by about two metres. As the ship was stranded quite near the bank, river traffic has not been affected. "We are trying to secure the vessel and prevent it from moving to the centre of the river," another on-scene co-ordinator Li Shengjiang said. He said that the Yangtze River is still in the flooding season and the vessel might drift inward as the river rises. He also said they will only pull the vessel out of water in October. Personnel from the vessel's company said yesterday that the tourists, organized by different travel agencies, had already left Chongqing to continue their sight-seeing in other cities.

#### ZIEMIA GORNOSLASKA (Liberia)

London, Sep 7 -- Bulk Ziemia Gornoslaska arrived at Valleyfield previous to Sep 5 and on Sep 6, was reported still at Valleyfield effecting repairs to the rudder. Bulk Iryda (into which cargo was transferred) was reported arriving at Cleveland on/about Sep 6, where cargo was being unloaded.

#### ZIEMIA LODZKA (Liberia)

Detroit, Sep 1 -- North American Marine were assigned to perform hull inspection on bulk Ziemia Lodzka on behalf of Hull underwriters. Vessel was in Cleveland at the port on Aug 26, discharging from hold number one and Saturday morning (Aug 27) Cleveland Ship Repair began repairing the hull. Vessel continued discharging during repairs on Monday. Repairs were finished this morning and vessel will be sailing this afternoon. Repairs were made to Frame 194 through Frame 202.5. Shell plating was set in 0 to 10 mm due to lock damage. Frames were severely buckled and repaired according to class. -- Lloyd's Agents.



#### SOMALIA

London, Sep 5 -- A press report, dated Sep 4, states: Dozens of Asian fisherman and their three vessels (fishing Cheng Ching Feng, fishing Chung Yi 218 and fishing Hsin Lien Feng 36) are being held hostage in

Somalia by pirates who have demanded a \$1.5 million ransom, officials said. The Taiwanese Foreign Affairs Ministry has said that the Somali gunmen threatened on Friday (Sep 2) to start killing one hostage a day if the ransom was not paid within 48 hours. The hostages include three Taiwanese captains as well as 45 crew members from Indonesia, China, the Philippines and Vietnam. Gunmen have been holding the fishermen and their vessels near the southern Somali port of Kismayo since Aug 15. They have demanded \$500,000 for each of the vessels and their crews, Taiwan's Foreign Affairs Ministry said. "Human right groups and civil society organisations are still engaged in negotiations with the hijackers to ensure the release of the hostages unharmed, by all means," Ali Bahsi, chairman of the Fanole Human Rights Centre, a rights group in the Lower Juba region where the fisherman are being held, said today. Bahsi said that he last talked to the kidnappers on Friday and they assured him then that the fishermen were safe. Taiwan has asked for international help in contacting the gunmen, and talked to the hostage-takers last week in an effort to negotiate a lower ransom.

London, Sep 7 -- A press report, dated Sep 6, states: Somali pirates holding 48 Asian fishermen and their three vessels hostage have sharply reduced their ransom demand during government-brokered negotiations, a Somali human rights activist said today. The gunmen originally demanded \$500,000 for each boat and its crew, but later cut the demand to \$50,000 per vessel during talks with the Malaysian agent for the Taiwanese trawlers, said Ali Bashi, chairman of the Fanole Human Rights Centre. Somali Foreign Affairs Minister Abdullahi Sheik Ishmail acknowledged that negotiating ransom could damage the country's already poor international image, but said officials had to act to ensure the safety of foreign hostages.

### Port State Control



#### REPUBLIC OF IRELAND

London, Sep 2 -- A press report, dated today, states: The International Transport Federation has called for an investigation into why inspectors in Britain allowed passenger Seabourn Pride (9975 gt, built 1988) to sail from Falmouth to Ireland after defects had been identified. Department of the Marine inspectors in Waterford detained the ship because of the defects. The Irish representative of the ITF, Tony Ayton, said it seemed Britain's Maritime and Coastguard Agency had passed the problem on to the Irish authorities rather than deal with it and this was not acceptable where the safety of passengers and

crew was concerned. Seabourn Pride arrived in Waterford, where it was inspected by Irish Department of the Marine officials. They were not satisfied and ordered the detention of the ship. No statement was issued about the actual defects, but information is that they are centred on insulation in the engine-room. There are about 170 passengers on board the ship. Authorities there were informed by the Irish marine officials of the detention and the ship's owners were also notified. The Irish Department of the Marine said it would detain the ship until the defects are remedied to its satisfaction. The ITF said it was writing formally to the MCA seeking an investigation about the way in which the matter had been handled at Falmouth.

#### UNITED KINGDOM

London, Sep 7 -- A Maritime & Coastguard Agency press release, dated today, states: The Maritime & Coastguard Agency announced today that they had detained chemical/oil carrier Oil Ambassador (12758 gt, built 1981) on Aug 31 at its berth at Purfleet, Port of London. The attending Inspector found the following detainable items: Radio equipment defective; cleanliness of engine room and galley very poor; fire doors inoperative. A further inspection on Sep 2 revealed serious deficiencies in the on-board Safety Management System and the vessel was further detained for: Crew not able to operate planned maintenance system; not able to conduct satisfactory emergency drill; planned maintenance system not functioning. Other deficiencies to be rectified prior to departure were: Cockroach infestation; cold room over temperature and dirty; rotten provisions; no hot water available in the galley and accommodation, and widespread deck corrosion.

### Seizures & Arrests



#### ARDEAL (Romania)

Khulna, Sep 4 -- Understand general cargo Ardeal has been sold by order of the High Court Division of the supreme court of Bangladesh, to Six Star Corporation, Chittagong. The vessel was towed from Mongla to Chittagong on Sep 1. -- Lloyd's Sub-agents.

#### DANAPRIS 6 (Ukraine)

Naples, Sep 5 -- General cargo Danapris 6 (2360 gt, built 1988), which arrived at Naples on Aug 29, is currently at Naples Roads, under arrest. -- Lloyd's Agents.

#### ESPERANZA (South Korea)

London, Sep 7 -- A press report, dated Sep 6, states: Fishing Esperanza

(499 gt, built 1972) was fined £65,000 by the Falkland Islands government, yesterday, on three charges, two on false reporting and one on catching unauthorized species. Kim Myeong, master of the vessel was also fined £2,500 plus legal costs of £500. On Aug 26 the Falklands Fisheries Protection patrol vessel Sigma sighted four vessels operating suspiciously in the Islands EEZ including Esperanza which was licenced to catch skate with a 10% by catch allowance. However when a Fisheries Department officer boarded the trawler the catch was found to be in excess of the 10% limit and a hold inspection discovered amongst the skate seven tons of Loligo squid which had not been declared in the catch report. The value of the excess catch was estimated in £27,000. When questioned the master alleged there must have been mistaken calculations by the crew. The vessel was then escorted to Stanley to face formal charges in court. Richard Marlol acting in defence argued that the offences were committed inadvertently by an inexperienced crew and that this was the first time that charges had been brought against the master and the Dong Yang Fisheries Company, both in the Falklands and in the rest of the world where vessels from the company operate. The defence admitted that "significant mistakes had been committed" but that there had been no deliberate attempt to conceal the excessive by catch, adding that the company had suffered losses of £90,000 due to the vessel being idle. Mr. Marlol emphasized that the maximum fine for all three charges should be reserved for the worst offenders who deliberately conceal. Senior Magistrate Claire Faulds noted that Mr Myeong and the Dong Yang Fisheries Company had given full co-operation and had pleaded guilty at the earliest possible time. A fine of £65,000 was given to the Dong Yang Fisheries Company which included legal costs and the value of the by catch. It was also stated that the vessel would not be discharged until all fines were paid. Korean companies are among the leading purchasers of Falklands fishing licences and contrary to vessels from other flags, Korean trawlers and jiggers normally co-operate with Fisheries officials. (FIRS/MP).

#### EUGENIA P. (Honduras)

London, Sep 6 -- A press report, dated Sep 4, states: Indian authorities in Kolkata detained general cargo Eugenia P., carrying arms, ammunition and a large amount of explosive headed for Indonesia. The operation was carried out following a request from local customs department. "The customs authorities have sought time to check on details concerning the delivery of the consignment before allowing the Eugenia to leave the berthing dock," said Anup Kumar Chand, Chairman of Kolkata Port Trust. The matter was referred to the customs

authorities in New Delhi to seek confirmation regarding delivery of consignment from Indonesia. The vessel registered in Honduras arrived at the Kidderpore docks last week and was to have set sail Friday (Sep 2). It was carrying arms, ammunition and 20 tons of explosive. "It's a huge consignment and a serious matter. Unless Indonesian authorities conform us that this consignment is meant for them, we cannot allow the vessel to leave the docks," said Chand. He said the vessel was still unloading iron pipes brought from Romania and it may take a couple more days to complete this operation.

#### JUPITER ACE (Vietnam)

London, Sep 7 -- General cargo Jupiter Ace (5470 gt, built 1991), which arrived at Hong Kong at 0629 hrs, Sep 6, was today reported at Pun Shan Shek Anchorage, Hong Kong, under arrest.

London, Sep 8 -- General cargo Jupiter Ace sailed from Hong Kong at 1140 hrs, today.

#### LAMA (Belize)

Beirut, Sep 6 -- General cargo Lama is still lying sunk at Beirut. -- Lloyd's Agents.

#### MICRONESIAN NAVIGATOR (Marshall Islands)

Honolulu, Sep 1 -- C.c. Micronesian Navigator is still under arrest. The parties are in negotiations and it is hopeful it will be resolved so the vessel can sail early next week. -- Lloyd's Agents.

#### YAOKI (Panama)

London, Sep 8 -- Chemical/oil carrier Yaoki sailed Hong Kong Aug 31.



#### GHOR RIYANO AREA, PAKISTAN

London, Sep 5 -- A press report, dated Sep 4, states: An explosion was reported from the Ghor Riyano area in a 13-inch diameter gas pipeline, owned the Pakistan Petroleum Limited, disrupting the gas supply to some areas of Kashmore, Guddu city and Rahimyar Khan. Police said that high pressure was the cause of the explosion, but sources claimed that some explosive material had been planted which went off and damaged the pipeline. A bomb disposal squad from Sukkar arrived on scene and started investigations. Repair work on the pipeline has been started the sources said.

#### KALAKAMA, NIGERIA

London, Aug 31 -- A press report, dated today, states: Eleven persons are feared missing and aquatic life completely destroyed when a 28-inch

Liquefied Natural Gas underground pipeline exploded at Kalakama, an Ogoloma fishing community in Okrika Local Government Area of Rivers State. The incident, which occurred at the weekend, resulted in a wild inferno which engulfed an estimated 27 square kilometres of the once rich Kalakama mangrove, killing sea foods and cash crops. So huge, the impact of the explosion was felt on the Okrika Island and the Borikiri area of Port Harcourt where, residents were forced into "a stampede for safety". The problem started more than two months ago, when a minor gas leakage was noticed by inhabitants of the Kalakama fishing community, upon which a formal report was said to have been lodged with Nigeria Liquefied Natural Gas Limited (NLNG) by His Royal Majesty, Chief Nemi Tamunoyalla-Oputibeya, Amanyanabo of Koniama. The leakage assumed a frightening dimension, last Monday (Aug 22), when a wild fire was first reported, before culminating in a major gas explosion. It took NLNG fire fighters, using hi-tech helicopter services, more than 48 hours to put out the fire, but not before shutting down the NLNG gas plant at Rumuoji substation. Rivers State Environment Commissioner, Dr. Roseline Konya, on a visit to the area, last Monday described the incident as a great disaster, and blamed it on bureaucratic delays by companies in treating life threatening complaints. Leader of the Okrika delegation and chairman of the Okrika Divisional Council of Chiefs, Chief Taribo Sekibo-Oduobaji blamed the incident on negligence on the part of NLNG. Chief Oduobaji, who was a Second Republic Senator of the Federal Republic of Nigeria, and chairman of the Senate Committee on Petroleum and Gas Matters, said it was unimaginable that a report involving gas leakage could be allowed to snowball into such huge disaster.

## Pollution



### NITEROI AREA, BRAZIL

See Saga Mascot under "Marine".

### VENICE AREA, LOUISIANA, UNITED STATES

London, Sep 3 -- A press report, dated Sep 2, states: A huge oil spill was spotted near two storage tanks on the Mississippi River downstream from New Orleans, state officials said today. The oil was seen in a flyover of the Venice area by the Department of Environmental Quality. "Two tanks with the capacity of holding two million barrels appear to be leaking," the department said in a statement.

## Weather & Navigation



### BRAZIL

London, Sep 3 -- A press report, dated Sep 2, states: A powerful storm packing winds of up to 70 mph slammed into southern Brazil today, killing and least one person and injuring five others. Officials said the storm forced the closure of some airports in the south and caused sporadic power outages, according to media reports. An 81-year-old farmer died after being hit by a falling tree, while at least five people were treated for minor wounds from flying debris, the reports said. Fifteen-foot waves and heavy seas prompted civil defence workers to evacuate some homes and warn fishermen to remain ashore.

### EL SALVADOR

San Salvador, Sep 6 -- At least six people died in El Salvador today when heavy rains caused a wall to collapse and triggered landslides, officials said. In Ciudad Delgado, north-east of the capital San Salvador, a 19-year-old woman, her one-year-old child and a 24-year-old man were buried in a landslide, national emergency agency Coen said. Two others may have died in Delgado, although that was not confirmed. Another person died in a mudslide in Mejicanos, north of the capital, while in San Marcos to the south, a mother and her young child were killed when a wall collapsed on top of them. El Salvador's ground is soaked and rivers swollen from weeks of intense rains, causing danger for neighbourhoods built on steep mountainsides and riverbanks. Officials rescued 45 families today, including six people injured in mudslides, on the edge of Ilopango Lake to the east of San Salvador. -- Reuters

### HURRICANE "KATRINA"

London, Sep 1 -- Following navigation warning issued, timed 1231, UTC, Aug 31: The port of New Orleans is closed, along with all bridges, floodgates, and locks in the vicinity of the port. The ports of South Louisiana, St. Bernard, Port Plaquemines and Greater Baton Rouge are closed. The Gulf Intercoastal Waterway for the New Orleans and Morgan City zones are closed. There are numerous barges on levees on the Mississippi River and numerous derelict boats at Bayou la Batre. Several tankers are grounded on the Lower Mississippi River.

London, Sep 1 -- Captain Paskewich, COTP, Sector New Orleans, has opened the entire river to tug and barge traffic. USCG is very close to opening most of river to deep draft vessel Shifts within the river, and are working feverishly on getting soundings in the lower river to

determine draft and obstructions. He reports there are 80 to 100 barges on the bank around mm 55, and I have other reports some may have sunk, so they are concerned about draft in that area. They currently have three vessels aground, two at AMA anchorage and one in Algiers, not blocking traffic. Agents, continue to coordinate movements on a case by case basis until the COTP officially opens the river for inter-port movements. Captain Paskewich also reports that SW Pass Pilot station and Pilottown are in tact, with some possible damage, but appear operational. They will have a further report today. Per Captain Gibbs, President of Crescent Pilots. The Coast Guard has coordinated with the Bar and Crescent Pilots presidents to bring a Navy Vessel into the river with about 15 feet of draft. There is another Navy vessel drafting 35 feet that will be brought in when a Bar Pilot is available, and that should be a good test of the status of the channel depth to New Orleans. Captain Gibbs has received word from the Coast Guard, and MRMA has received word from sources, that barges have sunk in the vicinity of mm 55, and that is of concern for channel depth. Per Captain Watson, President of NOBRA Pilots, they are collecting current contact number of their pilots and have arranged pilots on a case by case basis with the Coast Guard to re-anchor or move about six vessels so far. Continue to work with the pilots and Coast Guard directly for individual moves of vessels within the upper river. Captain Watson believes that the river north of New Orleans appears to be navigable without obstructions in the channel, but they have not confirmed all areas yet.

London, Sep 2 -- A press report, dated today, states: Lloyd's is likely to face a hit of around £1bn, net of reinsurance, from claims resulting from the devastating hurricane "Katrina," say market sources. Speculation on the potential insured cost is very much unofficial and preliminary, but centres on the Louisiana hurricane taking a 5%-8% slice out of the market's 2005 capacity of £13.7bn. Some experts say it will be six to nine months before a truly reliable picture of losses emerges. At Lloyd's, the hit is expected to fall six times more heavily on the shore-based classes than on offshore energy.

London, Sept 2 -- A Coast Guard St. Louis, press release, dated Sept 1, states: More than 2,580 people have been rescued off of rooftops and flooded neighbourhoods since rescue operations began Monday, and joint-agency rescue operations are continuing through the day and night. The Coast Guard's primary focus along the Alabama, Mississippi and Louisiana coast will remain search and rescue as long as necessary. Coast Guard assets continue to arrive in the impacted areas. There are 25 cutters off the Gulf Coast, in the rivers, and in the ports and waterways. The Coast Guard cutters Pelican, Cypress and

Spencer are currently transiting the Mississippi River to New Orleans to establish a command and control presence and provide a flight deck, fuel and communications to the search and rescue assets in and around New Orleans. Thirty-five aircraft and hundreds of air crew personnel are in the area from Coast Guard air stations as far away as Barbers Point, Hawaii, and Cape Cod, Mass. Coast Guard C-130s are en route to Air Station New Orleans with additional fuel supplies. Coast Guard Auxiliary members have responded and are supporting the Coast Guard incident management team. The Coast Guard is contacting its Auxiliary divisions throughout the area to ask for help with post-hurricane recovery operations. Many other federal and local government assets are already in the area or being sent there, including FEMA urban search and rescue teams, incident management teams, disaster assistance and response teams, maritime safety and security teams, marine safety response teams, critical incident stress management teams. The Coast Guard anticipates significant waterways management and environmental clean-up operations. Most Gulf ports remain closed. However, joint-agency surveys of the ports, waterways and rivers are underway. There are approximately 86 vessels awaiting transit to or through the Port of New Orleans. The Gulf Intracoastal Waterway in Louisiana, Red River, Atchafalya, and Ouachita Rivers has been opened in some areas. More than 100 barges have reportedly sunk, or are aground south of New Orleans, and the majority of buoys and other kinds of navigational markers are off station throughout the Gulf Coast. Ports of New Orleans, Gulfport, Pascagoula, and Destin/Panama City are closed. The ports of Pensacola and Mobile are open only to vessels with a 12-foot draught or less. The Intracoastal Waterway is open from the Mobile Ship Channel east to Apalachicola, Fla., and closed from the Mobile Ship Channel west to Pass Christian, Miss. The Mississippi River is closed to deep draught traffic and open to tug and barge traffic only from Sea Buoy to Mile Marker 507. Deep draught vessels may move within anchorages if they have pilots on board. All bridges, floodgates, and locks are closed in the vicinity of the Port of New Orleans. The Red River is open from Carr Point, La. to Alexandria, La. The Athchafalya River is open from Eugene Island Sea Buoy to Krotz Springs. The Port Allen Route is open from Baton Rouge to the Port Allen Lock. The Ouachita/Black River is open from Jonesville to Shreveport. The railroad Bridge across Delcambre Canal is open. Vessels may transit Louisiana Highway in Delcambre.

London, Sept 2 -- A Shell press release, dated Sept 1, states: Comprehensive post-hurricane assessment and recovery operations continue at all Shell-operated Gulf of Mexico assets. Significant efforts are

ongoing to evaluate our hurricane-impacted assets, Mars, Cognac, and West Delta 143. Assessment and repair activities for two drilling rigs under contract to Shell, Transocean's Deepwater Nautilus and Noble Jim Thompson continue as planned. Today we are ramping up production at Auger, North Padre Island and Fairway (Mobile Bay). This systematic process can take several days before full production rates can be achieved. Recovery of production from other GoM assets not impacted by "Katrina" will resume as appropriate once final inspections of the facilities are completed and pipelines and other related downstream facilities that transport and receive our production to onshore locations have been systematically inspected and are operational. Shell is expanding its Robert Training Center facility in Robert, LA, about 45 miles northwest of New Orleans, to provide a temporary Operations Center to manage GoM production activities until such time as New Orleans offices can reopen. Activities include establishing communications and increasing space for offices and accommodations.

London, Sept 2 -- A press report, dated Sept 1, states: The Louisiana Offshore Oil Port (LOOP) has resumed pumping operations at its offshore oil port facilities in the Gulf of Mexico. The first tanker to visit the port since Saturday is being unloaded. The operation was initiated following the completion of a series of successful pressure tests on the LOOP and LOCAP crude oil pipelines. The start up was delayed after an emergency generator went down earlier today. However, once generator power was restored, tanker offloading began around began at 1700 hrs and LOCAP deliveries began at 1800 hrs. When commercial power is restored, LOOP and LOCAP will be capable of achieving maximum capacity. LOOP stopped offloading tankers Saturday, August 27, 2005, in anticipation of hurricane "Katrina".

London, Sept 2 -- An Apache Corporation, press release, dated Houston Sept 1, states: Apache Corp said it has reported to the U.S. Minerals Management Service and the U.S. Coast Guard that it lost eight of its production platforms in hurricane "Katrina". All personnel were safely evacuated from offshore facilities before the storm, and all Apache employees living in the storm's path have been accounted for, the company said. The platforms lost to the storm were: Main Pass 312-JA; South Timbalier 161-A; South Pass (SP) 62-A; SP 62-B; West Delta (WD) 103-A; WD 103-B; WD 104-C; and WD 133-B. Aggregate gross production from the eight lost platforms was 7,158 barrels of oil and 12.1 million cubic feet of gas per day before the storm. A detailed inspection of damage to other facilities is under way. Apache personnel have begun the process of restoring production as pipeline and processing facilities become available. Apache

carries insurance coverage for its facilities and has up to \$150 million of business interruption insurance to help defray the cost of an extended shut-in.

London, Sept 2 -- Information received, dated Sept 1, states: Initial port of New Orleans assessment following hurricane "Katrina": A tour of accessible facilities via land was made yesterday, Monday, Aug 29 from approximately 1530 to 1900 hrs and again this morning via water, Tuesday, Aug 30, from 1000 to 1300 hrs. Henry Clay Wharf: Heavy damage to roller doors and skylights. Wharf is dry, no flooding. Draught alongside ranged between 36 feet to 38 feet. Nashville A Wharf: Moderate damage to siding, on the end of the shed, and roller doors. The Fantuzzi mobile Harbor Crane with P & O, looks to be in "operational shape" but would need to be inspected. Draught alongside was better than 39 feet. Nashville B Wharf: Moderate damage to siding on shed and roller doors, sections of roof missing. Draught alongside between 39 feet to 48 feet. Napoleon Container Terminal: Numerous stacked containers were "pancaked" in the yard. Our guess is around 100 units and that most were empties. One container had fallen from the stack onto the train adjacent to the facility. A small number of containers on the ground were in approximately 2 feet of water, any cargoes inside would be effected. All four port gantry cranes were secured and intact. The two newer cranes though had lost the sides of the cabs where the computer hardware is located. This will be advised when technicians can service the equipment. One of the cranes had a container next to the base of the crane. This had fallen from a stack of containers in the back reach of the crane. Also the Zim Ship had left the wharf during the storm and proceeded to anchor (both port and starboard) just off the wharf. Draught alongside was between 46 feet to 51 feet. Napoleon C Wharf and Milan Street Wharf: The roller doors experienced heavy damage. The draught alongside ranged from 35 feet to 38 feet. Louisiana Street Wharf: Roller doors appeared to be in good shape, but the new roof had lost sections. The draught alongside ranged from 40 feet to 45 feet. Harmony Street Wharf: The roof had lost sections. The draught alongside ranged from 36 to 38 feet. 7th Street Wharf: Skylights were missing from the roof, and moderate to heavy damage to the roller doors. The draught ranged between 37 feet to 39 feet. 1st Street Wharf: Heavy damage to the roof and roller doors. Adjacent to the Wharf the Jackson Street Ferry Landing had also experienced major damage. The draught ranged between 38 feet to 44 feet alongside. Erato Street Wharf: Wharf incurred heavy damage due to a Bollinger dry dock which was adrift from its mooring on the west bank. The dry dock moved up the river, impacting the wharf, but missing the Crescent City Connection Bridge. The dry dock then became

lodged on the west bank across from the Robin Street Wharf. Julia Street Cruise Terminal: The roof had sections missing. All windows at the terminal appeared to be intact. The new passenger jet way appeared intact as well but will need to be inspected. The auxiliary jet way appeared intact with the canopy still attached. The draught alongside was between 31 feet to 36 feet. Governor Nicholas Street Wharf: The transit shed had moderate damage to the side panels and roller doors. Draught alongside was sufficient. We were not able to sound with the vessel General Kelly due to a bulk ship being there in a lay berth status. Esplande Street Wharf: Heavy damage to the siding and the roof. We did not sound alongside due to the vessel in the lay berth. Pauline Street Wharf: We include the Pauline Street Wharf due to the vessel in the lay berth, bulk Chios Beauty (see issue of Sept 2), lines parted setting it adrift. Vessel is now located on the west bank, having impacted with the Cooper Tug Barge and lodging itself against the barge and at least one tug. We observed two Cooper Tugs trying to dislodge the vessel from the west bank. Poland Street Wharf: Appeared intact with moderate damage, we did not sound in this area. The "nested" MARAD ships appeared intact. Alabo Street Wharf: Moderate damage to the skylights and doors. Draught alongside was OK. We did not sound due to a vessel at the berth. France Road Wharf and Jourdan Street Wharf: We were not able to access these facilities due to flooding in the area. It should be noted that electricity has been lost and Jourdan Street Wharf, used to export frozen poultry, and is now without refrigeration. Summary of Our wharves appear to be, for the most part, intact and able to conduct cargo operations. The transit sheds incurred damage, but could be used while we make repairs. Issues concerning cargo operations would be procuring labour to work the vessels (a lot of the labour most likely incurred heavy damage to their homes or evacuated out of town), distribution of cargoes due to highway connectors being damaged (I-10 twin spans had sections lost and connectors in Orleans and Jefferson Parishes are under water) and initially used for recovery operations, and the ability of the river to receive vessels specifically at the southwest pass and the MRGO. Presently river traffic is limited to tugs, barges, off shore vessels relocating and recovery boats. We must wait now for sounding to be performed by the pilot's organizations and the Army Corp of Engineers. In addition, we need to analyze the Cruise Operation. Right now the Louis Armstrong Airport is underwater and hotels supporting the cruise industry need to repair their facilities. We still have autos for passengers parked which incurred heavy damage.

Sydney, Sep 2 -- Oil and gasoline prices dipped today as the US government moved to avert a fuel shortage and some Gulf Coast oil

operations resumed, but losses were limited by fears it may take months to recover from the rampage of hurricane "Katrina". Washington loaned out emergency crude supplies, eased environmental regulations on motor fuels and waived a shipping law to allow better flow of oil into the Gulf region, where most oil output and eight refineries were idled for a fifth day. Some regional pipelines also started pumping supplies around the country and power was restored to a number of plants. However, the US government said it might take months to recover from the killer storm, which struck at the heart of an industry already running nearly flat-out to satisfy two years of exceptionally strong demand growth around the world. Crude oil prices on the New York Mercantile Exchange retreated 57 cents, or 0.8%, to stand at \$68.90 a barrel today, having hit an all-time high of \$70.85 on Tuesday (Aug 30), one day after "Katrina" hit the coast. London Brent crude was down 42 cents to \$67.30 a barrel. Gasoline prices, which have led the market's gains on fears that already low stockpiles would be squeezed severely, traded 6.96 cents, or 2.9%, lower to \$2.339 a gallon. The contract hit a record high of \$2.9250 a gallon on Wednesday. "My feeling is that the pressure on the gasoline market is much more severe than we first imagined," said Tetsu Emori, chief commodities strategist at Mitsui Bussan Futures in Tokyo. "With damage to refineries looking more serious than after hurricane 'Ivan' last year, I don't see prices falling far soon." The US Department of Energy said some of the refineries shut by "Katrina" could take months to restart, with reports that floodwaters swamped at least three in Louisiana. A dozen other refiners along the coast and in the Midwest have also been forced to slow operations due to pipeline and supply shutdowns, further straining already low inventories. Soaring gasoline prices -- up more than 20% from just a week ago -- have drawn an armada of gasoline cargoes from Europe, but most of those supplies will not arrive until October, leaving open the prospect of a month-long supply squeeze. President George W. Bush urged Americans to conserve gasoline supplies and warned retailers about price gouging as New Orleans and the Gulf Coast struggled to recover from one of the nation's most savage storms, now estimated to have killed thousands. The DOE confirmed the loan of crude supplies from its strategic reserve to three refiners to enable them to resume operations at their Louisiana facilities. Exxon Mobil Corp borrowed six million barrels, Valero Energy Corp 1.5 million and Placid Refining one million, while further requests are being considered. Washington temporarily eased environmental gasoline and diesel regulations and waived a shipping law to allow foreign tankers to move fuel between domestic ports. The European

Commission said it could revive a plan to coordinate EU oil stocks, while France announced financial aid to its citizens to cushion the blow of rampant oil prices. Canada's oil companies could defer autumn maintenance at refineries to maximise gasoline exports south of the border. Gasoline supply fears have overshadowed the loss of nearly all Gulf of Mexico crude production, a quarter of the nation's total, which is more easily compensated with robust commercial stockpiles, strategic inventories or additional OPEC output. Power was slowly being restored to refineries, but plant operations will take days or weeks to resume, operators said. Marathon Petroleum Co LLC said it planned to restart its 245,000-bpd Garyville, Louisiana, refinery at the weekend, the first major plant to resume operations. Motiva Enterprises said it hoped to restart its 230,000-bpd Convent refinery within one week, while Valero said its 227,000-bpd St. Charles facility should be up and running within two weeks. However, pipelines ferrying oil from the Gulf Coast to the rest of the country had resumed limited operations and the Louisiana Offshore Oil Port, which handles a tenth of US crude imports, should begin unloading tankers today, operators said. -- Reuters.

New Orleans, Sep 2 -- US troops poured into New Orleans today with shoot-to-kill orders to scare off looting gangs so rescuers can help thousands of people stranded by hurricane "Katrina", find the dead and clean up the carnage. Faced with a growing threat of anarchy after a natural disaster that may have killed thousands of people, the US military rushed in National Guard reinforcements. Armed looters have had the run of the city since "Katrina" pounded the US Gulf Coast on Monday (Aug 29), but they were warned not to push their luck. "These troops are battle-tested. They have M-16s and are locked and loaded," Louisiana Governor Kathleen Blanco said last night of one group of 300 National Guard troops being deployed here after recent duty in Iraq. "These troops know how to shoot and kill and I expect they will." Most residents are desperate for an end to the violence and a crackdown on looters was ordered when it became clear the looting and gunfire were hurting relief efforts. Bodies rotted on busy streets, gunmen opened fire on troops and rescue workers, and seriously ill people braved the floodwaters in wheelchairs to search for help. Officials said the death toll was certainly in the hundreds and probably in the thousands, but details remained sketchy. Pentagon officials said an additional 4,200 National Guard troops would be deployed over three days and that 3,000 regular Army soldiers may also be sent in to tackle the armed gangs that have looted stores across New Orleans. "We will not tolerate lawlessness, or violence, or interference with the

evacuation," Secretary of Homeland Security Michael Chertoff said. The reinforcements mean nearly 50,000 part-time National Guard and active-duty military personnel are being used in the biggest domestic relief and security effort in US history. However, the deployment has so far failed to guarantee an effective rescue plan and many of the hurricane's victims are increasingly frustrated at being left to fend for themselves. Under pressure from some Democrats for allegedly acting too slowly and for cutting federal funding for improvements to New Orleans' levees, US President George W. Bush was to visit the city today. The US Senate approved his request for \$10.5 billion in emergency disaster relief late yesterday, with billions more in aid seen passing Congress in coming weeks. Flooded New Orleans hospitals had no electricity and critically ill patients were dying because they no longer had access to oxygen, insulin or other medicines. Doctors worked around the clock to keep patients alive and evacuate them but logistical arrangements were chaotic and made worse by the violence. At one hospital, one evacuation was called off when a gunman opened fire on doctors and soldiers. Shelters set up to care for thousands of evacuees in New Orleans were still without food and water early today and families slept near corpses and piles of human waste. Lake Pontchartrain's muddy floodwaters still own New Orleans four days after bursting through the levees that once protected it, and now they are toxic with fuel, battery acid, gas, garbage and raw sewage. Health experts warn outbreaks of disease could wreak havoc in the days and weeks ahead. Thousands of people were finally evacuated from the city on Thursday night and taken to the Astrodome stadium in Houston, about 350 miles west, but it quickly filled up and police turned away busloads of the evacuees to other shelters. "Katrina" forced hundreds of thousands of people from their homes and shut refineries along the Gulf Coast shut, sending gasoline prices at the pump soaring to new records of well over \$3 a gallon in most parts of the country. Bush urged Americans to conserve gasoline to help overcome the crisis. "Don't buy gas if you don't need it." -- Reuters.

London, Sep 2 -- More than 2,580 people have been rescued off of rooftops and flooded neighbourhoods since rescue operations began Monday (Aug 29), and joint-agency rescue operations are continuing through the day and night. The Coast Guard's primary focus along the Alabama, Mississippi and Louisiana coast will remain search and rescue as long as necessary. Coast Guard assets continue to arrive in the impacted areas. There are 25 cutters off the Gulf Coast, in the rivers, and in the ports and waterways. The Coast Guard cutters Pelican, Cypress and Spencer are currently transiting the Mississippi River to New Orleans to establish a command and control

presence and provide a flight deck, fuel and communications to the search and rescue assets in and around New Orleans. Thirty-five aircraft and hundreds of air crew personnel are in the area from Coast Guard air stations as far away as Barbers Point, Hawaii, and Cape Cod, Mass. Coast Guard C-130s are en route to Air Station New Orleans with additional fuel supplies. Coast Guard Auxiliary members have responded and are supporting the Coast Guard incident management team. The Coast Guard is contacting its Auxiliary divisions throughout the area to ask for help with post-hurricane recovery operations. Many other federal and local government assets are already in the area or being sent there, including FEMA urban search and rescue teams, incident management teams, disaster assistance and response teams, maritime safety and security teams, marine safety response teams, critical incident stress management teams. There have not been any confirmed reports of casualties to Coast Guard members, but due to communications difficulties some Coast Guard personnel have not been accounted for. The Coast Guard anticipates significant waterways management and environmental clean-up operations. Most Gulf ports remain closed. However, joint-agency surveys of the ports, waterways and rivers are underway. There are approximately 86 vessels awaiting transit to or through the Port of New Orleans. The Gulf Intracoastal Waterway in Louisiana, Red River, Atchafalaya, and Ouatchita Rivers has been opened in some areas. More than 100 barges have reportedly sunk, or are aground south of New Orleans, and the majority of buoys and other kinds of navigational markers are off station throughout the Gulf Coast. Ports of New Orleans, Gulfport, Pascagoula, and Destin/Panama City are closed. The ports of Pensacola and Mobile are open only to vessels with a 12-foot draft or less.

New Orleans, Sep 3 -- Military convoys rolled into New Orleans yesterday, carrying troops to try to stamp out lawlessness and supplies for desperate survivors of hurricane "Katrina" after days of delays and broken promises. President George W. Bush, facing fierce criticism over the government's slow response to the one of the worst disasters in US history, signed a \$10.5 billion measure late yesterday to speed federal aid to Gulf Coast areas devastated by the storm. Earlier, Bush toured the stricken area and vowed to fix relief efforts he admitted had been "not unacceptable." "We're going to make it right," he said. A caravan of camouflage-green trucks carrying National Guard troops and escorted by helicopters brought a glimpse of hope to New Orleans, which quickly fell into chaos and desperation after the storm surge broke its protective system of levees, and floodwaters inundated the city. Thousands of people are feared killed and scenes of decomposing corpses, rampant looting and widespread

destruction have shocked Americans and aroused angry complaints from politicians and local residents about the lack of aid in the world's richest country. The arrival of the military convoy raised hopes the government might finally be getting a grip on the crisis. "We got food, water and medical attention. We are gonna get you people out of here," a National Guard officer told thousands of hungry and frustrated people who have waited days at New Orleans' convention centre for evacuation buses that never came. Some cheered but others demanded to know why it had taken so long. Many stranded evacuees recounted horrific tales of murder, rape, death threats and near-starvation inside the filthy, reeking shelter this week. "Bush and Congress described the relief measure as a downpayment on what will be a larger amount of money to be made available in coming weeks. The Army Corps of Engineers said it may need up to 80 days to drain the floodwaters from the city after the hurricane struck Louisiana, Mississippi and Alabama on Monday with 140-mph winds and a huge storm surge. Louisiana Governor Kathleen Blanco said the troops were going in with shoot-to-kill orders to stop looting. "These troops are battle-tested. They have M-16s and are locked and loaded." "Dozens of foreign governments offered help ranging from cash donations and helicopters to tents and medical teams. Even as the offers came in, the US government was widely criticised abroad for failing to move more effectively. Transportation Secretary Norman Mineta said Amtrak passenger trains would join buses and aircraft helping evacuate people trying to escape the city. -- Reuters.

London, Sep 3 -- A press report, dated Sep 2, states: Shipments of grain and other commodities have languished on barges on the Mississippi River since Saturday (Aug 27), unable to pass through the New Orleans ports closed by hurricane "Katrina." It remained unclear yesterday when the ports would reopen for business, raising questions about what will happen with this year's upcoming corn and soybean harvest. While alternative ports in Houston, Corpus Christi and Tampa say they are ready to handle incoming vessels, New Orleans ports are critical to what goes out, industry experts say. New Orleans traditionally has handled more than half of the country's grain exports to overseas destinations. Lisa Kelley, director of public policy for the National Corn Growers' Association, said it was too soon to tell what long-term transportation damage may be along the Mississippi River, the cheapest route for shipping many crops and other commodities destined for foreign markets, or to estimate damage to New Orleans ports. Barges carrying grain, goods and oil remained halted on the river as government and industry officials focused on efforts to rescue New Orleans residents and repair the sodden city's broken levees.

"It doesn't look like ocean freight will ship out of that area for some time," Kelley said. Matt Nobsch, a freight trader with Pattison Brothers of Fayette, Iowa, also said it was too early to assess the impact of the ports' closure. "If the export elevators are up and running in a week, it probably won't have much impact at all," he said. "If it takes them a month to get going, it's probably going to have very much of an impact." Nobsch said his company ships 40-50 million bushels of corn and beans a year to the Gulf. The Coast Guard has closed ports and waterways stretching from Texas to Florida. The lower Mississippi and other waterways were open to limited tug and barge traffic to help with clean-up, the extent of which had yet to be assessed. Aaron Ellis, spokesman for the American Association of Port Authorities, said it was up to individual shipping lines to determine whether to wait it out or take steps to move their cargo off the river for land transport.

London, Sep 4 -- A press report, dated Sep 3, states: Two major fires blackened the skies over New Orleans today, one of them engulfing an industrial stretch on the riverfront northeast of the downtown area and another burning at a fashionable mall. Thick clouds of black smoke from the Louisa Street Wharf area covered the city skyline this morning, where there was no sign of firefighting efforts to put out the blaze. Video showed flames shooting up 50 to 60 feet in the air as the warehouse appeared to be burn out of control. Witnesses said the fire apparently was started in a timber pile. Fears are the blaze could spread from warehouse to warehouse. Meanwhile, Ten fire companies, comprised of four firefighters each, were battling a blaze at the upscale The Shops at Canal Place, a New Orleans mall at the base of Canal Street and near the Aquarium of the Americas. Fire companies were being aided by four water tankers that had been sent to New Orleans from Mississippi. Firefighters told CNN that the building had no electricity and no gas and that the blaze started "under suspicious circumstances." They've given up, they said, because they simply don't have the water and water pressure to win the fight. Police were on scene watching the building, attached to the Wyndham Hotel, as it burned.

London, Sep 4 -- A press report, dated Sep 3, states: Some evacuees from hurricane "Katrina" will be housed on board three Carnival Cruise Line vessels, including two initially slated to be docked in Galveston. The Federal Emergency Management Agency is chartering the vessels, which will be crewed by Carnival employees, for six months, Carnival spokesman Vance Gulliksen said today. Passenger Ecstasy, normally stationed in Galveston, and passenger Sensation, normally stationed in New Orleans, are planned for Galveston, Gulliksen said. Both can hold 2,600 people, he said. The vessels will be

pulled from regular service on Monday (Sep 5). A third, passenger Holiday, which normally sails out of Mobile, will be docked there. It can hold up to 1,800 people, Gulliksen said.

New Orleans, Sep 5 -- A week after hurricane "Katrina", New Orleans today searched for growing numbers of its dead from the city's worst catastrophe and had not given up on finding more of the living. As emergency teams scouted flooded homes and streets for bodies, authorities said Louisiana's official death toll of 59 could rise into the thousands. Rescuers in boats and helicopters were still pulling hundreds of people from rooftops, homes and buildings and police said they were getting 1,000 or more emergency calls for help each day, many from people still trapped in their homes and attics by floodwaters. Local officials believe thousands remain in the city despite mass evacuations before and after "Katrina" struck the US Gulf Coast last Monday (Aug 29), hammering an area the size of Britain in one of the biggest natural disasters in American history. Well over 100 deaths have been confirmed in Mississippi, with many people unaccounted for. Authorities were slowly regaining control of New Orleans after days of murder, rape and looting that horrified America and the world. The Southern city, which lies below sea level, fell into chaos after being swamped by floodwaters when the hurricane's force burst protective levees. The US Army Corps of Engineers said it was making progress towards pumping out the city but still expected it would take 80 days or more to complete the job. President George W. Bush planned to visit relief efforts in Baton Rouge, Louisiana, and Poplarville, Mississippi, today -- his second trip to the devastated region in less than a week. His administration, criticised heavily for its slow response to the flooding, sent top officials to the disaster zone yesterday and pledged to do whatever it took to clean up New Orleans and help its evacuees. Bush has conceded the relief efforts were unacceptable and has ordered 7,200 extra active-duty troops to the disaster zone. Government and emergency officials said it was not the time to assign blame for the troubled rescue efforts but to focus on the challenges ahead. "We're going to have to go house to house in this city. We're going to have to check every single place to find people who may be alive and in need of assistance," Homeland Security Secretary Michael Chertoff said. Chertoff warned of grim times ahead in the rescue and recovery mission. "When we remove the water from New Orleans, we're going to uncover people who died hiding in houses, who got caught by the flood, people whose remains will be found in the street. It is going to be about as ugly a scene as you can imagine." Signs of hope were emerging for the stricken city. Lights began to go on in some neighbourhoods when the local power company began restoring

electricity. National Guard troops and US marshals patrolled once chaotic streets, while some residents joined the Coast Guard in rescue efforts. In New Orleans' notoriously poor 9th district, police launched search missions with small speed boats to find bodies and survivors. The tips of roofs poked out from water bubbling from burst gas mains, and, in one spot, a swelling corpse floated on floodwaters. Hundreds of thousands of internal refugees from the disaster in Louisiana, Mississippi and Alabama were dispersing to states across the country as they confronted how to rebuild shattered lives. Texas alone was accommodating 139,000 in public shelters, while 100,000 others were in hotels. Many more were in private shelters run by churches and other groups or with Texas family and friends. Texas Governor Rick Perry said he was seeking to airlift some of the refugees to other states such as Utah, Michigan, Iowa and New York. "As Texas provides food, shelter and medicine to more than 230,000 evacuees, we are concerned about our capacity to meet this great human need as thousands more arrive by the day," Perry said in a statement. "There are shelters set up in other states that are sitting empty while thousands arrive in Texas by the day, if not the hour." -- Reuters.

London, Sep 5 -- Hurricane "Katrina" has forced operational halts at 18 of Nippon Oil Corp's 27 offshore oil and gas fields in the Gulf of Mexico, officials of Japan's biggest oil distributor said Friday. Although the fields usually produce 10,000 to 20,000 barrels of crude oil a day, the hurricane has forced a 60% cutback in their combined output, the officials said.

London, Sept 5 -- A Shell press release, dated Sept 4, states: Production is now flowing and ramping up from all Shell operated assets in the Western Gulf of Mexico that were shut in because of hurricane "Katrina". Over the last 24 hours Bullwinkle and West Cameron 565 began flowing, and production continues from Auger, Brutus, Cougar, Enchilada, and North Padre Island. In the Eastern Gulf of Mexico our Fairway asset and Yellowhammer Gas Processing Plant near Mobile Bay are operating normally. Ram Powell and Main Pass 252 are ready to resume production, however, delivery of production is dependent upon the completion of ongoing systematic inspections and any needed repairs of pipelines and other related onshore processing/handling facilities that transport and receive our production. Significant efforts continue as we evaluate our hurricane-impacted assets, Mars, Ursa, Cognac, and West Delta 143.

London, Sept 5 -- A press report, dated Sept 1, states: Helmerich & Payne Inc, a contract driller of oil and gas wells, said today that one of its eight active platform rigs in the Gulf of Mexico was significantly damaged by hurricane "Katrina". The company's

Rig 201, which operates on Shell's Mars tensioned-leg platform, lost its entire derrick and sustained considerable damage to the rig floor and substructure. The company said it does not have a damage estimate yet, but expects insurance to cover all of its capital loss, after a \$1 million deductible. Helmerich said the rest of its assets in the Gulf look to have sustained little to no damage, based on early inspections.

New York, Sep 5 -- Energy companies kept working through the US Labor Day holiday to restore damaged Gulf of Mexico offshore oil and natural gas production facilities and restart Gulf Coast refineries devastated by hurricane "Katrina" last week. Gulf of Mexico oil and natural gas production showed improvement. The US Minerals Management Service said 30.43% of oil output was online this morning, up from about 21% pumping on Saturday (Sep 3). Natural gas production was at 47.75% today, up from 42.21% on Saturday. The government said nearly 28% of 819 manned production platforms and a similar percentage of 134 rigs operating in the Gulf remained evacuated today. Two of eight refineries shut in Louisiana and Mississippi by Katrina were in restart today. Marathon Petroleum Co LLC said its Garyville, La, refinery, third largest shut by "Katrina", was in restart and should be back to normal by tomorrow. Shell said yesterday that Motiva's Convent, La, refinery was coming back slowly, while its Norco, La, refinery could be able to restart by the middle of next week. The two largest shut facilities, Chevron Corp's in Pascagoula, Miss, and ConocoPhillips' in Belle Chasse, La, sustained extensive flood damage, according to the government. Chevron said today that the Pascagoula refinery did not suffer catastrophic damage but added that no restart estimate was available. It said it was still assessing damage as it worked to find employees dislocated by "Katrina." Reduced refinery throughput run rates were seen in 12 other refineries as far away as Illinois and Ohio. Colonial Pipeline's key gasoline and distillate products pipelines from the Gulf Coast heading north-east were at 73% capacity on Saturday and were forecast to reach 100% of normal capacity by tonight. The Department of Energy announced last week it will loan crude oil from the national Strategic Petroleum Reserve to refiners. By today oil was pegged for Exxon Mobil Corp, Placid Refining, Marathon, Total and Valero Energy Corp. -- Reuters.

London, Sep 6 -- A press report, dated today, states: Telephone company BellSouth Corp yesterday estimated that it would cost \$400 million to \$600 million to repair the damage from hurricane "Katrina" and said it could take four to six months to restore service in the hardest-hit areas of New Orleans and the Gulf Coast of Mississippi. The Atlanta-based company, the dominant

telephone service provider in much of the South, stressed that those were preliminary estimates. It has not yet been able to survey all of its sites given the breadth of the area struck by the hurricane a week ago. BellSouth said an estimated 1.1 million of its lines were out in the region, with 90% of these in what it calls the "red zone" -- New Orleans, areas north of the city and the Gulf Coast of Mississippi. That is down from 1.75 million lines that were out late last week. "Our best guidance, at this point, without having had the opportunity to physically survey and assess the full area, is \$400 million to \$600 million," BellSouth spokesman Jeff Battcher said of the company's estimated repair costs. Technicians yesterday began surveying parts of New Orleans, where the company believes that the majority of its roughly 472,000 customers remain without service. To protect its workers, BellSouth is sending armed guards to protect trucks of diesel fuel for those of its offices in the city that are running on generators, Battcher said. Battcher said BellSouth's main hub in New Orleans, on Poydras Street, is operating and is a key switching point for long distance carriers such as MCI Inc. AT&T Corp. and Sprint Nextel Corp. BellSouth's recovery is also vital to mobile phone providers, which typically depend heavily on land lines run by local telephone companies to connect their wireless calls. The major wireless providers said some of their calls are going through in New Orleans but service is still out in much of the city. In contrast, most of these companies -- Verizon Wireless, Cingular Wireless and Sprint Nextel -- said they had made significant progress restoring service elsewhere in the region, including to Baton Rouge and Mobile, as well as along parts of the Mississippi coast. Public safety experts said hurricane "Katrina" exposed two major weaknesses in emergency communications: a failure to deploy enough satellite phones and the lack of a national system for police, firefighters and medical personnel to talk with one another seamlessly. In addition to disabling much of the regular telephone network in New Orleans and along the Mississippi coast, the storm damaged local police radio systems and made it much harder for emergency personnel to help those in need.

Mobile, Sep 5 -- Hurricane "Katrina" came ashore around the Louisiana/Mississippi State Line during the early morning hours of Aug 29. Winds in Mobile were hurricane strength, and from about 1230 until about 1930, Aug 29, a storm surge of about 12-15 feet caused the following damage:

- 1) Warehouses 2-8 and A-E of the Alabama State Docks warehouse complex, were flooded with brackish water to a depth of 13-14 inches.
- 2) The McDuffie Coal terminal barge loaders were flooded. Motor reworks are in progress, and new components

are en route so that the power plant distribution is not entirely interrupted.

3) Twenty-six open hopper and covered hopper river barges broke free from Cooper Fleet at Mile marker 4.5 and when the surge receded, they gingerly grounded about 450 feet inland, on top of two tracks on the CSX railroad line. Salvage operations are now under way.

4) Semi-submersible accommodation/multifunctional support platform Chemul drydocked at Bender No 9 yard broke free from its moorings, travelled about 500 yards north and west, destroyed the Alabama State Docks No 9 barge loader, destroyed the Hess Oil Dock, then contacted the Cochran Bridge. Extensive damage to the platform is expected, but not yet quantified.

Currently, Mobile Ship Channel is open to a draught of 42 feet as far as far as Chocktaw Point, and 40 feet thereafter, but vessels with a draught of more than 12 feet are restricted to daylight movement. -- Lloyd's Agents.

London, Sep 6 -- A press release from the Port of New Orleans, dated Sep 4, states: In the wake of hurricane "Katrina", the Mississippi River is now open in one direction to vessels with a draught of 35 feet during daylight hours. Now that a route has been re-established to the Port of New Orleans and other ports on the lower Mississippi River, the port is bringing together all of the pieces that will allow it to be a major force in the reconstruction of New Orleans. "The Port of New Orleans' riverfront terminals survived hurricane 'Katrina' in fairly decent shape," said Port President and CEO Gary LaGrange. "Although they are damaged, they are still workable once electrical power and manpower is available. In the next several weeks, almost all of the Port of New Orleans will be dedicated to military relief vessels. In the next week to two weeks, commercial vessels will return once electrical power and manpower arrive," LaGrange said He added that many repairs will be needed though to bring the Port back to full capacity. Cargo containers have been tossed around at the Napoleon Avenue Container Terminal and the Nashville Avenue Complex and remain strewn about. Two gantry cranes at the Napoleon and Nashville Avenue Complexes are expected to have damage to electronic components. The other two gantry cranes at Napoleon/Nashville are expected to work once they have electric power. The US Department of Transportation's Maritime Administration is working to supply the cranes with power through huge generators. As of 1600 today, about 15 vessels passed by the Port of New Orleans on their way to upriver ports such as the Port of South Louisiana and the Port of Baton Rouge. All three river pilot groups on the lower Mississippi River recommend opening the river to two-way traffic. The Mississippi River-Gulf Outlet (MRGO), an alternate route for the



Mississippi River, is open to nine feet of draught. It could be opened to 27 feet of draught once debris is removed from the channel. The conditions of the terminals along the MRGO and the Industrial Canal are unknown except that they have no electrical power and they are severely flooded. Three senior staff members of the Port of New Orleans have established a headquarters at the Port's Administrative Office Building, and other members of the senior staff are working from the remote locations they evacuated to. Port CEO LaGrange, Executive Assistant for Port Operations Ted Knight and Operations Manager Paul Zimmermann have been on the scene in an attempt to continue port operations under some very adverse circumstances. The three senior staff members based in New Orleans have been in constant contact with MARAD and two of the Port's terminal operators -- P&O Ports and Ceres Gulf Inc -- to commence cargo operations for humanitarian aid and commercial cargo by the end of the week. A portion of the Port Headquarters building systems is running on emergency generator power. The Port is housing the Louisiana State Police SWAT team's operations centre on its first floor. P&O Ports and Ceres Gulf Inc have mobilised work crews in Texas. At the request of the Port of New Orleans, these work crews are available to load and unload vessels at the Port of New Orleans pending the arrival of vessels. They could be at the terminal within two or three days. The US Department of Transportation's Maritime Administration is following up on a request by the Port of New Orleans for help. They are providing several vessels with the capacity to temporarily house 1,000 people who will operate the port. Those 1,000 people will be either essential Port of New Orleans employees or crews working vessels at the Port of New Orleans. Some of the vessels will be outfitted with generators needed to supply the power needed for port operations. "We are thankful to Transportation Secretary Norman Mineta and his staff for helping to get us what we need to get our port up and running as soon as possible," said LaGrange. Port Chief Operating Officer Dave Wagner has established temporary administrative offices in Atlanta with the help of the Port's Board Chairman John Kallenborn of Chase Morgan. They have established ways for staff payroll to be distributed as usual. Some staff members have been notified by the Port's Emergency Hotline to make contact with the Port for payroll information and to establish communications. Although the Port is making tremendous progress in getting back on its feet, it continues to face many challenges, including fires. Mandeville, Piety and possibly Esplanade Street Wharves have been damaged by fire. The fire started off port property at a produce warehouse when propane tanks exploded. The fire was fought from the

river by the Port's fireboat General Roy Kelley, Crescent River tugs and two vessels owned by the Port of South Louisiana, vessels John James Charles and Accardo. "Propane exploding in the air like bombs touched off fires as far as a half-mile away," LaGrange said. The only way to fight the fire was to use firefighting vessels. Fire trucks responded to the emergency, but did not have ability to pump water. Just after midnight this morning, the fire at the Mandeville Street Wharf started to break out again. The team of fireboats and tugs were once again able to bring the fire under control, preventing the fire from spreading from the wharves into the French Quarter. The Harbour Police, the Port of New Orleans' police force, is working with about 15 officers who are very fatigued. A Harbour Police vehicle was struck by a hit-and-run driver and a Harbour Policeman had to be treated in hospital. From Texas, Pat Gallwey, the Port's Executive Assistant for Administration, is coordinating the needs of the Port with Congressional leaders, FEMA and other federal agencies. Port customers will be contacted by the Port of New Orleans' New York office and by Marketing Manager Bobby Landry once he returns to New Orleans early this week. At 1000 tomorrow, there will be a meeting in the Port Administration Building by the three pilot groups on the Lower Mississippi River, Port staff and any member of the maritime community to discuss rebuilding the port and making it more cost effective for customers.

New Orleans, Sep 5 -- Victims of hurricane "Katrina" returned to pick through their battered homes today and President George W. Bush promised to fix bungled rescue efforts after a disaster in which the mayor of New Orleans said as many as 10,000 may have died. Rescuers in boats, helicopters and military vehicles went house to house looking for stranded survivors of one of the worst natural disasters to hit the United States. A full week after "Katrina" crashed into the US Gulf coast and ravaged one of America's most popular cities, no one knows how many people perished. New Orleans Mayor Ray Nagin said "it wouldn't be unreasonable" for the death toll to rise to 10,000, although he admitted he had no idea of the exact number. While authorities allowed people to temporarily return to their homes in areas outside New Orleans, police pleaded with people who have not yet abandoned the city itself to get out. "There are no jobs. There are no homes to go to, no hotels to go to, there is absolutely nothing here," Deputy Police Chief Warren Riley said. "We advise people that this city has been destroyed, it has completely been destroyed." Forensic experts prepared a warehouse for the grim task of identifying victims when they are finally recovered. Some are not hard to find as swollen bodies float in the streets but officials fear thousands more are hidden in homes

across New Orleans. In suburban Jefferson Parish, stunned residents got a first look at the hurricane's damage to their homes when it struck with 140 mph winds and a massive storm surge. They were greeted by a panorama of toppled trees and street signs, and spacious middle-class homes that had been flooded with several feet of water. The Jefferson Parish government told its residents not to stay in their homes, but to gather items they needed and leave again by nightfall because there was no power or clean water. The US Army Corps of Engineers began pumping water from the flooded city after closing a major gap in the levees which burst during hurricane "Katrina" and allowed the waters of Lake Pontchartrain to rush through. Draining the entire city could take 80 days or more, but the Corps was working to plug another major breach in the levees, spokesman John Hall said. Bush, who has faced fierce criticism for the slow relief response, visited dozens of victims being cared for at a prayer centre in Baton Rouge and promised the country would "do what it takes" to help people get back on their feet. He has admitted the early relief effort was "unacceptable" and promised today to make changes as needed. "If it's not right, we're going to fix it, and if it is right, we're going to keep doing it. And this is just the beginning of a huge effort," Bush said. The official death toll in Louisiana stood at 59 but officials said it would climb dramatically in coming days. A warehouse in a Louisiana town is being set up to handle thousands of corpses. Police and troops were regaining control of the city after days of murder, rape and looting that horrified America and the world. However, New Orleans Police Department Deputy Chief Warren Riley said only about 1,000 of the force's 1,641 officers were accounted for and that many had had gone looking for missing relatives but others had apparently deserted. At least 240,000 evacuees had flooded into neighbouring Texas, where Governor Rick Perry said the state could handle no more and asked that any more be airlifted to other states. Two cruise vessels based in Galveston were expected to start boarding evacuees later today. They both have a capacity of 2,600 people. -- Reuters.

London, Sep 6 -- A press report, dated today, states: US refineries closed by the onslaught of Hurricane "Katrina" are trickling back on-stream, oil companies report. Two refineries are fully operational, while others are close to restarting. The return of US refining capacity has combined with the supply of oil from international stockpiles to help lower prices from record levels. Today saw US crude fall 1.1% to \$66.65 a barrel. Brent crude rose 0.3% to \$65.05, having fallen 1.8% during yesterday's holiday closure of US markets. The refineries which are coming back to life are receiving 12.6 million barrels of oil from the US's Strategic

Petroleum Reserve, the Department of Energy said. Europe, Japan and other members of the International Energy Agency are trying to provide stocks from their own reserves. Exxon's huge 500,000 barrel a day installation at Baton Rouge, Louisiana is "fully operational", according to the department, along with Total's facility at Port Arthur, Texas. Both had suffered reduced production because of the storm, as had a number of others in places as far afield as Illinois and Ohio. Five more - all in Louisiana and previously shut down - have lit their flares, indicating they are either in the process of restarting operations or preparing to do so. The closure of the facilities hit by Hurricane "Katrina" meant that 10% of the US's refining capacity was knocked out of commission - as well as a sizable slice of oil and gas production, as rigs were evacuated and in some cases torn from their moorings. Officials said that 30% of normal oil output was up and running, along with almost 50% of natural gas output, but almost 30% of rigs and production platforms remained evacuated, and at least 20 rigs or platforms are reported damaged, sunk or missing. Although more than half the eight refineries put out of action by "Katrina" are either up and running or in restart - being checked over in preparation for full-scale resumption of production - some look set to remain offline for weeks or even months. Chevron's Pascagoula, Mississippi refinery and ConocoPhillips' Belle Chasse, Louisiana plant have suffered major damage, while another two are without power. Together they account for 690,000 barrels a day of refining capacity. The status of US oil refineries shut by Hurricane "Katrina" (all in Louisiana except where marked) : Motiva in Convent: Restarted. Motiva in Norco: Flare lit - Midweek restart. Marathon in Garyville: Restart - began yesterday. Valero in Norco: Power restored - midweek restart. Murphy Oil in Meraux: Relit but crude leak. Chalmette Refining in Chalmette: Assessing damage. ConocoPhillips in Belle Chasse: Assessing damage. Chevron in Pascagoula, MS: Assessing damage. (See issue of Sep 7.)

London, Sept 6 -- A press report, dated today, states: With ship-loading cranes idle, New Orleans port officials vow the storm-damaged port will rebound once debris is cleared away and electricity restored. "In the next week to two weeks, commercial vessels will return once electrical power and manpower arrive," Port President and CEO Gary LaGrange said today in a telephone interview from New Orleans. "We're trying to bring the first ship in Friday." Mobile's port returned to work today, handling urgent cargo, including parts for the Hyundai plant in Montgomery and coal for utilities. Port warehouses had minimal damage from "Katrina" and generators kept the freezer terminal cold, but floodwaters from the storm surge dumped tons of mud in terminal

buildings. The mud was cleaned up yesterday. Along the north-central Gulf Coast, "Katrina" clobbered the port at Gulfport, Miss., gutting the east pier facilities and wiping out its cargo plants handling forest products, aluminum, paper. Some bundles of fence-board cargo were found in Long Beach about four miles away, Mississippi State Port Authority director Don Allee said. The port's DOLE food terminal was flattened. "One problem is that a three-story gaming barge is now sitting in the middle of the Great White Fleet terminal," Allee said in a report to AAPA. In New Orleans, crane electronics experts are expected soon to make repairs, but diesel fuel remains scarce, LaGrange said. Workers also must be brought back. The U.S. Department of Transportation's Maritime Administration is providing several ships with the capacity to temporarily house 1,000 people who will run the port. LaGrange said the Mississippi River is open, with 25 ships a day, mostly upriver. The river is open in both directions to ships with a draught of 39 feet during daylight hours. Twenty Coast Guard cutters and dozens of small boats between Florida and Mississippi are working to repair missing or damaged navigational aids in the waterways. Until the New Orleans port is rebuilt, its cargo could be diverted to neighbouring ports, including Mobile, said industry spokesman Aaron Ellis at the American Association of Port Authorities. Ports in Houston, south Florida, Savannah, Ga. and North Carolina also could receive some cargo if space is available. Poultry shipments could be diverted to Mobile. Some steel imports may wind up in ports like Philadelphia, Ellis said. Rubber needed for the tyre industry may be diverted to Morehead City, N.C. But space could be a problem: "Katrina" hit when ports were filled with cargo, said James Lyons, president and chief executive officer of the Alabama Port Authority. "I don't know that right now we'll be getting any of their cargo," Lyons said. "Everybody was pretty full before the storm." Ellis had no estimate on total port losses from "Katrina". T

New York, Sep 6 -- Nearly one million electricity customers remained without electricity eight days after hurricane "Katrina" hit the US Gulf Coast in Louisiana and Mississippi, according to area utilities and the US Department of Energy. More than half the customers in Louisiana, or 588,000 homes and businesses, were still without power, while Mississippi had about 382,000 customers with no service. Entergy Corp, the hardest hit electric company, had about 462,000 customers out in Louisiana and 41,000 out in Mississippi. Most of New Orleans, however, remained without power. Crews from Entergy started to return to the city over the weekend (Sep 3-4) for the first time since the hurricane hit to assess the situation, according to a report by the DOE.

Entergy also reported extensive damage to its natural gas distribution system serving 147,000 customers in New Orleans. The company said it would have to shut off gas service to many parts of the city to repair the damage but preserve flows to the power generators running the pumps to get the water out of the flooded areas of the city. Southern Co's Mississippi Power subsidiary had about 119,000 customers still without service. The company expects to restore power to all customers by Sep 11. The utilities in Florida, which restored power to customers last week, continued to urge customers to conserve energy due to the tight but improving natural gas supplies used to fuel power generation facilities. Entergy's subsidiaries own and operate about 30,000 mw of generating capacity, market energy commodities and transmit and distribute power to 2.6 million customers in Arkansas, Louisiana, Mississippi and Texas. Southern's subsidiaries own and operate more than 39,000 mw of generating capacity and provide power to more than four million customers in Georgia, Alabama, Mississippi and Florida. The Gulf Coast electric companies restored full power to the Colonial Pipeline, which supplies gasoline, diesel and jet fuel to the South-east, Mid-Atlantic and North-east, by yesterday afternoon, according to pipeline officials. The pipeline is now at 100% of pumping capacity. The Louisiana Offshore Oil Port (LOOP) has been operating at almost full capacity but Entergy has not yet restored power to the Clovelly storage facility. The LOOP expects to be at full capacity when Fourchon gets power, which should occur in about seven days, according to the DOE report. Tankers are making crude deliveries to the LOOP, which is making deliveries to the Capline, a crude oil pipeline serving the Midwest. The Capline is running at over 80% of capacity, according to the DOE. Three refineries with major damage in Louisiana remain without power, including facilities owned by ConocoPhillips in Belle Chasse, Exxon Mobil Corp in Chalmette and Murphy Oil Corp in Meraux. All of the other refineries in Louisiana and Mississippi still shut due to the hurricane have access to power. Even with access to power, however, it will still take some refineries weeks to resume operations. -- Reuters.

London, Sep 7 -- Insurers and reinsurers globally are facing a total loss of around \$50bn from the hurricane "Katrina" catastrophe in the United States, a top London practitioner has forecast. This would make the disaster twice as costly as the dreadful hurricane "Andrew" of 1992 and surpass the gravity in financial terms of the World Trade Center attack. Dane Douetil, chief executive of Brit insurance group, which has strong expertise in major risk, forecast that "Katrina" would be "the biggest natural catastrophe loss ever to hit the insurance market."

Commenting on earlier predictions by analysts that the insurance cost would range anywhere from \$9bn to \$35bn, Mr Douetil said: "I cannot see it being less than \$35bn. I can easily see it getting above \$50bn." With talk of 60-80 days before water could be pumped out of the worst areas, "what are we going to find when that job is done?" he asked. On the positive side for insurers, Mr Douetil said that the catastrophe retrocession (reinsurance of reinsurance) market was already hardening and likely to go on doing so, while property reinsurance, direct US property and energy classes would also see rates strengthen. If the loss was as big as he suspected, that would affect the whole insurance market. Like other insurers, Brit, which, for instance, is involved in catastrophe retrocession cover, is taking a thorough, new look at the underwriting plans it was on the point of finalising for 2006. A top reinsurance broker in London, Charlie Cantlay of Aon, said that, at this stage, the likely loss from what he described as "an industry-changing event" would be around \$40bn. Specialists expect London, especially Lloyd's, to continue to offer cover for physical damage and business interruption to Gulf of Mexico installations but premiums could soar and terms and conditions tighten substantially. Marine generally may manage a much-needed uplift. A huge loss-adjusting operation is being prepared, meanwhile, across marine, energy and non-marine areas to allow Lloyd's and the London insurance market to maintain a reputation of speedy settlement.

London, Sep 7 -- A US Army Corps of Engineers ports and waterways status report, dated today, states:

Port of New Orleans:

Six wharfs have been assessed as heavily damaged, and six wharfs as moderately damaged. The remainder had "cosmetic" damage, though all but one were assessed as workable with the availability of electricity and manpower. The one wharf with no determination made was inaccessible due to flooding. Where soundings were conducted, draughts ranged from 31 to 51 feet. Power has been restored to the Port Headquarters building. P&O Ports and Ceres Gulf Inc have mobilised work crews in Texas. These work crews are available to load and unload vessels at the Port of New Orleans pending the arrival of vessels. They could be at the terminal within two or three days. The US Department of Transportation's Maritime Administration is providing several vessels with the capacity to temporarily house 1,000 people who will operate the port.

Gulfport:

Total loss of dry cargo facilities. East pier facilities have been gutted. Damage is reported to lifting facilities and cranes as well as the banana storage facility.

Port of Pascagoula:

All phone lines -- cellular and landline -- are out of order. The port sustained

varying degrees of damage; the facility least affected was the Bayou Cassotte, which still had warehouses and piers standing. The port office sustained water damage, and e-mail and telephones are not working.

Port of Baton Rouge:

No damage. The port continues to address and respond to the immediate needs of the maritime community.

Port of Shreveport-Bossier:

No Damage.

Port of Lake Charles:

No Damage.

Port Fourchon:

Considerable damage at the port and to offshore facilities -- the port is key to supporting the repair of these facilities. Preliminary depth surveys show that there is no significant shoaling in the channel. However, there are several large capsized vessels blocking the inland channel. The port hopes to be back in operation within a week. The port's most immediate need is for a minimum of a 125KW generator to fuel and feed recovery workers.

Mississippi River:

The Mississippi River is open to shallow draught traffic and to deep draught vessels to 39 feet -- two way, daylight only -- until Aids To Navigation have been fully re-established. There are two obstructions that must be removed, and that will open the river to 48 feet.

Gulf Intracoastal Waterway:

The Inner Harbour Navigation Canal Lock still has some operational problems, and repair work is ongoing. The status of the Florida Avenue bridge is in question. There are sunken barges in the east approach to the IHNC Lock. A contract has been awarded to correct bridge and obstruction issues. The waterway is closed for 70 miles east of Harvey Lock. The Atchafalaya River is open. Algiers Lock is operational and the railroad bridge is in the up position. The Harvey Lock and St. Claude Avenue bridges are both operational, but the Florida Avenue Bridge is still in question. Dredging of the Baptiste Collette Channel has been completed to establish a 16-foot draught.

Corps Assessment of Status of Gulf Ports and Waterways:

Apalachicola Bay - open.

Bayou Coden - open with restrictions.

Sound Channel - closed - need verification of aids to navigation.

Bayou La Batre - closed - fourth priority for dive and salvage operations.

Biloxi Harbour - closed - second priority for dive and salvage operations.

Blackwater River - open.

Bon Secour River - closed - dredging expected to be completed Sep 10.

Cadet Bayou - closed - survey scheduled.

Carrabelle Harbour - open.

Dauphin Island Bay - closed.

Dog & Fowl Rivers - closed.

East Pass Channel - open.

Escambia-Conecuh Rivers - open.

Fly Creek - closed - survey schedule being developed.

Gulfport Harbour - closed - Navy Salvage Team removed the 2 obstructions in the Federal channel.

La Grange Bayou - open.

Mobile Harbour - open.

Naval Station - open.

Panacea Harbour - open.

Panama City Harbour - open/caution.

Pascagoula Harbour - open/caution.

Pass Christian Harbour - closed.

Pensacola Harbour - open.

Perdido Pass Channel - open.

Port Fourchon - sustained significant damage. Numerous sunken vessels were reported to be in and adjacent to the channel.

Port of New Orleans - open.

Port St. Joe Harbour - open to barge traffic.

St. Marks River - open.

Wolf and Jordan Rivers - closed.

Inland Waterways:

Tenn-Tom Waterway - open.

Black Warrior-Tombigbee Waterway - open.

Alabama River Waterway - open.

London, Sep 7 -- A Port of Mobile press release, dated Sep 6, states: The following is an updated status report for the Alabama State Port Authority terminals at the Port of Mobile:

Channel: The Mobile Ship Channel is open to 43-foot draught vessels up to the McDuffie Coal Terminal. We hope to have our normal draught of 45 feet at McDuffie within a few weeks. The remainder of the Mobile harbour is open to its normal 40-foot draught and the Theodore ship channel is open to 37-foot draught. Currently, traffic is limited to one-way transit during daylight hours only. Two-way transits and night navigation will be allowed once additional aids to navigation are in place.

Bulk Facilities: All bulk facilities are operational. These include the Authority's dry bulk facilities, the grain elevator, cement and liquid bulk terminals. The McDuffie Bulk Terminal is lightly limited in the barge loading/unloading operations pending the repair of some of the equipment. Vessel activity has resumed and rail delivery starts back up today.

General Cargo Terminals: The Authority has been operating on a limited basis since the day after "Katrina," handling urgently needed cargo. Our warehouses experienced only minimal damage. The floodwaters left a great deal of mud in the terminals but clean-up was completed yesterday and full operations began today. Our freezer terminal is also fully operational.

Pier 2 Container Terminal: The container terminal is operating on a limited basis and will continue limited operations for a few more days. We will have to replace all the computers at the gate and repair several container handlers. Neither of the container cranes was damaged.

Inland Access: All major roadways and river access to the port were open the day after the storm. The ASPA Terminal Railroad experienced only minor damage, and is operational. All Class One railroads that serve the

port -- Canadian National, BNSF/Alabama Gulf Railroad, Norfolk Southern and Kansas City Southern -- are operational and the CSX is expected to resume service this morning.

London, Sep 7 -- A Port of New Orleans press release, dated Sep 6, states: As of this day afternoon, the Coast Guard has advised the lower Mississippi River will be open during daytime hours to deep-draught vessels from the sea buoy to mile marker 235, near Baton Rouge, for vessels with draughts of 39 feet or less. This is an increase from the previous allowed draught of 35 feet. Vessels with draughts deeper than 39 feet must have the permission of the Coast Guard captain of the port to enter the river. The Port of New Orleans' riverfront terminals survived hurricane "Katrina" in fairly decent shape. Although they are damaged, they are still workable once electrical power and manpower is available. The Mandeville Street Wharves, Piety Street Wharves and possibly the Esplanade were damaged by fire. The fire broke out off port property at a produce warehouse when propane tanks exploded and spread the fire. Two of the gantry cranes at the Napoleon and Nashville Avenue Complex are expected to have damage to electronic components. The other two gantry cranes are expected to work once they have electric power. The US Department of Transportation's Maritime Administration is working to supply the cranes with power through generators. An alternate route for the Mississippi River, is open to nine feet of draught. It could be opened to 27 feet of draught once debris is removed from the channel. The conditions of the terminals along the Mississippi River-Gulf Outlet and the Industrial Canal are unknown, except that they have no electrical power and they are severely flooded. About six or seven Maritime Administration vessels and three Navy vessels are scheduled to dock at the Port of New Orleans. Among the vessels that will dock at the port is assault vessel Iwo Jima, which has been assigned a berth at the Julia Street Cruise Terminal, and will be used to launch helicopters that will go on missions throughout the city. The Port headquarters building now has power, and the Louisiana State Police SWAT team has opened a temporary headquarters on the first floor. Electricity has also been re-established for the Crescent City Connection and the Riverwalk.

London, Sep 7 -- A press report, dated Sep 6, states: The mayor of New Orleans has warned the estimated 10,000 residents still believed to be holed up in the ruined city to leave or risk being taken out by force. As floodwaters began to slowly recede with the city's first pumps returning to operation, Mayor C. Ray Nagin authorised law enforcement officers and the US military to force the evacuation of all residents who refuse to heed orders to leave. Police Capt.

Marlon Defillo said that forced removal of citizens had not yet begun. "That's an absolute last resort," he said. Nagin's order targets those still in the city unless they have been designated as helping with the relief effort. The move -- which supersedes an earlier, milder order to evacuate made before hurricane "Katrina" crashed ashore on Aug 29 -- comes after rescuers scouring New Orleans found hundreds of people willing to defy repeated urgings to get out. In Washington, DC, President Bush and Congress today pledged to open separate investigations into the federal response to "Katrina" and New Orleans' broken levees. "Governments at all levels failed," said Senator Susan Collins of Maine. The pumping began after the Corps used hundreds of sandbags and rocks over the Labour Day weekend to close a 200-foot gap in the 17th Street Canal levee that burst in the aftermath of the storm and swamped 80% of the city. Although toxic floodwaters receded inch by inch, only five of New Orleans' normal contingent of 148 drainage pumps were operating, the Army Corps of Engineers said. How long it takes to drain the city could depend on the condition of the pumps, especially whether they were submerged and damaged, the Corps said. In addition, the water is full of debris, and while there are screens on the pumps, it may be necessary to stop and clean them from time to time. New Orleans Police Superintendent Eddie Compass said lawlessness in the city "has subsided tremendously," and officers warned that those caught looting in an area where the governor has declared an emergency can get up to 15 years in prison. About 124 prisoners filled a downtown jail set up at the city's train and bus terminal. Some National Guardsmen and helicopters were diverted from their search missions Tuesday to fight fires, an emerging threat in a city that has no water pressure to fight fires or electricity, which has prompted holdouts to use candles. In a plea to those who might be listening to portable radios, Nagin warned that the fetid floodwater could carry disease and that natural gas was leaking all over town. The Pentagon began sending 5,000 paratroopers from the Army's 82nd Airborne Division to use small boats to launch a new search-and-rescue effort in flooded sections of the city. Floodwaters also had receded from St. Bernard Parish south-east of New Orleans, but it was still a disaster scene with bedroom dressers and hot tubs scattered on roofs, toilet seats dangling in tree limbs and cars overturned in driveways. Water gurgled and spouted where natural gas seeped from below. While New Orleans waited for the floodwaters to recede before counting its dead, the effort to accurately catalogue Mississippi's toll was struggling to keep up with the decaying effect of 90-degree heat. Even when dogs pick up a scent, workers say they frequently cannot get at the bodies without heavy

equipment. That is leading officials to estimate that more than 1,000 people could be dead. As of tonight, workers had recovered 196 bodies in Mississippi, the majority coming from coastal counties. Nagin has estimated New Orleans' dead could reach 10,000.

London, Sep 7 -- The following press release, dated Sep 6, received: The following is an updated status report for the Alabama State Port Authority terminals at the Port of Mobile: Channel: The Mobile Ship Channel is open to 43 ft. draught vessels up to the McDuffie Coal Terminal. We hope to have our normal draft of 45 ft. at McDuffie within a few weeks. The remainder of the Mobile harbour is open to its normal 40 ft. draft and the Theodore ship channel is open to 37 ft. draft. Currently traffic is limited to one way transit during day light hours only. Two way transits and night navigation will be allowed once additional aids to navigation are in place. Bulk Facilities: All bulk facilities are operational. These include the Authority's dry bulk facilities, the grain elevator, cement and liquid bulk terminals. The McDuffie Bulk Terminal is lightly limited in the barge loading/unloading operations pending the repair of some of the equipment. Vessel activity has resumed and rail delivery starts back up today. General Cargo Terminals: The Authority has been operating on a limited basis since the day after "Katrina", handling urgently needed cargo. Our warehouses experienced only minimal damage. The flood waters left a great deal of mud in the terminals but clean-up was completed yesterday and full operations began today. Our freezer terminal is also fully operational. Pier 2 Container Terminal: The container terminal is operating on a limited basis and will continue limited operations for a few more days. We will have to replace all the computers at the gate and repair several container handlers. Neither of the container cranes was damaged. Inland Access: All major roadways and river access to the port were open the day after the storm. The ASPA Terminal Railroad experienced only minor damage, and is operational. All class one railroads that serve the port (Canadian National, BNSF/Alabama Gulf Railroad, Norfolk Southern & Kansas City Southern) are operational and the CSX is expected to resume service this morning.

New York, Sept 7 -- An Exxon Mobil Corp spokeswoman said today it will take "several weeks to assess the situation" at its joint-venture 190,000 barrels-per-day Chalmette, Louisiana, refinery shut by hurricane "Katrina". The Chalmette LLC plant, owned 50-50 by Exxon and Venezuelan state oil company PDVSA, does not yet have power, said Betsy Eaton, Exxon spokeswoman. "People are on the ground assessing the situation," said Eaton. "It will take several weeks to assess the situation. When the assessment is completed, then we will be in a better position to say when the refinery will begin its operations." The

assessment began yesterday, when Exxon Mobil said that the refinery was "in better condition than we originally thought." The Chalmette plant is one of four refineries that have the oil industry concerned because there is no solid information of when they will return and vague reports that the term could be months. These plants are the four that were hit by the most violent winds and storm surge caused by "Katrina". The three other refineries that oil trading sources say may be out for weeks and possibly months are the 325,000-bpd Chevron refinery in Pascagoula, Mississippi, the 247,000-bpd ConocoPhillips refinery in Belle Chasse, Louisiana, and the 120,000-bpd Murphy Oil Corp. refinery in Meraux, Louisiana. The EIA said today that 900,000 bpd production on the Gulf Coast will still be out by the end of September under a "medium recovery" scenario. -- Reuters.

Washington, DC, Sep 7 -- Early estimates for rebuilding roads and bridges in hurricane-ravaged Louisiana and Mississippi approach \$2.5 billion combined as the government signed its first road rebuilding contract today, Transportation Secretary Norman Mineta said. Mineta said the cost of rebuilding highway infrastructure knocked out by "Katrina" last week could reach \$1.3 billion in Louisiana and \$1.1 billion in Mississippi. "We still don't know the full extent of the damage to the region's transportation systems," Mineta said. "But we're already working aggressively to get the Gulf Coast moving again." Mineta said energy pipeline operations serving the storm-struck region and extending into the Midwest and eastern US were running normally. In addition, all airports in the region, except Lakefront just north-east of New Orleans, were fully operational. Lakefront remained under water, Mineta said. The agency said it had signed a \$5 million contract with a local company to start work on a key bridge along Interstate 10 in Mississippi. -- Reuters.

London, Sep 8 -- A press report, dated Sep 7, states: The hurricane-ravaged lower Mississippi River is open to two-way traffic for grain shipments from the Gulf Coast, and 63 percent of grain elevator capacity has been restored, the government said yesterday. "Vessels are moving on the river. Vessels are being loaded today, literally as we speak," Agriculture Secretary Mike Johanns told reporters. But, he added, shipments remain restricted. River navigation is limited to the daytime because Hurricane "Katrina" knocked out lights used at night. Also, because there are two blockages in the major shipping channel, known as the Southwest Pass, the Army Corps of Engineers is limiting ships to a draft of 39 feet. That is keeping larger vessels out of the channel. Removing the two obstructions and allowing nighttime navigation are the biggest hurdles to resuming shipping, said Lt.

Gen. Carl Strock, chief of engineers for the corps. The United States exports one-fourth of its grain. More than half of that amount departs from Mississippi Gulf ports hit by Katrina. Producers rely on the Mississippi River as the cheapest route for shipping crops and other commodities overseas. Officials said some grain company employees and federal grain inspectors have returned to work. Johanns said most of the 10 grain export elevators along the lower Mississippi are able to operate.

#### **HURRICANE "MARIA"**

London, Sep 2 -- A press report, dated today, states: Tropical Storm "Maria" formed today out in the open Atlantic, but it posed no threat to land, forecasters said. At 1100 the 13th named storm of the Atlantic hurricane season had top sustained winds of 40 mph, just above the 39 mph threshold to be classified a tropical storm. Its centre was about 1,185 miles south-east of Bermuda. It was expected to move toward the west-north-west at about nine mph later in the day. "It should stay out in the open Atlantic," said Lixion Avila, a hurricane specialist at the National Hurricane Centre in Miami.

London, Sep 5 -- Following received from the Meteorological Office, dated today: At 0900, UTC, today, the centre of hurricane "Maria" was located near lat 31.3N, long 57.0W. The position is accurate to within 30 nautical miles. The present movement is towards the north-north-west or 345 degs at nine knots. Estimated minimum central pressure is 977 mb. The eye diameter is 15 nautical miles. Maximum sustained winds 80 knots with gusts to 100 knots. Radius of 64-knots: 15 nautical miles in all four quadrants. Radius of 34 knots: 100 nautical miles in the north-east quadrant, 80 nautical miles in the south-east quadrant, 50 nautical miles in the south-west quadrant and 75 nautical miles in the north-west quadrant. At 0600, UTC, Sep 6, the centre is predicted to be near lat 34.4N, long 56.2W, with maximum winds of 90 knots and gusts to 110 knots.

London, Sep 5 -- A press report, dated today, states: Hurricane "Maria" continued to intensify early today over warm water in the open Atlantic, but remained only a threat to shipping interests, forecasters said. Its top wind speeds were up to 90 mph, and the system was expected to strengthen before reaching cooler waters - which are expected to sap "Maria" of its strength later in the week. At 0500 hrs, the storm was centred 465 miles east of Bermuda. It was moving north-northwest at 10 mph. Forecasters at the National Hurricane Centre said gradual turns to the north and north-east would keep "Maria" well to the east of Bermuda. "Maria" is the fifth hurricane and 13th named storm of the Atlantic hurricane season.

London, Sep 6 -- Following received from the Meteorological Office: Hurricane "Maria": Hurricane centre located near lat 33.3N, long 56.4W, at

0900, UTC, Sep 6. Position accurate to within 20 nautical miles. Present movement towards the north-north-east, or 020 deg at six knots. Diameter of eye 15 nautical miles. Maximum sustained winds 90 knots with gusts to 110 knots. Radius of 64-knot winds 20 nautical miles east semicircle, 15 nautical miles elsewhere. Radius of 50-knot winds 30 nautical miles south-west quadrant, 40 nautical miles north-west quadrant, 50 nautical miles elsewhere. Radius of 34-knot winds 60 nautical miles south-west quadrant, 80 nautical miles north-west quadrant, 100 nautical miles elsewhere. Radius of 12-foot seas 100 nautical miles north-west quadrant, 200 nautical miles south-west quadrant, 400 nautical miles elsewhere. Forecast for 0600, UTC, Sep 7: Position lat 35.6N, long 53.9W. Maximum sustained winds 70 knots with gusts to 85 knots. Radius of 64-knot winds 20 nautical miles east semicircle, 15 nautical miles elsewhere. Radius of 50-knot winds 40 nautical miles north-west quadrant, 50 nautical miles south-west quadrant, 60 nautical miles elsewhere. Radius of 34-knot winds 80 nautical miles north-west quadrant, 90 nautical miles south-west quadrant, 110 nautical miles elsewhere.

London, Sep 6 -- A press report, dated today, states: Hurricane "Maria" weakened on its way to the colder waters of the North Atlantic, forecasters said. "Maria" peaked late yesterday as a Category 3 hurricane with top wind speeds at 115 mph. By 0500 hrs, today, it was centered about 495 miles east of Bermuda with winds near 105 mph, forecasters at the National Hurricane Centre said. The hurricane was only a threat to shipping interests as it moved north-northeast near seven mph, forecasters said.

London, Sep 7 -- Following received from the Meteorological Office: Tropical storm "Maria": Storm centre located near lat 35.2N, long 53.0W, at 0900, UTC, Sep 7. Position accurate to within 30 nautical miles. Present movement towards the east-north-east, or 060 deg at 13 knots. Maximum sustained winds 55 knots with gusts to 65 knots. Radius of 50-knot winds 75 nautical miles east semicircle, 40 nautical miles elsewhere. Radius of 34-knot winds 80 nautical miles north-west quadrant, 70 nautical miles south-west quadrant, 140 nautical miles elsewhere. Radius of 12-foot seas 100 nautical miles north-west quadrant, 200 nautical miles south-west quadrant, 400 nautical miles elsewhere. Forecast for 0600, UTC, Sep 8: Position lat 37.2N, long 49.7W. Maximum sustained winds 50 knots with gusts to 60 knots. Radius of 50-knot winds 75 nautical miles east semicircle, 50 nautical miles elsewhere. Radius of 34-knot winds 140 nautical miles east semicircle, 80 nautical miles elsewhere.

London, Sep 8 -- Following received from the Meteorological Office, dated today: Hurricane "Maria" located near

lat 38.3N, long 48.5W at 0900, UTC, today. Position accurate within 40 nautical miles. Present movement toward the north-east or 50 degrees at 11 knots. Maximum sustained winds 65 knots with gusts to 80 knots. Forecast position lat 39.4N, long 46.9W at 1800, UTC, today. Maximum winds 60 knots, gusts 75 knots. Forecast position lat 41.0N, long 44.7W at 0900, UTC, Sep 9. Maximum winds 60 knots, gusts 75 knots.

#### **HURRICANE "NATE"**

London, Sep 6 -- Following received from the Meteorological Office: Tropical storm "Nate": Storm centre located near lat 28.6N, long 66.6W, at 0900, UTC, Sep 6. position accurate to within 30 nautical miles. Present movement towards the west, or 275 deg, at two knots. Maximum sustained winds 40 knots with gusts to 50 knots. Radius of 34-knot winds 40 nautical miles. Radius of 12-foot seas 50 nautical miles. Forecast for 0600, UTC, Sep 7: Position lat 29.0N, long 67.4W. Maximum sustained winds 60 knots with gusts to 75 knots. Radius of 50-knot winds 25 nautical miles. Radius of 34-knot winds 60 nautical miles.

London, Sep 6 -- A press report, dated today, states: Tropical storm "Nate", which formed yesterday as the 14th named storm of the season, was at 0500 hrs, centered about 275 miles south-southwest of Bermuda with top sustained winds near 45 mph. Forecasters said it could reach hurricane strength, with winds of at least 74 mph, by tomorrow. It was presently meandering west near two mph, though it was expected to eventually make a turn to the north-east, forecasters said. "Perhaps by the end of the work week it could be posing a threat to Bermuda, but not the U.S.," hurricane specialist Stacy Stewart said.

London, Sep 7 -- Following received from the Meteorological Office: Tropical storm "Nate": As of 0900, UTC, Sep 7, the Bermuda Weather Service has issued a tropical storm watch for Bermuda. Storm centre located near lat 28.8N, long 66.5W, at 0900, UTC, Sep 7. Position accurate to within 30 nautical miles. Present movement towards the north-west, or 315 deg, at two knots. Maximum sustained winds 60 knots with gusts to 75 knots. Radius of 50-knot winds 40 nautical miles north-east quadrant, 20 nautical miles south-west quadrant, 30 nautical miles elsewhere. Radius of 34-knot winds 80 nautical miles north-east quadrant, 40 nautical miles south-west quadrant, 60 nautical miles elsewhere. Radius of 12-foot seas 100 nautical miles east semicircle, 60 nautical miles elsewhere. Forecast for 0600, UTC, Sep 8: Position lat 30.1N, long 66.2W. Maximum sustained winds 70 knots with gusts to 85 knots. Radius of 64-knot winds 20 nautical miles. Radius of 50-knot winds 40 nautical miles. Radius of 34-knot winds 90 nautical miles.

Miami, Sep 7 -- In the mid-Atlantic, Hurricane "Nate" strengthened as it neared Bermuda. It had top winds of 85 mph and was expected to pass just south of the island of 65,000 people yesterday. "Nate" was centered 200 miles south-south-west of Bermuda and was expected to pound the island with battering waves. "I think we're unlikely to sustain a lot of damage from Hurricane "Nate"," said Elizabeth Harris, a meteorologist with the Bermuda Weather Service. "It's just really going to brush past." -- Reuters.

London, Sep 8 -- Following received from the Meteorological Office dated today: Hurricane "Nate" centre located near lat 30.2N, long 64.6W at 0900, UTC, today. Position accurate within 30 nautical miles. Present movement towards the north-east or 50 degrees at eight knots. Maximum sustained winds 75 knots with gusts to 90 knots. Forecast position lat 31.2N, long 63.1W at 1800, UTC, today. Maximum winds 75 knots, gusts 90 knots. Forecast position lat 32.9N, long 60.1W at 0600, UTC, Sep 9. Maximum winds 75 knots, gusts 90 knots.

#### **INDONESIA**

Padang, Sep 2 -- A landslide on Indonesia's Sumatra island triggered by torrential rains buried at least 10 people in their homes and left more than two dozen missing, a rescue official said today. The landslide occurred yesterday near Padang city, about 940 km north-west of the capital, Jakarta, after two days of heavy rains. Rescue official Yal Effendi said 10 bodies had been recovered and 12 people found safe. However, with more people reported missing, it was estimated that 34 could be buried in the rubble. The search was suspended this afternoon because of heavy rain, Effendi said. Also yesterday, a police helicopter carrying seven people came down in bad weather in the Bung Hatta national park, 30 km east of Padang, a police spokesman said. At least one of the passengers had survived the crash and had been found on the outskirts of the thick forest, a provincial police spokesman said. He said the fate of the other six on board was unknown because rescue teams had yet to reach the crash site. -- Reuters.

#### **TROPICAL STORM "KHANUN"**

London, Sep 7 -- Following received from the Meteorological Office: Tropical storm "Khanun" near lat 13.0N, long 133.7E, at 0600, UTC, Sep 7. Movement past six hours 250 deg at six knots. Position accurate to within 60 nautical miles, based on centre located by satellite. Maximum sustained winds 55 knots with gusts to 70 knots. Radius of 50-knot winds 25 nautical miles. Radius of 34-knot winds 80 nautical miles south semicircle, 50 nautical miles elsewhere. Forecast for 0600, UTC, Sep 8: Position lat 15.5N, long 130.7E. Maximum sustained winds 80 knots with gusts to 100 knots. Radius of 64-knot winds 25 nautical miles. Radius

of 50-knot winds 45 nautical miles. Radius of 34-knot winds 105 nautical miles south semicircle, 95 nautical miles elsewhere.

London, Sep 8 -- Following received from the Meteorological Office, dated today: Tropical storm "Khanun" near lat 16.1N, long 132.2E at 0600, UTC, today. Movement for the past six hours 340 degrees at eight knots. Position accurate to within 60 nautical miles. Maximum sustained winds 60 knots, gusts 75 knots. Forecast position lat 18.1N, 131.1E at 1800, UTC, today. Maximum sustained winds 70 knots, gusts 85 knots. Forecast position lat 19.7N, long 129.1E at 0600, UTC, Sep 9. Maximum sustained winds 85 knots, gusts 105 knots.

#### **TROPICAL STORM "OPHELIA"**

London, Sep 7 -- Following received from the Meteorological Office: Tropical storm "Ophelia": At 0900, UTC, Sep 7, a tropical storm warning is in effect for the east coast of Florida from Sebastian Inlet northwards to Flagler Beach. The tropical storm warning south of Sebastian Inlet has been discontinued. Also, the government of the Bahamas has discontinued all warnings for the Bahamas. A tropical storm watch is in effect for the north-east Florida coast from north of Flagler Beach to Fernandina Beach. Interests elsewhere in northern and central Florida and the south-eastern United States coast should monitor the progress of this system. Storm centre located near lat 28.3N, long 78.9W, at 0900, UTC, Sep 7. Position accurate to within 15 nautical miles. Present movement towards the north-north-west, or 335 deg, at seven knots. Maximum sustained winds 35 knots with gusts to 45 knots. Radius of 34-knot winds 60 nautical miles north-east quadrant, nil elsewhere. Radius of 12-foot seas 160 nautical miles north semicircle, nil elsewhere. Forecast for 0600, UTC, Sep 8: Position lat 28.8N, long 79.8W. Maximum sustained winds 45 knots with gusts to 55 knots. Radius of 34-knot winds 45 nautical miles south-east quadrant, 20 nautical miles south-west quadrant, 60 nautical miles elsewhere.

London, Sep 8 -- Following received from the Meteorological Office, dated today: Tropical storm "Ophelia" centre located near lat 28.7N, long 79.5W at 0900, UTC, today. Position accurate within 15 nautical miles. Maximum sustained winds 50 knots with gusts to 60 knots. Forecast position lat 29.0N, long 79.6W at 1800, UTC, today. Maximum winds 55 knots, gusts 65 knots. Forecast position lat 29.4N, long 79.6W at 0600, UTC, Sep 9. Maximum winds 55 knots, gusts 65 knots.

Miami, Sep 7 -- Tropical Storm "Ophelia" sat off Florida's Atlantic Coast today, barely budging and defying forecasters' attempts to predict where or if it might hit land. "Ophelia" coalesced overnight from a loose and swirling mass of thunderstorms and had top winds of

50 mph. At 1700 hrs, (2100, UTC), "Ophelia"s centre was about 80 miles east-north-east of Cape Canaveral, Florida. The storm was nearly stationary all day long and was expected to meander around the same spot for the next few days, forecasters at the National Hurricane Centre said. "Ophelia" was expected to alternately weaken and strengthen as it hugged the Florida coast, but could still grow into a weak hurricane, with winds of at least 74 mph. Tropical storm warnings, alerting residents that the storm could hit them within 24 hours, were posted for an 85-mile stretch of shoreline from Cocoa Beach to Flagler Beach in north-east Florida. Forecasters said "Ophelia" could dump three to eight inches of rain on parts of central and north Florida and south-east Georgia, and trigger dangerous rip tides all along the southeastern coast of the United States. But the air currents that guide the path of tropical storms were so weak that forecasting models disagreed greatly on "Ophelia"s most likely track. One or two nudged it west across Florida and into the northern Gulf of Mexico, the region stricken by catastrophic Hurricane Katrina. Others had it looping slowly eastward and away from the United States. The individual models flip-flopped all day long, so the hurricane center issued a compromise forecast: "Ophelia" is going to stay put for a few days. -- Reuters.

#### **TYPHOON "NABI"**

London, Sep 2 -- Following received from the Meteorological Office: Super typhoon "Nabi" near lat 19.6N, long 136.8E, at 0600, UTC, Sep 2. Movement past six hours 290 deg at nine knots. Position accurate to within 25 nautical miles, based on centre located by satellite. Maximum sustained winds 140 knots with gusts to 170 knots. Radius of 64-knot winds 45 nautical miles. Radius of 50-knot winds 100 nautical miles. Radius of 34-knot winds 210 nautical miles south semicircle, 200 nautical miles elsewhere. Forecast for 0600, UTC, Sep 3: position lat 21.8N, long 133.4E. Maximum sustained winds 140 knots with gusts to 170 knots. Radius of 64-knot winds 40 nautical miles. Radius of 50-knot winds 95 nautical miles. Radius of 34-knot winds 210 nautical miles south semicircle, 205 nautical miles elsewhere. (See issue of Sep 2.)

Tokyo, Sep 3 -- A powerful typhoon heading north-west towards Japan's Okinawa islands weakened enough by today to lose its super-typhoon status, but the storm remained extremely strong and could threaten Japan's main islands. Typhoon "Nabi" was a Category 5 storm yesterday. According to the website of the Tropical Storm Risk group at University College London, "Nabi" had weakened to Category 4 today, but it was projected to strengthen to super-typhoon status again in 24 hours. An official at Japan's Meteorological Agency said the storm may pass over Okinawa on Monday (Sep 5) and near the

southernmost main island of Kyushu early on Tuesday, possibly making landfall, but that the worst of its fury was likely to have been spent by then. "This is an extremely strong storm, and could bring a lot of rain to Japan, but I think that in terms of overall destructive force it has already passed its peak," he said. "We will still have to be extremely careful, though." At 0100, UTC, the typhoon was some 600 km south-east of Minami Daitoshima, an island around 1,100 km south-west of Tokyo. The storm was moving north-west at 15 kph, the Meteorological Agency official added, and was likely to pass over Okinawa some time on Monday. Although it is still too early to predict the storm's ultimate course, "Nabi" could make landfall on Kyushu before passing across it to strike the Korean peninsula. -- Reuters.

Tokyo, Sep 5 -- A powerful typhoon bore down on south-western Japan today, threatening the nation's heavily populated main islands with torrential rain and strong winds and disrupting transport and oil refineries. Typhoon "Nabi" was 100 km east of the tiny southern Japanese island of Amami Oshima at 1200 hrs, the Meteorological Agency said. Winds were gusting up to 160 kph at the centre of the Category 2 storm. The typhoon was travelling north-north-west at a speed of 15 kph, heading directly for the densely populated southern island of Kyushu. The Meteorological Agency expects "Nabi" to swerve to the east over the next 24 hours, putting it on course to batter much of Japan and southern and eastern parts of South Korea but weakening slightly as it passes over cooler water. Television pictures showed coastal areas of Amami Oshima being engulfed by waves which national broadcaster NHK said were up to nine metres high. Local government officials in Japan's southernmost main island of Kyushu urged people to be alert. Hundreds of flights in and out of Kyushu were cancelled today, NHK said. Trains were also cancelled and expressways closed in southern parts of the island. "Nabi" has already sparked thunderstorms in Tokyo, where more than 110 mm of rain fell in an hour in some areas late yesterday. Two men were killed -- one drowned and one was struck by lightning -- in areas close to the capital, police said. Thousands of households in or near Tokyo were flooded and lost power, some highways were closed and trains delayed. Some banks' cash machines were also out of action due to power outages. Japanese oil refiners suspended waterborne operations at some of their facilities today, refinery spokesmen said. Idemitsu Kosan Co, Japan's third biggest refiner, said it had halted waterborne shipments of refined products at its terminals in Okinawa and Kagoshima, both located in southern Japan, because of the storm. Operations at Idemitsu's refinery facilities with a total capacity of 640,000 barrels-per-day were unaffected, a company spokesman

said. Japan Energy, the refining unit of Nippon Mining Holdings Inc, also suspended tanker operations at its 200,200-bpd facility in Mizushima, western Japan. Kyushu Oil Co suspended waterborne operations at its 155,000-bpd Oita refinery in south-western Japan, a company spokeswoman said. The large scale of the storm and the low speed at which it is moving mean it will affect Japan for a relatively long time, possibly causing extensive damage, a Meteorological Agency official said. -- Reuters.

London, Sep 5 -- Following received from the Meteorological Office: Typhoon "Nabi" near lat 28.8N, long 130.4E, at 0600, UTC, Sep 5. Movement past six hours 340 deg at eight knots. Position accurate to within 20 nautical miles, based on centre located by satellite. Maximum sustained winds 110 knots with gusts to 135 knots. Radius of 64-knot winds 60 nautical miles north-west quadrant, 50 nautical miles elsewhere. Radius of 50-knot winds 100 nautical miles. Radius of 34-knot winds 210 nautical miles north-east quadrant over water, 190 nautical miles south-west quadrant, 185 nautical miles south-east quadrant and 160 nautical miles north-west quadrant.

Tokyo, Sep 5 -- Typhoon "Nabi" lashed south-western Japan with torrential rains and high winds today, cutting power supplies and disrupting transport and oil refineries. Weather officials in South Korea also warned of flooding, while eastern China braced for possible effects from the typhoon after the region's previous storm killed at least 84 people in the east of the country, newspapers said. "Nabi" was 180 km south of the tiny southern Japanese island of Yakushima at 1500 hrs (0600, UTC), the Meteorological Agency said. Winds were gusting up to 160 kph at the centre of the typhoon, but the storm was expected to weaken slightly as it passes over cooler water. The Tropical Storm Risk Website classified "Nabi" as a Category 4 storm on an ascending scale of 1 to 5. The typhoon was travelling north-north-west at 15 kph, heading directly for the densely populated southern island of Kyushu. The Meteorological Agency expects Nabi to swerve to the east over the next 24 hours, putting it on course to batter much of Japan and southern and eastern parts of South Korea. Television pictures showed coastal areas of Amami Oshima being engulfed by waves that national broadcaster NHK said were up to nine metres high. The Japanese government set up a liaison office within the prime minister's official residence to co-ordinate efforts among ministries and agencies concerned to minimise possible damage from the typhoon. Japan's top government spokesman, Hiroyuki Hosoda, said the country's military, police, fire-fighters and coast guard would be put on standby for rescue operations. He also urged people to stay off rooftops and away from rivers, oceans, paddy fields and waterways. Hundreds of flights in

and out of Kyushu were cancelled today, NHK said. Trains were also cancelled and expressways closed in southern parts of the island. Nearly 20,000 households were without electricity on Kyushu, NHK said. "Nabi" has sparked thunderstorms in Tokyo, where more than 110 mm of rain fell in an hour in some areas late yesterday. Two men were killed -- one drowned and one was struck by lightning -- in areas close to the capital, police said. Thousands of households in or near Tokyo were flooded and lost power, while some highways were closed and trains delayed. Some bank cash machines were also out of action due to power outages. Japanese oil refiners suspended waterborne operations at some of their facilities today, refinery spokesmen said. Idemitsu Kosan Co, Japan's third-biggest refiner, said it had halted waterborne shipments of refined products at its terminals in Okinawa and Kagoshima, both located in southern Japan, because of the storm. Operations at Idemitsu's refinery facilities, with a total capacity of 640,000 barrels per day, were unaffected, a company spokesman said. Japan Energy, the refining unit of Nippon Mining Holdings Inc, also suspended tanker operations at its 200,200-bpd facility in Mizushima, western Japan. Kyushu Oil Co suspended waterborne operations at its 155,000-bpd Oita refinery in south-western Japan, a company spokeswoman said. The large scale of the storm and the low speed at which it was moving mean it would affect Japan for a relatively long time, possibly causing extensive damage, a Meteorological Agency official said. -- Reuters.

Tokyo, Sep 6 -- Powerful typhoon "Nabi" was pummelling south-western Japan with torrential rain and high winds today, causing floods and landslides, snarling transportation and forcing people to flee their homes. Police said one man was missing, believed to have been buried in a landslide that engulfed his home, and 10 others were injured. At 0900 hrs the eye of the storm was about 40 km south-west of Kushikino, near the southern tip of the mountainous island of Kyushu. Winds had weakened slightly but were gusting up to 144 kph at the storm's centre, Japan's Meteorological Agency said. "Nabi" was moving north at 20 kph but was forecast to swing east and beat a path up the Japan Sea coast, affecting much of Japan over the next few days. Television showed roads deep under water in the city of Kagoshima and waves engulfing coastal roads on the island. More than 70,000 people were being advised to evacuate from the city of Nobeoka in Oita Prefecture for fear that nearby rivers might burst their banks, public broadcaster NHK said. About 800 mm of rain had fallen in some parts of Kyushu in 24 hours, NHK said. The slow pace at which the typhoon is moving means that further heavy rains are expected to fall before "Nabi"

moves on. Hundreds of flights in and out of Kyushu and the neighbouring island of Shikoku were cancelled because of the high winds, as were high-speed "bullet" train services in western Japan. The Tropical Storm Risk website classified "Nabi" as a Category 3 storm but forecast it would weaken to a Category 1 over the next 24 hours. -- Reuters.

Busan, Sep 6 -- At about 0930, Sep 6, while general cargo Long Xuyen (5470 gt, built 1990) was lying anchored at Pohang outer harbour, the vessel ran aground on sandy bottom some 100 metres from Dogu Beach during strong winds caused by typhoon "Nabi". The vessel was reportedly waiting for a berth to load steel products. All 22 crew members are being rescued by a marine police rescue team. -- Lloyd's Sub-agents.

London, Sep 6 -- A press report, dated today, states: South Korea's southern and eastern provinces suffered damage from Typhoon "Nabi" today. Most ferry services and 133 domestic flights between Seoul and provincial cities were cancelled due to strong wind and heavy rain. A total of 29 international flights from South Korean cities to Japanese cities were also called off. In Ulsan, an unidentified man in his 70s went missing after being swept away into a river amid torrential rain early in the morning, reported South Korean Yonhap News Agency. Some 34 elementary schools and 90 kindergartens temporarily closed down in Busan and another 34 elementary and secondary schools in Pohang, North Gyeongsang Province, were also forced to shut down, said Yonhap. The KMA has issued a typhoon alert for coastal areas in Gangwon and South and North Gyeongsang provinces, southern waters far south of Jeju Island. Winds were gusting up to 38 metres a second at the center of the powerful typhoon, according to the KMA. The KMA expected South Korea will be completely out of the typhoon's influence around Thursday (Sep 8). Tokyo, Sep 6 -- Typhoon "Nabi" pummelled south-western Japan with torrential rain and high winds today, causing floods and landslides, paralysing transport and prompting officials to tell more than 100,000 people to flee their homes. Sixteen people were missing and 23 injured, Kyodo news agency reported. A woman drowned after falling from a ferry early today, but public broadcaster NHK later said the incident was not related to the typhoon. At about 1400 hrs (0500, UTC), the eye of the storm made landfall at Isahaya near Nagasaki on the mountainous island of Kyushu, Japan's third-biggest main island and home to about 10% of the country's almost 130 million population. A total of about 110,000 residents of Kyushu and the neighbouring main island of Shikoku were told to evacuate, Kyodo said, while more than 16,000 left their homes voluntarily. Winds had weakened slightly but were gusting up

to 126 kph at the storm's centre, Japan's Meteorological Agency said. Military personnel were sent to help evacuate residents of the town of Takaoka-cho in Kyushu after the governor of Miyazaki prefecture requested assistance, said Japan's top government spokesman, Hiroyuki Hosoda. "There is expected to be further damage due to the typhoon so all agencies and ministries are joining together to respond," Hosoda told reporters. The typhoon was moving north at 30 kph but was forecast to swing east and beat a path up the Japan Sea coast, bringing rain and strong winds to western Japan and parts of South Korea before hitting the northernmost main Japanese island of Hokkaido. It was not expected to hit China. Airlines in South Korea cancelled dozens of domestic and international flights today because of the weather and vessels were warned to stay in port. Television showed roads deep under water in the Kyushu city of Kagoshima and waves engulfing coastal roads on the island, which has a mixture of heavy industry and agriculture. About 800 mm of rain had fallen in some parts of Kyushu in 24 hours, public broadcaster NHK said. The slow pace at which the typhoon is moving means further heavy rains are expected before it moves on. Hundreds of flights and ferries in and out of Kyushu and Shikoku were cancelled because of high winds. All West Japan Railway Co train services in Kyushu and Shikoku were halted, railway officials said. About 270,000 households were without electricity at 1400 hrs, according to Kyushu Electric Power. Car makers Toyota Motor Corp, Nissan Motor Co and Mazda Motor Corp suspended work at assembly plants in south-western Japan as a safety precaution. Honda Motor Co had also halted production last night at a factory in Kyushu that makes motorcycles, power products and engines, and said it would cancel the day's work today. The car makers said they saw no long-term impact from the suspension since lost production could be made up through overtime or other means. Oil refiner Kyushu Oil Co said the storm was affecting production at some secondary units in Oita. It halted oil shipments in the area. Web site Tropical Storm Risk classified "Nabi" as a Category 3 storm but forecast it would weaken to a Category 1 over the next 24 hours. -- Reuters.

London, Sep 6 -- Following received from the Meteorological Office: Typhoon "Nabi" near lat 33.1N, long 130.4E, at 0600, UTC, Sep 6. Movement past six hours 005 deg at 18 knots. Position accurate to within 40 nautical miles, based on centre located by satellite. Maximum sustained winds 80 knots with gusts to 100 knots. Radius of 64-knot winds 40 nautical miles. Radius of 50-knot winds 70 nautical miles. Radius of 34-knot winds 180 nautical miles north-east quadrant over water, 170 nautical miles north-west quadrant, 160 nautical miles elsewhere. Forecast for



0600, UTC, Sep 7: Position lat 40.3N, long 134.8E. Maximum sustained winds 50 knots with gusts to 65 knots. Becoming extratropical. Radius of 34-knot winds 140 nautical miles north-east and south-west quadrants, 120 nautical miles elsewhere.

London, Sep 7 -- A press report, dated today, states: Typhoon "Nabi" lashed southern Japan yesterday, causing floods and landslides that left at least 21 dead or missing and over 50 people injured. More than 100,000 people have been ordered to flee their homes as storm surges flooded seaside towns. Power to more than 270,000 households was knocked out. The typhoon also grounded nearly 900 flights. The Tropical Storm Risk website had originally classified "Nabi" as a Category 4 storm on an ascending scale of 1 to 5 but late on Monday (Sep 5) it was downgraded to a Category 3. Forecasters yesterday expected it to weaken to a Category 1 over the next 24 hours.

Tokyo, Sep 7 -- Typhoon "Nabi" faded into a tropical storm and headed into the Sea of Japan today after killing at least nine people on the southern Japanese island of Kyushu. Thirteen people were missing and at least 80 were injured as "Nabi" drenched parts of Japan's third biggest island with more than 1,000 mm of rain, triggering floods and landslides, authorities said. One person was also missing in South Korea. Television pictures showed rescue workers and military personnel hunting for survivors among wrecked houses. Police said at least 48 houses were badly damaged or destroyed completely and close to 5,000 houses had been flooded. At the height of the storm, over 250,000 people fled their homes for evacuation centres throughout south-western Japan, the Yomiuri newspaper said. About 80,000 households in Kyushu were still without electricity at 0900 hrs, Kyushu Electric Power said. Floodwaters in many areas were already drawing back by this morning, officials said. "Although there are some low-lying areas that are still flooded, a lot of the water has gone down already," said an official with the government in Miyazaki Prefecture, some of whose towns were particularly hard-hit. Nearly 300 people spent the night on a train at Osaka station after being stranded after the storm halted rail services, Kyodo news agency said. Japan's Meteorological Agency forecast that "Nabi" would travel north-east, skimming the country's western coast and hit Hokkaido, the northernmost of the country's main islands, tomorrow. The agency warned of heavy rains, high winds and possible flooding and landslides across northern Japan. Oil refiners, meanwhile, were bringing disrupted operations up to speed. Kyushu Oil Co said it planned to bring the operation rate of its sole Oita refinery in southern Japan back to normal levels later today. It had already resumed oil product shipments by truck and was ready to resume berthing operations as well, a company spokesman said. In South Korea, which

escaped the brunt of the typhoon, one person was reported missing and several hundred others were evacuated after heavy rains and winds battered the southern and eastern parts of the country. The storm dumped about 622 mm of rain in the south-eastern industrial city of Ulsan and triggered landslides across roads and railroad tracks, snarling transport. It tossed around vessels docked in harbours like toys. About 150 people in Ulsan remained in shelters, waiting for the water to recede in their neighbourhoods. The country's two main airlines -- Korean Air and Asiana -- cancelled over 100 flights. The National Emergency Management Agency has been working to tally up the damage but has released no figures yet. The one person reported missing was a man in his 60s or 70s, officials said. -- Reuters.

London, Sep 8 -- A press report, dated today, states: Typhoon "Nabi" moved north away from the Japanese archipelago today, with the death toll from the storm rising to 21 after a body believed to be that of a missing man was found at the site of a landslide in Takachiho, Miyazaki Prefecture, in the afternoon. The typhoon moved over the Sea of Okhotsk this morning after crossing Hokkaido overnight. The typhoon brought heavy rain and strong winds to Hokkaido, causing the cancellation of two flights connecting New Chitose Airport near Sapporo and Tokyo's Haneda airport today.

#### TYPHOON "TALIM"

London, Sep 1 -- A press report, dated today, states: Three people were killed and 59 injured after Typhoon "Talim" has pounded Taiwan with strong winds and heavy rains, forcing offices, schools and financial markets to close. Two men drowned in southern Tainan and northern Miaoli counties while a 60-year-old woman was hit by lightning in the southern Changhua county, said the National Fire Agency. The injured were from the worst-hit northern and central parts of the island. Winds uprooted billboards and trees across the island, all domestic flights were cancelled and many trains and international air services were delayed. Taiwan Power Co shut down generators installed in two nuclear power plants due to strong winds but said one of the generators would resume operation later in the day. Safety considerations prompted the company to cut the operation of its three nuclear power stations to 25 percent of capacity. Electricity was cut to 1.7 million homes but most were expected to be reconnected before the end of the day. In central Taichung, a bridge connecting Kukuan, a popular hot spring, was submerged by flash floods, prompting the evacuation of hundreds of tourists, police said. In north-eastern Ilan county, powerful waves smashed into the port of Wushi, which was closed by the authorities. Nine people, eight prisoners and a policeman, were injured when a van carrying them rammed a crash barrier in Taipei county. Three were seriously hurt. In

the capital, where the rains and winds were less severe than elsewhere, bars, karaoke lounges and restaurants were crowded as people took advantage of the national holiday declared by the government as a result of Talim. Most air and land traffic was expected to return to normal later today as the typhoon moved away from the island and made landfall on the Chinese mainland.

Beijing, Sep 2 -- Typhoon "Talim" killed 14 people as it swept across Taiwan and tore into China, triggering landslides and forcing hundreds of thousands to flee their homes, Chinese state media and Taiwan rescue officials said today. The typhoon, which has since weakened into a tropical storm, killed nine people in mudslides and cave-ins yesterday in mountainous parts of China's eastern Zhejiang province, Xinhua news agency said. Fifteen people were missing. In one county alone, more than 300 houses had been destroyed and main roads cut off. A father and son were killed when their house collapsed in Fuzhou, capital of Fujian province, to the south of Zhejiang. In Taiwan, three people were killed and 59 people were injured, according to the island's National Fire Administration's disaster response centre. As of late yesterday, more than 780,000 homes in Taiwan were without power and 48,000 had no access to clean water. Chinese authorities bracing for the storm had evacuated nearly 500,000 people, the China Daily said. Fujian authorities also shut schools and airports, closed sections of highway and suspended ferry services to ride out the storm, the newspaper said. The storm kicked up waves as high as 10 metres off Fujian. -- Reuters.

London, Sep 4 -- A press report, dated Sep 3, states: Flooding and landslides triggered by typhoon "Talim" have killed at least 53 people on China's mainland and left 21 missing, the government said today. Talim roared ashore on Thursday (Sep 1), wrecking houses, damaging crops and roads and knocking out power and phone services. Before it hit the mainland, the storm killed at least two people on Taiwan and injured 24. The storm knocked down nearly 12,000 houses in Wenzhou in Zhejiang province and damaged homes in the Dabie Mountain area of Anhui, the official Xinhua News Agency reported. The Dabie Mountain area got 16 inches of rain over 24 hours from yesterday to today, a record for the region, Xinhua said. "Talim" weakened to a tropical storm late on Thursday and moved inland. The storm forced the evacuation of nearly one million people in Zhejiang and neighbouring Fujian province from low-lying coastal areas and mountain villages prone to flash floods. More than 100,000 people were evacuated in Anhui, Xinhua said. In Fujian, flooding cut power in the provincial capital of Fuzhou and forced schools to cancel classes. Highway travel was disrupted and some airline flights cancelled.

London, Sep 5 -- A press report, dated today, states: The death toll from

typhoon "Talim" could be as high as 73. According to Xinhua News Agency reports, in addition to the deaths the direct economic losses from torrential rains, flooding and landslides are 7.8 billion yuan (US\$960 million), mainly in East China's Fujian, Zhejiang, Anhui and Jiangxi Provinces. In the worst-hit Anhui Province, at least 53 were killed as heavy rains began falling on Thursday (Sep 1). Rainstorms and heavy flows of mud and rock also destroyed 17,200 residential houses, damaged 61,100 houses and affected more than 130,000 hectares of cropland in the province, according to an official with the Anhui Provincial Disaster Relief Office. The province evacuated 168,100 people. The provincial government has allocated 8 million yuan (US\$986,440) in relief funds for affected areas. The provincial civil affairs bureau distributed 400 tents and other relief materials to affected people. In the two worst-hit counties Yuexi and Jinzhai, close to the Dabie Mountain area, about 400,000 people suffered from the disasters and 46,000 hectares of cropland were affected. In Yuexi County, where a landslide occurred, more than 10,000 homes were damaged and transport were cut off. The Ministry of Civil Affairs sent two work teams to carry out disaster relief work in affected provinces after the disaster happened. In Wenzhou, Zhejiang Province, the typhoon killed 15, China News Agency reported. According to statistics, in Wenzhou and Lishui, a total of 2.22 million people in 18 counties have been affected. Meanwhile, 11,789 houses have been pulled down. The direct loss was put at 3.42 billion yuan (US\$421.7 million), the local government said. Xinhua said the tropical storm was weakened on Friday as it passed further inland into Jiangxi Province. However, the destructive force was not reduced as parts of Jiujiang city, situated about 20 kilometres from Lushan Mountain, were flooded by the downpour. At 2200 Friday, a mudslide triggered by the typhoon at the Lushan Mountain area buried two buildings, where 21 occupants were inside. One was found dead by the time rescue crews reached him and five others were injured. The remaining 15 are still missing.

## Earthquakes



### INDONESIA

Jakarta, Sep 5 -- A strong earthquake struck off Indonesia's eastern Sulawesi island today but there were no immediate reports of casualties or damage, authorities in the closest major city said. The 6.2 magnitude quake hit at 0658, local time, with the epicentre 400 kilometres under the Sulawesi Sea, near the border with the Philippines.

"It was under the sea. We don't have any damage reported," said Artina, an official at the Geological and Meteorology Agency's office in the North Sulawesi capital of Manado, 250 kilometres east of the epicentre. Manado is some 2,200 kilometres north-east of Jakarta. -- Reuters.

### JAPAN

London, Aug 31 -- A press report, dated today, states: An earthquake with a preliminary magnitude of 6.2 hit Iwate, Miyagi and other prefectures in northeastern Japan early today, the Japan Meteorological Agency said. There were no immediate reports of casualties or damage from the 0311 hrs, quake.

### TAIWAN

Taipei, Sep 6 -- An earthquake measuring 6.1 on the Richter scale rattled Taiwan today and shook buildings in the capital but there were no immediate reports of casualties or damage. The epicentre of the quake, which struck at 0916 hrs, was about 63 km east of Hualien on the east coast, at a depth of about 12 km, the Central Weather Bureau said. -- Reuters.

## Political & Civil Unrest



### AFGHANISTAN

London, Aug 30 -- A press report, dated Aug 29, states: The U.S.-led coalition and Afghan forces have killed a suspected Taliban commander and three of his fighters in the country's south, while six other rebels died in a clash with Afghan police, officials said today.

London, Aug 31 -- A press report, dated today, states: US aircraft bombed a Taliban position in central Afghanistan killing eight militants in the latest violence in the run-up to a September 18 election, a provincial official said today. US and Afghan troops, acting on intelligence reports that Taliban had set up a base in the mountains of Uruzgan province, were met with a hail of bullets when they went to investigate yesterday, provincial governor Jan Mohammad Khan said, adding an air strike was called later. "The Taliban showed resistance, the US aircraft bombed the base," Mr Khan said. A US military spokeswoman said she had no information about the fighting. A Taliban spokesman confirmed the latest fighting but, speaking by telephone from an undisclosed location, said 12 Afghan government troops and US soldiers had been killed. US forces killed a senior Taliban commander in Uruzgan province last week. The man, Payenda Mohammed, had been responsible for a spate of attacks, the US military said. US and Afghan government forces have mounted a series of

operations in the south and east in recent months to root out pockets of militants and ensure security for the parliament elections. Afghan and US officials say the insurgents will not be allowed to disrupt the vote. Election organisers are cautiously optimistic that polling in most areas will be smooth.

Kabul, Sep 1 -- A British engineer was kidnapped after gunmen attacked a convoy in western Afghanistan and killed three police escorts, the Interior Ministry said today. Taliban guerrillas said they carried out the yesterday night attack in the western province of Farah and were holding the Briton, but Interior Ministry spokesman Lutfullah Mashal said a criminal gang was responsible. The attack took place on the road between the southwestern city of Kandahar and the western city of Herat, Mashal said. "They killed three policemen and kidnapped a British engineer working for a road construction company," he said. He gave no other details. Taliban spokesman Abdul Latif Hakimi told the Pakistan-based Afghan Islamic Press that the group's guerrillas had carried out the attack. He said three Britons had been killed and one arrested, but he later said three Americans had been killed. "The arrested Briton was also carrying a pistol," he said. He did not name the man, but said the guerrillas had seized a car from the convoy. He identified the Briton as "David". A spokesman for Afghanistan's NATO-led peacekeeping force, which has units in the west of the country, said checkpoints had been set up and surveillance aircraft scrambled late yesterday. The three people killed in the ambush were apparently Afghan security men, as the Interior Ministry was saying, not foreign troops, he said. Suspected Taliban members have kidnapped several Turkish and Indian nationals working on road projects in the south, but have released them unharmed after ransoms were paid. A Lebanese engineer kidnapped by the Taliban last month was freed unharmed. -- Reuters.

Kabul, Sep 2 -- A district level Taliban commander was killed in a clash with U.S. and Afghan government troops today, a provincial official said, the latest incident in a wave of violence in the run-up to September 18 elections. A spokesman for the Taliban confirmed that the commander, known as Tor Mullah Abdul Manan, had been killed in a battle in Zabul province, in the south. One of Manan's men was killed and a U.S. soldier was wounded in the fighting in a notoriously insecure district, said the provincial governor's spokesman, Gulab Shah Alikhail. A U.S. military spokeswoman said she had no information about the fighting. Taliban spokesman Abdul Latif Hakimi confirmed Manan had been killed. He said Manan's brother and wife were also killed, as well as eight government soldiers. In a separate incident, three Taliban rebels were killed when a bomb they were planting

beside a road in Zabul province went off, Alikhail said. Two Afghan government soldiers were killed in a clash in Helmand province yesterday night, another insurgent hot spot in the south, an official in that province said. -- Reuters.

Kabul, Sep 3 -- A Briton kidnapped in Afghanistan was found dead today and Taliban rebels said they killed him, while in a separate incident, the Taliban said they killed an election candidate and four government officials. Also today, an Afghan doctor said two bodies found dumped in a desert in the south were Japanese tourists who went missing last month. The two, a man and a woman, had been shot in the head, he said. In the latest in a surge of fighting in the run-up to September 18 elections, the Defense Ministry said 16 Taliban were killed in a battle in the central province of Uruzgan today. Briton David Addison, who the Afghan government said was working on security for a road project, was kidnapped with an interpreter in the west of the country on Wednesday (Sep 1) when gunmen ambushed their convoy, killing three police escorts. "During search operations, coalition forces and Afghan forces found the body of David Addison," said Interior Ministry spokesman Lutfullah Mashal. Addison was seized on the main road between the southwestern city of Kandahar and the western city of Herat. The Taliban, who are not known to operate in force in the west, said they kidnapped and killed Addison. "We shot him because he was our enemy," Taliban spokesman Abdul Latif Hakimi said by telephone from an undisclosed location. Addison was a soldier, he said. Mashal said criminals in league with the Taliban were responsible. "They were hired by the Taliban," he said. Security is the main worry two weeks before Afghans go to the polls to elect a lower house of parliament and councils in its 34 provinces. An election candidate, Mohammad Khan, running for a council seat in Kandahar province in the south, was kidnapped with a provincial official and three policemen yesterday, police said. Taliban spokesman Hakimi said Taliban fighters had captured the five. Later he said all had been killed on the decision of a Taliban shura, or council. The government said it could not confirm the Taliban claim and authorities were investigating. If his death is confirmed, Khan would be the fifth election candidate to be killed. Separately, an Afghan doctor said two bodies found in Kandahar province were those of Japanese teachers who went missing after entering Afghanistan from Pakistan on Aug 8. The two had been dead for three weeks or more, the head of the hospital where the bodies were examined told reporters. -- Reuters.

London, Sep 6 -- A press report, dated today, states: US and Afghan forces killed 12 people who they say were militants preparing to carry out attacks ahead of this month's

parliamentary elections in Afghanistan. They also arrested a nine people during the operation in the south-eastern province of Zabul, which was backed by American warplanes and attack choppers. It was the latest in a string of clashes between US-led troops and suspected Taliban guerrillas, who have pledged to derail the September 18 polls. A statement said the US and Afghan soldiers came under small arms fire as helicopters inserted them into the area. "The forces were conducting operational patrols to engage the enemy in their staging areas before they execute operations designed to influence or disrupt the election process in the Zabul area," it said. There were no American or Afghan military casualties, and material for making improvised bombs was discovered at the scene, the statement said.

London, Sep 8 -- A press report, dated today, states: Six policemen and two militants were killed after suspected Taleban rebels attacked a security checkpoint in central Afghanistan, officials say. Fighting at the checkpoint in the district of Muqur in Ghazni province lasted for over an hour yesterday. Also yesterday a woman standing in the parliamentary elections in the eastern province of Nangarhar escaped a gun attack unharmed. In a separate incident a car exploded in Helmand province killing two suspected suicide bombers and injuring four passers-by.

#### **BURUNDI**

London, Aug 31 -- A press report, dated today, states: Burundi's new president, former rebel leader Pierre Nkurunziza, has formed the country's first government since the end of the 12-year civil war. He gave key posts to members of his Hutu FDD party, and seven out of 20 ministerial posts to women. On Monday (Aug 29), parliament approved his nomination of a Hutu woman and a Tutsi man as his deputies. The new constitution guarantees a balance of power between Burundi's Hutu majority and Tutsi minority. These stipulations were agreed as part of five-year peace process designed to end the conflict between Hutu rebels and an army led by the Tutsi minority. In terms of the agreement, the cabinet should comprise 60% Hutu and 40% Tutsi, with at least 30% of posts going to women. There is one rebel group, the National Liberation Forces (FNL), which remains outside of the peace process. Mr Nkurunziza has said that the constitution may be changed to allow the FNL to join the government. On the eve of his inauguration last week, Mr Nkurunziza vowed to engage the FNL in peace talks.

#### **COLOMBIA**

London, Aug 26 -- A press report, dated Aug 25, states: Rebels massacred 13 coca harvesters and their cook, making them the latest victims of a feud with paramilitary gangs to control Colombia's lucrative cocaine trade, authorities said today.

Rebels of the Revolutionary Armed Forces of Colombia, or FARC, gunned down Flor Maria Gutierrez and 13 men as she was serving them lunch yesterday on a farm near the village of Puerto Valdivia, where the northern Andes flatten onto a sweltering plain. The killings in northwest Colombia starkly underscore a bloody truth generally overlooked in the ruthless drug trade: that drug-related killings sometimes occur even before the narcotics are made, and that the victims are often those on the lowest rung of the drug-trafficking business. In this case, the victims worked on one of the many farms in a corner of Antioquia state where coca flourishes. The men were harvesters who strip coca bushes of their leaves, grind them up and then add chemicals to make coca paste - a key step in producing cocaine. But they had earned the rebels' wrath by selling their product to a right-wing paramilitary faction, said Antioquia Deputy Gov. Jorge Mejia. "It's a coca-growing area - an area permanently being fought over by the guerrillas and the paramilitaries," Mejia told local Caracol radio. The aim by the warring factions is to terrify the harvesters and drug lab workers into selling their product exclusively to them. The illegal groups then have it processed into purified cocaine and export the drugs abroad. Colombian army counterinsurgency troops were deployed to the region and clashed with the rebels, killing three, said Gen. Jorge Daniel Castro, chief of the Colombian National Police.

London, Aug 30 -- A press report, dated Aug 28, states: Colombian police have taken control of a safe haven that was granted by the government to right-wing paramilitaries during peace talks. The 368sq km zone of Santa Fe de Ralito in northern Cordoba province had been home to United Self Defence Forces (AUC) commanders since May 2004.

Bogota, Sep 5 -- Over three million Colombians in the south-west part of the country were left without electricity today after attacks, blamed on leftist rebels, crippled power supplies, the army said. The bombing of the electricity towers in a mountainous area of Cauca Province was the latest offensive by the 41-year-old Revolutionary Armed Forces of Colombia, which has stepped up attacks ahead of next year's election, the army said. The Andean country's main electricity transporter ISA said it was seeking to import electricity from neighbouring Ecuador while the towers were being repaired. No one was injured in today's attack but the government says more than 300 Colombian soldiers and police have died at the hands of the rebels so far this year. -- Reuters.

Bogota, Sep 7 -- Colombia's government allowed a jailed leader from the second largest Marxist rebel group to leave prison today for three months to help clear the way for possible peace negotiations. The measure is part of efforts of President Alvaro Uribe to start talks with the

National Liberation Army (ELN) and comes after Uribe said he may yield to a rebel demand by recognising that Colombia is in an internal armed conflict rather than simply facing a terrorist threat. Rebel leader Francisco Galan, who was captured in 1992 and was held at the Itagui prison near the city of Medellin, will be freed for three months for the peace initiative, the presidential office said in a statement. The ELN, which recently acknowledged it had killed two Catholic priests and two civilians by accident, last week said Uribe must recognise Colombia's internal conflict as a condition before any talks. The president said yesterday he would recognise the conflict if the ELN called a cease-fire. -- Reuters.

#### **DEMOCRATIC REPUBLIC OF CONGO**

London, Aug 30 -- A press report, dated Aug 29, states: Renegade Congolese rebel leader Gen Laurent Nkunda has threatened to re-invade eastern Democratic Republic of Congo to bring "peace" to the area. In June last year he jeopardised DR Congo's shaky peace process when he briefly seized the town of Bukavu. In a 17-page letter, extracts of which were published in the Congolese newspaper *Le Potentiel*, he accused the government of promoting ethnic hatred. Meanwhile, the army has confirmed some of its men in the east have defected. Correspondents in the area say an estimated 1,000 soldiers, who speak Kinyarwanda - the language spoken by the ethnic Banyamulenge whom Gen Nkunda claims to be fighting for - have gathered in Masisi, North Kivu province. Gen Nkunda said he invaded Bukavu last year to protect the Banyamulenge from being targeted and killed by the Congolese army, but the UN dismissed his claims that he was preventing a genocide. In his letter, Gen Nkunda said the transitional administration of President Joseph Kabila was corrupt and intent on promoting instability in the east. He said the decision to stop more than 200,000 Congolese refugees living in neighbouring countries from returning home to Kivu to participate in the elections showed President Kabila's unwillingness to foster peace. Elections were due before the end of June under the terms of the 2002 peace deal, but MPs have backed a six-month delay. According to local sources, the United Nations refugee agency has said it is not logistically feasible to organise the return of the refugees before the completion of the electoral registration process.

#### **ECUADOR**

London, Sep 7 -- The Ecuadorian government has resumed exports of oil two weeks after a wave of strikes paralysed output in the Amazon region of the country. State oil company Petroecuador said it had resumed oil exports with a first shipment of 300,000 barrels of crude bound for the US. President Alfredo

Palacio had frozen exports from the company to protect domestic reserves, after protesters in two provinces occupied Petroecuador installations. The strikes -- centred in the Sucumbios and Orellana areas -- advanced the demand that most of the income generated by oil exports be invested for the benefit of the population. However, the protests finished last when the government reached agreement with strike leaders and with international oil companies that operate in the zones. As a result, local inhabitants are likely to see the repair of regional roads and the construction of better infrastructure.

#### **ETHIOPIA**

Addis Ababa, Aug 26 -- Clashes between communities in southern and eastern Ethiopia have so far killed 73 people this year and forced more than 85,000 to flee their homes, a human rights group said on Wednesday (Aug 24). The Ethiopian Human Rights Council said in a report that fighting over cattle and grazing land had erupted in March and June between the Oromo and Somali communities. Some 45 people were also wounded as the rival groups, armed with assault rifles - a legacy of the wars that have scarred the Horn of Africa region - launched attacks on each other. "Tensions are still high but fighting has stopped because the military is now patrolling the area," Adam Melaku, executive secretary of the human rights group, said. He urged the government to hold a referendum to resolve the underlying dispute over ownership and use of the region's grazing land. The Oromos are the largest community in Ethiopia, accounting for more than 25 million of the country's 71 million population. The Somali population is roughly four million. The clashes occurred in the East and West Haraghe Zones of Oromiya Region, some 400 km east of the capital, Addis Ababa. Clashes also erupted in May in Borana Zone in the same region, some 700 km south of Addis Ababa, close to the Kenyan border. In the six-page report, the human rights watchdog detailed the clashes in 2005, first sparked when armed Somali youths stole cattle belonging to members of the Oromo community. Its investigation teams, the report noted, had spent several weeks in the region interviewing witnesses, families of the dead and clan leaders. The USAID-funded Famine Early Warning Systems Network (FEWS Net) recently reported that ethnic clashes in southern Oromiya, Somali and Afar regions were exacerbating food insecurity. "Record high cereal prices, conflicts, food shortages and pockets of acute malnutrition remain persistent threats to food security and mean that many drought prone areas require ongoing assistance for the remainder of the year," FEWS Net said. Officials from the government's Disaster Prevention and Preparedness Commission travelled to the region and said they were assessing the

situation. The UN Office for the Coordination of Humanitarian Affairs reported that recent government and UN assessments said some 13,500 people urgently needed food and non-food assistance. Ethiopia has more than 80 ethnic groups and languages. - Reuters.

#### **INDIA**

Calcutta, Sep 5 -- Maoist rebels exploded a landmine under a security vehicle, killing at least 23 police and a civilian in the central Indian state of Chattisgarh, officials said yesterday. Three police were also wounded in the blast, one critically. The explosion occurred late on Saturday (Sep 3) in the remote Dantewada district, 500 km south of the state capital, Raipur. Chattisgarh Home Minister Ramvihar Netam said: "The explosion was so powerful that it blew the vehicle about 10 metres in the air. The vehicle was torn apart and it came crashing down with its occupants." Inspector-general of Police M.W. Ansari said the landmine had been planted beside a forest road in the remote district that is a known Maoist stronghold. -- Reuters.

Srinagar, India, Sep 8 -- Shops, schools and businesses were closed today in Kashmir's main city Srinagar in response to a strike call to protest against the arrest of women separatists. The strike left streets largely deserted barring armoured security vehicles and police foot patrols. The shutdown came as Muslim militants and troops exchanged fire near a heavily guarded building in Srinagar housing the offices of the chief minister of Kashmir. Police said two militants and two policemen were killed in the gunbattle which began yesterday. Three other policemen were wounded in the firefight, which ended today after the second militant was killed. Today's strike was in protest against the arrest of Asiya Andrabi, the chief of Dukhtar-e-Milat (Daughters of the Muslim Faith), who was arrested last week for raiding hotels, restaurants and wine shops to stamp out the "flesh trade" and check what the group called the "moral decline" in the Muslim-majority region. On Tuesday (Sep 6), authorities charged Andrabi, who wears a head-to-toe black veil, and seven followers under a tough public safety law, drawing condemnation from Kashmiri separatist groups. Syed Ali Shah Geelani, the chief of the hardline faction of the All Parties Hurriyat Conference, an alliance of separatist political parties, called the strike. "The detention of Asiya Andrabi and her activists is a heinous crime, a shameful act. Their crime is that they raised a voice against evils in society," Geelani said in a statement. -- Reuters.

#### **INDIA-PAKISTAN**

London, Sep 6 -- A press report, dated today, states: New peace talks between India and Kashmiri separatists have ended with an

assurance from India that it will cut troop levels in the region if insurgent violence and guerrilla incursions from Pakistan cease. The commitment has been given by Indian Prime Minister Manmohan Singh during talks with the All Parties Hurriyat Conference, Kashmir's main political separatist alliance. Kashmiri separatists have long demanded that India scale back its military presence in the troubled Himalayan region. Pakistan has also demanded that India withdraw troops. "The Prime Minister said that if there is a cessation of violence and an end to infiltration, conditions will be created for the reduction of armed forces," Singh's spokesman Sanjaya Baru said. "He reiterated his commitment to ensuring a life of peace, self-respect and dignity for the people of Jammu and Kashmir."

### INDONESIA

London, Aug 31 -- A press report, dated today, states: More than 70 rebels from Indonesia's Aceh province were freed from prison today, the first in a wave of releases called for in a peace deal ending a decades-long separatist war. The men, including four senior rebels, were to travel to Aceh later today, officials said. More than 1,300 other prisoners, both those held in Aceh and at prisons elsewhere in Indonesia, were also scheduled to be released today. The amnesty, which is to be followed next month by the decommissioning of rebel weapons, is seen as the first test of the willingness on both sides to comply with the terms of the accord. In two weeks, the rebels are scheduled to hand over their weapons and Indonesian troops are to begin a gradual withdrawal from the province. The process is being overseen by monitors from the European Union and Southeast Asian countries. Local and international human rights groups have long accused the military of torture, rape and arbitrary killings in Aceh. The military has denied the allegations. The insurgents, who number around 5,000, have also been accused of abuses during the war. The peace accord calls for the creation of a human rights tribunal to bring to justice soldiers accused of abuses. But there is widespread skepticism that the military - still a powerful force in Indonesian politics - will allow any troops to stand trial.

### IRAQ

London, Aug 30 -- A press report, dated Aug 29, states: A U.S. Army helicopter made a forced landing yesterday night under hostile fire in northern Iraq, and one soldier was killed and another injured, the U.S. military said. The incident occurred in Tal Afar, an insurgent-ridden city 260 miles northwest of Baghdad, the military said. No further details were released. Residents of Tal Afar, reached by telephone from Mosul, said the helicopter came down about 1830 hrs in the southwestern part of the city. U.S. troops fought insurgents last year in the Turkomen city and

managed to restore control enough to hand it back to Iraqi authorities. However, Iraqi authorities lost control, in part because of the city's volatile ethnic mix. The U.S. military has bolstered its force around Tal Afar last spring and have been trying to restore full control to the strategic city, which sits along major trade routes to Syria.

London, Aug 30 -- A press report, dated today, states: Several suspected al-Qaeda fighters were killed in western Iraq today when U.S.-led forces used precision guided bombs to destroy three terrorist hideouts in two cities near the Syrian border, the military said. At least 50 people died in the raids, Agence France-Presse reported. Four bombs were dropped on a house "occupied by terrorists" outside the city of Husaybah in the first strike, the military said in a statement e-mailed from the capital, Baghdad. Then at 0620 hrs, two bombs were dropped on a second house, killing a man identified as "Abu Islam, a known terrorist" and several others, the military said. At about 0830 hrs, another attack was conducted, this time on a house in the city of Karabilah, six kilometres south east of Husaybah, where some of Islam's followers are believed to have fled, the military said. Several terrorists were killed, according to the statement.

Baghdad, Aug 30 -- One of Iraq's top Sunni political leaders, Adnan Dulaimi, warned today that he would work hard to ensure the country's draft constitution was not approved in a referendum due by Oct 15. Dulaimi, speaking at a joint news conference with the U.S. ambassador to Iraq, said the draft did not represent the aspirations of the Iraqi people. "We will do our best to make sure this draft fails at the referendum," he told journalists. -- Reuters.

Kirkuk, Aug 30 -- Gunmen have killed a security official in Iraq's North Oil Company and a companion traveling with him in a car, a police source said today. The killing yesterday night appeared to be part of a campaign to undermine Iraq's oil industry, the biggest source of income for the U.S.-backed government. -- Reuters.

London, Aug 31 -- A press report, dated today, states: More than 600 people have been killed in a stampede of Shia pilgrims in northern Baghdad, Iraqi officials say. The incident happened on a bridge over the Tigris River as about one million Shias marched to a shrine for an annual religious festival. Witnesses said panic spread because of rumours that suicide bombers were in the crowd. Many victims were crushed to death or fell in the river and drowned. Health officials said the death toll could go as high as 1,000. Earlier, mortar rounds had been fired into the crowd, killing 16 people. About 36 others were injured when four mortar rounds landed close to the Kadhimiya mosque. So far no group has said it carried out the attack. Iraqi Interior Minister Bayan Jabbar blamed a "terrorist" for spreading the rumour.

"The terrorist pointed a finger at another person saying that he was carrying explosives... and that led to the panic," he said, quoted by AFP news agency. Iraqis are preparing to vote on a proposed constitution for their country, with Shia and Sunnis sharply divided on its contents. Today is the last day the majority of Iraqis can register to vote in October's referendum. Television pictures showed large crowds of Shia pilgrims heading towards the Kadhimiya mosque to mark the martyrdom of the 8th Century religious figure Imam Musa al-Kadhim. During the crush, iron railings on the Aima bridge leading to the shrine gave way and hundreds of people fell into the water. The bridge links the staunchly Sunni area of Adhamiya on the east bank of the Tigris and the Shia area of Kadhimiya on the west bank. Health officials said more than 640 deaths have been accounted for and there were more than 230 injured, but the number of fatalities could rise. The incident has caused the single biggest loss of Iraqi life since the US-led invasion in 2003. As the number of dead and injured continued to rise, Baghdad's hospitals struggled to cope, with many bodies and injured people left lying in corridors and on pavements outside. The government has declared three days of mourning.

Baghdad, Sep 1 -- Crowds gathered today for the funerals of some 1,000 Iraqis killed in a stampede during a religious festival, as the nation grieved over a tragedy which has overshadowed the daily bloodshed of war. Three days of official mourning will quieten a country inured to mass killing on its streets but shocked by the disaster. At least 965 people were confirmed to have died yesterday when thousands of Shi'ite pilgrims rushed for imagined safety onto a bridge across the Tigris in Baghdad, only to die in the river below or crushed on the roadway. The final toll, one senior official said, was likely to be more than 1,000 as bodies were counted scattered across hospitals, makeshift morgues and family homes across the city. Though fears of sectarian attacks, real or imagined, may have contributed to the fear that drove the pilgrims to their deaths, the shock was felt across the factional divides. A barrage of mortar and rocket attacks on the crowd, some 200,000 strong or more, had added to the tension early in the day. It killed seven people and was claimed by a Sunni group avowing links to the insurgency against the U.S.-backed, Shi'ite-led government. -- Reuters.

Baghdad, Sep 3 -- Unknown gunmen killed 19 Iraqi police and troops and wounded another 16 in three separate attacks near Baquba, north of Baghdad, today, police and hospital sources said. The first attack came in the morning at an Iraqi army checkpoint 30 km north of the mainly Sunni Arab city, when four soldiers died. Later, four police officers were killed by armed gunmen at a checkpoint in the center of Baquba, 65

km north of Baghdad. The third attack was on a checkpoint manned jointly by police and soldiers four km out of Baquba, in which seven police and two soldiers were shot dead. Police would not comment on whether the attacks were carried out by the same people, or on whether they were revenge attacks by Shi'ite Muslims following a stampede on a bridge in Baghdad on Wednesday (Sep 1) in which around 1,000 Shi'ite pilgrims died. -- Reuters.

Kirkuk, Sep 3 -- All exports of Iraq's Kirkuk crude oil through a major pipeline to Ceyhan on Turkey's Mediterranean coast were stopped today after a bomb blast set the pipeline on fire, an oil ministry source said. "The blast halted all exports, it stopped them completely," the source told Reuters. The pipeline was hit by an explosion early today and caught fire for several hours, a guard on the pipeline, who declined to be identified, told Reuters. The pipeline runs from the major northern Iraqi oilfield of Kirkuk to Ceyhan. The explosion took place near Fatha, between Kirkuk and the city of Baiji. The guard gave no further details. Another guard said a roadside bomb had been placed beside the pipeline some four km from Fatha, which is 95 km south-west of Kirkuk. By 1430 hrs (1030, UTC) the fire had been extinguished, a fire department official from Iraq's North Oil Company told Reuters, but he added that oil leaking from the pipeline had spilled some two km from the site of the explosion. It was not immediately clear how long it would take to repair the line and bring it back to full capacity. -- Reuters.

Baghdad, Sep 5 -- Up to 30 gunmen in 10 cars opened fire on Iraq's interior ministry at around 0615 (0215, UTC) this morning, killing two policemen and wounding five, police and interior ministry sources said. "Two policemen were killed and five wounded," an interior ministry source said, adding that the gunmen had used rocket-propelled grenades, mortars and automatic rifles. Iraq's Shi'ite and Kurdish-led government and US forces are facing a Sunni Arab insurgency which sees attacks on police and government forces on a daily basis. Tensions between Sunni and Shi'ite Muslims have been exacerbated by an impending referendum on a proposed new constitution for Iraq which Sunnis fear will reduce their influence. Sunni Arabs were the dominant force in Iraqi politics under Saddam Hussein and before, despite accounting for only 20% of the population. The government confirmed on Sunday that Saddam would face trial on a charge of mass killing on Oct 19, just four days after the last date on which the referendum can be held, further adding to the mood of violence. Shi'ite Muslims blame Sunnis for firing rockets into a crowd of Shi'ite pilgrims last Wednesday (Aug 31) and later spreading rumours that there was a suicide bomber in the crowd, triggering a stampede which killed 1,005 people. -- Reuters.

London, Sep 5 -- Two British soldiers were killed by a roadside bomb in southern Iraq today, Britain's Ministry of Defence said. The incident took place in Basra province in the late morning local time, a ministry spokeswoman said. -- Reuters.

London, Sep 6 -- A press report, dated today, states: U.S. Marine jets today attacked two bridges across the Euphrates River near the Syrian border to prevent insurgents from using them to move foreign fighters and munitions into major cities, the U.S. command said. A Marine statement said U.S. and Iraqi forces also destroyed a "foreign fighter safe house," killed two foreigners and arrested three others during a raid Tuesday in the same area as the bridge attack. The fighting occurred a day after U.N. chief Kofi Annan said Iraq had become an even greater terrorist centre than the former Taliban-ruled Afghanistan. Attacks attributed to al-Qaida's wing in Iraq have increased in the Baghdad area and western Iraq. In statements posted on Islamic Web sites, al-Qaida in Iraq claimed responsibility for two attacks yesterday - a roadside bombing that killed two British soldiers west of Basra and a daring daylight assault against the Interior Ministry in Baghdad in which two policemen died. Also yesterday, U.S. Marines said that al-Qaida in Iraq launched multiple attacks on Sunday (Sep 4) against U.S. and Iraqi targets in Hit, 85 miles west of Baghdad. Fifteen people - including 11 civilians, an Iraqi soldier and three suicide bombers - died in the Hit attacks. Elsewhere, Iraqi officials said that al-Qaida-linked foreign fighters had taken control of large areas of a strategic city on the Syrian border after weeks of fighting between an Iraqi tribe that supports the insurgents and one that opposes them. The officials, speaking on condition of anonymity for fear of reprisal, said much of Qaim, 200 miles west of Baghdad, had been abandoned after weeks of tribal fighting. The attacks in the Hit area began Sunday morning when two suicide car bombs exploded at security barricades on the northwest side of town, a Marine statement said. Shortly afterward, a vehicle car bomb exploded on the Hit bridge across the Euphrates River, rendering it impassable, the Marines said. The Marine statement said three insurgents and one Iraqi soldier died in the Sunday attacks. The government in Baghdad said eight civilians also died. Also yesterday, gunmen seized one of the sons of the governor of insurgent infested Anbar province, Mamoun Sami Rashid al-Alwani, officials said on condition of anonymity for fear of insurgent reprisal. The abduction occurred in the provincial capital of Ramadi west of Baghdad. U.S. and Iraqi officials had hoped Iraq's new constitution, which goes to the voters in a referendum Oct. 15, would in time help pacify the insurgency by luring Sunni Arabs from the movement.

However, Sunni negotiators rejected the constitution and vowed to defeat it in the referendum. The bitter, protracted negotiations appeared to have raised tensions among the country's ethnic and religious communities. About 1,500 people, mostly Sunnis, rallied yesterday near the Sunni city of Ramadi to protest the draft charter. Iraq's president said yesterday he and the other top Kurdish leader had agreed to changes in the draft constitution to mollify concerns among Arab countries that the wording in the charter loosened Iraqi ties to the Arab world. The language at issue describes Iraq as an Islamic - but not Arab country - a concession to the non-Arab Kurds who form about 15 percent of the Iraqi population. Talabani did not specify what changes in the language had been agreed to by him and Barzani, head of the Kurdistan Democratic Party.

London, Sep 6 -- A press report, dated today, states: US troops have officially handed over military control of the southern city of Najaf to Iraqi forces. It is the first of a planned series of security transfers across Iraq, paving the way for an eventual withdrawal of foreign forces from the country. Iraq's army is "capable of responding to all security needs... we are now here in a strictly advisory mode," said US commander Lt-Col James Oliver. The ceremony installed Iraqi troops in the strategic Forward Operating Base (FOB) Hotel in southern Najaf, while US forces withdrew to a base further outside the city. Washington has refused to set a deadline for withdrawal of US-led forces from Iraq, saying the timetable depends on the Iraqis' ability to maintain security. Elsewhere in Iraq, officials say large areas of the north-western city of Qaim have been taken over by insurgents loyal to the militant Islamist organisation al-Qaeda. Reports say gunman are patrolling the streets and summarily executing alleged collaborators with the US-backed regime in Baghdad. US troops are stationed outside the town, but reportedly do not have the capability to retake it while an assault on another rebel stronghold, Talafar to the north, has drawn away US troops. In other incidents, a roadside bombing followed by armed clashes has left four Iraqi troops and three civilians dead in the town of Khalidiya, near Falluja, west of Baghdad. An Iraqi army officer was killed by gunmen in Dhuluiya, north of Baghdad. High pressure water pipes in north-east Baghdad were sabotaged overnight, causing drinking water supplies to be suspended in large sections of the capital, Sharqia TV reported.

London, Sep 7 -- A press report, dated today, states: A blast today damaged a pipeline used for shipping oil from a field near the Iranian border to Baghdad, police said. The explosion on the line from Khanaqin to the al-Dora refinery caused a blaze in Thiaa Thiaa village, east of the city

Baqouba which is 60 kilometres north of the capital, the provincial police said.

London, Sep 7 -- A press report, dated today, states: Four US security contractors have been killed by a roadside bomb in the southern Iraqi city of Basra. Officials said the men worked at the US consulate and were attacked on their way from the airport to central Basra. TV pictures showed an overturned vehicle near a busy road. Three of the victims died instantly and a fourth died later in hospital. The British military said its forces were securing the area, and an investigation had started. Eyewitnesses said a convoy of four all-terrain vehicles was driving along the road when the attack happened. "A roadside bomb blew up the last car," one witness said.

Basra, Sep 7 -- A car bomb shattered the relative peace of the southern Iraqi city of Basra after dark today, killing 16 people and wounding 20 in a district packed with restaurants, officials said. At least two children were among the dead carried away by rescuers from the popular Sayed restaurant. Police said a pick-up truck had exploded outside it. They found no evidence of a suicide attacker, they added. Coming at the end of a day on which al-Qaeda claimed a bomb attack that killed four US security guards on diplomatic duties in Basra, it was not clear who had brought such violence to the relatively calm and mainly Shi'ite Muslim south. Although there have been tensions among rival Shi'ite militias and between armed groups and British occupying forces around Basra, major attacks on civilians of the sort associated with Sunni Islamist militants linked to al-Qaeda are rare. Early today, four US security guards died when a bomb hit their vehicle near Basra, the US embassy said in a statement. All four worked for a private security firm supporting the US embassy office in Basra. Meanwhile, US contractor, Roy Hallums, was freed by US troops from a remote farmhouse near Baghdad after being kidnapped in Mosul last November, a military spokesman said. He had been held hostage for 10 months since being kidnapped in Baghdad. A military statement said Hallums was freed after the military received information from an Iraqi detainee. -- Reuters.

London, Sep 8 -- A press report, dated today, states: U.S. and Iraqi forces have encircled the insurgent stronghold of Tal Afar, and Iraqi authorities today announced the arrest of 200 suspected insurgents there - most of them foreign fighters. The Iraqi military said 150 of those arrested yesterday were Arabs from Syria, Sudan, Yemen and Jordan. The joint forces have reported heavy battles on the outskirts of the city and several deadly bombings that have mainly killed civilians. Iraqi authorities reported most of the civilian population had fled the city, which is 260 miles north of Baghdad and about 35 miles from the Syrian

border. "Our forces arrested 150 non-Iraqi Arabs yesterday in addition to 50 Iraqi terrorists with fake documents as they were trying to flee the city with the (civilian) families," said Iraqi army Capt. Mohammed Ahmed. "We ordered the families to evacuate the Sunni neighborhood of Sarai, which is believed to be the main stronghold of the insurgents," Ahmed said. Eight civilians were killed in the city yesterday by a suicide car bomber at an Iraqi checkpoint, he said. Tal Afar is 90 percent Turkmen, and 70 percent of them are Sunnis. After the ouster of Saddam Hussein, the United States installed a largely Shiite leadership in the city, including the mayor and much of the police force. The Sunni majority has complained of oppression by the government and have turned to the insurgents - who are mainly Sunnis - for protection. Early today, a militant Web site carried a videotape showing the destruction of a U.S. Bradley Fighting Vehicle in Tal Afar. The video, emblazoned with the logo of al-Qaida in Iraq, claimed the armoured vehicle was struck by a roadside bomb. Twenty miles south of Baghdad, police today reported finding 14 unidentified bodies near the farming town of Mahmoudiya. "All the bodies are in civilian clothes and have no identification documents," said Lt. Adnan Abdullah of the Mahmoudiya police. They had been shot to death, he said. Two more decomposing bodies, blindfolded and handcuffed, were found on the outskirts of Baghdad, near a sewage plant, police said. A car bombing yesterday at a take-out restaurant in a central Basra market killed 16 and wounded 21, said an Interior Ministry official, who spoke on condition of anonymity because he was not authorized to talk to reporters. The felaful restaurant is in the Hayaniyah district market, a Shiite section of the city, Basra police Lt. Col. Karim al-Zaidi said. Two police vehicles and several nearby shops were destroyed in the blast. Also yesterday, an official of the court that will try Saddam Hussein discounted a claim by Iraq's president that the former leader had admitted wrongdoing in a confession to mass killings and other crimes during his rule. In an Iraqi television interview aired Tuesday (Sep 6), President Jalal Talabani, a Kurd, said Saddam had confessed he ordered the killing of more than 180,000 Kurds in the north of the country in the late 1980s. The official of the Iraq Special Tribunal, which will put Saddam on trial on Oct 19, said Saddam made a statement last month, but did not confess to criminal activity. The former dictator "boastfully" acknowledged a campaign against the Kurds in 1987-88. "He said it was legal and justified," according to the official, who spoke on condition of anonymity because of the sensitivity of the case.

London, Sep 8 -- A press report, dated today, states: A suicide car bomber detonated his explosives-laden BMW in the centre of the Baghdad today, targeting a passing convoy of

private American security agents - the second attack in a week near the heavily fortified Sadir Hotel. An Iraqi police official said one passer-by was injured but no one in the convoy was hurt in the explosion, which sent a huge plume of smoke into the sky in Baghdad's busy Karradah neighbourhood, a main shopping and commercial district.

## ISRAEL

Gaza, Sep 5 -- An explosion tore through the home of a Palestinian family active in the Hamas militant group today, killing at least four people and drawing vows of revenge against Israel, which denied any connection with the blast. The blast in the Gaza City's Sajaiya neighbourhood, which also wounded 36 people, destroyed the home of the Farhat family, well-known locally for its involvement in Hamas's military wing, and two nearby houses. "Our final information is that an Apache helicopter fired a rocket at the house, targeting the people inside. Four people were killed. At least two of them are members of Hamas," said Mushir al-Masri, a spokesman for the faction. The Palestinian Interior Ministry said an explosion had taken place inside the house. Palestinian security officials said they had opened an investigation which would also examine whether explosives were stored in the building and detonated prematurely. -- Reuters.

Jerusalem, Sep 6 -- Two rockets fired from the Gaza Strip slammed into southern Israel today, after Israel killed a Palestinian cutting his way into a demolished Jewish settlement in Gaza, an Israeli newspaper website said. The site of the "Maariv" daily newspaper said the rockets were fired from Beit Hanoun in northern Gaza and struck near the collective Yad Mordechai, causing no damage or injury. -- Reuters.

Gaza, Sep 7 -- Palestinian militants dragged former security chief Moussa Arafat from his Gaza home and shot the 64-year old dead in the street today, deepening internal turmoil ahead of Israel's military pullout from the territory. He was the most senior figure killed in factional violence that has stirred doubt about the ability of security forces to keep order in a brewing power struggle in the territory. Arafat, a major-general and cousin of late Palestinian leader Yasser Arafat, was a Gaza strongman who had retained an advisory role to President Mahmoud Abbas after being fired as head of military intelligence in April. In a statement, Abbas said no effort would be spared to arrest Arafat's killers and free his son. "This assassination ... will not undermine our efforts to impose law and public order." The gunmen abducted Arafat's son, Manhal, who is in his 30s. A militant coalition, the Popular Resistance Committees (PRC), claimed responsibility for what it called the "liquidation" of Arafat and snatching of his son. PRC spokesman Abu Abir said Arafat's son was being questioned

by his captors but did not say what the PRC would do with him. Arafat had survived several previous assassination attempts, including a car bomb attack on an Arafat convoy last year. -- Reuters.

#### IVORY COAST

London, Aug 31 -- A press report, dated today, states: A U.N. peacekeeper was killed today in a knife attack in a northern rebel stronghold of the war-divided country, a U.N. official said. The attack on the Moroccan soldier came shortly after midnight in the city of Bouake, according to U.N. spokesman Renald Boismoreau. A buffer zone patrolled by 6,000 U.N. troops and 4,000 French peacekeepers separates northern rebel fighters and Ivory Coast loyalist forces in the south. President Laurent Gbagbo's party and pro-government militias have been demanding they quit the country, charging they are partisan.

#### NEPAL

Katmandu, Sep 3 -- Nepal's Maoist rebels announced a three-month cease-fire starting today, their chief said, in a move to win support from political parties opposed to King Gyanendra's seizure of power in February. For "this period, our People's Liberation Army will be in defensive positions," the chief, Prachanda, said. "The P.L.A. will not launch any offensive from its side," he said. "We believe our move will encourage all forces, within and outside Nepal, who want peace through a forward-moving political solution." "We take this very positively," said Arjun Narsingh K. C., a spokesman for the Nepali Congress, the biggest party. He expressed hope that the cease-fire would help establish a permanent peace. Nepal's mainstream political parties said in July that they would talk with the rebels about joint protests against Gyanendra's seizure of power, but added that the rebels must stop the violence as a condition for talks. Prachanda also promised in July that the rebels would not attack unarmed civilians and would stop extortion. It also urged the seven parties to choose negotiators for talks on a united campaign against the king. More than 5,000 people attended a rally here today, organised by the seven parties to demand the return of democracy. Protesters holding red and white party flags and banners criticising the king sat cross-legged and shouted slogans. The truce, if it holds, would be the longest since talks collapsed in August 2003. -- Reuters.

London, Sep 5 -- A press report, dated Sep 4, states: Police in Nepal have detained dozens of opposition leaders and activists as thousands attended a pro-democracy rally in Kathmandu. The rally came a day after Nepal's Maoists declared a unilateral three-month cease-fire. The protesters were rallying against King Gyanendra, who has now ruled directly for six months. Former premier Girija Prasad Koirala was

among those detained. He fainted and was treated in hospital. Police used tear-gas and baton charges to break up demonstrators they said had tried to enter central areas declared off limits by the authorities. A day after declaring their ceasefire, the rebels adopted a hard-line position on talks with the king's government. They said they would talk only with opposition parties. The government has yet to make a formal response to the ceasefire.

#### PAKISTAN

Miranshah, Sep 5 -- Gunmen killed two government officials today in an ambush in Pakistan's tribal belt, near the Afghan border, a witness said. The attack took place while the two officials were patrolling a bazaar in Miranshah, the main town in the North Waziristan region. Two of the officials' guards and two passers-by were wounded. No one claimed responsibility, but in the past authorities have blamed such assaults on al Qaeda-linked guerrillas hiding in the region after fleeing from neighbouring Afghanistan. -- Reuters.

#### PHILIPPINES

Manila, Sep 2 -- A 30-year-old crew member who was severely burned in a bomb explosion on board ferry Dona Ramona died in hospital in Zamboanga City on Wednesday (Aug 31). This brings the number of fatalities in the terrorist attack to two, police authorities said. A 13-year old boy died at Camp Navarro hospital in Zamboanga City on Monday, also from severe burns. Nine more victims are in critical condition, authorities said. About 30 people were injured after an improvised firebomb exploded inside the vessel on Aug 28. The vessel was docked at Lamitan port, Basilan island, when the incident occurred. Authorities suspect that the Al-Qaeda-linked Abu-Sayyaf was responsible for the bombing. -- Lloyd's List Correspondent.

London, Sep 6 -- A press report, dated today, states: Investigators of Task Force Lamitan have achieved a breakthrough in the probe behind the explosion on ferry Dona Ramona on Aug 28 which killed two people and injured 27 others in Basilan. A member of the investigating team said that the team had obtained a statement from a witness the bombers had entrusted with a box of incendiary explosive. The witness, a contractual employee of the Basilan Shipping Lines, told investigators that, on the day of the explosion, a certain "Fernando" asked him to bring a carton box wrapped in plastic to the ferry canteen. The witness, the source said, told investigators that he left the box on the countertop and tended to his tasks. Subsequently, the explosion occurred. With the revelation, investigators are confident of producing a sketch of the suspect to ascertain his identity. The source said that, days before the explosion, a crewman named Paul Go received a threat through a text message from an

unknown sender that said: "There is a threat to the ship." He shared the message with his co-worker, Melchor Anino. Go, however, erased the message, unaware that the threat would be carried out days later. The breakthrough in the case came on the heels of the death of two possible key witnesses in the blast -- 30-year-old Isnain Olmoc and 13-year-old Sonny Boy Hamac. The two were reportedly nearest to the explosive planted by the bombers at the canteen of the vessel docked at the Lamitan Wharf. Nine victims are recuperating in hospitals around Zamboanga City.

London, Sep 7 -- A press report, dated today, states: The death toll from the bombing of ferry Dona Ramona has risen to three following the death of 18-year-old Emmanuel Torres on Monday night (Sep 5) in a local hospital. Torres, a resident of Barangay Kulaybato, Lamitan, succumbed to third-degree burns. Of the more than 30 passengers injured during the blast, eight are still recuperating in different hospitals in Zamboanga City.

#### RUSSIA

London, Aug 25 -- A press report, dated today, states: The prime minister of Russia's Ingushetia republic has been wounded when two bombs targeted his car in an assassination attempt, his office said. Prime Minister Ibragim Malsagov was injured in the leg but is in satisfactory condition in a hospital after the car he was riding in was hit by an explosive device in the city of Nazran this afternoon. Only a few seconds later, there was a second explosion, which the prime minister's driver was able to avoid, the prime minister's office said. One of the prime minister's security guards was killed in the attack and two other security personnel were wounded. Nazran is the main city in the Ingushetia region, which has suffered frequent spillover violence from neighbouring Chechnya and attacks by native militants and criminal gangs. Last week, the Nazran police chief was wounded when unknown assailants detonated a radio-controlled land mine as his car was passing.

London, Aug 29 -- A press report, dated Aug 27, states: An explosion derailed a passenger train in Russia's southern Dagestan region but caused no injuries, say reports. The train was travelling to the capital Makhachkala from the Caspian port of Astrakhan when the blast happened at 2300, local time, 1900, GMT. The locomotive and two carriages came off the track in the Khasavyurt region. Dagestan, which borders Chechnya, is an ethnically diverse mainly Muslim region with a history of violence by both rebel groups and criminal gangs. Investigators are working at the site to discover the cause of the blast, said a local interior ministry official. RIA Novosti news agency quoted a local official as saying an explosive device had been left on the rail tracks and exploded as the train passed. Local



transport police told Itar-Tass news agency that a gunman opened fire on the car of FSB security service officials as they headed to the blast site. One officer was injured and taken to a nearby hospital, the agency added.

London, Sep 2 -- A press report, dated today, states: A bomb exploded today in a pile of garbage in the capital of the southern Russian region of Dagestan, killing a serviceman and wounding five others who had been searching for explosives, police said. An engineering unit had been sent to the site, on a street leading to the base where it is stationed, said Ilyamin Magomedov, head of the Kirov district police department in the capital, Makhachkala. After they got out of the truck and started their search, the bomb went off, apparently triggered by remote control, he said. News agencies had earlier reported varying casualty tolls. The ITAR-Tass news agency, citing preliminary information from the Dagestani Interior Ministry, said two servicemen had been killed and three others wounded. Later, it said the Interior Ministry had corrected its toll to six servicemen and one civilian wounded, but none killed. The RIA-Novosti and Interfax news agencies quoted medical officials as saying that one soldier had been killed and six wounded. RIA-Novosti said the blast occurred near a trolley bus terminus in the capital, Makhachkala.

Makhachkala, Russia, Sep 7 -- A roadside bomb killed a Russian soldier in the turbulent Caucasus region of Dagestan today, a day after three policemen were killed in an attack blamed on local Islamists. The local interior minister said the soldier had been checking for bombs around a military camp near the town of Khasavyurt on the border with Chechnya when the blast occurred. Interfax news agency reported fresh fighting in Chechnya today, with pro-Moscow officials saying they had wiped out a rebel group near the village of Urus-Martan, south of Chechen capital Grozny. Unknown gunmen killed the three Dagestani police yesterday as they drove along a road near the town of Izberbash, some 70 km south of the regional capital Makhachkala. Local police blamed the attack on Islamist groups. -- Reuters.

#### SAUDI ARABIA

Riyadh, Sep 4 -- Two suspected militants and a policeman were killed in clashes in the eastern oil city of Dammam today, security sources said. One of the suspected militants died during a daytime gunfight in the city on the kingdom's east coast and a second died later of his wounds in hospital. A policeman died hours later in a shoot-out at a house where security forces said a third suspect was hiding. Thirteen policemen were wounded in the gunfight late last night. -- Reuters.

#### SRI LANKA

London, Sep 1 -- A press report, dated Aug 31, states: Tamil Tiger

rebels today rejected a government offer to hold crucial talks inside Sri Lanka, officials said, dealing a blow to efforts to revive the island's stalled peace process. The rebels' rejection of the offer came a week after the government refused Norway as the venue for the talks to review an increasingly fragile truce, arguing the rebels would use a foreign location to promote their autonomy bid. Both sides have turned down several offers, complicating efforts to hold what would be the first high-level negotiations since talks stalled in 2003, a year after they were brokered by Norway. The Tigers, citing security concerns, had said they would not attend the talks if they are held in-country, officials involved in the peace process said. They spoke on condition of anonymity because they were not authorized to comment publicly or to be quoted in the news media. A location in government-held areas of northern Sri Lanka - or even in neutral territory between government and rebel lines - were suggested as an alternative but were rejected by the rebels. The setback came as European cease-fire monitors warned that increasing violence in eastern Sri Lanka could re-ignite the war that began in 1983 with the Tamil's push to carve out a separate homeland. Punctuating the dispute over the negotiations has been sporadic fighting in recent weeks in the volatile east, violence that each side has blamed on the other. In the latest fighting, four soldiers and one policeman were wounded in a series of attacks today, prompting European cease-fire monitors to warn that the skirmishes could lead to renewed war. Analysts said neither side seems to be particularly keen to move ahead with the talks before presidential elections are held that will usher in a new leader. President Chandrika Kumaratunga cannot run for a third term. No date has yet been set, but the vote must be held before Nov 22.

London, Sep 6 -- A press report, dated today, states: Three Tamil Tiger rebels have been killed and five injured in a clash in the east of Sri Lanka, rebels say. The Tigers say their members were attacked by a heavily-armed group of Sri Lankan army soldiers, the pro-rebel TamilNet website reports, but the defence ministry has denied any involvement in the clash at a rebel base in Vakarai and suggested instead that a breakaway rebel faction might be to blame. Eastern Sri Lanka has been tense since a split in rebel ranks last year. Media in Sri Lanka have reported that they have been contacted by the rival Tiger faction who say they attacked an LTTE camp in the Vakarai area, killing nine rebels and injuring 13 others. The Sri Lanka Monitoring Mission (SLMM) which monitors the ceasefire between the government and Tamil Tigers says that it has received no complaint from the Tigers about the incident. Meanwhile the defence ministry said

that one army soldier had been killed in a separate attack by the LTTE in the east today.

#### SUDAN

London, Aug 31 -- Fighting may have died down in Sudan's crisis-torn Darfur region, but rampant banditry has taken its place and is hitting key humanitarian aid convoys, the UN said today. "There has been a tremendous rise in banditry. Not a single day goes by without two, three or four attacks on aid convoys," Keith McKenzie, UNICEF's representative in Darfur since 2004, told a new conference in London. "You never know when you are going to be hit or where. They seem to be targeting the humanitarian community and workers. If anything, the situation there is more unstable," he added. Fighting between Arab militias and rebels in the western region has decreased in recent months but UNICEF, the United Nations' children's fund, said there were still more than three million refugees and conditions were dire. Some two million of these were in more than 200 camps scattered around the region the size of France. The remainder were in isolated pockets and continuing to drift towards the already overfilled camps, putting them under intense pressure. "That is where the crisis is right now," McKenzie said. "There is a tremendous need. That is where the priority lies." He said the bandits came from both rebel and pro-government militias -- not the Sudanese Army -- and were attacking aid convoys because they were soft targets. "It is opportunistic. They see an aid convoy, hold it up and take everything there," McKenzie said. He said the 11,000 aid workers in Darfur were doing a superb job but warned the rising lawlessness was making some agencies consider reducing the size of their operations just when the need for their presence was growing. Martin Bell, UNICEF's ambassador for humanitarian emergencies and a former war correspondent and politician, said the international community had lost interest in Darfur since a January peace deal ended a separate north-south civil war in Sudan after more than 20 years. Bell praised the African Union ceasefire monitoring force -- which he said needed more people as well as far more logistic and communications support -- and urged the world to refocus on the crisis around new peace talks scheduled for Sep 15. "The prospect of half the population living in camps for the foreseeable future is simply not acceptable," he told the news conference. -- Reuters.

Khartoum, Sep 7 -- Rebels from eastern Sudan released three ruling party politicians, kidnapped in May as they returned from a conference in the region, a senior local official said today. The three men arrived in Port Sudan yesterday after rebels released them without preconditions following mediation efforts by the International Committee for the Red Cross (ICRC).

"They are free now," Red Sea state governor Hatim al-Wasiyla said. "The Red Cross facilitated contacts between the two sides and carried out mediation." The three men, politicians from the National Congress Party, were kidnapped after they left a government-organised conference in the town of Kassala near the Eritrean border on May 24. "The rebels didn't want money or anything for releasing the men ... they took them to make a statement, to say 'we are here' " Wasiyla said. The eastern rebel groups -- the Free Lions and the Beja Congress -- have clashed sporadically with government forces. The Justice and Equality Movement, one of the two main Darfur rebel groups, has said it joined forces with the eastern rebels to kidnap the politicians. -- Reuters.

#### TURKEY

London, Aug 30 -- A press report, dated today, states: One man was killed and five officers were injured during clashes between Kurdish protesters and police in south-eastern Turkey. Around 1,000 Kurds were demanding the release of the bodies of six men accused of being Kurdish separatists in the town of Batman. The six were killed during fighting with the Turkish military last week. The violence comes after the Kurdistan Workers Party (PKK) announced a unilateral ceasefire 10 days ago. Police asked the protestors to disperse and fired warning shots, tear gas and water cannon. They said the dead man had been hit by a stray bullet. Turkish forces launched an operation against PKK militants in Batman last Thursday (Aug 25), when the six suspected rebels were killed. The fighting came just a week after the PKK ordered its armed wing to refrain from violence for a month.

Istanbul, Sep 4 -- Turkish police fired tear gas and wielded batons today to disperse stone-throwing crowds in Istanbul protesting in support of Abdullah Ocalan, the jailed leader of the separatist Kurdistan Workers' Party (PKK). The demonstrators hurled petrol bombs and stones, blocked roads in various parts of the city and set fire to a bus, the police said in a statement. Television pictures showed police using water cannon to disperse the crowds. Eighty-eight people were detained in the city. The protesters had been gathering at various places, planning to attend a mass protest in the western province of Bursa but did not go as authorities did not give permission for the meeting. Police also stopped buses carrying protesters from mainly Kurdish south-eastern Turkey from entering Bursa. The crowds chanted slogans in support of Ocalan, who is held in an island prison near the site of the planned protest. -- Reuters.

#### UGANDA

Kampala, Sep 6 -- Ugandan troops killed 16 rebels in the remote north of the country in two attacks in recent days, the army said today. Military spokesman Lt. Col. Shaban Bantariza

said four Lord's Resistance Army (LRA) fighters were shot dead in Pader District on Sunday (Sep 4). "Then late on Monday we caught up with another group near the River Aswa in Gulu and killed 12 of them," he added. Uganda's army says LRA leader Joseph Kony is hiding in southern Sudan, and under a 2002 deal with Khartoum it can pursue him there. Ugandan troops are only allowed to roam south of the road between the Sudanese towns of Juba and Torit. But Ugandan military chiefs say Kony, a self-proclaimed prophet, retreated north of this so-called "Red Line" last month, and they want Sudan's government to let them follow him. "This is what we have been discussing with Khartoum," Bantariza said. "For now, Kony is having an undeserved rest." -- Reuters.

### Labour Disputes



#### FIJI

London, Sep 8 -- A press report, dated today, states: Fiji's Electricity Authority says it is confident it can maintain most electricity supplies during today's expected strike by power workers. The strike over cost of living allowance adjustments has been declared illegal. The chief executive officer of the Fiji Electricity Authority, Rokoseru Nabalarua, told a news conference in Suva late yesterday that about 30 per cent of the staff were not members of the unions that have called the strike. He says the authority is making sure that at least the critical locations are manned. Talks aimed at averting the strike appear to have failed. The Government has criticised the union leaders alleging the strike is political and aimed at coinciding with the Commonwealth Parliamentary Association conference in Nadi.

#### FINLAND

London, Sep 2 -- A press report, dated Sep 1, states: Stevedores in the key southern Finnish port of Kotka went on strike today to protest against job cuts announced yesterday, in the latest labour row to hit Finland's forestry sector. Union official Juha Anttila said that 600 workers walked off the job at dockyard operator Steveco at 0600 today and would stay out until 1400, Saturday. Steveco said it regretted the action. It gave no details about the number of staff on strike, but said in a statement that foremen who had walked out on today would return at 0600 tomorrow. The company announced yesterday it was cutting 253 jobs. "Steveco announced it would lay off permanent stevedore staff although it makes new contracts every day," Anttila said. "We can not accept this situation when there is constantly more work to be done than we have time for."

London, Sep 3 -- A press report, dated Sep 2, states: Employees of the stevedoring company Steveco went on strike at the port of Kotka yesterday. Both the stevedores and their supervisors walked off the job in protest at plans to reduce personnel by the main stevedoring company at Finland's largest export harbour. The supervisors went back to work today, while the stevedores are to stay off the job until tomorrow afternoon. On Wednesday (Aug 31), after the completion of mandatory talks with personnel representatives, Steveco announced that it would cut 253 jobs at the ports of Kotka and nearby Hamina. Most of the cuts will be covered by retirement arrangements, but 76 employees are to be let go. Head shop steward Juha Anttila feels that the job cuts are unfair, because as he sees it, the company keeps hiring new people every day. Anttila refers to the approximately 50 stevedores who work on the docks on a temporary basis one day at a time. The union feels that the hiring of temporary workers, which was originally supposed to be a stopgap measure to deal with sudden backlogs, has become a permanent feature. Anttila does not feel that there is any shortage of work at the harbour, and warns that if the cutbacks are implemented, the remaining employees will have to do vast amounts of overtime. He also fears that work that is now done in Kotka could move to Helsinki or Hamina.

#### FRANCE

London, Sep 7 -- A press report, dated today, states: Production at Total SA's refinery at Gonfreville l'Orcher near Le Havre has been halted by a strike, according to the CGT union. The entire early shift at the plant has "downed tools", the union said, in response to the company downgrading the status of four staff at another refinery in La Mede on disciplinary grounds. Management at Gonfreville - France's largest refinery, employing 1,600 - declined to comment. CGT, which on Monday (Sep 5) called for industrial action across all of Total's French installations, said the strike is also affecting refineries at La Mede, Donges, Feyzin and Grandpuits.

#### GHANA

London, Aug 30 -- A press report, dated today, states: Gold Fields Ltd said operations at its Tarkwa gold mine in Ghana have been interrupted as a result of a wildcat strike. Around half of the mine's 1,200 employees went on strike on Sunday, Aug 28. Gold Fields said the illegal industrial action, which is not supported by the Ghana Mineworkers Union, follows last week's agreement on the annual wage review between the union and the company. The company said it has engaged with the affected parties and aims to resolve the situation and to return the mine to full production as soon as possible.

#### INDIA

See "India" under "Political & Civil Unrest".

**ITALIAN AIRLINE PERSONNEL**

London, Sep 6 -- A press report, dated today, states: Flight attendants for Italy's state-controlled airline Alitalia went on strike today, at the start of a 48-hour strike, with travellers facing delays and cancellations. The walkout, which started shortly after midnight, was scheduled to last through until tomorrow night. The Sult union that called the strike said its members would work between 0700 and 1000 hrs and then again from 1800 to 2100 hrs each day, to allow a truce period for travellers. Strikers were risking fines for defying a transport ministry order to postpone the strike. The ministry said that not enough advance notice had been given for the strike. Alitalia said it had cancelled 21 flights ahead of the strike, warning passengers and booking them on other flights, but insisted the cancellations were not caused by Sult's protest. Alitalia said the cancellations were due to shortage of aircraft and local labour unrest in Turin and Bologna unrelated to the national strike. Sult and Alitalia have been locked in a dispute over recognising the union. The strike was originally set for Aug 30-31, but was postponed by a week because Italian law prohibits transport strikes during the heavy travel weeks of August.

**SOUTH KOREA**

London, Sep 1 -- A press report, dated today, states: Workers have stepped up strike action at South Korea's largest automaker, Hyundai Motor, shutting down production and preparing for a mass rally, company officials said. More than 20,000 workers downed tools on the day shift for four hours until noon and 10,000 night shift workers said they would keep the plant idle overnight from 2100 until 0800 tomorrow. "Production stopped again. All is quiet now," an official of Hyundai Motor in the southern city of Ulsan said. The union has called for a massive rally on the company premises later today, he said. "Despite the strike action, we will meet the union again later today to continue labor-management negotiations," the Hyundai official said. The strike action began Thursday last week when workers downed tools for two hours. The stoppage cost the firm 233.6 billion won in lost output. Hyundai's affiliate Kia Motors has also been hit by a strike as Kia's 27,000 workers launched a five-day partial walkout from Monday, calling for pay hikes and better working conditions. Hyundai and Kia control more than 70% of the country's auto market. Kia said this week's strike would result in financial losses amounting to 97 million dollars.

London, Sep 5 -- A press report, dated today, states: Workers at Hyundai Motor and its affiliate Kia Motors have launched a three-day work stoppage, ignoring a plea from major business organisations to end their strike. Five major associations of traders and exporters including the

Federation of Korean Industries which represents South Korea's leading conglomerates, said the auto workers should return to work. "The strikes which have hit the auto industry every year are damaging exports and the image of our nation," the organisations said in a joint statement. Hyundai's strike began on Aug 25 with workers downing tools for periods of several hours. A similar rolling strike began at associate company Kia four days later. The two companies control more than 70 percent of the country's auto market. Workers want higher pay, reduced working hours and a say in management decisions including plans for building overseas plants.

**SRI LANKA**

Karachi, Sept 1 -- The strike of Sri Lanka Locomotive Drivers' Union continues to protest the Government's failure to rectify their salary anomalies. An official of union said the salary anomalies of our field of work have not been addressed for over 20 years. We have conveyed our grievances to the Railways Minister and he has directed officials to take action. But there is no effort on their part to address the problem," he said. The engine drivers' island wide strike continued to cripple train services for the last two days despite strenuous efforts by railway authorities to maintain a satisfactory service. Meanwhile, Railways Ministry Secretary K. Haputhanthri told local media: "We are trying our best to provide a satisfactory service regardless of the strike". Accordingly, retired and competent engine drivers have been called for service. A group of non-striking engine drivers are also assisting us to continue the service," he said. However, over 100 trains on the usual schedule had to be cancelled yesterday due to the strike, which left thousands of commuters stranded at railway stations and bus terminals. -- Lloyd's List Correspondent

Karachi, Sep 4 -- The strike by Sri Lankan locomotive operators entered its sixth day yesterday. Railway Minister Felix Perera took a firm stand on the ongoing train strike, saying he was not prepared to hold discussions with the striking locomotive operators until they call off their trade union action. The Minister told local media that it was impossible at this juncture to grant a salary increase to striking engine drivers who already receive an average pay packet of around rupees 45,000 per month. "The Cabinet made a unanimous decision on Jul 29 not to revise the salaries of the state sector in a manner that would hinder the activities of the National Administration Council. If we increase the engine drivers' salaries it would give rise to similar demands from other railway unions," he said. Meanwhile, according to the Railway Main Control Room, around 80 trains, including 36 morning trains and 40 evening trains, were operating yesterday despite the ongoing strike. "We have also been able to resume the

operation of goods trains and mail trains. Only a small number of trains have been cancelled owing to the strike," the minister said. -- Lloyd's List Correspondent.

**TONGA**

London, Sep 5 -- A press report, dated today, states: Tongan Government workers who have been on strike for more than six weeks will return to work today after agreement was reached on a salary deal and a review of the country's political system. A Government negotiating team and the Public Service Association signed an agreement at the weekend which includes a significant political achievement for pro-democracy factions of Tongan society. Pesi Fonua, the editor of the online news site Matangi Tonga, said that the issues over money and democracy had been successfully separated and dealt with in a process helped by an appointed facilitator, Dr Sitiveni Halapua. During the six weeks the strike grew from an industrial dispute over pay rates into a wider political movement for reform. Mr Fonua said the strikers would return to work on their sought-after 60 to 80 percent pay increases for the next two years, but the rates could be reviewed if the cost could not be sustained from Government revenue. They had also pushed through a condition that the Cabinet look at setting up a royal commission to review the constitution and report back by the end of the year. At present the King appoints the Prime Minister and 12 members of the Cabinet. This year, for the first time, he allowed two elected people's representatives and two elected nobles into the Cabinet. Although the move was hailed as significant, the arrangement has achieved little for those wanting a more democratic structure as the elected Cabinet ministers have had to put the wishes of the wider Cabinet first. It has also been agreed that school principals, teachers and students will not be punished for their behaviour during the strike. Some Tonga College students trashed the school office after learning their principal, who had spoken out in favour of the strike, was to be transferred to another position in the Ministry of Education. Mr Fonua said he had heard that a further march was planned in Nuku'alofa tomorrow to call for the sacking of various Government officials.

**Awards & Settlements****ABUSE OF IMMIGRANTS, UNITED STATES**

London, Sep 8 -- A press report, dated Sep 7, states: Immigrants who claimed they were abused at a detention centre won a \$2.5 million

settlement from a private company that operated the centre for the federal government. After legal fees, some 1,600 detainees will divide about \$1.5 million based on how long they were held and what they said was done to them, the New Jersey Law Journal reported this week. US District Judge Dickinson R. Debevoise, in Newark, approved the settlement on Aug 10. The detainees were being held at the Elizabeth centre between August, 1994, and June, 1995, for what was then called the Immigration and Naturalisation Service. Many have since been deported. The centre was operated by Esmor Correctional Services, then based in Melville, NY, until shortly after a June, 1995, riot, when about 100 immigrants broke windows, destroyed furniture and overpowered guards, claiming they had suffered physical abuse and other inhumane conditions. The INS closed the centre and fired Esmor after its investigation found that poorly trained guards abused the detainees physically and mentally, gave them spoiled food and deprived them of sleep. The detention centre reopened in January, 1997, after renovations were completed by its new operator, Corrections Corp of America, of Nashville, Tennessee. Still pending is a related lawsuit against Esmor, now known as Correctional Services Corp, of Sarasota, Florida, by nine detainees who claim that political asylum seekers were abused and harassed at the centre. The judge last year dismissed their claims against the INS and its officials, saying the government cannot be sued.

#### **HARRASSMENT, UNITED STATES**

London, Sep 7 -- A press report, dated Sep 6, states: A federal appeals court today substantially reduced the \$108 million in punitive damages a Portland, Oregon, jury awarded to several abortion doctors and clinics harassed by abortion opponents. A three-judge panel of the 9th US Circuit Court of Appeals called the activists' actions reprehensible, but unanimously reduced the judgment to \$4.73 million to conform with a Supreme Court precedent limiting such damages. An attorney for many of the 12 activists who created Wild West-style posters and a Website targeting abortion doctors said the damages should be reduced further. "They were exercising their First Amendment rights," said attorney Ed White, of the Thomas More Law Centre. He was considering asking the court to reconsider. Three doctors listed on the Web site were murdered. The Supreme Court had already upheld lower court rulings that the activists' actions were not protected speech. Today's decision from the appeals court was based on a 2003 Supreme Court ruling generally limiting punitive damages to no more than nine times the amount of damages awarded to compensate for monetary losses. Maria Vullo, a Planned Parenthood attorney who represented the four doctors and two

abortion clinics, said that despite reducing the damage award, "the court made it clear the defendants' conduct was highly reprehensible." The four doctors, who said they feared for their lives, sued under racketeering laws and the 1994 law that made it illegal to incite violence against abortion doctors. During trial, targeted abortion doctors testified they used disguises, bodyguards, wore bulletproof vests, and instructed their children to crouch in the bathtub if they heard gunfire. A federal judge and the Portland jury found in 1999 that the Website and some of the posters were "true threats to kill." The jury awarded \$108 million in punitive damages to punish the 12 defendants, who operated under the group American Coalition of Life Activists, and another \$526,334 to cover their monetary losses. The San Francisco-based appeals court multiplied compensatory damages by nine to reach the \$4.73 million in punitive damages. The jury had punished some defendants with damages that were 30 or 40 times greater than the losses incurred by doctors and clinics.

#### **ROAD TRAFFIC ACCIDENT, UNITED STATES**

London, Sep 4 -- A press report, dated Sep 3, states: A Kane County jury awarded more than \$4.5 million Wednesday (Sep 1) to a Huntley couple injured in a 2003 crash with a pizza-delivery driver. The jury found in favor of Wyman Carey, 68, and his wife Carol, 66, injured in a crash in Hampshire, the couple's attorneys and court officials said. The Careys were riding in the back seat of a vehicle on Feb 15, 2003, driven by Dr. Thomas Duffy of Huntley, when they were hit by a car delivering for Rosati's Pizza of Hampshire. Duffy admitted that he was partially at fault for the crash, according to his lawyer, Raymond Fabricius. The jury assigned 85 percent of the blame to Duffy, and the rest to the delivery driver and the pizzeria owned by T-Ricks Ltd., Fabricius said. Duffy's insurance paid the \$4.5 million verdict yesterday, and now Duffy will seek 15 percent from the pizzeria and the delivery driver, Fabricius said. Joshua Grisolia, 16 at the time, was delivering for Rosati's when his car hit Duffy's car as Duffy pulled into the eastbound lane of Illinois Highway 72 at Brier Hill Road about 2000 hrs. The crash left Wyman Carey with fractured vertebrae, partial paralysis and numbness, according to attorney Thomas Boleky, of Corboy & Demetrio. His wife suffered injuries that included a fractured rib, he said.

#### **SHAREHOLDER LAWSUIT, UNITED STATES**

London, Sep 2 -- A press report, dated today, states: Royal Dutch Shell is set to pay \$9.2m to settle another shareholder lawsuit in the US as it works to close off the remaining fallout from its 2004 reserves scandal. The Anglo-Dutch oil major, that recently unified its ownership and

listing, has reached a settlement with US shareholders on their derivative action that was set up to force the company into corporate changes. The actions that were pending in the federal courts of New York and New Jersey sought to assert claims against current and former members of the board of directors and were looking for changes in corporate structure and governance. Under the terms of the settlement, Shell has agreed to pay \$9.2m in court costs and attorney fees for the derivative plaintiffs. It has also agreed on changes to corporate governance, some of which are already implemented, on areas such as policy, composition and function of the board of directors, financial reporting and compliance. "We are pleased to have taken another step towards putting the reserves recategorisation behind us," said Beat Hess, Shell's legal director. "And to have done so in a way that contributes to Shell's commitment to the highest standards of corporate governance, compliance and integrity." The world's third largest oil firm now has to wait for court approval before closing off this lawsuit. But it still has one other class action pending in the US by shareholders angered by the devaluation of their shareholdings immediately after the reserves recategorisation was announced.

#### **UNFAIR DISMISSAL, UNITED STATES**

London, Sep 3 -- A press report, dated Sep 2, states: A jury awarded more than \$4.7 million in damages today to 11 workers who say a contractor fired them for expressing safety concerns about work at the Hanford nuclear reservation. The workers say seven pipe fitters objected in 1997 when they were told to install a valve rated to withstand less pressure than was needed for a test of radioactive waste pipes. The crew was later laid off, but a settlement required the contractor, Fluor Federal Services Inc. of Arlington, Va., to rehire them. The plaintiffs' attorneys contended that foremen on the job were told they would have to lay off seven other pipe fitters to bring the first seven back. Attorneys for Fluor Federal Services argued there was not enough work at the Hanford site for all the pipe fitters. The jury awards ranged from \$89,700 for one plaintiff to more than \$553,000 for another. They sought lost wages, and all but one sought damages for emotional distress. The suit involved five of the original seven pipe fitters and six included in the second layoffs. Randy Squires, an attorney for Fluor Federal Services, said the company has 30 days to file notice that it plans to appeal. "The company's view is that it did not retaliate against these people," he said. The valve that was to have been installed was located in Hanford's so-called tank farms, which hold 53 million gallons of highly radioactive waste left from Cold War-era nuclear weapons production. Some of the 177 aging, underground tanks

are known to have leaked, threatening groundwater and the Columbia River less than 10 miles away. The Hanford site was created as part of the top-secret Manhattan Project to build an atomic bomb. Today, it is the nation's most contaminated nuclear site. Cleanup is expected to cost \$50 billion to \$60 billion, with the work to be finished by 2035.

#### **VEHICULAR MANSLAUGHTER, UNITED STATES**

London, Sep 4 -- A press report, dated Sep 2, states: A San Francisco jury awarded \$27 million today to the family of four-year-old girl killed in 2003 when she was struck by a Muni truck driver. After 3.5 weeks of trial, jurors deliberated almost five days before deciding for the family of Elizabeth Dominguez. The jury found that the driver, Sebastian Garcia, had been negligent when he drove into the intersection of Potrero Avenue and 24th Street on Feb. 11, 2003. Elizabeth was walking on the sidewalk with her mother when Garcia's truck hit her, pinning her against a restaurant. The girl died at the scene. Authorities investigated whether Garcia had run a red light, but the San Francisco district attorney wound up charging him with misdemeanor vehicular manslaughter, rather than a more serious felony. The girl's family said Garcia deserved more severe prosecution, but a spokesperson for then-District Attorney Terence Hallinan said at the time that conflicting witness accounts dictated what charges could be filed. Garcia, who is still employed at Muni, is scheduled to stand trial in January. If the verdict stands, it would be the largest personal injury award ever made by a jury against the city and county of San Francisco, according to Matt Dorsey, spokesman for City Attorney Dennis Herrera.

#### **WORK RELATED ILLNESS, UNITED STATES**

London, Sep 4 -- A press report, dated Sep 3, states: A jury yesterday awarded a former popcorn-plant worker \$15 million after finding that his exposure to butter-flavoring fumes led to his severe respiratory problems. The verdict brings to nearly \$53 million the total amount awarded in the last two years against the makers of the popcorn flavouring, International Flavors & Fragrances Inc. of New York and a subsidiary, Bush Boake Allen Inc. Four other plaintiffs reached confidential settlements with the defendants last year. The plant where the plaintiffs worked, the Gilster-Mary Lee Corp. microwave popcorn factory in Jasper, Mo., has paid the employees' worker's compensation and has not been named as a defendant in any of the actions. The latest case was filed by Carthage, Mo., resident Stephen McNeely, 35, a machine operator who filled popcorn bags with salt and butter flavouring. McNeely, who worked at the plant from 1989 to 2001, developed

bronchiolitis obliterans, a rare, progressive lung disease that may require him to get a lung transplant. McNeely is one of about 30 former and current workers at the Jasper plant who have sued International Flavors and Bush Boake Allen.

### **Railway Accidents**



#### **AMAGASAKI, JAPAN**

London, Sep 7 -- A press report, dated today, states: An interim report on the deadly Apr 25 crash of a speeding commuter train on West Japan Railway Co's Fukuchiyama Line touches on the driver's apparent erratic behaviour but leaves many questions unanswered. The report by the Aircraft and Railway Accidents Investigation Commission probing the derailment in Amagasaki, Hyogo Prefecture, was submitted yesterday to Land, Infrastructure and Transport Minister Kazuo Kitagawa. Its main conclusion is that speeding on the part of driver Ryujiro Takami, 23, caused the seven-car rapid service train to jump the tracks on a tight, 304-metre-radius curve and slam into a nine-storey condominium building, killing himself and 106 passengers and leaving 555 people injured. Officials of the commission said, however, they still had a long way to go before they could determine precisely why Takami failed to slow for the curve. It was widely reported that Takami was speeding to make up for lost time for fear of being punished by JR West but commission officials claimed they need more time to study the crash from an objective perspective. In the report, the commission said the rush-hour train was running at more than 110 kph -- well above the 70-kph speed limit for that section of track -- as it entered the sharp bend. According to data from the automatic train system, Takami applied the regular brakes only after the train entered the curve and never activated the emergency brakes. This has baffled experts, because drivers should instinctively sense a speeding danger and apply the brakes accordingly. Kozo Amano, a professor emeritus majoring in traffic engineering at Kyoto University, said drivers normally should start applying the regular brakes at least 300 to 400 meters before the curve to lower the speed to 70 kph. "It is conceivable that the driver was in an altered state," or was unconscious and unable to apply the brakes, Amano said. The train had overrun the platform at Itami Station, an earlier stop, by 70 metres, prompting speculation that Takami ran faster to make up for the time lost there, which reportedly amounted to 80 seconds. According to the report, Takami was involved in a 100-metre platform overrun at another station in June 2004.

#### **DAGESTAN, RUSSIA**

See "Dagestan, Russia" under "Political & Civil Unrest."

#### **FRASER VALLEY, BRITISH COLUMBIA, CANADA**

London, Sep 1 -- A press report, dated today, states: A Canadian National freight train left the tracks in British Columbia's Fraser Valley, the latest in a series of derailments that have beset the railway. CN spokesman Jim Feeney said the westbound train consisting of two locomotives and 97 cars derailed near Cheam View. The train was loaded with dry sulphur. "The crew of the train is unhurt," Feeney said. CN officials and local emergency crews were dispatched to the scene, he added. B.C. Ministry of the Environment spokesman Max Cleevely said the derailment involved nine cars and was about 300 metres from the Fraser River. "The spill is being characterized as minor in volume," he said, calling it "controlled and well in hand." Cleevely said ministry spill-response officers were expected to examine the scene between Chilliwack and Abbotsford today.

#### **HINTON AREA, ALBERTA, CANADA**

London, Aug 30 -- A press report, dated today, states: For the second time in less than a month, a CN (Canadian National Railway) train has derailed in Alberta. The company says 10 cars left the tracks about 25 kilometres east of Hinton at about 0700 hrs, yesterday. CN spokesman Jim Feeny said one of the cars contained caustic soda, a dangerous substance, but it remained upright. Another car loaded with coke, a coal-like substance, tipped over, but Mr. Feeny said there will not be any damage to the environment. No one was hurt and the cause of the derailment is not known. Mr. Feeny says there is a double track at the site where the accident happened, so other trains can get around the wreckage.

#### **LOUISA COUNTY, VIRGINIA, UNITED STATES**

London, Aug 30 -- A press report, dated today, states: Officials in Louisa County are on the scene of a train derailment. A spokesperson with the Louisa County Sheriff's Department says a train carrying gravel and clay overturned on Fredericksburg Avenue near Main Street around 1000 this morning. The train partly owned by Buckingham Branch Railroad and CSX was on its way to Doswell, Virginia. There were no hazardous materials on the four cars which overturned, or any of the other twelve forming the train. The are no injuries reported. The site of the derailment should clear by 2000 hrs tonight.

#### **ORANGE COUNTY, CALIFORNIA, UNITED STATES**

London, Sep 7 -- A press report, dated Sep 6, states: A freight train derailed early today without causing any injuries but it temporarily blocked

commuter train traffic on two Metrolink lines, officials said. The derailment occurred about 0410 in northern Orange County when a Burlington Northern Santa Fe platform car backed into a siding and struck other equipment, said Lena Kent, a spokeswoman for the railroad. The derailment blocked three tracks and prompted Metrolink to cancel two routes that run through the area, said Metrolink spokesman Francisco Oaxaca. One of the three tracks reopened at 0830 and the Metrolink trains were operating this afternoon with minor delays expected, Oaxaca said.

**SOUTH HUTCHINSON AREA, KANSAS, UNITED STATES**

London, Aug 31 -- A press report, dated today, states: Two freight train cars derailed, causing a tanker to spill 30,000 gallons of highly flammable ethanol into a ditch and forcing the evacuation of about 50 homes, authorities said. No injuries were reported in the Tuesday night (Aug 30) incident. The 17-car Kansas and Oklahoma Railroad train was headed to Hutchinson from Wichita when two tankers and an empty grain car jumped the track in a residential neighbourhood, said Jim Wineland, general manager of the K&O. One of the tankers tipped, spilling the ethanol into a water-filled ditch, said Scott Jones, police chief for South Hutchinson. Crews were sent in early today to upright the other derailed car, which had not spilled its load. Evacuees were being housed in a church, and classes at a nearby elementary school were cancelled today. Nearby businesses and government offices were expected to remain closed. A hazardous material team and firefighters were at the scene today, Jones said. He said sand and foam were poured onto the spill to help prevent the ethanol from igniting. Officials said it could be evening before evacuees could return to their homes. They were being escorted back briefly, one family at a time, to get belongings needed for the day. Jones said he didn't know what caused the derailment.



**ZOTOB VIRUS**

London, Aug 29 -- A press report, dated Aug 27, states: Computer software firm Microsoft has congratulated authorities in Turkey and Morocco on the arrests there of two men suspected of disrupting computer networks across the US last week. Farid Essebar, 18, of Morocco, and Atilla Ekici, 21, of Turkey, are believed to have been responsible for the Zotob worm that hit the Internet less than two weeks ago, along with predecessors called Rbot and Mytob

released earlier, the US Federal Bureau of Investigation said. Zotob caused computer outages at more than 100 US companies, including major media outlets like CNN and the New York Times, but it did not create widespread havoc along the lines of previous malicious software programs like SQL Slammer and MyDoom. Close teamwork among the FBI, Microsoft Corp and authorities in Morocco and Turkey was essential to the case, FBI Cyber Division assistant director Louis Reigel said. Mr Reigel says Essebar wrote the malicious code and provided it to Ekici for a fee. He says the two men will face prosecution in their native countries and FBI officials will provide evidence. Zotob targeted a recently discovered flaw in the Plug and Play feature of Microsoft's Windows 2000 operating system. Newer versions of the software were not affected. Users who heeded a prior warning from Microsoft and updated their systems were not victimised by the worms, but those who did not keep their systems up to date could have their computers taken over by remote servers or see them shut down and start back up repeatedly. Microsoft general counsel Brad Smith says the worms had a limited impact because more consumers were keeping their software up to date and using firewalls and anti-virus software. He says the software industry was taking threats more seriously as well. Mr Smith says Microsoft's team of 50 investigators was able to analyse the worms and find out where they were coming from. He says the team began work on the case in March after the release of Mytob, but Zytob provided the evidence to track them down.

Rabat, Sep 2 -- An 18-year-old maths student will go on trial in Morocco this month for unleashing computer worms that disrupted networks of major US firms, a Justice Ministry official said today. The FBI last week announced Moroccan Farid Essebar's arrest in Rabat and that in Turkey of 21-year-old Attila Ekici, both suspected of releasing the Zotob worm that hit the Internet three weeks ago. The official said Essebar's trial would start on Sep 13 and he would be in custody near Rabat until then. "The hearing will specify charges against him for the trial," the ministry official said. The Russian-born maths student is accused of illegal access to data systems, criminal conspiracy, aggravated theft and credit card piracy. Legal sources say he faces up to 10 years in jail if found guilty. The Rabat court will try another suspect, identified as 21-year-old Achraf Bahloul, on the same charges. "Bahloul got into this for having used Essebar's alias and pirated credit card data. We don't think Bahloul is directly involved in the Zotob attack," the official said. Police were trying to find any more Moroccan accomplices Essebar may have had, he said. Zotob caused computer outages at more than 100 US firms, including major media outlets like CNN, ABC and the New York Times, but did not create

widespread havoc like previous malicious software programmes like SQL Slammer and MyDoom. Close teamwork among the FBI, Microsoft Corp and authorities in Morocco and Turkey helped net Essebar and Ekici 12 days after the attack. Using the alias Diab10 (Wolves10), Essebar is suspected of having helped Ekici create the Zotob worm in exchange for credit cards data, local newspapers said,. -- Reuters.



**CABLE CAR CRASH, SOELDEN, TYROL, AUSTRIA**

Vienna, Sep 5 -- Nine people were killed when a helicopter dropped a concrete block on a ski-lift, plunging a cable car filled with tourists down a mountainside in the western Austrian state of Tyrol, police said today. Austrian radio reported that the victims were mainly young ski tourists travelling to the glacier ski area above the popular Alpine resort of Soelden. A helicopter carrying material to a mountain-top construction site shed its load over the ski-lift, knocking one car off its wires and causing others to swing violently and throw out their passengers, police said. Television pictures showed bodies lying on the rock beneath the glacier. Over 100 other passengers had to be rescued from stranded cable cars. A spokeswoman for the Austrian Red Cross said up to 10 more people had been seriously injured in the incident. Austrian press agency APA reported that the helicopter was flying the piece of concrete, weighing around 750 kilograms, around 300 metres above the ski-lift cables, when the block fell. -- Reuters.

**DAMAGE TO FLOATING DOCK, BATAM, INDONESIA**

London, Sept 7 -- A floating dock at Pan United Marine's Indonesian yard was damaged in an incident today reducing the group's docking capacity by 7% for the rest of the year. In a statement to the Singapore Exchange Pan United said that a 4,500 dwt lifting capacity dock at its yard in Batam had been damaged and would out of service for the rest of the year. Pan United has five floating docks at its Singapore and Batam yards, and the damaged dock represents 7% of its total docking capacity. Pan United was tight-lipped as to the cause of the damage of the dock. "We are investigating the cause of the damage," said Pan United director May Ng. "We don't know the cause right now." She did however clarify that another vessel was not involved in the incident and that no-one was injured. Pan United said that it did not expect any material impact on its financial performance this year as a result of the damage to the dock.

### **FLOODING IN COAL MINE, XINGNING, CHINA**

London, Aug 31 -- A press report, dated today, states: China is suspending production at 7,000 coal mines - nearly one-third of the nationwide total - in a safety crackdown on the accident-plagued industry, a government newspaper reported today. The mines, most of them small and poorly equipped, will be required to improve safety measures and will not be allowed to reopen if they fail to meet national standards, the China Daily said. The announcement came two days after 123 miners missing in a flooded coal mine in southern China were declared dead in a highly publicised disaster. Eleven mine officials blamed for the accident have been detained and two local mayors dismissed. So far, 1,324 mines have closed, and the rest must suspend production by the end of the year, the China Daily said. It said China's energy supplies should not be affected, because the mines account for only a small fraction of coal output. China has about 24,000 coal mines, according to the government. Fires, floods and other accidents killed more than 5,000 Chinese coal miners last year. Many of the accidents are blamed on lack of fire-control and ventilation equipment or failure to enforce safety rules. Despite repeated official promises to tighten enforcement, the death toll in coal mine accidents rose 33 percent in the first half of this year to 2,672, according to the government.

### **OUTBREAK OF "BIRD FLU"**

London, Aug 31 -- A press report, dated today, states: Antibody tests showed yesterday that chickens at seven more farms in Ibaraki Prefecture in Japan, may have been infected with a bird flu virus of the H5 strain in the past, the prefectural government said. Chickens at two farms near the seven in the town of Ogawa have already tested positive for antibodies to the virus. In another development, Iran has banned imports of all animal feed from countries which have reported cases of bird flu, a senior trade official said today. "We have banned all kinds of animal feed, grains and grasses from those countries where bird flu has broken out," said Abbas Moazzeni, deputy director of foreign trade at the trade ministry. Iran imported 63,000 tonnes of animal feed wheat in the three months to June before saying it had imposed a moratorium on such imports on Aug 22. Analysts said the bird flu ban would particularly affect the Caspian Sea grains trade. A Russian grains analyst said it had already pushed down grain prices in Russia. "The ban on grain imports from the Caspian region due to bird flu has contributed to an abrupt decline in exporters' demand for (Russian) feed grain prices, particularly of feed barley," Vladimir Petrichenko, of WJ Interagro trading company, said in a report. He said feed barley prices declined in the European

part of Russia in the last seven days by \$3.38 per tonne to \$87.41 EXW. Bird flu has spread from Asia to Russia and is now, according to some experts, threatening Europe.

Ha\noi, Sep 1 -- The deadly bird flu virus has killed a Vietnamese person, taking the number of deaths in Asia from the disease to 63, a senior official said today. The victim, whose gender was not disclosed, died from acute pneumonia on Sunday (Aug 28) and tests showed the H5 component of the H5N1 avian influenza virus in the body, the Tuoi Tre newspaper quoted Deputy Health Minister Trinh Quan Huan as saying. The victim was from Soc Son, a district on the outskirts of Hanoi, but the government had not spotted any outbreaks in poultry in August, Huan said. The death was announced as Agriculture and Health Ministry officials said they were finalising details of an emergency plan to tackle a flu pandemic, which international health officials fear could erupt if the H5N1 virus mutates. The WHO has urged governments to prepare for such an eventuality. Vietnam, which has had more human deaths from the H5N1 virus than anywhere else, was preparing plans for various scenarios, the state-run Tien Phong newspaper reported. "Vietnam is vaccinating poultry so there is a great infection risk involving the H5N1 virus jumping from poultry to humans," the newspaper quoted the Health Ministry as saying. There have been no reports so far of people contracting the virus from vaccinated poultry. Animal health officials said they were meeting today to review the vaccination campaign using Chinese and Dutch vaccines in the provinces of Nam Dinh and Tien Giang. This month, the government will expand the vaccination campaign to target 60 million fowl at small-scale farms nationwide, said Anton Rychener, the U.N. Food and Agriculture Organization representative in Vietnam. The government aims to complete vaccinations by Nov 15, before the onset of winter when the virus seems to thrive best. The latest human death took Vietnam's bird flu toll to 44, with 23 of the victims dying since the virus returned in December 2004, after sweeping through much of Asia in late 2003. -- Reuters.

### **OUTBREAK OF CHOLERA, NIGER**

Niamey, Sep 7 -- An outbreak of cholera has killed at least 22 people in Niger's north-east region of Tahoua, the national health service said today, after rains brought further misery to the famished central African state. Officials had identified 251 cases of the disease between Jul 13 and Sep 5 in Tahoua, 650 km north-east of the capital Niamey. Millions of people in land-locked Niger, one of the world's poorest countries, are still facing severe food shortages after a drought last year. Long-awaited rains have helped crops but brought an epidemic of the deadly bacterial disease. -- Reuters.

### **POWER OUTAGE, NORTHERN IRELAND, UNITED KINGDOM**

London, Sep 1 -- A press report, dated Aug 31, states: More than 20,000 homes and businesses were left without power at various times after 550 lightning strikes on the electricity network in Northern Ireland. Most supplies have been restored, but thousands of homes in Newry, Banbridge, and Dungannon remain without power. Northern Ireland Electricity said in a statement it expected to restore power to most homes overnight. Lightning also damaged rail signalling equipment in Portadown, temporarily disrupting trains on the Belfast line. Northern Ireland Electricity spokesman Robin Greer said the company was doing its best to restore power. "We have put our escalation plans into action with approximately 350 engineers, linesmen, field staff and call handlers working to restore supplies and keep customers informed," he said. NIE said some customers in rural areas around Dungannon and in the south east may be without supplies overnight "due to the considerable damage sustained by the network in that area." It said staff would work through the night to complete restoration work.

### **WELHAM GREEN, HERTFORDSHIRE, UNITED KINGDOM**

London, Sep 6 -- A press report, dated today, states: Network Rail, formerly Railtrack, has been found guilty of breaching health and safety legislation in the run-up to the Hatfield crash, but three ex-Railtrack managers, and two former employees of Balfour Beatty, the firm which maintained the line, were cleared at the Old Bailey. Four people were killed when a King's Cross to Leeds train left the tracks at high speed on 17 October 2000. Prosecutors said the crash resulted from a "cavalier approach" to safety. Network Rail pleaded not guilty. The company replaced Railtrack, which owned the East Coast Mainline at the time of the derailment, after it went into administration. The former Railtrack executives - Alistair Cook, 52, Sean Fugill, 52, and Keith Lea, 55 - and the officials from Balfour Beatty - Anthony Walker, 48, and Nicholas Jeffries, 50, also denied the charges. As they left court, the five executives expressed sympathy for victims of the crash, but they also questioned the decision to prosecute them. The jury was told the 117mph crash, which also left 102 people injured, took place when the train was derailed by a cracked section of the track. The prosecution said a backlog of essential work had been allowed to accumulate, and claimed the rail had been identified for repair 21 months earlier. Balfour Beatty, which had the contract to maintain the track at the time of the accident, admitted a charge under the Health and Safety Act, but the company said it did not accept all the facts of the case the prosecution had

outlined against it. During the trial, Balfour Beatty and the five rail executives were formally cleared by the judge, Mr Justice Mackay, of manslaughter. A new law making it easier to prosecute firms in the wake of major disasters is currently being considered by Parliament. The case, however, has renewed the debate over the legislation dealing with corporate manslaughter. "There is a recognition that the law as it stands at the moment is problematic," said solicitor John Pickering, who represented the families of the four who died. "There is a tension between wanting to create a system for corporate accountability so the victims think there has been a criminal level of redress, and for business to know where the borderlines are and how to conduct themselves so not to land in difficulty." The crash left Railtrack with a £733m bill for repairs and compensation to train-operating companies and helped trigger its collapse. Defence lawyers had told the court the executives were being used as scapegoats for a "botched and unworkable privatisation" in an under-funded industry. In a statement, Network Rail said the crash was a "terrible event for everyone involved". "This has been a long trial, it has now reached its conclusion and we respect the findings of the court," said chairman Ian McAllister. "It must be remembered that the maintenance of the railway has fundamentally changed since the Hatfield tragedy." Rail and Maritime Union general secretary Bob Crow said safety on the trains had improved since Network Rail had replaced Railtrack. "Mr McAllister, since he has taken over Network Rail and brought it back to a not-for-profit company, has done extremely well about bringing the maintenance back in-house and making it safer." Sentence will be passed in October.

## Fires & Explosions



### APARTMENT BLOCK, PARIS, FRANCE

Paris, Sep 4 -- An apartment block fire killed 12 people and injured 13 in the southern suburbs of Paris early today, the French fire service said, bringing to more than 30 the number of deaths in recent serious blazes in the capital. Some 160 firefighters tackled the fire which broke out in the entrance hall of the 15-floor building in l'Hay-les-Roses at around 0100 hrs, a spokesman said. He said most of the victims were choked by fumes. The fire was quickly brought under control, but the cause was not immediately known. It was the latest in a spate of fires in or around Paris which had already killed 24 people, mostly Africans, in a matter of weeks and raised questions over fire safety and the treatment of immigrants. After a fatal fire less than

a week ago, in which seven people died, President Jacques Chirac demanded action on fire safety to prevent further tragedies. -- Reuters.

### BAKERS, DURHAM, UNITED KINGDOM

London, Sep 8 -- A press report, dated Sep 7, states: A County Durham bakery is set to resume production on the site where an arson attack destroyed its premises more than a year ago. Peters Cathedral Bakers factory, on the Dragonville Industrial Estate in Durham City, was badly damaged by the fire in April 2004. The family-run company was forced to move to a temporary factory in Peterlee after the fire. However, production is soon to move to a new £9m factory on the old site. The company employs almost 700 people and has 71 retail outlets in the region. The workforce was retained and next week the recovery will be complete with the move to the new premises.

### COAL MINE, SHANXI PROVINCE, CHINA

London, Sep 7 -- A press report, dated today, states: Seventeen miners died, mostly from burns or suffocation, in a gas explosion at an illegal coal mine in northern China's Shanxi province, state media said today. The miners were killed when the blast happened yesterday in the Zhike Town Coal Mine in Zhongyang county, Luliang city, the Xinhua news agency said. Only nine of the 26 miners working underground at the time survived, Xinhua said. Two of them were injured. The mine, run by the township government, had been ordered to shut down due to safety problems but its owners secretly resumed operation on Monday without permission, Xinhua said, citing a local mine safety official. Police have detained six mine executives and authorities have frozen the company's bank accounts, Xinhua said.

### GAS WELL, AMALAPURAM AREA, ANDHRA PRADESH, INDIA

London, Sep 8 -- A press report, dated today, states: An Oil & Natural Gas Corporation oil rig caught fire following a heavy blow-out in an onshore well being drilled in the Krishna-Godavari basin in Andhra Pradesh this afternoon. Seven ONGC personnel were reported missing even as the district authorities evacuated the people from three adjoining villages to safer places. The accident occurred at Tandavapalli village, seven kms from Amalapuram town. There was a sudden blowout in the gas well when the drilling was going on. The blow-out was so severe that the oil rig and four vehicles parked nearby melted in the heat. ONGC officials said 30 people were on the rig at the time of the accident. While 23 escaped safely from the inferno, seven employees were reported missing. Their fate is not yet known, although ONGC officials believe that they could have jumped to the other side of the rig and gone to nearby villages. The

flames from the inferno leapt more than 150 feet and could be seen from a long distance. As a precautionary measure, the authorities have evacuated people from three nearby villages to safer places. Although fire tenders were rushed to the area, they were of no use and the ONGC officials were putting in place plans to cap the blow-out, which could take days or weeks. Meanwhile, in an official statement issued by ONGC, the oil major said: "At about 1130 hrs, Sep 8, there was a blowout in Exploratory Well PSAR at Pasarlapudi near Amalapuram, Rajahmundry. The rig crew has been evacuated and there is no casualty. ONGC's crisis management team based in Narsapur, which is well trained and equipped to handle such situation, has already been mobilised at the site."

### MARINA, GIG HARBOR, WASHINGTON, UNITED STATES

Seattle, Aug 31 -- A fire broke out at a marina in Gig Harbor on Aug 31. An estimated 50+ pleasure craft are involved, and damage to the facility is reported. -- Lloyd's Agents.

Seattle, Aug 31 -- Numerous pleasure craft left to burn out. Several rows were evacuated by vessel owners against advice of fire department personnel. Much of Marina collapsed upon moored vessels. Many vessels not actually on fire were hit by debris and damaged. -- Lloyd's Agents.

London, Sep 1 -- A press report, dated Aug 31, states: Firefighters monitored the smoldering wreckage of a downtown marina today after an early morning fire burned 50 boats and spewed billowing black smoke. No injuries were reported, fire spokeswoman Penny Hulse said. One person living on board a boat fled the covered marina before it was charred, she said. "Fuel and fiber-glass burn very quickly," Hulse said. "When we arrived, the flames were 30 feet high." Witnesses reported hearing boats explode around 0730 hrs. Within an hour, the Harborview Marina was in flames. Hulse said the fire started on one boat and quickly spread. The cause was under investigation. Fire crews kept watch on smoldering wreckage later in the day, dousing occasional flareups. "The whole roof is down at the dock level right now, just a rumpled pile of blackened aluminum," said teacher Ross Pomerenk, who has a boat at a nearby marina. Damage is likely to run into the millions of dollars, Hulse said. Gig Harbor is on the Key Peninsula at the south end of Puget Sound. Most of the boats were fiberglass pleasure craft, some as big as 60 feet, Pomerenk said.

London, Sep 1 -- A press report, dated Aug 31, states: An early-morning fire raced through a Gig Harbor marina today, blowing up propane tanks, sinking the marina cover and sending as many as 50 boats to the waters below. No one was hurt. The blaze was first reported about 0715 hrs, said Penny Hulse, a spokeswoman for the Gig Harbor Fire Department. The flames, contained by



the roof of the marina, spread outward, setting neighboring vessels aflame. The marina was soon an inferno. No cause of the fire was available today nor a damage estimate, although it's likely to run into the millions of dollars, officials said. Firefighters began arriving within minutes of the 911 calls, but by then the flames were eating up the boats and the marina. As the fire spread, the marina cover began to sink. The heat from the fire damaged boats at neighbouring marinas, melting the hull of at least one dinghy attached to a vessel moored nearby. City and fire officials reacted quickly, not only fighting the fire itself, but deploying floating booms to prevent debris and oil from spreading. Coast Guard Lt. Cmdr. Rick Rodriguez credited this action with preventing more fire damage and for reducing environmental harm. The Harborview Marina is what's known as a condo marina, in which the slips are bought at prices ranging from \$40,000 to \$100,000, John Platt, president of the marina's owners association, said. It's unlikely, he said, that the marina will be rebuilt as it was. City Administrator Mark Hoppen said environmental regulations designed to protect marine life would make it unlikely that a covered marina, which blocks light, would be permitted.

London, Sep 1 -- A press report, dated today, states: About 50 boats were destroyed by a superheated fire yesterday, the worst Puget Sound marina fire in recent memory. No one was injured in the blaze, which was fueled by gasoline, fiberglass, propane and diesel. Today, a barge carrying a crane will be brought into the marina to lift a metal canopy, which had covered the privately owned slips, from the water's surface. Divers will be sent to determine how much debris is at the bottom of the harbor. As of last night, authorities had given no official cause of the fire nor a damage estimate. Several officials said the fire's cost, including cleanup, will likely be in the millions. All of the destroyed boats were insured.

Seattle, Sep 2 -- Fire first reported at approximately 0715, Pacific time. Gig Harbor is a 'condo' marina, berths are purchased by boat owners. No estimate of damage yet available but 50 pleasure craft involved. Marina is total loss. Cause not yet available. Coast Guard deployed floating booms to prevent debris and pollutants from spreading. First reports indicate that exposure to pollutants was limited to the area of the fire. -- Lloyd's Agents.

#### **PREMISES, BENI SUEF, EGYPT**

Minya, Egypt, Sep 5 -- Twenty-five people were killed and 45 injured in a fire today in a cultural centre in the Egyptian town of Beni Suef, 100 km south of Cairo, police sources said. The fire broke out in the evening but it was too early to say how it started or why the death toll was so high, the sources added. -- Reuters.

London, Sep 6 -- A press report, dated today, states: At least 32 people were killed when fire broke out in a crowded Egyptian theatre apparently sparked by candles used by the performers, the official MENA news agency reported today. The blaze swept through the theatre in the town of Beni Suef south of Cairo late yesterday and many of the victims were believed killed in a stampede as hundreds of panicked theatre-goers tried to escape the flames. Egyptian hospital sources told MENA that some of the bodies were burnt beyond recognition in the fire that took hold at about 2330 hrs (2030, UTC). Twelve of those injured were in serious condition and some had to be evacuated to Cairo for treatment, the agency said. Health Minister Mohammed Awad Tag Eddin told state television that 16 of those injured suffered burns exceeding 60%. The blaze is believed to have been started accidentally by actors carrying lighted candles during the performance. The stage curtains caught fire and the flames quickly spread to other parts of the theatre, fuelled by combustible items that were part of the set's decor, including paper and wood. It provoked panic among the crowd as they attempted to escape the blaze, with many of the victims believed to have been trampled underfoot. There were also deaths due to asphyxiation, said Anas Gaafar, governor of Beni Suef which lies about 150 km south of Cairo. Firefighters eventually brought the blaze under control, officials said.

London, Sep 7 -- A press report, dated Sep 6, states: Survivors of a blaze that killed 32 people in a crowded theatre said today that only one exit was available as the audience stampeded in panic, and authorities were looking into possible fire code violations. Last night's fire was believed to have begun when an actor knocked over a candle, igniting a paper-filled set during a production at the government-run Culture Palace in Beni Suef, about 60 miles south of Cairo. Prosecutors early today inspected the concrete building, which was left a hollowed-out, charred husk. A top official from Egypt's Culture Ministry, which controls the theatre, said local culture authorities had not made sure the theatre's main exit could be opened in an emergency, restricting the escape to a smaller door blocked by debris at the end of the hall where the fire started. Security officials said 32 people were killed. Among them were 14 members of a theatre troupe from nearby Fayoum who were performing and its director, who had designed the set, said Alwy. The fire also injured 60 people, 18 critically, hospital and police officials said. The government requires some fire-safety measures in buildings, including fire extinguishers, but in general the rules are not strictly enforced. Alwy was unsure if the small theatre destroyed in the blaze was equipped with fire extinguishers.

#### **PREMISES, CALGARY, ALBERTA, CANADA**

London, Aug 31 -- A press report, dated today, states: More than 20 families are putting their lives back together after fire tore through their homes early yesterday morning, destroying over 30 townhouses and causing an estimated \$10 million in damage. Officials have no explanation for what caused the firestorm that consumed both sides of a street in the Bayside Pointe subdivision, near 8th Street S.W. and Big Hill Springs Road, but arson investigators were called in. Strong wind was being blamed for whipping the flames across the street from partially constructed condos at the end of the development. The blaze, which started sometime before 0130, ripped through 32 homes, leaving the neighbourhood looking like a war zone. With parked cars and barbecue tanks exploding and the sounds of houses collapsing all around them, residents fled their burning homes to safety. At least a dozen cars were lost. No one was hurt, but a number of pets were thought to have perished in the fire, said firefighters, who were assisted by crews from Calgary and Crossfield and the Municipal District of Rocky View.

#### **PREMISES, TOLEDO, OHIO, UNITED STATES**

London, Sep 8 -- A press report, dated Sep 7, states: Damage could reach \$1 million dollars after a massive fire yesterday afternoon destroyed several buildings on the Toledo's south side. It happened in the 2400 block of Broadway, near Alden Place. No one was seriously hurt, however, nothing but the smell of burnt wood was in the air where those buildings once stood. Toledo Fire Chief Michael Bell says the fire started in a four-family apartment building, and spread to six other buildings on the fire side of the street. The flames could be seen for blocks and the smoke could be seen for miles over south Toledo. Of those buildings, six of the seven either burned down or would need to be torn down, according to Bell. The heat was so intense cars on the other side of the street started to melt. Firefighters fought high winds in addition to the flames. Bell said the wind created a sort of a "blowtorch" that spread the flames and heat toward firefighters, damaging some of the Toledo fire trucks. One firefighter called it "one of the hottest fires" he had ever seen. The American Red Cross is helping the fire victims with clothing, food, and shelter. So, far there's no official cause of the fire. Toledo called for mutual aid from Ottawa Hills, Maumee, and Oregon. Ottawa Hills and Oregon firefighters went to the scene, while Maumee's firefighters filled in at empty Toledo station houses in south Toledo.

#### **WAREHOUSE, BURTON-UPON-TRENT, STAFFORDSHIRE, UNITED KINGDOM**

London, Sep 4 -- A press report, dated Sep 3, states: A large warehouse

in Staffordshire has been badly damaged by fire. The blaze broke out at about 0430 hrs, today at the 100-metre-long B&Q warehouse off Branston Road in Burton-upon-Trent. Much of the roof has been damaged, along with a number of forklift trucks and flat-pack kitchen units inside. At least six crews from across the county tackled the blaze. Fire service area commander Mick Archer said it was brought under control quickly.

#### **WAREHOUSE, LUTON, BEDFORDSHIRE, UNITED KINGDOM**

London, Sep 7 -- A press report, dated Sep 6, states: Fifty firefighters worked throughout Sunday (Sep 4) night and yesterday morning to extinguish a huge blaze in a Luton warehouse containing asbestos. Nearby families were warned to shut windows and doors and stay inside. The building in Camford Way, Sundon Park, was used by coffee packing and distribution company Van Lauren Beverages. Company director Maurice Stimler estimated that the fire cost the firm between £6 million to £7 million. He said: "The building is completely gone. We are looking into all the different options for the future of the company. We are absolutely devastated for the business and for the 35 people who worked here. We hope this will be covered by our insurers." Van Lauren Beverages, which supplies private label coffee to supermarkets across the country, was moved from its London headquarters to the specially-built warehouse in Luton two months ago. Firefighters worked throughout the night fighting the inferno, with the peak of activity at Sunday lunchtime, when 10 fire engines and 50 firefighters were at the scene. Rain overnight helped dampen the fire and smoke plume.

#### **WAREHOUSE, PRESCOTT, ARIZONA, UNITED STATES**

London, Sep 1 -- A press report, dated today, states: A massive blaze yesterday destroyed a Prescott oil company warehouse owned by state Senate President Ken Bennett. One person was injured, but no other information was available. The family-owned oil company has been cleaning up leaks from underground storage tanks under the direction of a state environmental protection programme. Yesterday's blaze didn't help. The warehouse was full of petroleum products, which leaked into nearby Granite Creek and the storm-drain system, fire officials said. Officials from the Environmental Protection Agency visited the site yesterday to assess the cleanup. Battalion Chief Bruce Martinez said. The three-alarm blaze broke out about 0915 hrs, at Bennett Oil Co., a wholesale gasoline distributor in Prescott. The fire temporarily closed nearby streets and forced the evacuation of Yavapai College's Prescott campus. The blaze

may have caused up to \$1 million in damage to the warehouse and its contents, including antifreeze, diesel fuel and unleaded fuel, fire officials said. Prescott Fire Chief Darrell Willis said officials will have a better understanding of the extent of the damage this morning. The blaze broke out as employees were transferring fuel from 55-gallon drums to smaller containers. Static electricity is believed to have ignited some spilled fuel, which set off a series of explosions, Willis said. Oil from the warehouse mixed in with water from the firefighting efforts and flowed down the street into the creek and storm-drain system, fire officials said. Martinez said firefighters put in dikes down one alley and in the creek to help divert some of the oil. About 50 firefighters from the Prescott and Chino Valley Fire Departments and the Central Yavapai Fire District responded to the blaze. It took firefighters about three hours to put it out, Willis said. Willis said firefighters were able to keep the fire from spreading to adjoining buildings, including an office building, a gas station and a deli. However, the blaze did damage the rear portion of the Bennett Oil building and about 10 vehicles. About 100 people were allowed to return to their nearby homes and business at 1300 hrs. Yavapai College officials cancelled classes until 1700 hrs, because of the smoke.

#### **WILDFIRES, PORTUGAL**

London, Sep 5 -- A press report, dated today, states: More than 1,000 firefighters battled flames in northern and central Portugal yesterday as new wildfires continued to flare up following devastating blazes that consumed hundreds of acres of land in the past months. Three firefighters were injured, one seriously, authorities said. So far this year, wildfires fed by high winds and one of the driest summers on record have claimed the lives of 15 people, including 11 firefighters, and destroyed an estimated 600,000 acres of forest and agricultural land, according to the latest government figures. More than 1,000 firefighters, supported by 321 trucks and 36 planes, were fighting eight wildfires in the central and northern districts of Santarem, Leiria, Guarda, Viseu, Braganca and Castelo Branco, firefighters said. Three firefighters were injured yesterday while fighting flames in the Lousa village of the central Coimbra district, firefighters said. Two were treated and released from the nearby Coimbra University hospital, but one who suffered burns on 50% of his body remained hospitalised in intensive care. Another fire, near Batalha county in the district of Leiria, forced traffic to be suspended along a stretch of highway as flames poured onto the road.



#### **5B-DBY**

London, Sep 3 -- A press report, dated Sep 2, states: Two Greek air traffic controllers face disciplinary procedures for allegedly failing to make contact with a Cypriot plane which went on to crash. They should have tried to hail the plane when it entered Greek air space, the Civil Aviation Authority said. But it said the alleged negligence did not directly contribute to the crash. In a statement about the disciplinary procedures, the civil aviation authority said all other personnel involved in handling Helios flight 522 had acted according to regulations.

Athens, Sep 7 -- Alarms heard on a Cyprus passenger plane that crashed near Athens last month confused pilots, who did not realise there was a lack of oxygen in the cabin, the International Herald Tribune reported today. The German captain and his Cypriot co-pilot struggled to communicate effectively in English and misinterpreted the alarms, failing to identify problems with the pressurisation of the plane, the report said, citing sources close to the crash investigation. According to the newspaper, the crew first heard an alarm warning of a failure to pressurise but which they mistakenly thought was indicating a malfunction of their controls. A second alarm related to the air cooling system went off minutes later, prompting the captain to leave his seat to try to turn it off. He quickly lost consciousness due to lack of oxygen, officials told the newspaper. An official involved in the investigation refused to comment on the report. "This is all speculation and until the official results of the inquiry are released they will remain only speculation," the official told Reuters. Pilots of two Greek fighter jets that were escorting the plane until the crash have confirmed the crew was visibly unconscious and the captain was not in his seat minutes before fuel ran out and the aircraft rammed into a hillside. The failure of the plane to pressurise stemmed from maintenance the night before the flight, the report said. The maintenance crew apparently left a pressurisation controller rotary knob out of place and the crew did not catch the mistake during preflight checks the next day, it said. -- Reuters.

London, Sep 8 -- A press report, dated Sep 7, states: Cyprus's Helios Airways denied a report today that the below-par language skills and the inexperience of one pilot contributed to last month's crash of an Athens-bound flight (Boeing 737-31S 5B-DBY) which resulted in the deaths of all 121 people on board. The daily "International Herald Tribune" said

crash investigators believed the pilots' inability to respond to warning signals, inexperience and poor communication skills in technical English, all contributed to the crash. However, asked whether he was confident the pilots were able to understand each other in English, Nicos Anastassiades of Helios replied: "Absolutely." Anastassiades said: "I've spoken to both pilots and their English was of a good standard." Citing sources close to the probe, they said an air system knob, incorrectly set during maintenance, prevented the Boeing from pressurising properly and the crew failed to notice the problem during pre-flight checks. As the aircraft ascended through 3 000 metres, cockpit voice recordings showed that an alarm sounded, which confused the pilots because of its dual purpose. The report said that before takeoff, the alarm warned of improper pre-flight settings. Afterwards, it meant that the cabin was not pressurising, and the pilots did not realise that. The sources said as the oxygen masks deployed while the aircraft continued to climb on autopilot, another alarm sounded, further confusing the pilots. It was at this point that the pilots realised they did not possess any shared language well enough to discuss complex technical problems, according to the report, which described Cyprus co-pilot Pambos Charalambous as young and inexperienced. The sources said for normal flight operations, both had adequate command of English -- the accepted default language for pilots -- but they had difficulty working together to solve the unexpected technical problems they faced. Anastassiades also defended German pilot Hans Jürgen Mertens, 58, saying he was "up to scratch." "The German pilot was very capable. He possessed all the relevant certificates. He was in his second season with us and had more than 17,500 hours flying time." The spokesperson said Helios did not want to speculate on the causes of the crash. According to the IHT report, Mertens left his seat to try to fix the alarm problem, at a time when oxygen was already becoming thin. The report also said the crash of the aircraft -- after a long period in an automatic holding pattern -- came when one of its two engines cut out because fuel was running low.

#### **C-FFNS**

London, Sep 6 -- At 1750 hrs, Aug 28, the float-equipped Aeronca Sedan 15AC (C-FFNS) was landing on the water at Portage Bay (three nautical miles west of Killarney, Ontario). The aircraft hit a large swell and bounced into the air. During the second touchdown the aircraft's right float was damaged and subsequently took on water. The pilot and passenger evacuated the aircraft and were picked up by a nearby boat. The aircraft sank with the engine still operating and was towed to a nearby mooring. There were no injuries.

#### **C-FHSC**

London, Sep 6 -- At 0857 hrs, Sep 1, an instructor and student in a Robinson R22 helicopter (C-FHSC) were practicing engine-off landings from the hover at Victoria International airport, British Columbia. The instructor was unable to prevent a rapid left cyclic input by the student and the helicopter touched down and rolled over. Both pilots escaped without injury, but the helicopter was substantially damaged.

#### **C-GAKD**

London, Sep 6 -- At 1420 hrs, Jul 30, after spraying a field near the London airport, PA-25-235 Pawnee aircraft, registration C-GAKD, was returning to St. Thomas, Ontario. Enroute the engine (Lycoming O-540) lost power. A forced approach was attempted in a hay field. However, the aircraft was unable to clear an adjacent corn field. The aircraft sustained substantial damage as it landed in the corn field. The pilot was not injured. A subsequent inspection of the aircraft fuel system indicated that the engine power loss was due to fuel exhaustion.

#### **CRASH INTO SEA OFF RICHARDS BAY, SOUTH AFRICA**

London, Sep 4 -- A press report, dated Sep 3, states: Two police helicopters from Durban, along with police divers, have been called in to search for a man who went missing after a Portnet helicopter crashed into the sea at the entrance to the Richards Bay Harbour this morning. Police spokesperson Captain Rene van der Westhuizen said the two pilots who were in the helicopter were rescued and taken to hospital with suspected spinal injuries and fractures. "One other person who was in the helicopter is still missing, and it's suspected that he went down with the aircraft. We can't see the helicopter as it sank and the water is about 20-30 feet deep," said Van der Westhuizen. She said it appeared as if the accident occurred at about 1145 hrs when the helicopter tried to drop or pick up one of the pilots from a vessel and its propeller touched the vessel, causing it to crash. Van der Westhuizen said the fire department as well as the private company who had rescued the two pilots were also assisting in the search.

London, Sep 5 -- A press report, dated today, states: The port of Richards Bay was re-opened to shipping yesterday afternoon after being closed for 24 hours following the fatal crash of the marine pilot transfer helicopter at the entrance to the harbour on Saturday (Sep 3) afternoon. Civil aviation authority accident investigators arrived at the port yesterday to start a detailed probe into the cause of the crash, which claimed the life of the helicopter's engineer. The victim's name has not been released yet and harbour authorities have declined to speculate on the cause of the accident, which is also under investigation by the police, the National Ports Authority and the South African

Maritime Safety Authority. Police Captain Rene van der Westhuizen said the helicopter wreckage had been taken to the Ports authority helipad for investigations. The crash occurred while the helicopter was lifting Ashwani Pathak from a vessel. Yesterday the National Sea Rescue Institute spokesperson Harvey Moir said: "The helicopter blades allegedly made contact with the vessel, during this process, causing the helicopter pilot to lose control. The chopper then nose-dived into the sea." He said Pathak was still being winched up when the incident occurred. Helicopter pilot John Basson and Pathak were rescued by divers who were repairing pipelines at the time.

#### **CRASH INTO SEA OFF STRUMBLE POINT, PEMBROKESHIRE, UNITED KINGDOM**

London, Sep 5 -- A press report, dated today, states: A man and woman from south Wales have died after their light aircraft crashed in the Irish Sea on its way to Cardiff airport. The single-engine Piper Cherokee left Dublin at 1215, BST, yesterday. It was last detected on radar off Strumble Head, Pembrokeshire, at about 1330, BST. A body, a pilot's licence and wreckage were found 10 miles north of Strumble Head early today. South Wales Police later confirmed a man and woman from Cowbridge had died. The plane was due to touch down at 1500, BST, yesterday before it disappeared off radar. Milford Haven coastguard has not confirmed whether the body found was that of the plane's pilot or the passenger. Spokesman Roy Thomas said: "They have found wreckage and one body." The search over 500 square miles of water was initially co-ordinated from RAF Kinloss in Scotland, with helicopters, a plane, lifeboats and a warship involved. RAF Rescue Centre spokesman Michael Mulford said weather conditions were "pretty bad" for flying when the plane vanished. "You had everything you don't want - fog, mist, heavy rain and severe turbulence," he said. A Nimrod aircraft from RAF Kinloss, an RAF Sea King rescue helicopter from Chivenor in Devon were involved in the search, alongside an Irish helicopter and a warship. Lifeboats from St Davids and Fishguard in Pembrokeshire were also searching for the plane, which only had enough fuel to stay airborne for four hours. According to a spokesman for Weston Aerodrome, near Dublin, the couple's plane had a normal take-off. He added that the couple had flown in the previous day and stayed the night in Dublin before flying out.

#### **CRASH, BOGOTA AREA, COLOMBIA**

London, Sep 1 -- A press report, dated today, states: A small twin-engine aircraft crashed shortly after take-off from the Colombian capital Bogota today, killing at least eight people, aviation officials said. The aircraft, which was heading from

Bogota's private Guaymaral airstrip for the central town of Puerto Berrio, apparently suffered mechanical problems, said Fernando Sanclemente, director of Colombia's Civil Aviation agency.

#### **CRASH, BUNG HATTA NATIONAL PARK, SUMATRA, INDONESIA**

See "Indonesia" under "Weather & Navigation."

#### **CRASH, ISIRO AIRPORT AREA, DEMOCRATIC REPUBLIC OF CONGO**

London, Sep 5 -- A press report, dated today, states: Seven people were killed today when an Antonov 26 aircraft crashed near Isiro airport in the east of the Democratic Republic of Congo (DRC), the United Nations-backed Okapi radio said. Those who died were four crew members and three passengers on the cargo plane, which belongs to the private DRC airline Galaxie, the radio report said. The Antonov crashed for as yet unknown reasons about 1,500m short of the runway where it had been coming in to land at Isiro in Orientale Province, the report said.

#### **CRASH, KAPIT, SARAWAK, MALAYSIA**

London, Sep 6 -- A press report, dated Sep 5, states: The crash involving a helicopter used for aerial logging in the interior of Kapit on Saturday (Sep 3) was probably caused by engine failure. Kapit police chief Deputy Superintendent Johar Ahmad said an employee of logging company Caiman Venture saw the Russian-made Kamov-32 helicopter plunging to the ground before it exploded. The weather was fine at the time. Johar said it was believed that when the aircraft developed engine trouble, the pilot tried to land at a helipad which was only six minutes from the crash site but failed. The crash claimed the lives of the helicopter's three Russian crew members -- pilot Anatoli Seleznev, 49, co-pilot Andrei Gritsenko, 26, and flight engineer Istomin Alexey, 38. Meanwhile, the bodies of the three Russians were flown from Caiman Venture logging camp to Sibu Hospital for post-mortem this afternoon. The remains had been placed at the camp after they were removed from the wreckage. The helicopter crashed at Nanga Ga'at, Baleh, at 1450 hrs.

#### **CRASH, OTTERY ST. MARY, DEVON, UNITED KINGDOM**

London, Sep 5 -- A press report, dated Sep 4, states: A mother and son had a lucky escape when their helicopter crashed in east Devon. The pilot's mother, in her 60s, was taken to hospital with suspected back injuries after the accident in a field at Putts Corner near Ottery St Mary. The pair were on a pleasure flight from Dunkswell, but on their return the pilot reported a loss of power. He landed in a field and the helicopter rolled over. The cause of the crash today is not known.

#### **CRASH, PETTIS COUNTY, MISSOURI, UNITED STATES**

See N37855.

#### **EMERGENCY LANDING, BORDEAUX, FRANCE**

London, Sep 1 -- A press report, dated today, states: More than 150 Scots holidaymakers were caught up in a terrifying mid-air scare today. Their flight to Spain was forced to make an emergency landing in France after a warning light indicated problems with air pressure. Panic spread as passengers were told to put on oxygen masks. But the aircraft landed safely after an anxious 60 minutes. The flyglobespan flight had left Glasgow Airport at 0600, bound for Alicante. About an hour into the flight, a red warning light started flashing in the cockpit. Fearing problems with the air pressure, the captain initiated emergency procedures and decided to land at the nearest airport. The Boeing 737-400 touched down safely in Bordeaux around an hour later. There, the aircraft was quickly evacuated and shocked passengers were ushered inside the terminal building where they contacted anxious relatives to inform them of the situation. They were stuck there for several hours until a back-up aircraft arrived. They were finally expected in Alicante late this afternoon, having been scheduled to arrive at 1010. A spokesman for flyglobespan said: "This was a standard emergency procedure and the captain reacted correctly. "If a warning light comes on, the captain has got to react as safety is a priority. "He made an emergency landing as a precaution. "The red warning light indicated there was a drop in pressure but there wasn't. It went on by mistake and now we will be investigating to find out why it came on." The aircraft has been taken out of service until a full investigation is carried out.

#### **EMERGENCY LANDING, NARITA, JAPAN**

London, Sep 4 -- A press report, dated Sep 3, states: A China-bound jet of the trouble-plagued Japan Airlines (JAL) returned to Narita Airport this morning after the rotating meter of one of its two engines malfunctioned, airline officials said. None of the 115 passengers or crewmembers of JAL Flight 603 bound for Kuangchou was injured in the incident. JAL officials said mechanics are investigating the cause of the trouble, adding that there was no problem with the engine itself. At around 1030 hrs, the pilots of a JAL Boeing 767 twin-engine aircraft on Flight 603 noticed the rotating meter of its left engine was not functioning properly shortly after taking off from Narita Airport. The aircraft made an emergency landing at Narita. The passengers are expected to take another flight to Kuangchou.

#### **EMERGENCY LANDING, NEW ULM, MINNESOTA AIRPORT, UNITED STATES**

See N505NR.

#### **EMERGENCY LANDING, PALEMBANG, INDONESIA**

London, Sep 8 -- A press report, dated today, states: A Batavia Air Boeing 737-200 plane flying from Jakarta to Medan made an emergency landing at Sultan Mahmud Badaruddin II Airport in Palembang today due to engine trouble. The plane was carrying 80 passengers.

#### **EMERGENCY LANDING, PANTELLERIA ISLAND, ITALY**

London, Sep 4 -- A press report, dated Sep 3, states: A passenger plane with an engine problem made an emergency landing on the Italian island of Pantelleria this evening, with all 27 passengers and crew aboard unhurt, Italy's civil aviation agency said. The ATR-42-320 plane took off from Trapani, in western Sicily, and was flying south to Pantelleria, when the pilot reported a problem with an engine shortly after 1900 hrs (1700, UTC), said Loredana Rosati, spokeswoman for the civil aviation agency. The plane made a "normal" landing after airport officials activated emergency landing procedures, giving the plane precedence to land and alerting emergency personnel, said Rosati.

#### **EMERGENCY LANDING, PEKANBARU AIRPORT, INDONESIA**

London, Sep 6 -- A press report, dated today, states: A Boeing 737-400 belonging to Indonesian flag carrier Garuda Indonesia made an emergency landing on the Sumatra province of Riau this morning due to engine failure. "The pilot told us one of the engines shut off. He asked all passengers to remain calm as he managed to control the situation," Azwar Anaz, a legislator aboard the plane, was quoted as saying by the Detikcom online news service shortly after the incident. The plane carried 82 passengers, including Minister of Social Affairs Bachtiar Chamsyah and five legislators. The engine problems came 40 minutes after departing from the Polonia Airport in Medan. Passengers said they heard small explosion before Captain Soni Bagus announced the engine failure on the right wing. The plane was en route to Jakarta. "The pilot decided to make an emergency landing at the nearest airport," Anaz said. The plane landed safely on the Pekanbaru airport in the provincial capital of Pekanbaru.

#### **N2012B**

London, Sep 4 -- A press report, dated Sep 3, states: A single-engine plane carrying three passengers crashed at the Beaufort County Airport on Lady's Island yesterday morning, but officials said no one was seriously injured in the crash, which involved a landing gear malfunction. Three passengers were transported to Beaufort Memorial Hospital with minor injuries, said Tom Olson, director of airports for Beaufort County. The plane, a Beechcraft Sierra, suffered substantial damage

from the crash, but did not catch on fire, Olson said. The crash happened at about 1145 hrs, and the runway was closed for about an hour, he said. Investigators with the Federal Aviation Administration were on the scene yesterday assessing the accident, Olson said.

London, Sep 7 -- Beechcraft Sierra 200 N2012B crashed near Beaufort, South Carolina, at 1517, Sep 2. The aircraft sustained minor damage. The three persons on board suffered minor injuries.

#### **N216RN**

London, Sep 8 -- A press report, dated Sep 7, states: Officials say one body has been recovered and a search for a second is under way following the crash of a small plane off Santa Catalina Island. F-A-A spokesman Donn Walker says the Cessna 172 was heading from Redlands in San Bernardino County to the island about 80 miles away when it crashed shortly before 1230 hrs. The victims' identities were not released and the plane's wreckage has not yet been found. The cause of the crash was not immediately clear. The F-A-A and National Transportation Safety Board will investigate.

London, Sep 1 -- Robin R 2160 N216RN crashed into the Pacific Ocean north of Catalina Island Isthmus, California, at 2100, Aug 31, while on a local flight from Long Beach, CA. The aircraft was destroyed. One of the two persons on board was killed and the other was seriously injured.

#### **N30491**

London, Sep 3 -- A press report, dated Sep 2, states: A small plane crashed into a post office building near Teterboro Airport late today, killing the pilot and injuring a passenger, authorities said. The single-engine Cessna struck the South Hackensack Post Office building as the plane was trying to land, said Steve Coleman, a spokesman for the Port Authority of New York & New Jersey, which operates the airport. The plane ended up crumpled nose-first against a brick wall near a loading dock. There was no immediate word on the extent of the passenger's injuries. The Cessna was diverted to Teterboro after the pilot reported an engine problem, FAA spokeswoman Arlene Murray said. She said the FAA and the National Transportation Safety Board are investigating the crash. The crash site is about a half-mile from Teterboro Airport, one of the nation's busiest small airports.

London, Sep 7 -- Cessna 177A N30491 crashed near Teterboro Airport, New Jersey, at 0122, Sep 3, while on a flight from Caldwell, NJ, to Teterboro. The aircraft was destroyed. One of the two persons on board was killed and the other was seriously injured.

#### **N330CC**

Baton Rouge, Sep 5 -- A civilian helicopter that was not involved in rescue operations crashed in New

Orleans today and the two people on board were slightly injured, a state official said. The helicopter crashed in the area of the Danziger Bridge, said Mark Smith, spokesman for the Louisiana Office of Homeland Security and Emergency Preparedness. "The helicopter came down hard and rolled over on its side and broke its blades off and broke its tail off," Smith said. "There were two civilians on the helicopter. Both sustained cuts and scrapes," he said. It was not known why the helicopter was in the area, Smith said. -- Reuters.

London, Sep 7 -- Eurocopter SA 330J N330CC crashed in New Orleans, Louisiana, at 0020, Sep 4. The aircraft sustained substantial damage. The two persons on board were not injured.

#### **N37855**

London, Sep 1 -- Porterfield FP-65 N37855 crashed near Smithton, Missouri, at 0052, Sep 1. The aircraft sustained substantial damage. The one person on board was killed.

#### **N424AA**

London, Sept 7 -- American Airlines McDonnell Douglas MD-82 N424AA, flight AAL488, taxied to the gate at Lester B.Pearson International Airport, Toronto, terminal 3 and the engines were shutdown in preparation for deplaning. The ground marshallers advised that the aircraft was not positioned correctly on the gate and arranged for the aircraft to be towed ahead. During the tow, the aircraft's starboard wing struck a fuel truck that was positioned in preparation for refuelling at 1717, EDT, Sept 4. The aircraft's starboard wing sustained substantial damage. As a result of a small fuel spill, two emergency chutes were deployed on the port side of the aircraft to deplane the passengers. There were no reported injuries. Maintenance replaced starboard No.4 slat. The aircraft is being ferried to Tulsa, Oklahoma, for further evaluation and disposition.

#### **N505NR**

London, Sep 1 -- Cessna 182R (Skylane) N505NR crashed on take-off from New Ulm Airport, Minnesota, at 1503, Aug 31, while on a flight from New Ulm to Minneapolis, MN. The aircraft sustained substantial damage. The two persons on board were not injured.

#### **N667JM**

London, Sep 7 -- Bell 206B JetRanger N667JM crashed near Long Beach, California, at 2030, Sep 5, while on a local flight from Long Beach. The aircraft sustained substantial damage. The one person on board was seriously injured.

#### **N821AA**

London, Sep 2 -- Dassault Falcon 20 N821AA crashed on take-off from Elyria, Ohio, at 0007, Sep 2, while on a flight to St. Louis, Missouri. The aircraft sustained substantial damage. The one person on board was not injured.

#### **N9083G**

London, Sep 7 -- Cessna 188 (AG Wagon) N9083G crashed near Blytheville, Arkansas, at 1740, Sep 5. The aircraft was destroyed. The one person on board was killed.

#### **PK-RIM**

Jakarta, Sep 5 -- An Indonesian Boeing 737 operated by local carrier Mandala Airlines, with more than 100 people on board, crashed in a populated area near the Sumateran city of Medan today, Metro TV reported. A government spokesman in Medan said the incident occurred as the aircraft was taking off from the city's airport but he had no further details. It was heading to Jakarta, Metro TV said. -- Reuters.

London, Sep 5 -- A press report, dated today, states: An Indonesian jetliner crashed into a crowded residential neighbourhood in the city of Medan shortly after takeoff today, killing all 117 on board and an unknown number on the ground, officials said. The Mandala Airlines Boeing 737 was heading to Jakarta when it crashed one minute after takeoff and burst into flames, said Transport Minister Hatta Radjasa. It was carrying at least 117 passengers and crew, said the airline's acting president, Maj. Gen. Hasril Hamzah Tanjung. "They have all died," Edi Sofyan, a government spokesman in Medan said. There were also casualties on the ground, he said, though he did not know how many. Smoke billowed from the burning debris and dozens of houses and at least 10 cars were in flames or damaged. Hundreds of policemen, paramedics and residents were trying to evacuate victims. Syahrial Anas, a doctor overseeing the removal of charred bodies, said flames were hampering their efforts. Officials said one of the dead included the governor of North Sumatra province, who was heading to the capital for a meeting with the president. Mandala Airlines is a Jakarta-based domestic carrier founded in 1969 by a military-run foundation. Its 15-plane fleet consists mainly of 1970s-vintage Boeing 737-200 jets. In recent years, the financially troubled airline has been forced to cut services and fares to remain competitive. Tanjung said an investigation was being carried out into the cause of the crash. The aircraft was nearly 25 years old, he said, and received its last comprehensive service in June. It had flown more than 50,000 hours and was due to be retired in 2016.

London, Sep 5 -- Boeing 737-200 PK-RIM, operated by Mandala Airlines, crashed near Medan Sep 9 following take-off from Medan for a flight to Jakarta.

Medan, Sep 5 -- A Boeing 737-200 (PK-RIM) crashed in a residential area of Indonesia's third biggest city just after take-off today, killing more than 100 people on board as well as 30 bystanders in an inferno on the ground. A spokesman for local carrier Mandala Airlines said several

passengers had survived the crash in Medan, contradicting the city's top rescue official who said all 117 on board died. The official Antara news agency put the number of survivors at six. The aircraft was carrying 112 passengers and five crew. "I could not believe it. After taking off, the plane really shook and then suddenly it plummeted to a main road on top of the cars below," passenger Freddy Ismail told El Shinta radio station from hospital. His name was on the passenger manifest. Mandala's director Asril Tanjung said the cause of the crash was being investigated, but added foul play was highly unlikely. Zainul Kahar, head of operations at Medan's search and rescue agency, said 30 people on the ground were also killed. The aircraft slammed into the heart of a major residential area in the capital of North Sumatra province, breaking into pieces, setting fire to homes, cars and motorbikes, and sparking widespread panic, witnesses said. "I arrived around 10 minutes after the accident. Burning bodies were everywhere," one local reporter said from the scene. "Around 10 houses were burnt, along with five to six minibuses. The plane was torn into pieces, we could only see the tail." Among those on board the flight were the North Sumatra governor and his predecessor. Fierce flames licked at the wreckage as it lay on one of Medan's main roads before fire crews were able to extinguish the blazes. Plumes of thick black smoke rose into the air. Kahar said some 20 homes were damaged by fire. Mandala's Tanjung said the aircraft had been made in 1981 and was fit for eight more years of flying. It was not raining when the aircraft took off, witnesses said. "Temporarily, we are saying the cause is from take-off failure but we don't know yet whether it was from engine trouble, human error or weather," Tanjung said. The aircraft came down 500 metres from the runway in Medan, Transport Minister Hatta Radjasa told El Shinta radio station. It was en route to Jakarta. A few hours after the crash, heavy rain began to fall, hindering recovery efforts. -- Reuters.

Medan, Indonesia, Sep 5 -- A Mandala Airlines Boeing 737-200 (PK-RIM) crashed in a busy residential area of Indonesia's third biggest city just after take-off today, killing 102 people on board and 47 local residents in an inferno on the ground. Officials said 15 passengers in the tail section of the aircraft survived the crash in Medan, capital of North Sumatra. The Boeing was carrying 112 passengers and five crew on a flight to Jakarta. Transport Minister Hatta Radjasa said in Medan that the number of passengers and crew killed totalled 102, although he gave no breakdown. Officials earlier said 104 people on board had died. The death toll on the ground was 47, he added. Mandala director Asril Tanjung said the cause of the crash was being investigated but added foul play was

highly unlikely. The aircraft crashed on a road in the heart of a residential area, breaking apart, setting fire to homes, cars and motorbikes. Officials said some 20 homes were damaged by fire. -- Reuters.

London, Sep 6 -- A press report, dated today, states: Investigators began a probe into the cause of the crash of Mandala Airlines Boeing 737-200 (PK-RIM) yesterday that killed at least 149 people, including dozens on the ground who lived in a crowded neighborhood in the city of Medan, officials said. Human error and mechanical failure are among the possibilities being explored in the crash, said Setio Rahardjo, chairman of the National Transportation Safety Committee. Rahardjo said that the aircraft's black box recorder had been recovered and that investigators hoped it would yield clues. The jet, which was built in 1981 and underwent comprehensive maintenance in June, hit the ground nose first shortly after take-off, officials said. It was bound for Jakarta with a full load of 112 passengers and five crew members.

Jakarta, Sep 7 -- A preliminary investigation into the crash of Mandala Airlines Boeing 737-200 (PK-RIM), which killed 149 people, has found a problem with one of the aircraft's engines, a transport safety official said. "During our preliminary investigation we have found a fuel problem on the engine," said Setyo Rahardjo, head of the National Transport Safety Committee. A Boeing 737-200s has two engines but Rahardjo did not say which was at fault and stressed the findings were preliminary. -- Reuters.

London, Sep 8 -- A press report, dated today, states: A mass burial was held yesterday for unidentified victims of the crashed Mandala Airlines Boeing 737-200 (PK-RIM). Investigators sifted through the charred wreckage of the aircraft, trying to determine why it slammed into a crowded street in Indonesia's third-largest city Medan on Monday (Sep 5), creating a path of destruction as it crashed into houses and pedestrians. Transport Minister Hatta Radjasa said it would be several weeks before the cause of the crash was known but a preliminary investigation found a problem with one of the aircraft's engines. Survivors said the Boeing shook violently after lifting off the runway and veered left before crashing to the ground. Some described a loud bang while the aircraft was still in flight but officials were quick to rule out terrorism. The dead included 101 passengers and crew and 47 residents on the ground. Sixteen people on board the flight survived. Hundreds of family members gathered at the Adam Malik Hospital morgue, looking for loved ones among a long row of charred bodies. Remains not identified by early yesterday would be buried next to another mass grave for victims of a Garuda Indonesia aircraft crash that killed more than 200 people in 1997, hospital

assistant director Dr Suprato said. By late Tuesday (Sep 6), 40 corpses had yet to be claimed.

#### TS-LBB

London, Sep 8 -- A press report, dated Sep 7, states: Italy's Civil Aviation Authority today suspended a Tunisian airline from operating in Italy after an investigation found that one of its aircraft went down off Sicily last month because the wrong type of fuel gauge had been installed. The Tuninter ATR-72 (TS-LBB) hit the water near Palermo on Aug 6, killing 16 people, after the aircraft ran out of fuel because the gauge was the wrong model and did not show that the tanks were nearly empty, according to ANSV, the Italian national agency for flight safety. The Civil Aviation Authority ENAC acted on the agency's recommendation. "It's not a hypothesis" that the fuel ran out, agency spokesman Cmdr. Aldalberto Pellegrino said. "It's a fact." The Tuninter charter, carrying 39 people, was flying from the Adriatic port of Bari to the Tunisian resort of Djerba. Twenty-three people, including the pilot, survived, and some of the passengers recounted how they heard one engine die, and then the other, before the small propeller aircraft went down. An ANSV investigation found that the fuel gauge installed in Tunisia on Aug 5 was actually designed for a smaller ATR-42 aircraft and could not read the larger aircraft's fuel load correctly, Pellegrino said. "It was indicating more fuel than there was in the tanks," he said. The pilot believed there were 1,984 pounds of fuel for each engine "when in fact there was none," Pellegrino said. Tuninter said it was studying the investigation's conclusions and had no immediate reaction. Prosecutors in Palermo investigating the accident had previously said the aircraft's fuel tanks, which were recovered, were still well-stocked. However, Pellegrino said the tanks contained no fuel, only seawater. Separate tests on fuel from a tanker that restocked the aircraft before it took off from southern Italy did not contain impurities that could have caused the accident, Pellegrino said. "The fuel was clean, but unfortunately there was too little of it," he said. ENAC said it was suspending authorisation for Tuninter to operate in Italy immediately and it asked the European Aviation Safety Agency to carry out urgent checks on procedures for the installation of fuel gauges on all ATR-42 and ATR-72 aircraft.

## Product Recalls



#### BICYCLE HELMETS, UNITED STATES

Washington, DC, Aug 31 -- The U.S. Consumer Product Safety Commission,

in co-operation with Target, of Minneapolis, Minn, today announced a voluntary recall of about 494,000 Back Trails Jr. Toddler, Youth and Child Bicycle Helmets. Consumers should stop using recalled products immediately unless otherwise instructed. Manufacturer UNA International Limited, of China. Distributor Dynacraft BSC Inc., of San Rafael, Calif. Some of these helmets do not meet CPSC safety standards for bicycle helmets, which poses a risk of riders suffering head injuries. No incidents/injuries reported. The recall includes Target's "Back Trails Jr." brand toddler, youth and child bicycle helmets sold in various colors. They were manufactured after January 1, 2004. Helmet model numbers: 89888 or 88003 (toddler), 89951 or 88001 (girl's 8-vent youth), 89952 or 88002 (boy's 8-vent youth), or 89917 (14-vent child's) appear on a white label inside the helmets, along with date of manufacture (YYYY/MM/DD) and the words "Made in China." Target product identification numbers: 082-01-0520 (toddler), 082-01-0149 (girl's 8-vent youth), 082-01-0189 (boy's 8-vent youth), and 082-01-0334 (14-vent child's) and the brand name "back trails jr." appear on the product packaging. Sold at Target stores nation-wide from April 2004 through July 2005 for about \$13. Consumers should take the helmets away from children and return them to the nearest Target Store for a gift card in the amount of a full refund. -- U.S. Consumer Product Safety Commission.

#### **BMX BICYCLES, UNITED STATES**

London, Sep 5 -- A press report, dated Sep 2, states: The U.S. Consumer Product Safety Commission, in co-operation with World Wide Cycle Supply Inc., of Islandia, N.Y., today announced a voluntary recall of approximately 25,000 Harley-Davidson 16-inch BMX Bicycles. The fork that holds the front wheel can separate at the weld, causing the rider to fall and suffer injuries. World Wide Cycle Supply Inc. has received 15 reports of fork welds breaking on these bicycles. There have been reports of six riders suffering injuries including injuries to the face, hands and mouth such as bruises, lacerations and lost teeth. The bicycle has a yellow and red painted flame pattern with a yellow fork and a sticker containing the words "Harley-Davidson" on the fork leg. Only bicycles with the specific serial numbers are being recalled. The bicycles were sold at Toys "R" Us stores nation-wide from July 2002 through June 2005 for about \$80.

#### **FOOD PROCESSORS, UNITED STATES**

London, Sep 7 -- A press report, dated Sep 6, states: The U.S. Consumer Product Safety Commission (CPSC), in co-operation with Ultimate Chopper LLC, of Los Angeles, Calif.,

today announced a voluntary recall of approximately 1.5 million Ultimate Chopper food processors. The interlocking lid assembly on the appliance can malfunction, allowing the food processor to be operated when the lid is off. This can result in a laceration or finger tip amputation hazard if consumers insert their hands into the food processor. CPSC and Ultimate Chopper LLC have received 17 reports of injuries resulting from a failure of the interlocking lid assembly or the blade assembly breaking. Five of those injured required stitches or surgery, and the remaining 12 consumers received cuts or scratches. manufactured in China, the Ultimate Chopper has been marketed and distributed through television infomercial sales, the firm's website, and various retailers nationwide from March 2002 through to July 2005 for about \$40.

#### **FORD MOTOR VEHICLES, UNITED STATES**

London, Sep 8 -- A press report, dated Sep 7, states: Ford Motor Co. announced the fifth-largest vehicle recall in U.S. history today to fix a faulty wiring problem blamed for more than 1,100 engine fires in some of the nation's most popular trucks and SUVs. The Dearborn automaker said 3.8 million vehicles are involved in the voluntary recall including 1994-2002 Ford F-150s, 1997-2002 Ford Expeditions, 1998-2002 Lincoln Navigators and 1994-1996 Ford Broncos equipped with factory-installed cruise control. Ford said the problem was caused by brake fluid leaking into and corroding the electrical components of the cruise-control system. In rare cases, the corroded components can cause overheating that may lead to a fire at the switch. Ford dealerships will install a fused wiring harness that should work as a circuit breaker and eliminate the problem. News outlets have reported that at least three deaths are related to the cruise control problem. In June, for example, CNN reported that an Iowa man filed a lawsuit against Ford after his wife died in a fire allegedly caused by their F-150 pickup. Officials at Ford say there is no evidence of a link between the cruise-control system problem and any fatalities. Ford officials didn't give a timetable on how long it would take to repair the nearly four million vehicles being recalled.

#### **GENERAL MOTORS VEHICLES, UNITED STATES**

London, Sep 7 -- General Motors Corp has issued a US recall for 804,000 of its Chevrolet and GMC branded vehicles. The recall is due to complaints referring to a problem caused by corrosion from road salt gets in between the casing surface and the sensor of the manufacturer's ABS system. The problem is reported to lead to false readings, causing the anti-lock brakes to activate at the wrong speeds, alarming drivers and making stopping difficult.

#### **GROUT SEALER, UNITED STATES**

Washington, DC, Aug 31 -- The U.S. Consumer Product Safety Commission, in co-operation with Tile Perfect, a division of Roanoke Companies Group Inc., of Aurora, Ill., today announced a voluntary recall of about 300,000 cans of Stand-On Seal "Spray-On" Grout Sealer sold in 2005. Consumers should stop using recalled products immediately unless otherwise instructed. The product's odor is not chemically pungent enough to force consumers to minimize their exposure to the fumes. Consumers overexposed to these fumes can experience respiratory-related illness. There have been 88 reports from consumers who have had adverse reactions after using the aerosol product, including 28 confirmed reports of overexposure resulting in respiratory symptoms for which medical attention was sought for coughing, irritation, difficulty breathing, dizziness and disorientation. Thirteen individuals required medical treatment including overnight hospitalisation. The product is marketed under the brand name of Tile Perfect Stand'n Seal "Spray-On" Grout Sealer. The date/lot codes are printed on the bottom of the can. All cans with date/lot codes starting with the following six digits are included in the recall: A20985; A30985; A10995; A20995; A30995; A11015; A21015; A31015; A11025; A21445; A31445; A11455; A21455; A31455; A11465; A21465. Units with other date/lot codes have been reformulated and are not subject to this recall. Sold exclusively at Home Depot Stores from April 2005 through June 2005 for about \$10. Manufactured in the United States. Consumers should not use the aerosol product and return it to the Home Depot for a full refund. -- Consumer Product Safety Commission.

#### **TOYOTA MOTOR VEHICLES**

London, Sep 8 -- A press report, dated today, states: Toyota Motor Co. yesterday announced a recall of nearly one million trucks to repair a steering-related problem that could cause drivers to lose control of the vehicles. The recall involved 978,000 1989-1996 4Runner SUVs and small T-100 pickups. It was the Japanese automaker's second-largest U.S. recall ever.

#### **Port Conditions**



#### **AUSTRALIA**

Sydney, Sep 7 -- The Queensland Nickel Yabulu Refinery has experienced a breakdown, resulting in a queue of five fully laden vessels off the port of Townsville. Demurrage costs are estimated to be about A\$32,000 a day. BHP Billiton, part owners of the refinery, said the vessels had been waiting to dock for five days and the last vessel in the queue is not

expected to unload for at least another 10 days. The first of the vessels, bulk Iris Halo, was expected to arrive in port last night for unloading and is not scheduled to sail until late tomorrow. The Townsville Bulletin reports that the last vessel is not expected to be unloaded until next week. The unloader or tippler broke down but has now been repaired. The refinery processes ore from third party mines in New Caledonia, Indonesia and the Philippines. Its production capacity is about 32,000 tonnes a year. -- "Lloyd's List Daily Commercial News."

London, Sept 7 -- A press report, dated today, states: A breakdown at the QNI Yabulu Refinery has left five fully-laden nickel ships laying at anchor off Townsville, some for five days. Industry sources said each of the ships would be chartered at a cost of about \$32,000 a day. They said the total cost of the delay would be more than \$1.3 million. The last ship in the queue is not expected to

unload for at least another 10 days. The first of the vessels, bulk Iris Halo, was expected to arrive in port last night for unloading and is not scheduled to sail until late tomorrow. A spokesman from shipping agent P & O Nedlloyd Ltd said the ships could only be unloaded one at a time. He said each vessel took 2 1/2 days to unload its cargo of nickel ore. One vessel, bulk Magnetic Isle is expected to take longer to unload because of its size. Industry sources said the last vessel would not be unloaded until late next week at the earliest. A spokeswoman from the BHP-Billiton refinery said the delay was caused by a breakdown in the machinery used to unload ore from rail wagons at the refinery. The ore is railed to Yabulu after being unloaded from ships at the port. The unloading mechanism used to tip the wagons over in order to empty the ore out is called a 'tippler'. Its operation is critical to the continued supply of nickel ore to the refinery. The spokeswoman said

the breakdown had been repaired and that wagons could now be unloaded. She said the plant continued to process ore from stockpiles while the rail wagon unloading system was under repair. It is understood there is still a large stockpile of ore on QNI land at the port waiting to be railed to the refinery.

**ITALY**

Genoa, Aug 29 -- Port situation Aug 29: Genoa: One bulk carrier waiting for berth. Average number of days delay in berthing 24-48 hrs. La Spezia: No vessels waiting for berth. Savona: No vessels waiting for berth. -- Lloyd's Agents.

**SYRIA**

Lattakia, Aug 20 -- Waiting time presently 24 hours at Lattakia and five days at Tartous. -- Lloyd's Agents.

Lattakia, Aug 27 -- Waiting time presently 24 hours at Lattakia and four days at Tartous. -- Lloyd's Agents.



**Port Delays**

(Information received from BIMCO, Denmark and Indian Ports Association, New Delhi)

Country/Port	Date of report	No. of vessels waiting and/or days delay
<b>Australia</b>		
Abbot Point	05-Sep-2005	Coal: 1 vessel berthed and loading, 1 anchored; 15 vessels due by 2/10; up to 4 days berthing delay expected.
Brisbane	05-Sep-2005	Coal: Fisherman Island coal berth: 4 vessels due by 14/9; up to 1 day's delay expected due to berth congestion and cargo availability
Dalrymple Bay	05-Sep-2005	Coal: 1 vessels berthed and loading, 13 anchored; 47 vessels due by 28/9; 5-25 days berthing delay subject to cargo availability and berth congestion; waiting times vary greatly due to different stem supply issues.
Dampier	05-Sep-2005	Iron ore: Parker Point: 1 vessel berthed and loading, 3 anchored; 6 vessels due by 15/9; up to 6 days berthing delay expected; shippers cannot guarantee that vessel will be able to load up to max. sailing draft available; Parker Point 2: 1 vessel due 7/9; 3 days berthing delay expected; shippers cannot guarantee that vessel will be able to load up to max. sailing draft available; East Intercourse Island: 1 vessel berthed and loading, 1 anchored; 10 vessels due by 21/9; up to 12 days berthing delay expected; maintenance shutdowns ca. 8/9 and 19/9; a shift to a lay-by berth for loaded vessels is always a possibility; shippers cannot guarantee that vessel will be able to load up to max. sailing draft available.
Gladstone	05-Sep-2005	Coal: R.G. Tanna coal terminal: 2 vessels berthed and loading, 1 waiting at berth, 4 off port; 21 vessels due by 26/9; up to 3 days berthing delay expected subject to port congestion and cargo availability; Barney Point: 5 vessels due by 22/9; up to 3 days delay expected due to port congestion and cargo availability; the stacker will be unavailable due to repairs from 06.00-18.00 hrs. 15/9.
Hay Point	05-Sep-2005	Coal: 2 vessels berthed and loading; 12 vessels due by 16/9; up to 3 days berthing delay expected; vessels berthing in order of cargo availability.
Newcastle	05-Sep-2005	Coal: Kooragang 4, 5 and 6: 2 vessel berthed and loading; 65 vessels due by 30/9; Dykes 4+5: 2 vessels loading; 22 vessels due by 30/9; 2 unallocated vessels due by 25/9; 4-7 days delay expected prior to berthing due to planned maintenance at Kooragang terminal, coal product problems with some shippers berthed congestion and cargo receipt.
Port Hedland	05-Sep-2005	Iron ore: BHP Iron Ore Pty. Ltd., Mt. Newman (Nelson Point), "A" berth: 1 vessel berthed and loading, 5 anchored; 7 vessels due by 14/9; up to 6 days delay expected due to berth congestion and cargo availability; "B" berth: 1 vessel berthed and loading, 3 vessels anchored; 7 vessels due by 14/9; up to 5 days berthing delay expected due to berth congestion and cargo availability; BHP Iron Ore Pty. Ltd., Goldsworthy (Finucane Island) "C" berth: 2 vessels due by 11/9; up to 1 day's delay expected due to berth congestion and cargo availability; "D" berth: 1 vessel berthed and loading; 4 vessels due by 11/9; up to 2 days delay expected due to berth congestion and cargo availability.
Port Kembla	05-Sep-2005	Coal: 10 vessels due by 22/9; up to 1 day's berthing delay expected due to port congestion; CB-1: 2 vessels due by 25/9; no delays expected
Port Walcott	05-Sep-2005	Iron ore: 2 vessels berthed and loading, 5 anchored; 11 vessels due by 22/9; no delays expected; Line-up expected to change at short notice. Cargo grade shortages and stockpile problems may result in vessels berthing out of turn.
<b>Azerbaijan</b>		
Apshehon	05-Sep-2005	Oil products: Dubendi terminal: 1 vessel berthed, completed discharging crude oil.
Baku	05-Sep-2005	Oil products: Bay of Baku: no vessels; Azernefttyag terminal: no vessels; Azer Trans terminal - Nobel avenue: 1 vessel berthed, discharging crude oil; 1 vessel due to discharge crude oil; Sangachal district: 2 vessels due by 5/9, both to discharge crude oil; Transserve terminal: closed.
<b>Brazil</b>		
Paranagua	06-Sep-2005	Fifteen vessels berthed of which 2 container dischargers, 4 fertiliser dischargers, 3 pellets loaders, 1 soya loader, 2 reefer loaders, 1 sugar loader, 2 other loaders/dischargers; 29 vessels waiting in roads, of which 14 to load (3 reefers, 3 sugar, 4 pellets, 1 soya, 3 other loaders), 15 to discharge (13 fertiliser, 2 containers); 30 vessels due over the next 7 days.
Rio Grande	06-Sep-2005	Five vessels berthed of which 2 salt loaders/dsichargers, 1 urea discharger, 1 potassium chloride discharger, 1 soya meal loader; 5 vessels waiting in roads; 33 vessels due over the next 10 days.
Santos	06-Sep-2005	Eighteen vessels berthed of which 7 sugar loaders, 1 bulk soya loader, 1 fertiliser discharger, 3 chemical products dischargers, 1 bulk juice loader, 1 wheat discharger, 1 Ro/Ro loader/discharger, 1 other loader/discharger, 2 full container loaders/dischargers; 35 vessels waiting in roads; 28 vessels due over the next 7 days;
Sao Sebastiao	06-Sep-2005	Six vessels berthed, 2 waiting in roads; 7 vessels due over the next 10 days.

**Port Conditions**

**Chile**

Antofagasta	06-Sep-2005	Three vessels berthed, 4 berths vacant; 11 vessels due this week to load/discharge concentrates, bulk copper, containers and general cargo.
Arica	06-Sep-2005	Four vessels berthed, 3 berths vacant; 13 vessels due this week.
Iquique	06-Sep-2005	Three vessels berthed, 4 berths vacant; 12 vessels due this week.
Valparaiso	06-Sep-2005	Two vessels berthed, 6 berths vacant; 2 vessels anchored; 9 vessels due this week.

**Egypt**

Adabiya	05-Sep-2005	Eleven vessels berthed (loading/discharging), of which 4 general cargo, 2 bulk carriers, 2 livestock, 1 tanker, 2 containers..
Alexandria	05-Sep-2005	Sixty-two vessels berthed (loading/discharging), of which 25 general cargo, 13 bulk carriers, 2 tankers, 3 container vessels; 19 vessels dry-docked; 34 vessels at inner anchorage, 14 at outer anchorage.
Damietta	05-Sep-2005	Twenty-seven vessels berthed (loading/discharging), of which 14 general cargo, 2 bulk carriers, 4 containers; 5 vessels at outer anchorage, 2 at inner anchorage.
Dekheila	05-Sep-2005	Six vessels berthed (loading/discharging), of which 2 general cargo, 4 bulk carriers; no vessels at outer anchorage
Port Said	05-Sep-2005	Five vessels berthed (loading/discharging), of which 2 general cargo, 3 containers.
Suez	05-Sep-2005	Twelve vessels berthed (loading/discharging), of which 2 general cargo, 1 tanker, 3 reefers, 3 passenger vessels; 2 tugs, 1 vessel dry-docked.
Suez Canal	05-Sep-2005	Twenty-two vessels transiting Northbound, 25 Southbound.

**Estonia**

Tallinn	05-Sep-2005	Paljassaare (formerly Kopli): 1 fertiliser vessel loading at berth, 1 malt vessel discharging at berth; no vessels waiting at anchorage; 2 vessels due, with 6 days berthing delay expected
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**India**

Kolkata	05-Sep-2005	6 vessels operating at berth of which 1 vessel loading Containers, 4 discharging (Timber Logs, Edible Oil-2, Containers), 1 vessel waiting to load General Cargo; 1 vessel working at midstream and discharging Timber Logs; 1 vessel under repair; 5 vessel under dry docked; 1 vessel waiting to sail; 1 vessel waiting due to non receipt of port clearance from customs by steamer Agent.
Haldia	05-Sep-2005	11 vessels operating at berth of which 5 loading (Iron Ore-3, POL, Steel), 3 vessels discharging (Crude, Coke-2), 3 vessels loading and discharging Containers; 4 vessels awaiting berth to load; 21 vessels waiting at anchorage (8 to discharge, 13 to load); 4 vessels due (POL, LPG, Crude, Iron Ore).
Paradip	05-Sep-2005	8 vessels operating at berth of which 5 loading (Iron Ore-3, Chrome Concentrate, Iron ore(P)), 3 vessels discharging (Coking Coal, NC Coal, Phosphoric Acid); 3 vessels awaiting berth (1 to discharge, 2 to load); 4 vessels waiting at anchorage (3 to discharge, 1 to load).
Visakhapatnam	05-Sep-2005	10 vessels operating at berth of which 3 loading (Iron ore, Steel Plates, Granite Blocks), 7 vessels discharging (Coking Coal-2, Steam Coal, Pet Coke, urea-2, SKO); 6 vessels not ready to work and waiting at anchorage (5 to discharge, 1 to load); 1 vessel under repair (MV Chin Shwe Raw at HSY Jetty which was collide with AMV Uttar Kasi); 34 vessels due (Iron ore-7, Steel, B.F. Slag, Thermal Coal, C.P.Coke, Transshipment Crude, Ammonium Sulphate, Urea, MOP, Coking Coal-4, Project Cargo, Pet Coke, Steam Coal, Timber Logs, Methonal-2, Phosphoric Acid, Met Coke, Containers-3, POL Products-2, Crude Oil-2).
Chennai	05-Sep-2005	11 vessels operating at berth of which 2 loading (IOL, Iron Ore), 6 vessels discharging (CPO, Raw Sugar, Wood Pulp/Project Cargo, S.Coal, Thermal Coal, Petroleum Oil), 3 vessels loading and discharging (Steel Pipes/Granite Blocks, Containers, Steel Coil/Granite Blocks); 2 vessels not ready to work and waiting at anchorage to load; 2 vessels due (Project, Barytes).
Tuticorin	05-Sep-2005	10 vessels operating at berth of which 3 loading General Cargo, 6 vessels discharging (Thermal Coal, Copper Concentrate, Raw Cashew, VCM, Phosphoric Acid), 1 vessel loading and discharging Containers; 2 vessels awaiting berth to discharge.
Cochin	05-Sep-2005	5 vessels operating at berth and discharging (Coal, Rock Phosphate, Petroleum Oil, MOP, Timber Logs); 1 vessel awaiting berth to discharge.
New Mangalore	05-Sep-2005	8 vessels operating at berth of which 5 loading (Iron ore (F)-4, POL Product), 3 vessels discharging (Cement, Timber Logs, LPG); 3 vessels waiting at anchorage to load; 13 vessels due (POL Crude-2, POL Product, Iron ore (F)-2, Iron ore(P)-2, Ammonia, Containers, Urea, Granite Stone, Phosphoric Acid, Timber).
Mormugao	05-Sep-2005	2 vessels operating at berth of which 1 loading Iron ore, 1 vessel discharging HSD; 2 vessels working at mid stream to load Iron ore; 8 vessels under repairs; 5 vessels due (Containers, Coking Coal, MOP, Alumina, S.Scrap).
Mumbai	05-Sep-2005	14 vessels operating at berth of which 6 loading (General cargo/Steel-2, Steel Cargo, Steel Coils/Pipes, POL-2), 5 vessels discharging (Steel Cargo, Bagged Pulses/Logs, Peas, POL-2); 3 vessels loading and discharging (Wood Pulp/Mach/Pipes, Steel/General/H.Lift-2); 3 vessels awaiting order to discharge; 2 vessels waiting at anchorage (1 to load, 1 to discharge); 15 vessels under repairs; 7 vessels under arrest, 22 vessels under laid up (Berths not required for cargo operations); 21 vessels due (Containers-4, General Cargo-17).
J.N.P.T.	05-Sep-2005	8 vessels operating at berth of which 2 discharging (UTC, Lubricant Oil), 6 vessels loading and discharging containers; 4 vessels awaiting berth to load and discharge; 4 Container vessels due.

**Port Conditions**

Kandla	05-Sep-2005	16 vessels operating at berth of which 10 discharging (Chemical, St. Pipes, DSBO, Timber Logs-2, Fertiliser, Vegetable Oil, Phosphoric Acid, Fuel Oil, Sulphur), 5 vessels loading (Rice, Agriculture Product, Salt-2, Cement); 1 vessel loading and discharging Containers; 3 vessels not ready to work and waiting at anchorage (2 to discharge, 1 to load).
Ennore	05-Sep-2005	1 vessel loading Iron ore at midstream; 2 vessels due (MV APJ Sri Devi (Thermal coal), MV Etemal Star (Steam Coal)).
<b>Israel</b>		
Ashdod	06-Sep-2005	Two general cargo vessels loading at berth, 5 vessels discharging at berth (4 general cargo, 1 bulker), 3 vessels loading/discharging at berth (2 containers, 1 tanker); 2 vessels waiting at anchorage to load/discharge (1 containers, 1 tanker); 1 vessel awaiting orders; 20 vessels due, with 2-3 days delay expected.
Haifa	06-Sep-2005	Four general cargo vessels discharging at berth (1 general cargo, 3 bulkers), 9 vessels loading/discharging at berth (6 containers, 3 tankers); 3 vessels waiting at anchorage to discharge (1 general cargo, 2 bulkers), 2 container vessels waiting at anchorage to load/discharge; 2 vessels under repairs/dry-docked, 1 awaiting orders; 26 vessels due, with 2-3 days delay expected.
<b>Kazakhstan</b>		
Aktau	05-Sep-2005	Oil products: 1 vessel berthed, loading unknown cargo; 2 vessels in roads, both to load unknown cargoes; 5 vessels due by 7/9, all to load unknown cargoes.
<b>Pakistan</b>		
Karachi	05-Sep-2005	Two vessels loading at berth (1 MOL, 1 cement), 11 discharging at berth (1 coal, 2 DAP, 1 general cargo, 6 sugar, 1 TSP), 1 container vessel loading/discharging at berth; 4 vessels waiting at anchorage to discharge (1 phosphate, 2 crude oil, 1 palm oil); no vessels bunkering, 2 under repairs/dry-docked, none awaiting orders; 7 vessels due (1 containers, 2 general cargo, 1 fertiliser, 1 palm oil, 1 crude oil, 1 chemicals), with no berthing delays expected.
Port Qasim	05-Sep-2005	Three vessels discharging at berth (1 sugar, 1 rape seed, 1 crude oil), 1 container vessel loading / discharging at QICT berth; 2 container vessels waiting at anchorage to load, 5 vessels waiting at anchorage to discharge (2 containers, 2 palm oil, 1 fertiliser).
<b>Russia</b>		
Novorossiysk	05-Sep-2005	Sixteen vessels in port operating, all loading, of which 2 DRI, 1 bulk NPK, 1 scrap, 1 slabs, 1 pig-iron, 1 steel billets/tin plate, 1 copper, 3 wheat, 1 pipes/coils/scrap, 1 bulk ammonium nitrate, 1 bulk urea, 1 steel billets/coils, 1 steel billets; 4 vessels waiting in roads, all to load, of which 1 steel billets, 1 ammonium sulphate, 1 WRIC, 1 copper; 55 vessels due, of which 54 to load (3 steel billets, 2 DRI, 4 wheat, 4 scrap, 1 WRIC/coils, 2 bulk fertiliser, 6 aluminium, 5 coils, 1 bulk urea, 1 pig-iron, 1 pipes/steel billets, 1 steel sheets/tin plates/cars, 1 steel billets/ WRIC/scrap/tin plates/coils/steel sheets, 1 bulk cement, 3 copper, 4 bulk NPK, 1 UAN solution, 5 pipes, 2 HBI, 1 bulk ammonium nitrate, 1 cartons, 1 cartons/cellulose, 1 ammonium sulphate, 1 diesel oil, 1 WRIC), 1 to discharge non-ferrous metals, 1 to discharge/load containers; Oil terminal: 2 tankers berthed, both loading crude oil; 3 tankers in roads, all to load crude oil; 4 tankers due, all to load, of which 6 crude oil, 1 diesel oil.
<b>Slovenia</b>		
Koper	05-Sep-2005	Eight vessels berthed of which 1 discharging/loading containers, 2 bulk carriers discharging coal/scrap, 1 vessel loading grain, 4 vessels loading steel products/sawn timber/general cargo; 21 vessels due over the next 2 days of which 5 to discharge/load containers, 4 bulk carriers to discharge ore/minerals/cement, 3 bulk carriers to load coal, 1 barge to load coal, 2 vessels to load sawn timber/general cargo, 4 car carriers to discharge/load vehicles, 2 tankers to discharge mineral oils/liquid cargo.
<b>Spain</b>		
Bilbao	05-Sep-2005	Twenty-six vessels operating (4 tankers, 22 others), of which 8 loading, 12 discharging, 6 loading/discharging.
Sagunto	05-Sep-2005	Sixteen vessels in port operating of which 4 loading (1 steel products, 2 cement, 1 bulk fertiliser), 11 discharging (8 steel products, 2 vehicles, 1 miscellaneous cargo), 1 discharging/loading steel products; no vessels outside commercial wharf; no berthing delays at present.
<b>Turkmenistan</b>		
Turkmenbashi	05-Sep-2005	Oil products: 2 vessels in roads, both to load unknown cargoes; 1 vessel due 5/9 to discharge crude oil.
<b>Ukraine</b>		
Ilichevsk	05-Sep-2005	Four vessels in port operating, of which 1 loading wheat, 1 discharging palm oil, 2 discharging/loading containers; no vessels in roads; 20 vessels due, of which 14 to load (11 steel products, 3 grain, 1 sunflower seed oil, 1 machinery), 2 to discharge (1 nickel ore, 1 palm oil), 4 to discharge/load containers.
Mariupol	05-Sep-2005	Twelve vessels in port operating, all loading, of which 5 steel, 1 wheat, 2 fire-clay, 2 coal, 1 barley, 1 fire-clay/containers; 4 vessels in roads, of which 3 to load (1 steel, 1 coal, 1 fire-clay), 1 to discharge/load containers; 58 vessels due, of which 57 to load (29 steel, 18 coal, 4 fire-clay, 1 fire-clay/containers, 4 wheat, 1 pitch), 1 to discharge equipment.

## Port Conditions

Odessa	05-Sep-2005	Eleven vessels in port operating, of which 5 loading (3 metal, 1 general cargo, 1 barley), 3 discharging (1 sugar, 1 bananas, 1 luggage), 1 container vessel loading/discharging, 2 passenger vessels; 2 vessels in roads, of which 1 to discharge sugar, 1 to load/discharge containers; 55 vessels due, of which 26 to load (16 metal, 2 scrap, 1 pig-iron, 3 wheat, 1 grain, 1 wood, 1 corn, 1 ore), 1 to discharge metal, 28 to discharge/load containers.
<b>United States</b> New Orleans	06-Sep-2005	Per CDR Rawson this morning, controlling draft restriction of 39FT; will most likely remain in effect all day today and tonight as they have found one obstruction that they have to evaluate and possibly clear close to a terminal, obviously not effecting traffic, but continuing to cause them concern that only more detailed channel surveys can take care of. CDR Rawson also reports that (20) vessels have moved into the river since they opened on Saturday and (7) have moved out. A large navy ship is transiting up the river today, the Iwo Jima.

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## **ATTACHMENTS**

26. “Major Project to secure Ireland’s natural gas supply” - Shannon LNG booklet May 2006. See [www.shannonlngplanning.ie](http://www.shannonlngplanning.ie) on Volume 4 of EIS Page 61 - Appendix 1G - News

# Major project to secure Ireland's natural gas supply



**Shannon LNG, an Irish subsidiary of Hess LNG Limited, which is a 50/50 joint venture of Hess Corporation and Poten & Partners, is at the early stages of a major development which will help secure Ireland's long-term supply of natural gas.**

The company has entered into an 'option-to-purchase' agreement with Shannon Development, the regional development agency, in relation to 281 acres of the 600-acre state-owned land bank between Tarbert and Ballylongford, County Kerry. Subject to feasibility studies, technical assessments and in due course, planning and other approvals, it will become the site for a major €400 million liquefied natural gas (LNG) import terminal.



*Shannon Development's 600-acre land bank between Tarbert and Ballylongford, County Kerry*

Liquefying natural gas reduces the volume it occupies by more than 600 times, making it manageable for storage and transportation. LNG is produced primarily in locations where large gas reserves have been discovered; however, these reserves are often too distant from market areas to economically transport the gas by pipeline. Natural gas is liquefied at these locations and loaded on LNG tankers. LNG export sources include Algeria, Australia, Egypt, Indonesia, Malaysia, Nigeria, Oman, Qatar and Trinidad. LNG exports are also planned from a number of other countries, including Norway, Russia and Venezuela.

As natural gas is the most environmentally friendly fossil fuel, over the past two decades it has become the global fuel of choice for electricity generation, other industrial energy consumption, home heating and cooking.

For many years the Kinsale Head Gas Field was Ireland's only source of natural gas. However, this field is now nearly exhausted. In recent years, the UK North Sea was the primary supply source, but now it too is rapidly depleting. Some industry forecasts predict that the UK will be importing over half its natural gas needs by 2011 from remote fields in Russia, Algeria, offshore northern Norway and elsewhere.

LNG is natural gas that has been cooled to a very low temperature (minus 160 degrees centigrade), at which point it becomes a liquid. It is stored and transported in insulated tanks at normal atmospheric pressure like a cold drink in a thermos flask.

*Continued Overleaf*

Ireland currently imports over 85% of its natural gas requirements from the UK and Irish wholesale gas prices are set primarily by UK market conditions, plus the cost of transporting gas from the UK to Ireland.

The overall increase in demand and the increasing distances (from Russia and Algeria, for example) over which pipeline gas must be transported will exert substantial upward pressure on prices, as reported recently in the national newspapers. An LNG terminal in Ireland will help to address the supply-demand imbalance, avoid the costs to move gas within the UK system and will give rise to increased competition in the local gas market, leading to downward pressure on prices.

With the announcement of the project, Shannon LNG will start the necessary site evaluation work to establish how best to configure and accommodate an LNG terminal on the site. This will have to be considered in tandem with marine investigations, to ascertain where and how best to establish berthing and offloading facilities for visiting LNG tankers. The earliest any planning application can be lodged with Kerry County Council will be 2007. In the meanwhile, Shannon LNG will keep you informed through the local development associations, occasional newsletters and through personal contact as project activity on the ground increases.

Shannon LNG is committed to active communication and consultation with the local community and all interested parties during the planning for the proposed LNG terminal.

## National Gas Grid



*“...a major development which will help secure Ireland’s long-term supply of natural gas”*



Site location

# Shannon Development



Shannon Development, the government established regional development company, owns and manages several major industrial and business parks in the Shannon Region. A primary activity of Shannon Development is the

provision of property based solutions for Irish and foreign industry projects in the Shannon Region. Shannon Development has over 45 years experience in attracting large-scale industrial development and investment and also holds land banks to facilitate industrial development, the largest of which is this 600 acre site.

Shannon Development has actively marketed the potential of the site to an international business audience over many years and is pleased to have attracted leading global energy players of the calibre and experience of the Shannon LNG team. Shannon Development has agreed to give an option on a portion of its site to Shannon LNG, to allow time for the detailed design and appraisal of the proposed project, and for full consultation with the relevant authorities and the local community.

Shannon Development believes that the proposed project could bring significant long-term economic benefits to North Kerry and provide a regional solution to a national energy need, in terms of providing additional security and diversity of energy supplies.

Securing the project will also enable Shannon Development to explore the potential of its remaining lands at Tarbert/Ballylongford, and Shannon Development will be working to ensure that the overall development of this important national strategic site is progressed in conjunction with the Shannon LNG project.



Signing the purchase option agreement between Shannon Development and Shannon LNG were (l-r) Kevin Thompstone, Chief Executive, Shannon Development, Gordon Shearer, CEO, Hess LNG, Liam McElligott, Chairman, Shannon Development, and Paddy Power, Managing Director, Shannon LNG

## PRODUCTION



## LIQUEFACTION



## SHIPPING



## REGASIFICATION



## MARKETING



# Economic benefits

Natural gas is the fuel of choice for industrial and domestic use and also for electricity generation. It is clean and produces significantly less carbon dioxide than coal or oil. The world has large reserves of natural gas but much of it is often located in inaccessible areas, far from markets and requiring substantial investment in pipelines or liquefaction plants to transport the gas to the marketplace.

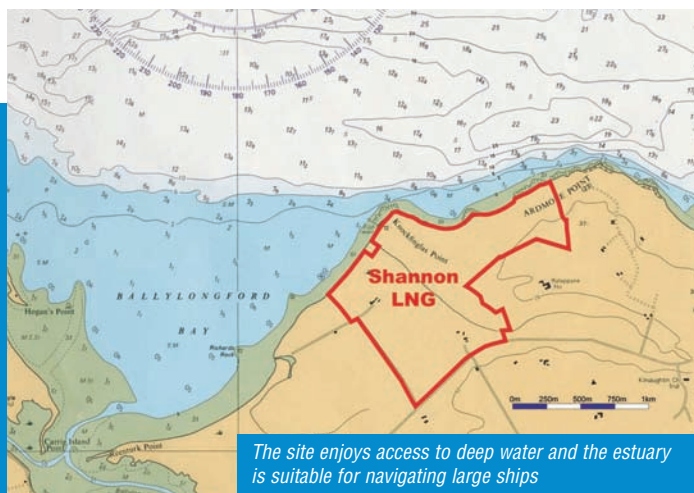
At present, sharply declining gas production in both the UK and Ireland coupled with escalating market demand is driving local gas prices upwards, as reported recently in the national newspapers. As the EU becomes increasingly reliant on imports from Russia and other remote areas, security and diversity of supply is increasing in importance. This was brought sharply into focus by the recent dispute between Russia and Ukraine, which caused a temporary disruption of Russian gas supplies to some parts of Central and Western Europe. Ireland needs secure, diverse, competitively priced and environmentally friendly supplies of energy. The LNG industry can meet these supply requirements, thereby supporting economic and social development in Ireland and assist the country in meeting national environmental targets.

A Shannon based LNG terminal will provide new gas supplies and mitigate security of supply concerns. The proposed project would bring significant long-term economic benefits to North Kerry and provide a regional solution to a national energy need. Some other benefits include:

- ■ **Security and Diversity of Supply:** LNG will allow Ireland to access multiple sources of gas and deliver greater security and diversity of supply. This leads to greater gas price competition, which is good news for Irish consumers.
- ■ **Energy Efficiency:** In modern electricity stations gas is more efficient and environmentally friendly/benign than other fossil fuels. Gas has an energy efficiency of around 60% compared to oil (38%) and coal (39%).
- ■ **Environmental Benefits:** Greater use of natural gas will help Ireland comply with its national Kyoto obligations to reduce CO<sub>2</sub> emissions. When used to generate electricity, natural gas generates lower CO<sub>2</sub> and NO<sub>x</sub> emissions than other fossil fuels. It produces no SO<sub>x</sub> emissions.
- ■ **Employment:** The terminal will employ about 50 long-term operating staff. Additional jobs will be also be created in support, ancillary and contracted services. Employment during construction could reach over 350 jobs at peak, leading to substantial local economic benefits.
- ■ **Local Impact:** Particular attention will be paid to the use of local employment and the purchase of local goods and services.



# The proposed facility



**The site, owned by Shannon Development, was acquired by the state as a national strategic location for large-scale maritime related industry. It enjoys access to deep water and the estuary is suitable for navigating large ships. The site is also close to the national gas and electricity grids, presenting a suitable location for an LNG import terminal.**

An LNG import terminal primarily consists of a marine berth, LNG offloading facilities and storage tanks and vaporisers to turn LNG from a liquid back into gas. The facility under consideration will have a capacity of three million tonnes per annum, or about 400 million cubic feet per day, equivalent to roughly 40% of Ireland's annual natural gas consumption. The deep water berth will include a jetty and secure mooring arrangements capable of receiving state-of-the-art double hulled LNG tankers, including the maximum size now under construction.

LNG will be pumped from the tankers to storage tanks comprised of an inner tank built from cryogenic steel, surrounded by several feet of insulation and an outer tank of steel reinforced concrete. Each tank is at normal atmospheric pressure, storing the LNG like a cold drink in a well-insulated flask.

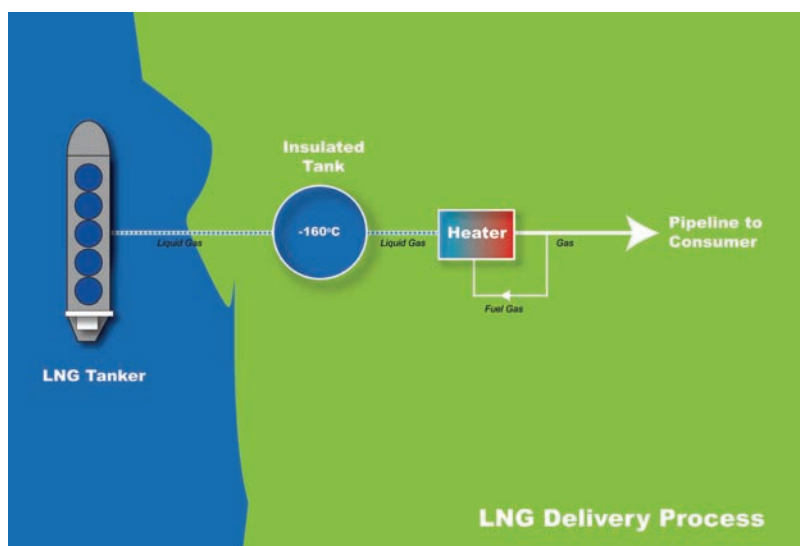
LNG will be converted back to natural gas at the terminal. Typically, a re-gasification terminal uses the heat extracted from large volumes of seawater or warmth from gas-fired heaters to vaporise the gas in heat exchangers. The LNG is only under pressure when it is ready to be re-gasified and the pressure is just sufficient for it to be piped into the existing national gas grid and on to the end users.

The facility will be designed, built and operated in compliance with Irish and EU regulations and international LNG industry guidelines, employing state-of-the-art technology. The planning process and commercial arrangements will take a minimum of two years to complete. Construction will take an additional three years.

In these circumstances construction is not expected to begin until 2008 with the terminal becoming operational in 2011 at the earliest. Following topographical, geotechnical and other assessments of the site, the optimum location for the LNG tanks, regasification facilities and jetty will be determined. The requirements for a safe and efficient berth include a sheltered berthing area with water depths greater than 13 metres at low tide.

Subject to confirmation through further due diligence and site investigations, the site and the Shannon estuary appears to be suitable for an LNG import terminal. Marine surveys and shipping simulations will be completed as part of the project development activities. Initially, a three million metric tonne per annum import terminal is envisaged, comprising two or possibly three tanks. Possible future expansion will also be considered.

Shannon LNG will keep interested parties informed as the project study proceeds. In due course, when the necessary pre-planning application evaluations have been conducted, Shannon LNG will be happy to discuss the proposal and its implications in detail with you.



# A safe technology

**LNG import terminal technology is relatively simple and has proven safe and reliable for over 40 years. There are 52 LNG import terminals operating worldwide and in light of the changing economics and security of future energy supply, an estimated 60 more are currently in the course of construction or planning.**

LNG is a safe fuel both to transport and store. Ship tanks and shore tanks are maintained at atmospheric pressure, or very slightly above to make sure no air can enter. LNG contains no oxygen and in liquid form LNG cannot burn and cannot explode. LNG vapours are flammable in air but only in a narrow gas to air concentration of 5% to 15% and will not explode unless they are ignited in a confined space. LNG terminals are specifically designed to detect any leakages and to shut down the process systems before dangerous conditions can arise, to eliminate ignition sources and to prevent potential leakages entering confined spaces.

Safety at the proposed facility will be achieved through the application of the latest technology, continuous personnel training, full compliance with procedures for safe operation and strict monitoring and enforcement of industry and government regulations.

The facilities and procedures will be designed to prevent accidents, however for the credible worst-case scenario safety systems will be deployed throughout the terminal. Import terminals employ a series of safety measures including gas detectors, fire, heat, cold and smoke detectors and close monitoring of all systems.

Codes and standards for LNG terminals are well established and proven to ensure the safety of the employees, the public and the facilities. Emergency response plans and drills will be performed and coordinated with local authorities.

LNG has been safely transported around the world by sea for the past 40 years. LNG tankers have made over 45,000 ocean voyages, covering more than 90 million miles without any serious incident. LNG tankers are also generally more environmentally friendly than other tankers and ships because they use natural gas, rather than oil, as their primary fuel source for propulsion and their cargo is non-toxic and non-polluting.

## LNG terminals in Europe



## LNG terminals worldwide

**The use of liquefied natural gas is by no means new. It has been in use since the 1960s around the world and LNG import terminals are generally located close to areas with high gas demand but insufficient local supply and in some cases, in or adjacent to cities such as Boston and Tokyo.**

For example, large volumes of LNG are currently delivered to Japan, which with virtually no domestic source of gas, has built its gas infrastructure around LNG over the past 35 years. In order to meet the expected growth in LNG demand in the US, more than 50 new import facilities have been proposed. Japan, Korea and Taiwan, major industrialised nations, get almost 100% of their natural gas requirements from imported LNG.

In the UK, the first LNG import terminal began operation at Canvey Island on the Thames estuary in 1964 and operated safely until it was closed in 1990 with the arrival of more economical North Sea gas. With North Sea gas reserves now inadequate a new LNG terminal opened in July 2005 on the Isle of Grain, in Kent. Two additional terminals are under construction at Milford Haven, in Wales.



*Insulated tank under construction*

# Some questions answered

## What is proposed?

Shannon LNG is proposing to build a liquefied natural gas (LNG) receiving terminal on a 281 acre site owned by Shannon Development on the Shannon Estuary, comprising two or more LNG storage tanks and related buildings and facilities. In addition, a new pipeline, about 25 to 30km in length, will be built to transport the gas to the national gas pipeline system, east of the site.

## Why did you pick this site?

The site is located adjacent to the deepwater estuary of the Shannon and it is also close to the national gas pipeline system. The site, in state ownership, has been designated by Shannon Development for deep-water projects.

## Why do we need this project?

We need additional supplies of natural gas for Ireland. There is growing concern regarding our ability to meet the demand for natural gas, the most environmentally friendly of all fossil fuels, from existing sources. Increasingly over the past few years, our electricity system has come to rely on natural gas fuelled power stations. Ireland lies at the very end of the European natural gas pipeline system, far away from the major producing fields in Norway, Russia and Algeria. Within Ireland, gas demand has been growing in recent years.

Traditionally Ireland has been supplied by its own domestic gas supplies from the Kinsale Field which is now in irreversible decline, as well as imports from the UK delivered via the interconnector pipeline from Scotland. The UK traditionally enjoyed a surplus of gas production, but its demand is also rising just as its supplies are falling. The UK is now turning to LNG to meet the growing gap between demand and supply. Ireland need not rely on LNG imported via the UK when it can import LNG directly and enjoy the benefits of a new gas supply – added security and diversity of energy supply and lower prices.

## What is LNG?

LNG is the liquid form of natural gas - the kind you may use to heat your home or for cooking. Natural gas is turned into a liquid by cooling it in a plant that operates like a giant refrigerator, cooling it to minus 160 degrees centigrade. Once the natural gas converts to a liquid at that temperature it is called LNG and it can be transported and stored at normal atmospheric pressure in insulated tanks, which act just like thermos flasks. It is the most environmentally friendly of all fossil fuels.

## Is there a lot of natural gas available?

The world's proven reserves of natural gas total more than 6,000 trillion cubic feet and are growing faster than they are being consumed. That's enough to meet the world's needs for 70 years. Unfortunately, much of this natural gas is located far from Ireland and cannot be economically brought here by pipeline.

## Why liquefy natural gas?

Converted to a liquid, natural gas takes up far less storage space. That makes LNG much safer, easier and less expensive to transport on tankers from overseas where there are large quantities of natural gas that cannot be transported by pipelines. Japan, Korea and Taiwan, major industrialised nations, get almost 100 percent of their natural gas from LNG imported by tankers.

## Where does LNG come from?

LNG is produced in Abu Dhabi, Alaska, Algeria, Australia, Brunei, Egypt, Indonesia, Malaysia, Nigeria, Oman, Qatar and Trinidad. New production plants are being developed today in Angola, Equatorial Guinea, Norway, Peru, Russia and Venezuela among others.

## Does LNG burn? Will it explode?

LNG by itself cannot burn because it doesn't contain oxygen or air. However, LNG vapour (natural gas) is flammable but only when mixed with air in a narrow range of concentration - at least 5%, but not more than 15% natural gas-to-air mixture. If the fuel concentration is lower than 5% it cannot burn because of insufficient fuel. If the fuel concentration is higher than 15% it cannot burn because there is insufficient oxygen. Therefore, LNG must first be vaporised, then mixed with air, and then exposed to an ignition source before it will ignite. Natural gas in its liquid form, LNG, cannot be ignited.

LNG is not stored under pressure. If a tank is ruptured, there is no instantaneous release of energy and thus no explosion, and any liquid which spills will evaporate.

LNG spill studies have shown that high winds rapidly dissipate the LNG vapour and in low winds (or no wind) the flammable vapour cloud would dissipate very close to the source as methane into the atmosphere, because it is lighter than air.

For an explosion to occur, LNG must first return to its gaseous state and then the natural gas vapours must accumulate in an enclosed space in a mixture of 5% to 15% of gas in air, and come in contact with an ignition source. The terminal design will incorporate a series of safety measures for detection, containment and extinguishment.

## Could the tankers leak?

In the unlikely event that there's a release from a tanker, the LNG will evaporate. That means the liquid will warm up and change back into a gas. This gas would quickly dissipate because it is lighter than air. Because the LNG is not transported under pressure any leak would evaporate more slowly and cover a much smaller area than a pressurised gas such as propane or butane. Compared to petrol or home heating oil, LNG is far less flammable and will not pollute the environment if it spilled.

LNG has been transported in tankers for more than 40 years involving over 45,000 voyages and covering 90 million miles at sea. All LNG tankers are double hulled and of robust state-of-the-art construction, specially designed to protect the cargo and prevent any leakage. Although there have been typical marine accidents such as groundings and minor collisions none has resulted in release of LNG.

## How safe is an LNG facility?

LNG has had an exemplary operating history and is effectively the safest of all fuels to store and manage. Today's regulations and codes are very stringent, requiring very specific technology controls, multiple containment systems and the use of special construction engineering, design and materials.

The design of LNG storage tanks involves a very thick outer wall of reinforced concrete with additional layers of steel and insulation inside. In the highly unlikely event of any leak of LNG from the storage tanks, the leak would regasify and vaporise on contact with air and being lighter than air it would quickly dissipate. In the unlikely event that a spill was to happen, it would be confined within a short distance of the storage tank and the escaped gas would gassify and dissipate without posing a local safety risk.

## Who will regulate the facility?

The siting, design and construction of the proposed facility will be regulated by agencies including Kerry County Council, the Health and Safety Authority, the Department of Communications, Marine, and Natural Resources and the Commission for Energy Regulation. The facility will require planning permission and would also have to operate under the terms of an Integrated Pollution Prevention and Control (IPPC) Licence to be determined by the Environmental Protection Agency (EPA). The terminal will also be an establishment to which SEVESO regulations apply.

## Will there be an environmental impact?

Once it is in operation, the plant would have very few impacts – LNG import terminals are quiet, there is no smell, no smoke, no steam, and no noise that can be heard beyond the site boundary. An LNG import terminal has extremely low air emissions and produces almost no wastewater. Shannon LNG will consult with the local authorities and the community to minimise any impacts associated with the construction of a large facility.

## Will there be an impact by construction traffic?

The proposed development will be a big construction project but will be managed to minimise traffic and nuisance impacts as far as is possible. Shannon LNG will look to Kerry County Council and the local community to help achieve the best possible outcome with the least inconvenience to the community. Shannon LNG will also investigate the possibility of supporting construction on the site through barge and ferry traffic from the estuary and Shannon LNG will work with all interested parties to develop the best possible outcome.

## When should LNG operations begin?

Shannon LNG hopes to begin operations in 2011, at the earliest.

## When will you apply for planning permission?

A lot of work has to be undertaken before Shannon LNG can apply for planning permission. It is likely to take a year of background and detailed engineering work before it is ready to apply to Kerry County Council. An application can therefore be expected in 2007.

## Will there be employment for local people?

Shannon LNG will work with the local FÁS office to maximise local employment and to support skills training to ensure that the proposed terminal can be operated by a work force which is substantially local.

# Shannon LNG

Shannon LNG was established by Paddy Power, a native of Tralee, to pursue, develop and implement this exciting project. Paddy is the Managing Director of Shannon LNG and has over 35 years experience in the international oil and gas industry. The company is now a wholly owned subsidiary of Hess LNG Limited, which is a 50/50 joint venture of Hess Corporation and Poten & Partners; both highly experienced in the international oil and gas business. As the project moves forward Shannon LNG will bring on-board a highly experienced project development team to design an LNG terminal that will be both world-class and configured to suit the site.



*Typical LNG receiving terminal*

## Further information

Shannon LNG acknowledges that the proposed development will attract public and community interest and wishes from the outset to establish a good communications system to keep people informed. Shannon LNG will publish and circulate newsletters occasionally, as the project develops to ensure that this is the case. Since the project will develop gradually, a Lo-Call telephone service to respond to enquiries has been established.

As activity on the project increases later in the year a Shannon LNG office will be established in Shannon Development's offices in Listowel, Co Kerry. Further out into 2007 a planning application will be lodged with Kerry County Council. Additionally, positioning of the pipeline and tie in to the national gas grid will be discussed with The Commission for Energy Regulation (CER) and Bord Gáis Éireann (BGE).

The proposed LNG facility is ideal for a deepwater estuary and the project, as the anchor tenant on the Shannon Development land bank, will attract other industry and investment into the region. The project is safe, attractive and environmentally sound and it is Shannon LNG's wish to foster community interest in the project and to become a good employer and a good neighbour.

**Shannon LNG can be contacted about this project Monday to Friday, during normal business hours on 1890 25 23 24.**



## **ATTACHMENTS**

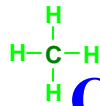
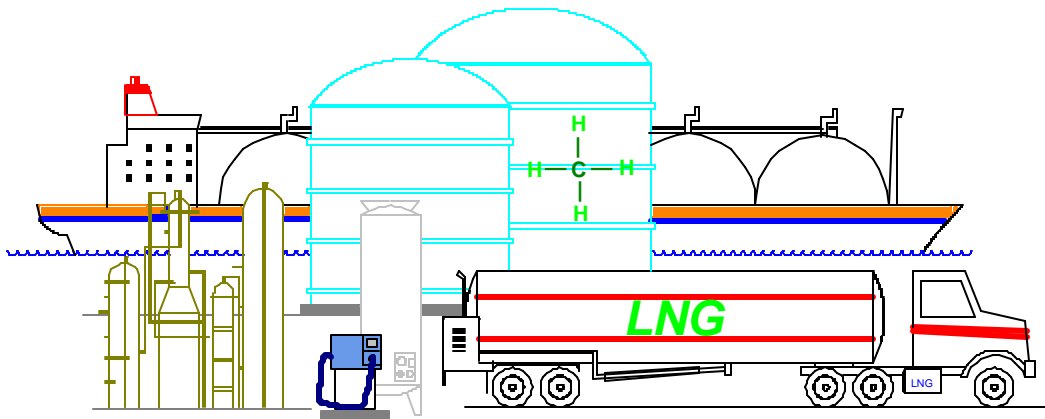
27. Basic Job Descriptions at DownEast LNG

<http://www.downeastlng.com/docs/TypicalJobDescriptionsRev4.pdf>



## Typical LNG Import Facility Organization Structure - Basic Job Descriptions

Prepared by ~



**CH·IV International**

**Baltimore Office**  
1120C Benfield Boulevard  
Millersville, MD 21108  
410-729-4255

**Houston Office**  
1221 McKinney, Suite 3325  
Houston, TX 77010  
713-344-2500

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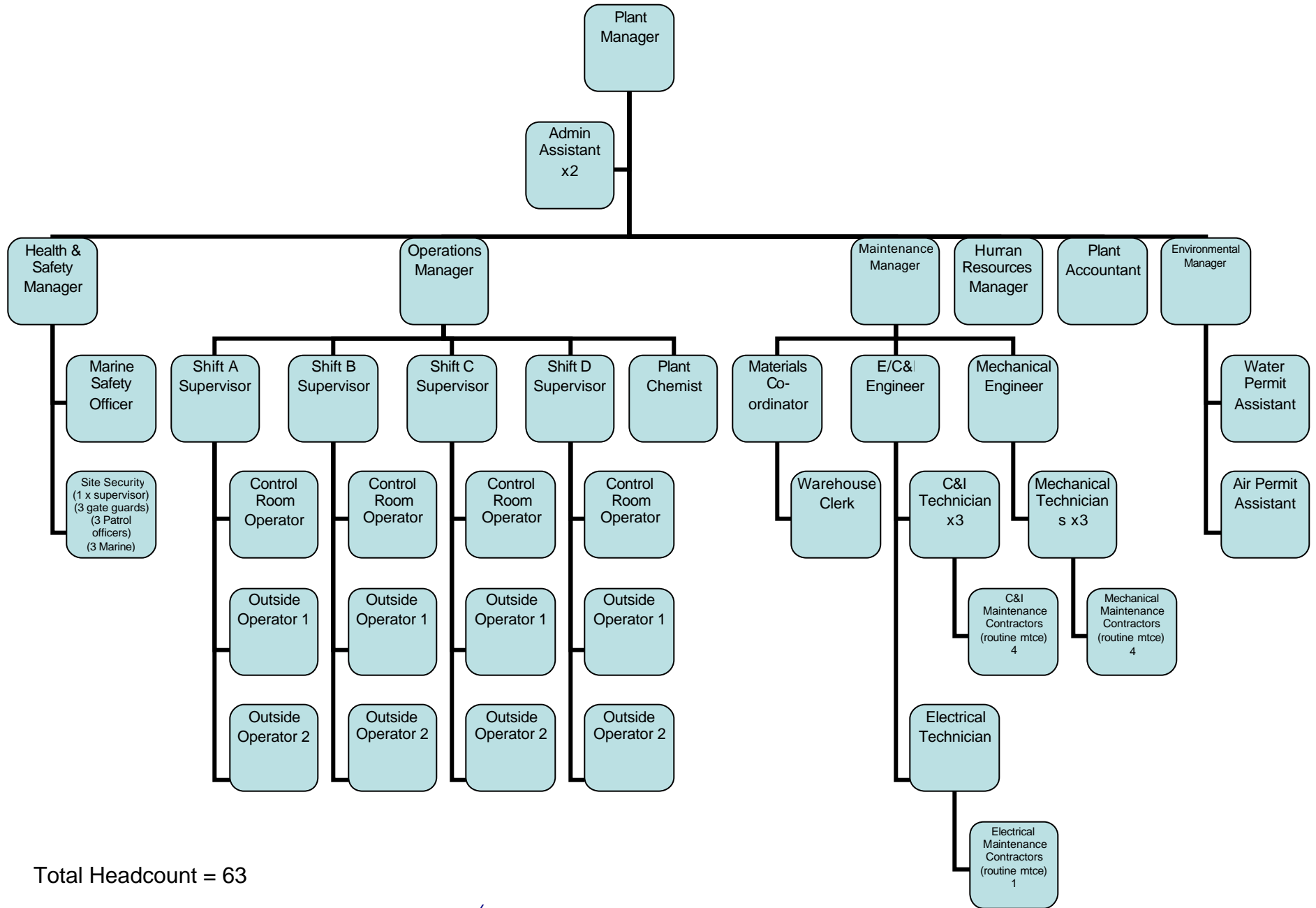


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# ORGANIZATION STRUCTURE



Total Headcount = 63

# **1 PLANT MANAGER**

## **1.1 Objective**

Responsible for the management, operation, engineering/maintenance and administration of the facility.

## **1.2 Major Duties**

- Manage, direct, and lead the operation, maintenance and administration teams to meet the requirements of project agreements, federal, state and local permits, regulations and legislation.
- Maintain the interface with federal, state and local agencies and counter-parties to principal contracts and operating permits.
- Ensure compliance with federal, state and local regulations and current legislation regarding environmental, safety, health and personnel issues.
- Administer and monitor facility contracts and permits.
- Produce annual commercial and operating business plans for the facility, which will include budgets and manpower schedules to ensure that plant objectives are met.
- Participate in civic, neighborhood industrial and government activities to promote good public and business relationships.
- Ensure the engineering and maintenance well-being of the plant to maintain the asset.

## **1.3 Position Requirements**

At least ten years experience in a senior management role in a high technology process plant, or similar industrial complex.

Degree in engineering, business management or equivalent.

## **2 ADMINISTRATIVE ASSISTANT**

### **2.1 Objective**

Provide confidential, professional secretarial service to the facility management team.

### **2.2 Major Duties**

- Provide a personal confidential service to the management team.
- Arrange travel for the facility management team as required.
- Coordinate and arrange site meetings/conferences, public relations and social activities.
- Provide general secretarial and administrative services such as filing, typing and reception duties.

### **2.3 Position Requirements**

Three years relevant experience providing administrative services for a management team.

Relevant secretarial and administrative qualifications.

### **3 HEALTH & SAFETY MANAGER**

#### **3.1 Objective**

Promote, train, advise and report on health and safety matters within the facility in accordance with federal, state and local health and safety policies and procedures.

#### **3.2 Major Duties**

- Develop and implement health and safety policies and procedures and develop training programs in accordance with such policies and procedures and also federal, state and local legislation, regulations and permits.
- Perform regulatory compliance requirements pursuant to designation as Facility Security Officer (FSO).
- Develop and implement health and safety policies and procedures for contractor interfaces.
- Maintain records of all health and safety and environmental related documents in accordance with applicable legislation, regulations and permits.
- Provide advice to the plant management team in direct support of safe plant operations and maintenance.
- Conduct periodic audits to monitor compliance with health and safety regulations, policies and procedures.
- Interface with local emergency personnel, health care professionals, vendors, other groups as it relates to health and safety of plant personnel.
- Develop, implement and manage annual health, safety and environmental budgets.
- Develop and manage site security policies, procedures and personnel.

#### **3.3 Position Requirements**

Seven to ten years experience working in a health and safety related role in large industrial complexes.

Minimum of an engineering/environmental degree.

## **4 MARINE SAFETY OFFICER**

### **4.1 Objective**

Represent the terminal in all marine operations and marine safety matters, and interface with and audit the crew and equipment onboard the LNG ship while alongside the terminal.

### **4.2 Major Duties**

- Maintain and update the marine aspects of the Terminal Operating Manual (USCG approval necessary).
- Communicate, review and vet all prospective LNG ships nominated by the suppliers.
- Regularly meet with the USCG, pilots, tug crews, and other local marine agencies and stakeholders to adopt, maintain and improve local requirements and practices.
- Remain informed and provide advice regarding implementation of rules/decisions regarding LNG ship transits, arrivals and departures.
- Witness all LNG ship berthing approach maneuvers and remain onboard the LNG ship while alongside the terminal.
- Conduct onboard safety inspections/audits, and complete the ship-shore safety checklist.
- Record a log of the LNG ship alongside time activities and delays, and review/approve any demurrage claims.
- Ensure that sufficient, proper marine emergency response resources are available and proper drills and training are undertaken.
- Coordinate marine activities with berth operations and maintenance teams.

### **4.3 Position Requirements**

Must hold a valid Master Mariner or Chief Engineer license and must have at least five years experience onboard oil tankers and/or gas carriers.



## **5 SITE SECURITY PERSONNEL**

### **5.1 Objective**

Provide site security services in accordance with the site security policies and procedures.

### **5.2 Major Duties**

- Provide dedicated site security services including guard house, roaming patrol of the Terminal and also Marine Facilities.
- Provide assistance during site emergency situations
- Monitor security systems and report on security breaches
- Provide advice to the Health and Safety Manager on security related matters

### **5.3 Position Requirements**

Five to ten years experience working in a security related industry and possessing necessary credentials required by local, state and federal policy and code.

## **6 ENVIRONMENTAL MANAGER**

### **6.1 Objective**

Promote, train, advise and report on environmental matters within the facility in accordance with federal, state and local environmental policies and procedures.

### **6.2 Major Duties**

- Develop and implement environmental policies, procedures and monitoring programs.
- Develop training programs in accordance with such policies and procedures and also federal, state and local legislation, regulations and permits.
- Develop and implement environmental policies, procedures and monitoring programs for contractor interfaces.
- Maintain records of all environmental related documents in accordance with applicable legislation, regulations and permits.
- Provide support to the plant management team regarding environmental practices and statutory regulations.
- Conduct periodic audits to monitor compliance with environmental regulations, policies and procedures.
- Develop, implement and manage annual environmental budgets.

### **6.3 Position Requirements**

Five to ten years experience working in a environmental related role in large industrial complexes.

Minimum of an environmental science degree.

## **7 ENVIRONMENTAL ASSISTANT – WATER/LAND**

### **7.1 Objective**

Maintain compliance with site policies and procedures related to relevant water and land related permits.

### **7.2 Major Duties**

- Conduct necessary sampling and routine checks in accordance with site policies, procedures, and relevant monitoring programs.
- Draft routine compliance reports for Environmental Manager in accordance with local site policies, procedures and relevant monitoring programs.
- .
- Maintain records of all environmental related documents in accordance with applicable site policies, procedures and relevant monitoring programs.
- .
- Provide support to the plant management team regarding environmental practices and statutory regulations.
- Assist Environmental Manager when conducting periodic audits to monitor compliance with environmental regulations, policies and procedures.

### **7.3 Position Requirements**

Two to five years experience working in a environmental related role in industrial complexes.

Minimum of an environmental science degree or technical school training.

## **8 ENVIRONMENTAL ASSISTANT – AIR QUALITY**

### **8.1 Objective**

Maintain compliance with site policies and procedures related to relevant air quality permits.

### **8.2 Major Duties**

- Conduct necessary sampling and routine checks in accordance with site policies, procedures and air monitoring programs.
- Draft routine compliance reports for Environmental Manager in accordance with local site policies, procedures and air monitoring programs.
- Maintain records of all environmental related documents in accordance with applicable site policies, procedures and air monitoring programs.
- Provide support to the plant management team regarding environmental practices and statutory regulations.
- Assist Environmental Manager when conducting periodic audits to monitor compliance with environmental regulations, policies and procedures.

### **8.3 Position Requirements**

Two to five years experience working in an environmental-related role in industrial complexes.

Minimum of an environmental engineering/science degree or technical school training.

## **9 OPERATIONS MANAGER**

### **9.1 Objective**

Responsible for the development of a safe and efficient operating program for the facility and directs the operations team to ensure the key operating objectives are met in accordance with the operating budget and plan.

### **9.2 Major Duties**

- Recruit personnel for the key posts within the operations department and organize and direct the operations team.
- Provide guidelines to Shift Supervisors for the continuing training of the personnel within their team and develop appropriate training programs.
- Develop and manage operating budgets and personnel schedules.
- Develop and implement operating policies and procedures and monitor their use.
- Monitor the adherence to health, safety and environmental policies and procedures.
- Be conversant with all relevant legislation and permit requirements related to environment, safety and personnel and use this knowledge to ensure the operations team responds to situations in the appropriate manner.
- Maintain an awareness of the facility's relationship with state and local agencies, federal agencies and the local community and ensure that good relationships are maintained.

### **9.3 Position Requirements**

Five to ten years experience in process related industries.

An engineering degree.

## **10 MAINTENANCE MANAGER**

### **10.1 Objective**

Responsible for developing the maintenance management system for the facility and for ensuring the maintenance program is adhered to in accordance with the maintenance plan and budget.

### **10.2 Major Duties**

- Recruit personnel for the key posts within the maintenance department and organize and direct the maintenance team.
- Provide guidelines to maintenance engineers for the continuing training of the personnel within their team and develop appropriate training programs.
- Develop and implement the maintenance management system, including maintenance management policies and procedures.
- Develop and implement preventative, predictive and corrective maintenance procedures as well as work planning and coordination policies and procedures.
- Develop and manage annual maintenance plans and budgets.
- Verify that maintenance activities are performed in compliance with applicable safety standards.
- Develop technical and commercial terms for maintenance contracts in accordance with maintenance plans. This will include long term maintenance contracts with major original equipment manufacturers.
- Ensure that the maintenance team remains updated on current technologies.

### **10.3 Position Requirements:**

A minimum of five years experience in a similar position in a process plant or similar industrial facility. Display extensive maintenance experience for rotating equipment, such as pumps and compressors, pressure vessels and other applicable ancillary equipment.

Degree in engineering, and/or equivalent experience.

## **11 HUMAN RESOURCE MANAGER**

### **11.1 Objective**

Responsible for developing and administering the human resource management program.

### **11.2 Major Duties**

- Develop human resource management policies and procedures.
- Monitor the implementation of human resource policies and procedures.
- Develop and manage the human resource budget, which will include salary reviews.
- Take part in the selection of all staff in conjunction with the management team.
- Manage the provision of payroll, sickness, welfare and all other personnel requirements under the terms of contract of employment.

### **11.3 Position Requirements**

Five years experience in human resource management and administration, preferably in industrial, process or manufacturing sectors.

Degree in human resource management or similar training.

## **12 PLANT ACCOUNTANT**

### **12.1 Objective**

Establish the accounting function in accordance with accepted accounting principals and procedures.

### **12.2 Major Duties**

- Develop, implement and monitor accounting policies and procedures.
- Arrange for warehouse inventory stock checks.
- Develop accounting reports.
- Develop annual budget management policies and procedures.
- Assist in the development of annual budget plans.

### **12.3 Position Requirements**

Certified Professional Accountant with at least five years experience in a similar position.



## **13 SHIFT SUPERVISOR**

### **13.1 Objective**

Responsible for the safe, efficient operation of the facility, implementing operations plans, and auditing their application to optimize facility operation in line with project performance criteria.

### **13.2 Major Duties**

- Plan operational activities in the facility and instruct the Operations Technicians accordingly.
- Provide training guidelines to Operator Technicians and review their performance.
- Update the operating and safety procedures and contribute to developing and implementation of the training programs.
- Contribute to the development of budgets and be responsible for their implementation.
- Supervise Operator Technicians on an assigned shift to provide maximum operating efficiency to meet customer demand.
- Implement operating plans to fully utilize the operating capabilities of the plant and maximize revenue.
- Plan and direct daily work activities for the assigned shift. Assist the Operations Manager with planning of overall activities of the plant.
- Coordinate shift activities with maintenance teams, whilst maintaining good communications with all plant staff during the respective shift period.
- Contribute to maintaining good relationships with the surrounding community with the help of the shift team.

### **13.3 Position Requirements**

A minimum of ten years operational experience in an industrial process environment.

Degree in process engineering (or equivalent) and/or suitable experience.

## **14 OPERATOR TECHNICIANS**

### **14.1 Objective**

Provide safe and efficient operation of the plant on an assigned shift in compliance with operating, safety and environmental procedures.

### **14.2 Major Duties**

- Operate, monitor, inspect and control all plant parameters.
- Provide start-up or shut-down services and participate in simulated emergency shut-down of plant equipment periodically to prevent damage and to assure efficiency of operations.
- Monitor the operation of the plant to ensure maximum efficiency and minimized downtime of plant equipment.
- Advises Shift Supervisor of maintenance defects.
- Provide on the job training and coaching to less experienced technicians as required.

### **14.3 Position Requirements**

Minimum of five years similar experience in a process plant.

## **15 PLANT CHEMIST**

### **15.1 Objective**

Responsible for fuel and water chemistry, and for providing recommendations to the operations team to ensure compliance with contractual and equipment specifications, permit requirements, procedures, and quality control plans.

### **15.2 Major Duties**

- Perform LNG and natural gas analysis as required and monitor compliance with operating permit requirements, customer specifications and equipment specifications.
- Establish potable water quality assurance protocols as required by EPA, Department of Health (DOH) and relevant state agencies.
- Manage chemicals inventory. As part of this responsibility, the Chemist will establish a re-ordering procedure along with the warehouse clerk. The Chemist will also advise and assist the Health, Safety and Environmental Manager to develop procedures for the correct handling of chemicals on site including storage, transportation, and usage. The Chemist will also assist the Health, Safety and Environmental Manager to develop procedures for the correct disposal of waste chemicals and contaminated containers.
- Develop sampling procedures which will form the basis for quality control plans. Such quality control plans will include the periodic review of all procedures to ensure that these procedures meet the needs of the plant efficiently and effectively.
- Verify plant waste water analysis certification as per relevant regulations.
- Provide training on sampling procedures and analysis to plant personnel as needed.
- Monitor laboratory chemical products and equipment to assure a continuous laboratory operation, and coordinate the calibration of laboratory instruments by third parties.
- Develop contingency plans for use by the operations team in “out of specification” situations. Such plans will also include corrective actions.

- Develop and maintain a database of all analysis results in accordance with contractual requirements, permit requirements, equipment specifications, local procedures and quality control plans.

### **15.3 Position Requirements**

Three years or more of relevant laboratory experience and good analytical, organizational, technical, communication and interpersonal skills, computer literate, and knowledge of fuel sampling, water processes, waste water treatment and waste material characterization.

B.S. in Chemistry or Chemical Engineering.

## **16 MATERIALS COORDINATOR**

### **16.1 Objective**

Responsible for establishing policies and procedures for establishing minimum warehouse stock levels in accordance with the operations and maintenance requirements for the facility.

### **16.2 Major Duties**

Develop and implement an effective warehouse stock control system to meet the day-to-day operational needs of the facility.

Develop and implement warehouse management policies and procedures that are interfaced with plant accounting and maintenance management policies and procedures.

Work closely with operating and maintenance teams when planning for upcoming major maintenance activities.

### **16.3 Qualifications:**

Three years experience in purchase and supply as a materials coordinator.

Experience in the use of Computerized Maintenance Management Systems.

## **17 ELECTRICAL, CONTROL & INSTRUMENTATIONENGINEER**

### **17.1 Objective**

Perform critical analysis of electrical, control and instrumentation (EC&I) systems and equipment, highlighting anomalies and propose improvements and modifications. Provide technical support needed for the economic management of the plant.

### **17.2 Major Duties**

- Understand, use and develop the computerized maintenance system and promote its use. Implement and monitor the work planning and coordination system.
- Assist the Maintenance Manager to prepare and manage any contracts for plant maintenance.
- Ensure maintenance subcontractors utilize up-to-date technologies.
- Is prepared to learn new skills and to keep abreast of technical developments in the industry.
- Manage spare parts list interfacing with the Warehouse. Prepare lists of materials and components not normally held in the Warehouse for future scheduled maintenance.
- Monitor actual expenditures against the available budgets and give suggestions for the preparation of future budgets.
- Assist Maintenance Manager to identify critical points and suggest modifications to extend equipment life and reduce maintenance costs.
- Work with the Maintenance Manager to optimize the proper functioning of the equipment.
- Coordinate maintenance activities with the shift teams and maintain communications with them during day-to-day plant operations.

### **17.3 Position Requirements**

Minimum of five years experience in an engineering position in a process plant or industrial complex.

Degree in an appropriate engineering discipline.

## **18 MECHANICAL ENGINEER**

### **18.1 Objective**

Perform critical analysis of machines and equipment, highlighting anomalies and propose improvements and modifications. Provide technical support needed for the economic management of the plant.

### **18.2 Major Duties**

- Understand, use and develop the computerized maintenance system and promote its use. Implement and monitor the work planning and coordination system.
- Assist the Maintenance Manager to prepare and manage any contracts for plant maintenance.
- Ensure maintenance subcontractors utilize up-to-date technologies.
- Is prepared to learn new skills and to keep abreast of technical developments in the industry.
- Manage spare parts list interfacing with the Warehouse. Prepare lists of materials and components not normally held in the Warehouse for future scheduled maintenance.
- Monitor actual expenditures against the available budgets and give suggestions for the preparation of future budgets.
- Assist Maintenance Manager to identify critical points and suggest modifications to extend equipment life and reduce maintenance costs.
- Work with the Maintenance Manager to optimize the proper functioning of the machinery.
- Coordinate maintenance activities with the shift teams and maintain communications with them during day-to-day plant operations.

### **18.3 Position Requirements**

Minimum of five years experience in an engineering position in a process plant or industrial complex.

Degree in an appropriate engineering discipline.

## **19 WAREHOUSE CLERK**

### **19.1 Objective**

Responsible for the day-to-day operation of the site warehouse facilities and stock control system. The management of goods received and goods distributed or returned is a key feature of this role, working in close liaison with the materials coordinator.

### **19.2 Key Duties**

- The effective use of the computerized maintenance management system to stock and locate spare parts within the warehouse.
- Receive, record and stock items within the warehouse.
- Locate and distribute warehouse stock items in accordance with the warehouse and inventory control policies and procedures.

### **Qualifications:**

At least three years previous experience in similar positions with experience using Computerized Maintenance Management Systems.



## **20 CONTROL & INSTRUMENTATION TECHNICIAN**

### **20.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the E/C&I Engineer.

### **20.2 Major Duties**

- Ensure the optimum use of the computer maintenance management system and conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Planning and coordination of day-to-day work and project work. This will include the management of contract resources and ensuring that approved subcontractors perform their allocated work properly.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.
- Work in conjunction with the shift teams to maximize availability and efficiency of the facility.

### **20.3 Position Requirements**

Must hold an appropriate trade certificate.

## **21 C&I MAINTENANCE CONTRACTORS**

### **21.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the C&I Technicians.

### **21.2 Major Duties**

- Conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.

### **21.3 Position Requirements**

Must hold appropriate trade certificates.

## **22 ELECTRICAL TECHNICIAN**

### **22.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the E/C&I Engineer.

### **22.2 Major Duties**

- Ensure the optimum use of the computer maintenance management system and conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Planning and coordination of day-to-day work and project work. This will include the management of contract resources and ensuring that approved subcontractors perform their allocated work properly.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.
- Work in conjunction with the shift teams to maximize availability and efficiency of the facility.

### **22.3 Position Requirements**

Must hold an appropriate trade certificate.

## **23 ELECTRICAL MAINTENANCE CONTRACTOR**

### **23.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the Electrical Technician.

### **23.2 Major Duties**

- Conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.

### **23.3 Position Requirements**

Must hold an appropriate trade certificate.

## **24 MECHANICAL TECHNICIANS**

### **24.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the Mechanical Engineer.

### **24.2 Major Duties**

- Ensure the optimum use of the computer maintenance management system and conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Planning and coordination of day-to-day work and project work. This will include the management of contract resources and ensuring that approved subcontractors perform their allocated work properly.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.
- Work in conjunction with the shift teams to maximize availability and efficiency of the facility.

### **24.3 Position Requirements**

Must hold appropriate trade certificates.

## **25 MECHANICAL MAINTENANCE CONTRACTORS**

### **25.1 Objective**

Carry out all preventative, predictive and corrective maintenance as directed by the Mechanical Technicians.

### **25.2 Major Duties**

- Conduct preventative, predictive and corrective maintenance tasks in accordance with the maintenance program.
- Verify maintenance tools and equipment are in proper working order.
- Comply with all safety and environmental requirements.

### **25.3 Position Requirements**

Must hold appropriate trade certificates.

## **ATTACHMENTS**

28. “Locals fear terminal could hit house prices” – The Kerryman newspaper October 17<sup>th</sup>, 2007 <http://www.kerryman.ie/news/locals-fear-gas-terminal-could-hit-house-prices-1202905.html>



## Locals fear gas terminal could hit house prices

Wednesday October 17 2007

A number of locals living on land bordering the landbank ? a 600 acre industrial site where the LNG terminal is to be built ? are expected to discuss the potential impact of the gas terminal on property values in the area at a public meeting scheduled for the Lanterns Hotel on Monday, October 29, at 8pm.

With upwards of 40 homes on the scenic landbank, which stretches between Tarbert and Ballylongford, the issue is likely to cause concern for Shannon LNG as they await An Bord Pleanála?s decision on the planning application for the gas complex, which was submitted at the end of last month.

Already there are claims that the value of homes in the area has fallen in recent months. One North Kerry auctioneer, who did not wish to be named, told The Kerryman that he had finalised a sale on a substantial new property only for it to fall through at the last minute. Everything was sealed, the deposit was paid and the contracts were ready to be signed but the buyers pulled out at the very last minute. After speaking to locals they believed their house could be devalued by the gas terminal,? the auctioneer said.

The issue comes as Shannon LNG awaits the An Bord Pleanála decision. The complex planning procedure has to date played out as successfully as the company could have hoped and there is massive public support in the villages of Tarbert and Ballylongford for the planned gas terminal.

The company expects up to 400 workers could be employed in the construction of the terminal with 50 permanent jobs guaranteed thereafter.

Their environmental impact statement published recently has not given rise to any major concerns thus far. This week Shannon LNG ratified an agreement with farmers in the area.

The agreement will see a liason officer working between the company and farmers close to the site and farmers were assured their cattle and lands would not be adversely affected by the gas terminal development

Shannon LNG?s planning application is currently available for viewing at the Bridewell Centre in Tarbert and the local Development Association encourage all to examine it.



## **ATTACHMENTS**

29. County Manager's Report on Proposed Variation No 7 to the Kerry County Development Plan 2003 – 2009

**County Manager's Report on  
Proposed Variation No 7  
to the Kerry County Development Plan 2003 – 2009**

**Variation No 7**

This variation proposes to rezone 188.8ha (466.53 acres) of land, comprising 105ha (261.43 acres) currently zoned as Rural General and 83ha (205.1 acres) currently zoned as Secondary Special Amenity, in the townlands of Reenturk, Rallappane and Kilcolgan Lower, to industrial zoning.



Kerry County Council  
Planning Policy Unit

## **Introduction**

### **1.0 Legal Preamble**

In accordance with Section 13(2a) of the Planning and Development Act 2000 (as amended), Kerry County Council propose to make a variation to the Kerry County Development Plan 2003-2009 to facilitate the development of industrial uses on lands in Reenturk, Rallappane and Kilcolgan Lower.

### **2.0 Proposed Variation**

The Kerry County Development Plan 2003-2009 was adopted by the Council in November 2003, and came into effect on 9 December 2003. This variation proposes to rezone 188.8ha (466.53 acres) of land, comprising 105ha (261.43 acres) currently zoned as Rural General and 83ha (205.1 acres) currently zoned as Secondary Special Amenity, in the townlands of Reenturk, Rallappane and Kilcolgan Lower, to industrial zoning.

The purpose of this variation is to facilitate consideration of suitable development of these lands in accordance with the provisions of section 5.2.9 of the Kerry County Development Plan 2003 – 2009 which states: 'Lands have been identified as Ballylongford/Tarbert as suitable for development as a premier deepwater port and for major industrial development and employment creation'. The adoption of this variation will also give effect to Objective ECO 5-5 of the Kerry County Development Plan 2003 - 2009 which states: 'It is an objective of Kerry County Council to identify lands in key strategic locations that are particularly suitable for development that may be required by specific sectors. Land in such locations will form part of a strategic reserve that will be protected from inappropriate development that would prejudice its long-term development for these uses'.

### **3.0 Public Consultation**

In accordance with Section 13 (2) of the Planning and Development Act 2000 (as amended) notice of the proposed variation was published in the local papers inviting observations and submissions. Copies of the variation were put on display from the 2<sup>nd</sup> February to the 8<sup>th</sup> of March 2007.

### **4.0 Statutory Bodies**

Under Section 13 (2) of the Planning and Development Act 2000 (as amended) the planning authority is required to consult the prescribed authorities listed under Part 3 Section 13 of the Planning and Development regulations 2001 (as amended).

## 5.0 Submissions Received

### Written Submission No. 1 – No. 4

**An Bord Pleanála.  
Department of Education  
and Science.  
Department of the  
Environment, Heritage and  
Local Government.  
Office of the Minister for  
Agriculture and Food.**

#### **Submission**

No observations on the proposed variation.

### Written Submission No. 5

**Catherine McMullen, An  
Taisce, Kerry Association,  
5 Glenashe, Killorglin,  
County Kerry.**

This submission raises the following issues –

1. The proposed zoning is appropriate for the majority but not all of the lands. The submission proposes that half of the lands currently zoned as Secondary Special Amenity should be retained for amenity uses such as walking and recreation to meet the needs of local people.
2. Positioning amenity lands at either end of the land bank would provide a buffer between houses in the vicinity of the industrial site and the site itself.
3. Public access to the shore line should be maintained particularly in view of the likely loss of public access to Kilcolgan Strand from the public road following the development of the site.
4. Sufficient land should be zoned residential in Tarbert and Ballylongford to meet the housing requirements of any workforce.

#### Response

1. An extensive area of land to the west of the site is designated as Secondary Special Amenity and includes a walking route to Carrig Island. It is considered therefore, that sufficient natural amenity lands have been reserved. The adopted Tarbert Local Area Plan makes adequate provision for the amenity requirements

of the village. In addition, a draft local area plan for Ballylongford is in the process of being prepared and will make provision for amenity uses to serve the towns catchment area.

2. The impact of development on the residential amenity of houses in the vicinity of zoned industrial lands will be dealt with at the planning application stage.
3. It is recognised that industrial and public amenity uses are incompatible due to reasons of health, safety and utility. Extensive foreshore lands from Richards Rock to Reenturk Point are however, excluded from the proposed industrial zoning and remain designated as Secondary Special Amenity.
4. The adopted Tarbert Local Area Plan makes adequate provision for an increase in demand for residential development. In addition, a draft local area plan for Ballylongford is in the process of being prepared and sufficient land will be zoned to cater for increased demand.

**Written Submission No.6**

**Clare County Council  
New Road,  
Ennis  
Co. Clare**

The submission makes the following points:

The proposed rezoning is likely to have a significant impact on the future development of the Region, and will have a direct impact on the planned objectives for the Mid West Regional Guidelines for the Shannon Estuary and in particular the Planning, Economic and Service Infrastructural development objectives for zone 5 of the plan.

Any industrial development including the construction of a deepwater harbour will have a major impact on both the visual and ecological amenities of the area, and potentially on the whole lower Shannon estuarine environment, including the foreshore of County Clare. Clare County Council would like an appraisal of any SEA investigation which may have been undertaken in respect of the proposed variation.

Response

Any future application on these lands will be subject of an Environmental Impact Assessment. This process will ensure that any proposals will take into account impacts on the visual and ecological amenities of the area. A copy of the SEA screening report for the proposed variation will be forwarded to Clare County Council.


The lands subject of this variation have been in the ownership of Shannon Development for a number of years. While the text of the County Development Plan 2003-2009

facilitated industrial development on the land, the relevant zoning map did not reflect this objective. This variation will regularise the zoning maps with the text of the Plan. It is considered therefore that the proposed variation will not alter or impact to any additional extent on the objectives of the Mid West Regional Planning Guidelines.

## 6.0 Recommendation

Having considered the submissions received it is recommended that the variation to rezone 188.8ha (466.53 acres) of land, comprising 105ha (261.43 acres) currently zoned as Rural General and 83ha (205.1 acres) currently zoned as Secondary Special Amenity, in the townlands of Reenturk, Rallappane and Kilcolgan Lower, to Industrial zoning is adopted.

Signed:



*M. McMahon/ M. Mac Mathúna,*  
*Director of Services/Stiúrthóir Seirbhíse,*

Planning & Sustainable Development/Pleanáil Agus Forbairt Inbhuanaithe

Date:

8/3/07

**ATTACHMENTS**

30. Minutes of March 12<sup>th</sup> 2007 Meeting of Kerry County Council

**MINUTES OF THE ORDINARY MEETING OF KERRY COUNTY COUNCIL  
HELD IN THE COUNCIL CHAMBER, ÁRAS AN CHONTAE, TRALEE ON  
MONDAY 12<sup>TH</sup> MARCH, 2007.**

***MIONTUAIRISCÍ NA CRUINNITHE MHIOSIÚIL DE COMHAIRLE  
CONTAE CHIARRAÍ A THIONÓLADH I SEOMRA NA COMHAIRLE, ÁRAS  
AN CHONTAE, TRÁ LÍ, AR AN LUAN, 12 MÁRTA, 2007.***

**PRESENT/I LÁTHAIR**

***Councillors/Comhairleoirí***

R. Beasley	J. Brassil	T. Buckley
M. Cahill	M. Connor-Scarteen	B. Cronin
T. Ferris	S. Fitzgerald	T. Fitzgerald
N. Foley	M. Gleeson	D. Healy-Rae
M. Healy-Rae	P. Leahy	P. McCarthy
A. McEllistrim	C. Miller	T. O'Brien
B. O'Connell	J. O'Connor	N. O'Sullivan
L. Purtill	T. Sheahan	

**IN ATTENDANCE/I LÁTHAIR**

Mr. T. Curran, Co. Manager	Mr. J. O'Connor, Head of Finance
Mr. M. McMahon, Director of Planning	Mr. O. Ring, Dir of Water Services
Mr. J. Breen, Dir. of Housing	Mr. P. Stack, A/Dir. Rds., & Trans.
Mr. B. Sweeney, A/Dir. Of Environment	Mr. C. O'Sullivan, SEO Corp. Affairs
Mr. T. Sheehy, SE Planning	Mr. D. Murphy, SEE Planning
Mr. F. Hartnett, A/SE Roads & Transp.	Mr. P. Corkery, Press & Comm. Officer
Ms. B. Reidy, S.S.O. Corp. Affairs	Ms. M. Gleeson, C.O. Corporate Affairs
Ms. A. O'Sullivan, CO Corporate Affairs	

**The meeting commenced at 10.50am.**

The Mayor, Cllr. T. Fitzgerald, took the Chair.

At the outset the Mayor welcomed the Kerry Education Service students present in the public gallery to the meeting.

**Vote of Sympathy**

Cllr. M. Gleeson PROPOSED a vote of sympathy to Garda Andy McCabe on the death of his wife and baby daughter. He added that the heading in the Sunday Independent that weekend was scurrilous as it made the link between Garda McCabe and the tragic events at Abbeylara. This was both wrong and immoral and he unreservedly condemned it. He added that the Carty Family was also upset at the linkage of the two events when they had nothing in common.

Cllr. R. Beasley SECONDED this vote of sympathy and stated that the article in the Sunday Independent was scurrilous.



## Minutes of March 2007 Council Meeting

The Mayor requested that a letter be forwarded to the Editor of the Sunday Independent expressing the strong views of the members on this issue.

### **Alternative entrance to Kerry General Hospital**

Mayor T. Fitzgerald informed the meeting that he lived close to Kerry General Hospital he was conscious of the large volumes of traffic passing the entrance to the hospital on the way to and from Manor. He called for the provision of another entrance by the HSE to cater for emergencies. He requested that a letter be forwarded to the HSE calling on them to provide a second entrance to the hospital.

Cllr. M. Healy-Rae supported this request.

### **Vote of Congratulations**

Cllr. M. Gleeson congratulated Ardfert Intermediate Football team on winning the All Ireland Final.

The Mayor stated that all members would like to be associated with this vote of congratulations as it was a great achievement for Ardfert. He added that Duagh also did the county proud in their final and he hoped that Dr. Crokes would be successful at Croke Park in the All Ireland Club Championship Final on St. Patrick's Day.

Cllr. T. Ferris also congratulated Ardfert on winning the All Ireland Intermediate Final and PROPOSED that Kerry County Council host a Civic Reception to honour their achievement.

Cllr. N. Foley SECONDED this proposal.

Cllr. R. Beasley also supported the proposal.

### **07.03.12.01 Mayor's Report on the CPG Meeting held on the 8<sup>th</sup> March, 2007.**

Mayor T. Fitzgerald read the following report into the record of the meeting:-

#### ***1. Agenda for March Council Meeting***

*Mr. C. O'Sullivan briefed the meeting on the agenda for the March meeting.*

#### ***2. County Development Board***

*Mr. J. Breen said that the work of the CDB is focussed on priority actions. It is important that all agencies on the CDB would begin to take responsibility for actions to be taken otherwise it will be left to Kerry County Council. If this happens there will be no benefit for the council in being on the CDB.*

### **3. Update on the National Spatial Strategy**

*Mr. M. McMahon informed the meeting that the second round of public consultation on the Environs Plan for Tralee and Killarney is taking place and a special meeting of the council will be held on the 2<sup>nd</sup> April to consider submissions received. It is hoped that this plan together with the Local Area Plan for Farranfore will be adopted at that meeting.*

*Mr. McMahon also informed the meeting that the Chambers of Commerce in Tralee and Killarney had held public meetings concerning the National Spatial Strategy following which they sought meetings with Minister John O'Donoghue and the Government regarding the benefits to Kerry arising out of the NSS.*

*Mayor T. Fitzgerald said that approx. 2½ years ago the members of Kerry County Council debated the NSS at length and agreed to put forward Tralee and Killarney for gateway status. He said that he was surprised at the public meetings now being held by the Chambers of Commerce as the NSS was published a number of years ago.*

*Mr. M. McMahon informed the meeting that the NSS was published in 2002. The members of Kerry County Council considered it in detail and subsequently accepted the decision of Government that Tralee/Killarney got Hub status. A Steering Group was established to oversee the preparation of a series of area plans and this work is progressing.*

*Cllr. J. O'Connor stated that Kerry County Council should continue to lobby Government for Gateway status for the Tralee/Killarney area.*

### **4. Update from the Chairs of the SPC's.**

#### ***Environment SPC***

*Cllr. J. O'Connor informed the meeting that the Environment SPC discussed the proposed new SAC designated areas and they subsequently requested that the closing date for receipt of submissions be extended. However, the NPWS have indicated that this is not possible. He asked that the full council call on the Minister to extend this deadline. The SPC is also considering the issue of responsibility for the maintenance of rivers and there are four bodies involved i.e. Kerry County Council, OPW, NPWS and the Fisheries Boards. It is hoped to compile a booklet which would inform landowners and the general public who to contact on this issue.*

*Mr. J. Flynn stated that this is a complex area and it may be more appropriate to focus on the areas of responsibility of Kerry County Council.*

#### ***Planning SPC***

*Cllr. B. Cronin informed the meeting that the principal issue being considered by the Planning SPC is the Telecommunications Policy. Representatives of the mobile phone companies have been requested on a number of occasions to agree a date for a meeting with the SPC but to-date they have not suggested a date. The SPC is anxious to be in a position to make a recommendation to full council as soon as possible.*

*Mr. J. Flynn suggested that the mobile phone companies be informed that the SPC will report to the May Council meeting and that they would have until then to make their presentation to the SPC. If they do not meet with the SPC a report would be brought to the May meeting.*

## Minutes of March 2007 Council Meeting

*Mr. J. Breen informed the meeting that if the roll out of wireless broadband is to be successful masts will be required.*

*Cllrs. M. O'Shea and R. Beasley stated that they would report on the activities of their SPC's at the April CPG meeting.*

### **6. Report to full Council by the Chairs of SPC's.**

*This matter was discussed in detail and it was agreed that in order to give these reports the importance and attention they deserve one or two reports per month would be included on the agenda for the full council meeting.*

*The Mayor suggested that these reports would focus on one or at most two issues.*

### **7. Criteria for the placing of area specific motion on the agenda for full Council meetings.**

*All members asked that a common sense approach be adopted to this issue and if possible area specific motions should not be on the agenda for full council meetings.*

*It was pointed out by some members that issues can arise which require urgent attention.*

*Mr. J. Flynn asked members that urgent issues be brought to his attention and he would endeavour to have them attended to if possible.*

*Mr. J. O'Connor, Head of Finance, stated that for the past several years senior staff have been attending Area Meetings to deal with issues and notices of motion. Management advocate that the Area Meetings have an important role to play and it is important to free up the time of full council meetings to deal with other issues.*

### **8. Supplement on Kerry County Council in the local papers**

*Mr. J. Flynn circulated a copy of the supplement which was circulated with local papers recently and asked members for feedback. It is intended to produce this supplement every 6 months and the next issue would be in July.*

*All members complimented Mr. Flynn on this excellent publication which sets out for the general public some of the activities of the Council.*

### **9. Update on the acquisition of land**

*Mr. J. Breen informed the meeting that in the past month 2½ acres have been acquired.*

*Cllr. J. O'Connor stated that in view of the recent designations and the affect they will have on farmers Mr. B. Sweeney, A/Director of Environment, wrote to the NPWS requesting an extension of the date for receipt of appeals. Nationally in excess of 700 appeals have been*

## Minutes of March 2007 Council Meeting

submitted. He PROPOSED that a letter be forwarded to the NPWS again requesting that the closing date for receipt of appeals be extended.

Mayor T. Fitzgerald SECONDED this proposal and it was agreed.

### **07.03.12.02 Confirmation of Minutes**

- (a) On the PROPOSAL of Cllr. N. O'Sullivan, SECONDED by Cllr. P. Leahy, it was resolved that the minutes of the Budget Meeting of Kerry County Council held on the 8<sup>th</sup> January, 2007 be confirmed.
- (b) On the PROPOSAL of Cllr. M. Healy Rae, SECONDED by Cllr. N. O'Sullivan, it was resolved that the minutes of the Adjourned Budget Meeting of Kerry County Council held on the 15<sup>th</sup> January, 2007 be confirmed.
- (c) On the PROPOSAL of Cllr. N. Foley, SECONDED by Cllr. M. Healy-Rae, it was resolved that the minutes of the Ordinary Meeting of Kerry County Council held on the 19<sup>th</sup> February, 2007 be confirmed.

### **07.03.12.03 Disposal of Property**

- (a) On the PROPOSAL of Cllr. S. Fitzgerald, SECONDED by Cllr. M. Healy-Rae, it was agreed to approve the disposal of a plot of land measuring 0.089 acres approximately at Inchinaleega West, Sneem to Sneem Welfare Committee Limited, Sneem in accordance with the terms of notice issued 27<sup>th</sup> February, 2007 pursuant to Section 183 of the Local Government Act, 2001.
- (b) On the PROPOSAL of Cllr. P. Leahy, SECONDED by Cllr. N. Foley, it was agreed to approve the leasing of a kiosk at Ballybunion to Patrick Coyle and Patricia McGrath, Lixnaw in accordance with the terms of notice issued 27<sup>th</sup> February, 2007 pursuant to Section 183 of the Local Government Act, 2001.

### **07.03.12.04 Report in accordance with Section 179(3) of the Planning and Development Act, 2000.**

On the PROPOSAL of Cllr. M. Gleeson, SECONDED by Cllr. T. O'Brien, it was agreed to note the proposed development and the Manager's Report thereon in accordance with Section 179(3) of the Planning and Development Act, 2000 and Part VIII of the Local Government (Planning and Development) Regulations 2001 in respect of the construction of a local authority house at Boolteens East, Castlemaine.

### **07.03.12.05 Draft Supplementary Development Contribution Scheme for An Daingean Relief Road and associated Coach Park.**

Mr. M. McMahon, Director of Planning, referred members to his report dated 8<sup>th</sup> March, 2007 on this item which was circulated and he briefed them in detail on the report. He informed the meeting that the Draft Supplementary Development Contribution Scheme for An Daingean Relief Road & Associated Coach Park was placed on public display from 24<sup>th</sup> January, 2007 to 8<sup>th</sup> March, 2007 and submissions or observations were invited. The report now before the members for consideration outlines the two submissions received and he stated that both submissions have been taken into account. The purpose of the Supplementary Development Contribution Scheme is to fund the construction of the An Daingean Relief Road and the associated Coach Park and if this road and coach park are not provided it will hinder the development of An Daingean. He added that there is broad support for this Scheme.

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Cllr. S. Fitzgerald thanked Mr. T. Sheehy and Mr. D. Murphy of Forward Planning for their work on this worthwhile Scheme. He asked if a section of the road is provided by a developer in accordance with a planning condition would this be deducted from the estimated overall cost of €17.5m and he requested that a report on levies received be presented to the members annually.

Mr. M. McMahon, Director of Planning, confirmed that if a section of the road is provided by a developer the cost involved would be deducted from the overall cost. He added that it would be necessary to follow the Part VIII procedure for the road scheme and it would be developed in stages depending on the level of activity by developers. Kerry County Council will borrow for this project and the development levies received will be used to repay the loan. He confirmed that an annual report would be presented to members on this scheme.

Cllr. S. Fitzgerald PROPOSED that this Council having considered the County Manager's Report on submissions received approves the making of the Supplementary Development Contribution Scheme for An Daingean Relief Road and associated Coach Park pursuant to Section 49 of the Planning and Development Act, 2000.

Cllr. R. Beasley SECONDED this proposal.

A vote was taken on this resolution which resulted as follows:

**For:** Cllrs. Beasley, Brassil, Buckley, Cronin, S. Fitzgerald, Foley, Gleeson, D. Healy-Rae, Leahy, McCarthy, McEllistrim, O'Brien, O'Sullivan, Purtill, T. Fitzgerald **(15)**

**Against:** None **(0)**

**Not Voting:** Cllrs. Ferris, M. Healy-Rae, O'Connor **(3)**

The Mayor declared the resolution carried.

### **07.03.12.06 Proposed variation No. 7 of the County Development Plan 2003-2009**

Mr. M. McMahon, Director of Planning, referred members to his report on this item which was circulated and he briefed them on the report.

Cllr. N. O'Sullivan PROPOSED that this Council having considered the County Manager's Report on submissions received in relation to proposed Variation No. 7 of the Kerry County Development Plan 2003 – 2009 in respect of lands in the townlands of Reenturk, Rallappane and Kilcolgan Lower (Ballylongford) approves the making of this variation to the Kerry County Development Plan 2003 – 2009 pursuant to Section 13 of the Planning and Development Act, 2000.

Cllr. R. Beasley SECONDED this proposal.

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A vote was taken which resulted as follows:-

**For:** Cllrs. Beasley, Brassil, Buckley, Cronin, Ferris, S. Fitzgerald, Foley, Gleeson, M. Healy-Rae, Leahy, McCarthy, McEllistram, Miller, O'Sullivan, Purtill, T. Fitzgerald **(16)**

**Against:** None **(0)**

**Not Voting:** None **(0)**

**Absent:** Cllrs. Cahill, Connor-Scarteen, Fleming, D. Healy-Rae, MacGearailt, O'Brien, O'Connell, O'Connor, O'Donoghue, O'Shea and Sheahan **(11)**

The Mayor declared the resolution carried.

### **07.03.12.07 Nominee to attend the Eighty-first Ordinary General Meeting of IPBMI Ltd.**

Mr. C. O'Sullivan, SEO, referred members to the correspondence received from Irish Public Bodies Mutual Insurances Ltd. which was circulated.

Cllr. J. Brassil PROPOSED that Cllr. M. O'Shea be nominated to attend the Eighty-first Ordinary Meeting of Irish Public Bodies Mutual Insurances Ltd.

Cllr. N. Foley SECONDED this proposal.

Cllr. T. Buckley PROPOSED that Cllr. P. McCarthy be nominated to attend the Eighty-first Ordinary Meeting of Irish Public Bodies Mutual Insurances Ltd.

Cllr. L. Purtill SECONDED this proposal.

A vote was taken which resulted as follows:-

**For Cllr. O'Shea:** Cllrs. Beasley, Brassil, Ferris, Foley, M. Healy-Rae, McEllistram, Miller, O'Sullivan, T. Fitzgerald **(9)**

**For Cllr. McCarthy:** Cllrs. Buckley, Cronin, S. Fitzgerald, Gleeson, Leahy, McCarthy, O'Connor, Purtill **(8)**

**Not Voting:** None **(0)**

The Mayor declared Cllr. M. O'Shea to be Kerry County Council's nominee to attend the Eighty-first Ordinary Meeting of Irish Public Bodies Mutual Insurances Ltd.

### **Vote of Congratulations**

Cllr. R. Beasley congratulated Cllr. A. McEllistram on the birth of her son.

All members indicated that they wished to be associated with this vote of congratulations.

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### **07.03.12.08 Report on the operations and activities of Tuatha Chiarraí**

Cllr. N. Foley requested that this item be deferred to the April meeting.

This was agreed.

### **07.03.12.09 Summary of proceedings at Conferences**

As none of the members nominated to report on the conferences listed on the agenda were present it was agreed to defer this item to the April meeting.

### **07.03.12.10 Dates for the next round of Electoral Area Meetings**

It was agreed that the next round of Electoral Area Meetings would be held as follows:-

<b>Area</b>	<b>Date</b>	<b>Venue</b>	<b>Time</b>
Killarney	Wed. 18 <sup>th</sup> April	Town Hall, Killarney	10.00am
Listowel	Mon. 23 <sup>rd</sup> April	Áras an Phiarsaigh, Listowel	10.00am
Tralee	Mon. 23 <sup>rd</sup> April	Council Chambers	3.00pm
An Daingean	Wed. 25 <sup>th</sup> April	Dingle Area Offices	10.30am

Following a debate on the date for the holding of the Killorglin Electoral Area Meeting it was agreed to defer a decision until later when all members for the Killorglin Area were present.

### **List of Notices of Motion provided to members for Council Meetings**

Cllr. N. O'Sullivan requested that members be provided with a list of the notices of motion in hard copy for all future council meetings.

### **07.03.12.11 Reception of Deputations**

- (a) Cllr. P. O'Donoghue requested that a deputation be received from the Portmagee Development Association regarding difficulties with Valentia Bridge. It was agreed that this deputation would be received at the next Killorglin Electoral Area Meeting.
- (b) Cllr. J. O'Connor requested that a deputation be received from the Residents of Sunhill, Killorglin regarding the Douglas Road. It was agreed that this deputation would be received at the next Killorglin Electoral Area Meeting.
- (c) Cllr. M. Healy-Rae requested that a deputation be received from the Residents of Killarney Road, Kenmare regarding traffic calming measures. It was agreed that this deputation would be received at the next Killorglin Electoral Area Meeting.
- (d) Cllr. L. Purtill requested that a deputation be received from Tarbert Development Association. It was agreed that this deputation would be received at the next Listowel Electoral Area Meeting.

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### **07.03.12.12 Approval for the opening of Tenders**

On the PROPOSAL of Cllr. M. Healy-Rae, SECONDED by Cllr. S. Fitzgerald, it was agreed to approve the opening of the following tenders:-

- (a) Kenmare Water Supply Scheme – DBO
- (b) Waterville Water & Sewerage Scheme – DBO
- (c) Fieries Sewerage Scheme – DBO
- (d) Barraduff Sewerage Scheme – DBO
- (e) Milltown Sewerage Scheme – DBO
- (f) N86 Derrymore Bridge Widening and Lispole Bridge Deck Widening and Replacement
- (g) Bituminous Overlay Requirements – Kerry County Council 2007 Roadworks Programme

### **07.03.12.13 Notices of Motion**

#### **2. Support for victims of serious crime**

##### **Pursuant to notice duly given Cllr. B. Cronin PROPOSED:**

"That this Council support victims of serious crime and condemn the practice by TD's and Government Ministers of making representations on behalf of prisoners convicted of murder, rape and serious drug offences"

**Mr. C. O'Sullivan, SEO, stated that this is a matter for consideration by the members.**

Cllr. B. Cronin stated that this issue arose from the recent case in Clare where a Government Minister made representations on behalf of a person convicted of murder. He added that he believed that this practice is widespread but he stated that all public representatives should stand side by side with victims of crime. He called on all candidates in the forthcoming general election together with all sitting TD's to declare if they have made such representations in the past and also not to make representations on behalf of those convicted of serious crime in the future. He called for a public commitment from all potential candidates in the forthcoming election that they would not make such representations and that they would support victims of crime.

Cllr. M. Gleeson supported the motion which he stated was valid as the Oireachtas members who make representations are also responsible for adopting the legislation. It is, therefore, a contradiction that those responsible for adopting the legislation would request that their own rules would be overturned.

Mayor T. Fitzgerald supported the motion and requested that a letter outlining the views of the members be forwarded to all candidates in the forthcoming General Election.

#### **3. 90<sup>th</sup> Anniversary of the late Thomás Ashe**

##### **Pursuant to notice duly given Cllr. M. O'Shea PROPOSED:**

"The 90th anniversary of the late Thomás Ashe will take place on September 25th of this year. Have Kerry County Council any plans to commemorate such a historic event"



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### **Mr. C. O'Sullivan, SEO, read the following report:-**

*This is a matter which can be considered by the Community, Culture and Tourism Strategic Policy Committee of the Council, together with input from the local studies section of Kerry County Council Library Service. Any proposals for such a commemoration will be considered in due course.*

Cllr. M. O'Shea welcomed the report and stated that he hoped that the Community, Culture and Tourism SPC would liaise with Lispolle National School on this project.

Cllr. T. Ferris supported the motion.

#### **4. Accessibility of Currán Tuathail**

##### **Pursuant to notice duly given Cllr. M. Gleeson PROPOSED:**

"In view of Currán Tuathails status as Ireland's highest mountain, its attractiveness as a destination for mountaineers and its economic importance to the County, that this Council calls on Rialtas na hEireann to make available the funding necessary to make the mountain more readily accessible and its ascent/descent safer"

##### **Mr. C. O'Sullivan, SEO, said that this is a matter for consideration by the members.**

Cllr. M. Gleeson expressed his disappointment with the reply as he understood that Kerry County Council in conjunction with the Department of Arts, Sport and Tourism was preparing plans to facilitate the intent of the motion. He did not intend that sleepers, like those at Torc Waterfall, would be put in place but he had hoped that a river crossing would be provided near the car park. Some climbers are reluctant to climb the Devils Ladder because of the amount of loose stone on the path and this should also be addressed. He was simply requesting that adequate safety measures be put in place.

Mayor T. Fitzgerald supported the motion.

Mr. T. Curran, County Manager, informed the meeting that the reason that a substantial reply was not provided was because the motion called on Rialtas na hÉireann to make funding available. A submission was made to Fáilte Ireland for funding to improve the access to the Devil's Ladder. Kerry County Council has taken in charge the access to Carrauntoohill at Lisliebane and additional car parking will be provided. The provision of a bridge to cross the river is a planning issue. With regard to the removal of the loose stone on the path to the Devil's Ladder the expertise of a Scottish Company was engaged but the biggest issue is to get the agreement of all the landowners involved and to-date this has not been possible. For this reason the project is at a stand still.

Cllr. M. Gleeson called on the County Manager to reactivate this project prior to the General Election.

Cllr. J. O'Connor congratulated Beaufort Community Council on contributing to the acquisition of the land for a car park. He PROPOSED that a letter of thanks be forwarded to them.

Cllr. M. Gleeson SECONDED this proposal and it was agreed.

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Cllr. D. Healy-Rae informed the meeting that he was withdrawing Notice of Motion No. 5.

### **6. Criteria for percolation tests etc.**

#### **Pursuant to notice duly given Cllr. J. P. O'Connor PROPOSED:**

"That this Council arrange a presentation for all elected members on the criteria for percolation tests and other environmental criteria i.e. the treatment of effluent and wastewater that must be adhered to in order to achieve the standards required so that planning permission can be granted in rural areas. This presentation should be provided by the Kerry County Council Environment Department and other independent consultants"

#### **Mr. C. O'Sullivan, SEO, read the following report:-**

*Percolation Tests for proposed wastewater treatment systems are carried out in accordance with the guidelines in the EPA Wastewater Treatment Manual. These guidelines are currently being reviewed by the EPA and it is expected that revised guidelines will be issued to local authorities in May. The revised guidelines will be brought to the Environment SPC for consideration and the need for further presentations can then also be considered.*

Cllr. J. O'Connor asked why new guidelines were being introduced if guidelines are already in place. When the new guidelines are issued the various departments should arrange a presentation to brief members and agents. He pointed out that there is a substantial variation in the topography from one area to another and he asked if this was taken into account in assessing planning applications.

Cllr. B. Cronin SECONDED the motion and stated that many applicants have experienced difficulties with percolation tests and results. He was concerned that permission is being granted for 3 or 4 houses while family members are being refused. He acknowledged that percolation tests and results must be satisfactory in order to protect the environment but he added that there are a number of companies who provide successful sewerage treatment facilities. He added that applicants have been requested to re-open trial holes and if the weather happens to be very wet the results can be different. He agreed with Cllr. O'Connor that a presentation should be made to members and agents when the new guidelines are issued.

Cllr. M. Connor-Scarteen also supported the motion and added that permission is also being refused on the grounds that the proposed development would be visible from the Ring of Kerry Road despite the fact that the proposed site would be 3 miles from the Ring of Kerry road.

Cllr. P. McCarthy concurred with the sentiments expressed by other members and said that there is an extraordinary level of ignorance regarding percolation tests. In many instances planning staff are blamed because the proper procedure is not followed and if applicants were advised to move to another part of the site they may achieve satisfactory results. The general public must be educated on this very important issue.

Cllr. D. Healy-Rae said that he understood that agents are submitting planning applications with failed percolation tests and this is very unfair on the applicants.

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Mr. T. Curran, County Manager, informed the meeting that when the new guidelines are issued they would be considered by the Planning SPC and they could recommend that the full council be briefed on them.

### **7. Preservation of the tower at Rossbeigh Spit**

#### **Pursuant to notice duly given Cllr. M. Cahill PROPOSED:**

"That Kerry County Council call on the Department of Communications, Marine and Natural Resources to carry out emergency works so as to preserve the famous landmark tower at the end of Rossbeigh Spit"

#### **Mr. C. O'Sullivan stated that this is a matter for consideration by the members.**

Cllr. M. Cahill stated that this is a unique landmark which was tilting over a number of years ago. At that time no state body would take responsibility for it and at his request boulders were put in place to support it. He called on Kerry County Council to liaise with the Department of Communications, Marine and Natural Resources to ensure that this landmark is secured before it is too late.

Cllr. M. Healy-Rae supported the motion.

Cllr. J. O'Connor also supported the motion and requested that it receive immediate attention.

### **8. Development of a bio fuel production facility.**

#### **Pursuant to notice duly given Cllr. T. Ferris PROPOSED:**

"That this Council, through its participation on the County Development Board, would explore the possibility of developing a bio fuel production facility to provide an alternative industry to the Kerry farming community following losses to that community such as the sugar beet industry etc"

#### **Mr. C. O'Sullivan, SEO, read the following report:-**

*The County Enterprise Board has established a special agricultural task group to develop strategies to support full time and part time farmers. The inaugural meeting of this group was held on the 16<sup>th</sup> February last. The group will, in the context of the consideration of sustainable energy options, consider the exploratory task suggested in the motion. The County Development Board is also organizing for an expert in bio fuel technology to brief the Board at the next scheduled meeting in March.*

Cllr. T. Ferris welcomed the establishment of the agricultural task group and said that the growing of bio fuels would be of particular benefit to farmers in North Kerry many of whom had produced large amounts of sugar beet until recently.

**9. Funding for the provision of sheltered housing in Kenmare.**

**Pursuant to notice duly given Cllr. M. Connor-Scarteen PROPOSED:**

"That we the members of Kerry County Council urgently request the Minister for the Environment, Heritage and Local Government to grant funding to Kerry County Council and CARA for the provision of a sheltered housing scheme in Kenmare, Co Kerry which has been promised and long overdue"

**Mr. C. O'Sullivan, SEO, read the following report:-**

*The above scheme went to tender in late 2006. The tender report was submitted to the Department of the Environment, Heritage & Local Government in early January 2007 and further documentation was submitted on 27<sup>th</sup> February 2007. Following subsequent discussions with the Department of the Environment, Heritage & Local Government personnel it is expected that funding for this scheme will be approved in the in the very near future.*

Cllr. M. Connor-Scarteen welcomed the report and said that this is a very important scheme for Kenmare which would provide 38 units of accommodation. He requested the Housing Department to keep in regular contact with the Department with a view to securing funding for this project as soon as possible.

Cllr. M. Healy-Rae SECONDED the motion.

**10. Number of sewerage schemes to be commenced in 2007.**

**Pursuant to notice duly given Cllr. M. O'Shea PROPOSED:**

"To ask the County Engineer how many sewerage schemes will start in the county during 2007"

**Mr. C. O'Sullivan, SEO, read the following report:-**

*Construction will commence on the following schemes in 2007.*

- |   |                      |  |
|---|----------------------|--|
| • | <i>Fieries SS</i>    | <i>Contract signed 30<sup>th</sup> January</i>   |
| • | <i>Milltown SS</i>   | <i>Contract signing 20<sup>th</sup> February</i> |
| • | <i>Barraduff SS</i>  | <i>Contract signing 20<sup>th</sup> February</i> |
| • | <i>Kilcummin SS</i>  | <i>Contract signing 20<sup>th</sup> February</i> |
| • | <i>Waterville SS</i> | <i>Contract signing 2nd March</i>                |
| • | <i>Sneem SS</i>      | <i>Contract signing April</i>                    |

*In addition, the Council has engaged Consultants to carry out the design of a number of other schemes which the Council is proposing to fast track having regard to development pressure in these areas. These villages include Abbeydorney, Ardfert, Caberdaniel, Castlemaine, Fenit, Kilflyn, Lixnaw, Tarbert, Castlegregory, Ballylongford, Finuge and Kilgarvan. In parallel with the design, site investigations will be carried out and suitable sites for treatment plants are being identified for acquisition. Subject to site investigations results, planning and success in acquiring the necessary lands, the Council is aiming to go to tender on these schemes by the end of the year or early in 2008.*

Cllr. M. O'Shea welcomed the report but stated some villages such as Boolteens are not mentioned in the list despite the fact that there is no sewerage scheme there. He requested

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that priority be given to providing a sewerage scheme for Boolteens as it is a health hazard at present.

In response Mr. O. Ring, Director of Water Services, stated that the Council commissioned a Preliminary Report for 28 villages including Boolteens. When this Report is ready it will be forwarded to the Department for funding. It would not be possible to provide any form of treatment in Boolteens until a proper scheme is provided.

### 11. Surface dressing at junctions with minor roads

#### **Pursuant to notice duly given Cllr. M. Gleeson PROPOSED:**

"That the Council when surface dressing a minor road on its approach to a junction would provide a different colour overlay on the final 10 metres of the road as an additional indication/warning to motorists that they are approaching a major road and must stop safely"

#### **Mr. C. O'Sullivan, SEO, read the following report:-**

*In practical terms it would not be feasible to alter the colour of the surfacing close to junctions as the effect is achieved by changing the colour of the chips which would increase costs significantly with limited effect as it would not be seen at night.*

*The layout, markings and warning signage currently applied to junctions in the County comply with the specifications as set out in the Traffic Signs Manual by the Dept of Environment, Heritage and Local Government and it is proposed to continuously upgrade signage and road markings.*

Cllr. M. Gleeson stated that many motorists experience difficulties with traffic exiting junctions. Nationally road signage should be reviewed. He added that there is a proliferation of signage from the bottom of Pike Hill to his own house and it is impossible for a motorist to read all the signs while driving safely. He acknowledged that it would be more expensive to use a different colour overlay on the final 10 meters of the road to the junction with the main road but it would highlight the need to slow down to motorists. It may be worthwhile to examine this idea at a national level.

Cllr. P. McCarthy supported the motion and said that this means of highlighting a junction is very effective and in the North of Ireland it is used very effectively. When a motorist sees the different colour surface they automatically slow down and there is less need for signage. He added that Cork County Council is already incorporating this practice in their road programme.

Cllr. T. Fitzgerald also supported the motion.

Mr. P. Stack, A/Director of Roads and Transportation, stated that anything that improves road safety would be considered. He acknowledged that Cork County Council used this type of surface in Ballyvourney and it is a high skid resistance surface. This surface was used in Listry but it is extremely expensive and would cost as much as ½kilometer of road. If this surface was used it would have to be provided at all junctions as motorists would expect it. However, consideration would be given to this option in the future.

### **Introduction of the white tailed eagle to Kerry**

Cllr. M. Healy-Rae stated that there is major concern among the farming community regarding the introduction of the white tailed eagle to Kerry. Many sheep farmers are already under pressure and it would be wrong to introduce the eagle. Many sheep farmers have had inspections of their flocks and this is very unusual at this time of year as many sheep are heavy in lamb. In conclusion he stated that it is more important to look after farmers than to introduce the eagle to Kerry.

Cllr. M. Gleeson stated that he had called for the reintroduction of the white tailed eagle to Killarney National Park, which is large and capable of supporting the eagles. Killarney Town Council provided €10,000 in the Budget to support this project. Tourism is the lifeblood of Killarney in conjunction with farming. Any project that will enhance our tourism industry should be welcomed and the introduction of the white tailed eagle will attract thousands of tourists to the county. Glenveigh National Park introduced eagles to the Park and it has attracted many tourists to the greater Donegal area. He acknowledged that the eagle may take the occasional lamb but it is usually a sick and weak lamb that is taken. He stated that he was from a farming community and he was satisfied that the farmers of Kerry would not begrudge the reintroduction of the white tailed eagle to Killarney National Park. During a recent visit to Killarney both the Taoiseach and Minister O'Donoghue signed a request to have the white tailed eagle reintroduced to Killarney National Park.

Cllr. J. O'Connor stated that farmers had to bring down their sheep from the hills to ensure they are not overgrazing the hills. He added that the Department of Agriculture and Food had used a helicopter for this purpose and he asked what was the cost involved. It would be more reasonable to do these inspections later in the year. He said that he understood that while the eagle would be released in Killarney National Park it would move towards the sea. He had asked an environmentalist about the impact of the reintroduction of the eagle to Killarney and he stated that it was suspect why the eagle died off in Ireland originally and it would be years before the effect will be known.

Cllr. B. Cronin said that he would be cautious in making a decision on this issue without being fully informed. He also stated that marauding dogs also kill sheep and lambs.

Following further debate it was agreed that this item would be considered at the April Meeting when all the facts would be presented to members.

### **12. Road safety measures at junctions in the Killarney area.**

#### **Pursuant to notice duly given Cllr. D. Healy-Rae PROPOSED:**

"To ask the N.R.A. and the Roads & Transportation section of Kerry County Council to make a real attempt to assist in road safety in the Killarney Area i.e. Junction off Lewis Road and bypass, Lissivigeen Junction off N71 and N22, Poulagorm Bridge Junction, Madams Hill Junction with N22, Shinnagh Cross, Rathmore, Farranfore Village Junction for Firies & Currow, Woodlawn Road Junction to the N22 and many other dangerous locations"

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### **Mr. C. O'Sullivan, SEO, read the following report:-**

#### Junction of Lewis Road and N22 Killarney By-Pass

*A traffic calming scheme was completed at this junction in 2005 in conjunction with the pavement overlay of the By-Pass. A reduction in the 100 km/h Speed Limit was recommended by the Speed Limit Review Steering Committee, however this measure was not approved by the National Roads Authority.*

#### Junction of N72 and N22 at Lissivigeen

*It has been agreed in principle with the National Roads Authority Inspectorate that a roundabout is required at this location however funding was not received in 2007. A further application for funding will be submitted to the National Roads Authority for funding in 2008.*

#### Poulgorm Bridge Junction

*The Roads and Transportation Department will continue to seek funding for further safety measures at this junction including public lighting to highlight the junction at night.*

#### Madams Hill Junction with N22

*An application for funding for this junction was submitted to the National Roads Authority for funding under the Safety Measures allocation in 2007. In this context, this junction has been discussed with the National Roads Authority and the Regional Road Safety Officer has examined the accident database that applies to this section of the N22. This examination indicated that there were few if any accidents attributable to the junction, notwithstanding this, the Roads Department will continue to liaise with the National Roads Authority to seek funding for safety measures at the junction.*

#### Shinnagh Cross, Rathmore

*An application for funding for a roundabout at this location was submitted to the National Roads Authority however no funding was received and a further application will be submitted for funding in 2008.*

#### Junction of the R561 and N22 at Farranfore Village

*This junction is 50 km/h limit in Farranfore. Traffic signals were considered at this junction however the introduction of traffic signals was not supported by traffic count data and would lead to excessive tailbacks on the N22. Enhanced lining and signing was undertaken in 2006.*

#### Woodlawn Road Junction with N22

*This junction on the N22 is constructed to a very high standard in a traffic calmed area within the 50 km/h speed limit. It is not considered that any further works are required at present at this location*

Cllr. D. Healy-Rae stated that there were a number of accidents at the junction of the Lewis Road and the By-Pass. He acknowledged that traffic-calming measures have been provided at this location but he said that there are more accidents since these were provided. Urgent measures must be taken at this junction before there is fatality there. He then referred to Lissivigeen Cross and stated that the NRA inspector agreed that a roundabout is need at this junction yet the NRA has not provided

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the funding. There have also been a number of accidents at Poulgorm Bridge where he had requested that lighting be provided but this request was refused. He stated that he was recently in Letterkenny and beyond Letterkenny there is a turn off for Convoy and this section of road has public lighting. He also called for the provision of a ghost island at Madams Hill to facilitate traffic turning off the main road. A roundabout is also required at Shinnagh Cross and improvements are urgently needed at the Firies and Currow Junctions at Farranfore. In conclusion he stated that there is no Yield Right of Way sign at Ballybeg Road at Dromulton and he requested that one be provided immediately.

Cllr. M. Healy-Rae SECONDED the motion.

Cllr. M. Connor-Scarteen also supported the motion.

Cllr. B. Cronin also supported the motion and called on the NRA to fund improvements to these junctions immediately.

Mr. P. Stack, A/Director of Roads and Transportation, stated that the Roads Department is also concerned about safety at the junctions outlined in the motion. Over €2m has been allocated to improvements to junctions in 2007. He added that the Council would work with the NRA on this issue but there is an onus on motorists to respect signage at junctions.

Cllr. T. Sheahan called for the preparation of a priority list of junctions to be improved and the provision of an annual allocation to deal with these.

### **13. Provision of a third lane on major roads in Kerry**

#### **Pursuant to notice duly given Cllr. J. P. O'Connor PROPOSED:**

"That a few pilot initiatives would be instigated on some of our busy roads that a third laneway would be put in for a half of a mile one way and a half of a mile the other way in order to alleviate the traffic pile ups that happen. This system is extremely beneficial in the continent"

#### **Mr. C. O'Sullivan, SEO, read the following report:-**

*The scheme referred to is termed "two plus one" and is in operation extensively particularly in Sweden. It has been introduced on a number of new and existing roads in Ireland (e.g. Mallow to Cork National Primary Road) as pilot schemes to determine its suitability to Irish conditions.*

*A study is presently underway to determine the suitability of the scheme to the Killarney/Cork N22 road between Killarney and the County Bounds. There is a difficulty in retro-fitting a 2+1 scheme on an existing road where you have a number of existing entrances. These exits would either have to be closed or diverted onto a service road with controlled access onto the main road.*

Cllr. J. O'Connor stated that this is used successfully in Sweden and the Ring of Kerry road is appropriate for it.

Mr. P. Stack, A/Director of Roads, informed the meeting that the Ring of Kerry road is too narrow at many locations for a third lane. It maybe possible on some national primary roads



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but he was not satisfied that it would be possible on national secondary roads until they are realigned.

### 14. Identification of suitable PPP Projects for Kerry

**Pursuant to notice duly given Cllr. M. Cahill PROPOSED:**

"That Kerry County Council identify suitable public private partnership projects for the county"

**Mr. C. O'Sullivan, SEO, read the following report:-**

*The essence of public private partnership (PPP) projects is that the private sector will do one of the following:-*

- i. provide private finance to fund the project;*
- ii. enter into a long term [greater than 5 years] service contract;*
- iii. undertake the design and construction of an asset on the basis of an output specification prepared by the public sector and designed to meet broad performance targets;*
- iv. enter into a joint venture arrangement with the public sector to provide a service or asset.*

*Public Private Partnerships can come in different forms but to be successful must provide long term "value for money" for the Council, ensure that environmental and public health and safety standards are maintained; and that the public interest is fully protected. Because of the contractual complexities involved and having regard to the above principles, the use of PPP projects is generally only considered for major infrastructural projects.*

*All major projects by the Council are considered on their merits as to whether the use of a public private partnership for its delivery is the most appropriate having regard to the above principles.*

Cllr. M. Cahill welcomed the report and requested the council to have an open mind on PPP's as it is a good means of progressing projects as the Killorglin Town Centre project has proved. He requested that suitable projects be identified and developers may then express an interest in them.

### 15. Provision of a bus lay-by and shelter in Farranfore

**Pursuant to notice duly given Cllr. B. Cronin PROPOSED:**

"What is the current position in regards to the bus lay-by and shelter that I have requested in Farranfore"

**Mr. C. O'Sullivan, SEO, read the following report:-**

*Negotiations are ongoing at present with the owner of the land to agree terms for a lease that will facilitate construction of the bus bay and shelter. Funding is available and construction will commence following successful negotiation of the leasing agreement.*

Cllr. B. Cronin welcomed the report but expressed his disappointment that it is taking so long to sort out the leasing arrangements. Many elderly passengers have to wait in bad weather for buses and a bus shelter is urgently required. In conclusion he appealed to management and the landowner to resolve this issue immediately.

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Cllr. M. Gleeson SECONDED the motion.

### 16. Employment of additional planners.

#### **Pursuant to notice duly given Cllrs. M. Cahill & P. O'Donoghue**

"That Kerry County Council employ additional planners so as to clear the pre-planning backlog in the county"

#### **Mr. C. O'Sullivan, SEO, read the following report:-**

*A number of Planners have now been recruited to return the Planning Staff to full complement of 15.*

*Due to staff movements in recent months, all staff have been employed in specific geographic areas and there has been no backup to relieve the pressure points.*

*Each Planner devotes half a day per week to office pre-planning meetings. In addition, on-site preplanning is carried out as time permits subject to work pressures.*

*When new staff will have been in place for a period, it is anticipated that the backlog will be dealt with.*

*In 2006, the number of office pre-planning meetings held were 1,962 with an additional 245 on-site meetings held. The average waiting period for an office pre-planning meeting, which is acceptable, is two weeks and for on-site, four weeks. This is being achieved in some areas but not all. It is our goal in 2007 that these waiting periods will apply to all areas, or will be further reduced if possible. It should be noted that Kerry County Council are still the only Planning Authority to offer the on-site consultations to applicants.*

Cllr. M. Cahill informed the meeting that this issue was discussed at a recent Killorglin Electoral Area Meeting at which time a detailed report was presented which acknowledged that the Killorglin area is problematic.

Cllr. T. Buckley stated that he was aware of some applicants who are waiting six months for on-site pre-planning meetings. This delay is unacceptable.

Cllr. R. Beasley also supported the motion and concurred with the views expressed by Cllr. Buckley.

Cllr. M. O'Shea stated that it is unacceptable that an applicant must wait six or nine months for an on-site pre-planning meeting. He asked if all planners are co-operating fully with the policy of facilitating these meetings.

Cllr. J. O'Connor stated that if applicants were given the option of a meeting with a planner in the office it would probably be sufficient. If some areas are not experiencing any difficulties the resources should be put into the areas that are experiencing delays. A written agreement should also be provided on what is agreed at a pre-planning meeting.

Cllr. A. McEllistrim requested that even if there is a long delay in getting a pre-planning meeting applicants should be given a date for their meeting with the planner.

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Cllr. B. Cronin asked if the zoning amendment for the Aghadoe storage facility had been withdrawn.

In response Mr. M. McMahon, Director of Planning, said that the reply speaks for itself as the planning department is providing a phenomenal service together with the processing of 5000 planning applications. Two senior executive planners monitor the workload of planners so there is a clear understanding of the workload of all planners which is evenly divided. Each planner also deals with on-site pre-planning meetings in their area and there is a greater demand for these meetings in some areas. Two planners are assigned to relieve the pressure in any particular area. However, due to the fact that some planners have resigned there is no spare capacity at present. He added that there is not always agreement at on-site pre-planning meetings but a written record of the meeting is kept.

Cllr. S. Fitzgerald emphasised the need to agree an account of the on-site pre-planning meeting on the day of the meeting.

Mr. M. McMahon agreed that both parties should sign a written record of on-site planning meetings on the day. He then referred to the proposed rezoning in Aghadoe which was opposed by the executive yet voted through by the members. This amendment was put out on public display and a number of submissions were received. It has not been withdrawn and it cannot be in accordance with planning legislation. This amendment will stand until the elected members consider the Manager's Report on the 2<sup>nd</sup> April.

### **07.03.12.14 Correspondence – Conferences and Seminars**

- (a) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllrs. B. O'Connell, M. Healy-Rae, J. O'Connor and D. Healy-Rae at the Irish Rural Dwellers Association Planning Conference 2007 to be held in Killarney from 18<sup>th</sup> – 20<sup>th</sup> April, 2007.

Cllr. J. O'Connor was nominated to report back to the Council on this conference.

- (b) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllrs. T. Buckley, L. Purtill and B. MacGearailt at the Southern & Eastern Regional Assembly 8<sup>th</sup> Annual Regional Assembly Conference to be held in Naas, Co. Kildare on the 20<sup>th</sup> April, 2007.

Cllr. T. Buckley was nominated to report back to the Council on this conference.

- (c) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllrs. B. O'Connell, T. Buckley, T. Fitzgerald, S. Fitzgerald, L. Purtill and J. O'Connor at the Seminar for Councillors on "The Local Government Housing Service" to be held in Letterkenny, Co. Donegal from 27<sup>th</sup> – 29<sup>th</sup> April, 2007.

Cllr. B. O'Connell was nominated to report back to the Council on this seminar.

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- (d) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllrs. B. O'Connell, T. Fitzgerald, R. Beasley, B. Cronin, P. Leahy and P. McCarthy at the Carlow Tourism 5<sup>th</sup> National Tourism Conference to be held in Carlow on the 29<sup>th</sup> & 30<sup>th</sup> March, 2007.
- Cllr. B. Cronin was nominated to report back to the Council on this conference.
- (f) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllrs. R. Beasley, P. Leahy, D. Healy-Rae and M. Healy-Rae at the Rural and Regional Development Conference held in Killybegs, Co. Donegal on the 2<sup>nd</sup> & 3<sup>rd</sup> March, 2007.
- (g) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllr. M. Healy-Rae at the AMAI Conference held in Tralee on the 9<sup>th</sup> & 10<sup>th</sup> February, 2007.
- (h) On the PROPOSAL of Cllr. T. Buckley, SECONDED by Cllr. J. Brassil it was agreed to approve the attendance of Cllr. M. Healy-Rae at the 15<sup>th</sup> Annual Kerry Environmental Conference to be held in Ballybunion from 28<sup>th</sup> March – 1<sup>st</sup> April, 2007.

### **07.03.12.15 Correspondence General**

It was agreed to note the following items of correspondence which were circulated.

1. Letter dated 28<sup>th</sup> February, 2007 from the Office of the Minister for Education and Science regarding information and communications technology (ICT) in schools.
2. Letter dated 19<sup>th</sup> February, 2007 from the Office of the Minister for Foreign Affairs concerning the plight of the Benghazi Six.
3. Letter dated 15<sup>th</sup> February, 2007 from the Office of the Taoiseach regarding the rural Post Office network.
4. Letter dated 13<sup>th</sup> February, 2007 from the Office of the Minister for Environment, Heritage and Local Government concerning an invitation to the Minister to visit Inch.
5. Letter dated 13<sup>th</sup> February, 2007 from the Office of the Minister for Health and Children concerning restitution to residents of long-stay hospitals/nursing homes.
6. Letter dated 12<sup>th</sup> February, 2007 from the Office of the Minister for Transport regarding an amnesty for provisional drivers.
7. Letter dated 14<sup>th</sup> February, 2007 from the Office of the Minister for Arts, Sport and Tourism regarding public lands at St. Finian's Hospital, Killarney.
8. Letter dated 27<sup>th</sup> February, 2007 from the HSE South regarding the establishment of an independent inspectorate for nursing homes.
9. Letter dated 26<sup>th</sup> February, 2007 from the Office of the Minister for Health and Children regarding the establishment of an independent inspectorate for nursing homes.

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10. Letter dated 23<sup>rd</sup> February, 2007 from the Office of the Minister of State at the Department of Transport regarding the funding of members' personal accident insurance costs for the Kerry Mountain Rescue Team.
11. Letter dated 20<sup>th</sup> February, 2007 from the Department of Social and Family Affairs regarding free air travel for old age pensioners.
12. Letter dated 20<sup>th</sup> February, 2007 from the Office of the Taoiseach regarding transport projects in Kerry.
13. Letter dated 23<sup>rd</sup> February, 2007 from the Association of County and City Councils calling for an update of the dog control legislation 1998 so that an outright ban can be applied to certain dangerous breeds such as pit-bull terriers.
14. E-mail dated 1<sup>st</sup> March, 2007 from Sligo County Council concerning a resolution adopted by that authority concerning the appointment of conflict mediators at national level.

### **Granting of planning permission for a caravan park at Banna**

Cllr. T. Ferris referred to a recent decision to grant planning permission for a caravan park at Banna and said that it is important that an explanation is given on how this decision was arrived at. The proposed location of the development is often under water and is known locally as The Lough. The number of holiday homes in the area out numbers permanent homes 17 or 18 to 1. She added that 2 local people were refused permission while permission is granted for a caravan park.

Mayor T. Fitzgerald asked what the current position in relation to this application was. Has it been appealed to An Bord Pleanála and is it appropriate for members to discuss it.

Cllr. M. Healy-Rae stated that it was unfair of Cllr. Ferris to question the decision of the planning department in this way. This is casting a slur on the planning staff which is unfair. He acknowledged that part of the site for the caravan park is wet but he welcomed the decision by the planning department to grant permission for this development.

Cllr. J. Brassil supported Cllr. Ferris's right to raise this issue and stated that he supported and tried to promote good planning. He added that Cllr. M. Healy-Rae had moved many Section 140 motions in the past 5 years and members are entitled to get a response from planning officials on this case. A local public meeting would be held later that week and it is important that the views of the local community would be taken into consideration. The Planning Department was recently promoting a policy of moving away from large caravan parks.

Cllr. P. McCarthy stated that Cllr. Ferris was merely reflecting the view of the local community, which she was entitled to do.

Mr. M. McMahon stated that the planning process is the most transparent of any process operated by the Council. The planning file is available for public inspection and every report together with the recommendation of the planner and the reasons for his recommendation are available to any member of the public who wish to inspect the file. He could not comment on any other application. He pointed out that people have the right to appeal the planning authority's decision.

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**Civic Reception**

Cllr. P. Leahy PROPOSED that a Civic Reception be held to honour the fundraising achievements of Willie Guiney, Listowel.

Cllr. R. Beasley SECONDED this proposal and it was agreed.

The meeting concluded at 1.15pm.

**C. O Suilleabhain**  
SEO Corporate Affairs

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**Mayor of Kerry**

## **ATTACHMENTS**

31. Typical Arrangement LNG Tanks 1&3 Front Elevation – submitted as part of Planning Application to An Bord Pleanála by Shannon LNG  
<http://www.shannonlngplanning.ie/files/PlanningDrawings/LNGTankAndJettyDrawings/C202.pdf>

## **ATTACHMENTS**

32. Notice of proposed variations of the kerry county development plan 2003 - 2009  
<http://www.kerrycoco.ie/ballylongfordvariation.asp>



<http://www.kerrycoco.ie/ballylongfordvariation.asp>  
**COMHAIRLE CONTAE CHIARRAÍ**

**KERRY COUNTY COUNCIL**



**COMHAIRLE CONTAE CHIARRAÍ**  
**KERRY COUNTY COUNCIL**

**PUBLIC NOTICE**  
**PLANNING AND DEVELOPMENT ACTS 2000 - 2006**

**NOTICE OF PROPOSED VARIATIONS OF THE KERRY COUNTY DEVELOPMENT PLAN  
2003 - 2009**

Kerry County Council, pursuant to the provisions of Section 13 of the Planning and Development Act, 2000, (as amended), has prepared a variation of the Kerry County Development Plan 2003 - 2009 as follows:-

To rezone 188.8ha ( 466.53 acres) of land, comprising 105ha (261.43acres) currently zoned as Rural General and 83ha (205.1 acres) currently zoned as Secondary Special Amenity, in the townlands of Reenturk, Rallappane and Kilcolgan Lower, to Industrial zoning.

Reason: The purpose of this variation is to facilitate consideration of suitable development on these lands in accordance with the provisions of section 5.2.9 of the Kerry County Development Plan 2003 – 2009 which states: 'Lands have been identified at Ballylongford / Tarbert as suitable for development as a premier deepwater port and for major industrial development and employment creation'

Objective ECO 5-5 of The Kerry County development Plan 2003-2009 states 'It is an objective of Kerry County Council to identify lands in key strategic locations that are particularly suitable for development that may be required by specific sectors. Land in such locations will form part of a strategic reserve that will be protected from inappropriate development that would prejudice its long-term development for these uses'

A copy of the proposed variation may be inspected during office hours (9.00a.m. - 5.00 p.m.) from Wednesday 7th February, 2007 to Thursday 8th March, 2007, both dates inclusive, at :-

The Planning Department, County Buildings, Tralee

The County Council Offices, Bridge Road, Listowel.

Observations and submissions in respect of the proposed variation should be made in writing, addressed to Lorraine Sheehan, Planning Department, Kerry County Council, Áras an Chontae, Tralee and marked 'Submission - Variation to the County Development Plan, Ballylongford / Tarbert' to be received before 4.00 p.m. on Thursday 8th March 2007, and will be taken into consideration before the making of the variation.

**Kerry County Council**

**Rathass, Tralee, Co. Kerry, Ireland**

**Tel:+353 066 7183500 Fax: +353 066 7129764**

**E-mail: [kcc@kerrycoco.ie](mailto:kcc@kerrycoco.ie)**

**Webdesign: [webteam@kerrycoco.ie](mailto:webteam@kerrycoco.ie)**

## **ATTACHMENTS**

33. Ballylongford screening Report

**STRATEGIC ENVIRONMENTAL  
ASSESSMENT  
Screening Report**

Report Pursuant to Article 13k Planning And Development (Strategic Environmental  
Assessment) Regulations 2004

**Kerry County Council Development Plan  
2003-2009  
Proposed Variation**

**November 2006**

## **1.0 INTRODUCTION**

Kerry County Council intend to make a variation to the Kerry County Development Plan 2003 under Section 13 of the Planning and Development Act 2000(as amended). The purpose of this screening report is to consider whether the proposed variation requires Strategic Environmental Assessment (SEA) in terms of the Provisions of Article 13k of The Planning and Development (Strategic Environmental Assessment) Regulations 2004. It shall consider whether or not the proposed variation is likely to have significant effects on the environment.

## **2.0 PROPOSED VARIATION**

The proposed Variation is to amend the Kerry County Development Plan 2003 - 2009 to rezone lands of 188.8 hectares from its current zoning of 'Rural General' and 'Rural Secondary Special Amenity' to 'Industrial'.

## **3.0 CONTEXT**

The area of land proposed for rezoning is located on the Ballylongford Land Bank in North County Kerry to the Northeast of the village of Ballylongford and to the West of Tarbert Village. The lands border Ballylongford Bay, which forms part of the Shannon Estuary.

The council's objective in proposing this variation is to ensure that sufficient land is zoned for industrial use throughout the county. The lands proposed for variation are currently zoned Rural General (106.15 ha.) and Rural Secondary Special Amenity (82.65 ha.). The *Rural General* zoning designation refers to rural landscapes that generally have a higher capacity to absorb development than other rural zoning designations. The *Rural Secondary Special Amenity* designation refers to areas which are generally sensitive to development proposals.

## **4.0 MANDATORY REQUIREMENTS**

In terms of SI No. 436 of 2004 Planning and Development (Strategic Environmental Assessment) Regulations 2004 where a planning authority proposes to make a variation of a development plan under section 13K of the Act it shall consider whether or not the proposed variation would be likely to have significant effects on the environment. An assessment of the Proposed Variation in terms of the criteria set out in Schedule 2A of the Regulations is set out in Section 5. below.

**5.0 ASSESSMENT IN TERMS OF SCHEDULE 2A OF THE PLANNING AND DEVELOPMENT (STRATEGIC ENVIRONMENTAL ASSESSMENT) REGULATIONS 2004**

1.0	The Characteristics Of The Plan Having Regard In Particular To;
1.1	<p><b>The degree to which the plan sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources,</b></p> <p>The variation does not set a framework for projects and other activities, rather it responds to the comprehensive development framework set out in the Kerry County Development Plan 2003 - 2009. This plan sets out policies and objectives to ensure the proper and sustainable development of the County. Through the zoning process, a framework is established for the location of particular land uses and types of development.</p> <p>Any proposed development of the lands will have regard to the general planning, design and environmental standards and criteria and all relevant policies and objectives set out in the Kerry County Development Plan 2003 – 2009 and relevant National and European guidance.</p>
1.2	<p><b>The degree to which the plan influences other plans, including those in a hierarchy,</b></p> <p><b>sets</b> The variation does not influence other plans, rather it responds to the standards and guidelines set down in the National Planning Policy Hierarchy.</p>

1.3

**The relevance of the plan for the integration of environmental considerations in particular with a view to promoting sustainable development,**

Any development undertaken as a result of this variation will be required to comply with the environmental standards and guidelines set out in local, national and European policy documents. As the statutory plan for the area, the Kerry County Development Plan 2003 – 2009 which was prepared under the Planning and Development Acts 2000-2004, will guide the integration of environmental and sustainability considerations into development proposals for the lands.

The current Kerry County Development Plan 2003 – 2009 outlines a number of provisions to ensure the integration environmental considerations into development proposals and promote of sustainable development in the County. (See below).

- *Employment & Economic Activity:* Policy objective ECO 5-24 seeks ‘the integration of environmental considerations into the proposed new developments’.
- *Environmental Protection:* The council ensures environmental protection and prevention of pollution under policy objective EN 10-1 ensures that ‘*all necessary measures to prevent pollution in order to maintain the maximum quality of the environment of County Kerry*’ should be taken.
- *Groundwater Protection:* Policy Objective EN 10 – 12 ensures all planning applications within 300m of any public or group scheme groundwater source will be assessed in terms of their potential impact on the water quality of that source. Additionally cumulative impacts of planning applications on existing groundwater schemes will also need to be considered.
- *Air Quality:* The objective of policy EN 10 – 16 is to ensure that the air quality of County Kerry is in accordance with prescribed standards. Therefore any new Industrial developments on the proposed subject lands will not adversely affect air quality.
- *EU and National Designations:* Kerry County Council strongly support the protection of EU and National Designations in County Kerry through the creation of regulatory policies in order to safeguard against adverse affects on these designated lands. Policy objective EN 10 – 18 ensures ‘*that any development proposal in the vicinity of or affecting in any way a designated SAC, SPA or NHA provides sufficient information showing how its proposals will impact on the habitat and appropriate amelioration will be indicated*’. It is a also an objective of Kerry County Council under policies EN 10 – 19, EN 10 – 20 and EN 10 –21 to maintain the conservation value of those sites identifies by Duchas, The Heritage Service, as Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas.
- *Coastal Management:* Part of the proposed variation lands are located within the Coastal Development zone however there are a number of Policy objectives safeguarding against any

1.4

**Environmental problems relevant to the plan,**

Possible environmental issues arising from the proposed rezoning relate to the impact of future development in terms of the capacity on the water supply and sewerage network, traffic and visual amenity.

At this point in time, no specific significant environmental problems can be identified in relation to the above issues. Any proposed developments on the lands would be subject to assessment under the development control process and required to have regard to the general planning, design and environmental standards and policies set out in the Kerry County Development Plan 2003 – 2009

Furthermore, it is considered that any environmental problems likely to arise would be resolved through Environmental Impact Assessment legislation. An EIS will be required if any project or development exceeds the specified thresholds under Part X of the Planning and Development Act 2000 and Schedule 5 Part 2 (12) of the Planning and Development Regulations 2001.

With regard to services and traffic, any proposed development on the site would be subject to the availability/provision of water, surface water and sewerage facilities. Given the likelihood of mitigation measures being put in place and adherence to best practice in developing on site solutions with regard to drainage, traffic management and waste water treatment it is considered unlikely that there will be significant environmental impacts.

It is considered that there is potential for significant visual impact, this however can also be mitigated against through the incorporation of design solutions and adherence to

1.5	<p><b>The relevance of the plan for the implementation of European Union legislation on the environment (e.g. plans linked to waste-management or water protection).</b></p> <p>While the lands are not subject to any designations, they are located in proximity to a number of areas designated for protection under national and EU Legislation. The Lower River Shannon is designated as a 'candidate SAC' (ref; 00216) and NHA (ref;001332), while the River Shannon and River Fergus Estuaries contain areas designated as SPAs.</p> <p>It is considered, given the size and extent of areas designated, the localised nature of the lands to be rezoned and the mitigation measures required by the policies and standards outlined in local and national planning guidance, that there is unlikely to be significant environmental impacts on these areas.</p>
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2.0	<p><b>Characteristics Of The Effects and Of The Area Likely To Be Affected, Having</b></p>
2.1	<p><b>The probability, duration, frequency and reversibility of the effects.</b></p> <p>The industrial zoning objective will be in place until 2009. In 2007 the status of the zoning will be reviewed as part of the preparation of a new County Development Plan in 2009.</p> <p>It is anticipated that the policies, objectives and principles adopted as part of the Kerry County Development Plan 2003 - 2009 will ensure that the duration, frequency and irreversibly of the effects resulting from the proposed variation on the existing environment will not be significant.</p>
2.2	<p><b>The cumulative nature of the effects,</b></p> <p>It is considered that there is potential for some cumulative impacts due to the extent of land to be rezoned. However, given the likely phased basis of development and the provision of appropriate mitigation measures through the development control process it is considered that cumulative impacts can be mitigated against.</p>



<p>2.3</p>	<p><b>The transboundary nature of the effects,</b></p> <p>It is considered that there will not be any transboundary effects on the environment as a result of the Proposed Variation.</p>
<p>2.4</p>	<p><b>The risks to human health or the environment (e.g. due to accidents),</b></p> <p>The risk to human health will be dependant on the nature and type of industry proposed in the area. However given the distance to the nearest settlements (Ballylongford 2.3km and Tarbert 3.9km) and the standards controlling the development and operation of industries it is not considered that the proposed variation would pose any particular risks to human health in the context of accidents.</p> <p>Development control and policy and objectives contained within the Kerry County development Plan 2003 - 2009 (outlined above in section 5 1.4) will ensure appropriate assessment of any development on the lands. Additionally, polluting industries are subject to Environmental Protection Agency licensing.</p> <p>An EIS will be required if any project or development exceeds any one of the specified thresholds under Part X of the Planning and Development Act 2000 and Schedule 5 Part 2 (12) of the Planning and Development Regulations 2001 set out the statutory requirements in relation to the need for Environmental Impact Assessment.</p>
<p>2.5</p>	<p><b>The magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected),</b></p> <p>The area of land to be rezoned under the proposed variation is 188.8 hectares. In the 2002 census Ballylongford had a population of 405 persons with Tarbert village at 805 persons (2006 figures not available). It is therefore considered that the magnitude and spatial extent of the likely effects are not significant in the context of the geographical area and population likely to be affected.</p>

<p>2.6</p>	<p><b>The value and vulnerability of the area likely to be affected due to:</b></p> <ul style="list-style-type: none"> <li>• <b>Special natural characteristics or cultural heritage,</b></li> <li>• <b>Exceeded environmental quality standards or limit values,</b></li> <li>• <b>Intensive land-use,</b></li> </ul> <p>No likely significant effects on either special natural characteristics or cultural heritage are anticipated.</p> <p>Part of the area is zoned as a Secondary Special Amenity Area, which is 'generally' sensitive to development', however it is not designated under national or EU legislation.</p> <p>There are no protected structures on the lands. However there are two sites listed on the 'Record of Monuments and Places' (ref; Reenturk and KE 003 014). It is likely that there will be an impact on these.</p> <p>Development of the site shall be subject to an application for planning permission and no development shall be permitted which would exceed environmental quality standards or limit values.</p>
<p>2.7</p>	<p><b>The effects on areas or landscapes which have a recognised national, European Union or international protection status</b></p> <p>While the lands are not located within SAC, SPA or NHA the northern boundary is adjacent to the Ballylongford SAC and the Shannon Estuary SPA and NHA.</p> <p>The variation is not regarded as having any significant effect on these designated areas as regulatory policy measures have been put in place within the Kerry County Development Plan in order to safeguard and mitigate against development proposals in the vicinity of or affecting in any way a designated SAC, SPA or NHA.</p>

## 6.0 STATUTORY CONSULTATION

In line with the requirement under Section 13A (4) is proposed to consult with the following authorities;

- The Environmental Protection Agency (EPA)

- The Department of the Environment, Heritage and Local Government (DEHLG)
- The Department of Communications, Marine and Natural Resources (DCMNR).

## **7.0 DETERMINATION IN TERMS OF ARTICLE 13K**

In terms of the provisions of Article 13K of the Regulations, following the appropriate consultation period the planning authority shall determine whether or not implementation of the Proposed Variation would be likely to have significant effects on the environment, taking account of relevant criteria set out in Schedule 2A of the Regulations (see section 5 above) and any submission or observation received from the environmental authorities (see section 6 above).

## **8.0 CONCLUSION**

On balance it is considered that the Proposed Variation is not likely to have significant effects on the environment for the reasons detailed above. It is proposed to initiate the procedures for the variation of the Kerry County Development Plan in order to facilitate balanced growth by the promoting the strengthening of rural communities by facilitating job creation, decrease in numbers that commute to work and improvement of services.

The policy and objectives contained within the Kerry County Development Plan 2003 - 2009 will ensure the appropriate assessment of any proposed developments on the lands so as to prevent any adverse effects. The nature of the proposed variation is considered to be relatively minor. Therefore it does not appear that there is a need for a SEA in this instance as the proposed variation is unlikely to result in development which would have significant effects on the environment.