

ORAL HEARING

PROPOSED LIQUEFIED NATURAL GAS (LNG) REGASIFICATION
TERMINAL LOCATED ON THE SOUTHERN SHORE
OF THE SHANNON ESTUARY IN THE TOWNLANDS
OF RALAPPANE AND KILCOLGAN LOWER, CO. KERRY

HEARD BEFORE THE INSPECTOR,

MR. ANDREW BOYLE

ON WEDNESDAY, 23RD JANUARY, 2008

AT THE BRANDON HOTEL, TRALEE, CO. KERRY - DAY 3

I hereby certify the
following to be a true
and accurate
transcript
of recordings of the
evidence in the
above-named action.

3

APPEARANCES

KERRY COUNTY COUNCIL:

MR. T. SHEEHY

FOR THE APPLICANT
(SHANNON LNG):

MR. HUGH O'NEILL SC
MR. JARLATH FITZSIMONS BL

INSTRUCTED BY:

NICOLA DUNLEAVY
SOLICITOR
MATHESON ORMSBY PRENTICE

OBJECTORS:

MR. J. McCELLIGOTT
MS. GRIFFIN
MR. NOEL LYNCH
MS. JOAN MURPHY
MR. DONNCHA FINUCANE
MS. EILEEN O'CONNOR
MR. E. McCELLIGOTT
MRS. LILY O' MAHONY
MR. RAYMOND O' MAHONY
MR. TIM MAHONY
MR. THOMAS O' DONOVAN
MR. MICHAEL FINUCANE
MR. RICHARD O' SULLIVAN
MR. DES BRANIGAN

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1 THE HEARING RESUMED AS FOLLOWS ON WEDNESDAY, 23RD
2 JANUARY, 2008

3
4 **INSPECTOR:** Good morning everybody.
5 This is Day 3 of the oral 10:04
6 hearing on the Shannon LNG project and today I was
7 hoping to at least start on the health and safety
8 module. Before I do that though, I have been reminded
9 by EirGrid that I promised them that they could have a
10 few minutes and Mr. Mark Norton is here. They put in a 10:04
11 very brief submission to us just a few days before this
12 hearing and I think the best thing is if they read it
13 over and then if anybody has any brief questions we
14 will allow time for that. So, Mr. Norton please.

15
16 MR. NORTON PRESENTED HIS SUBMISSION AS FOLLOWS:

17
18 **MR. NORTON:** Hello. This is a letter
19 dated 15th January, 2008.
20 It is regarding the proposed Liquefied Natural Gas 10:05
21 Regasification Terminal located at the southern side of
22 the Shannon Estuary in the townlands of Ralappane and
23 Kilcolgan Lower, Co. Kerry and it as follows:

24 "Dear sirs,

25 In response to your letter dated 21st
26 December, 2007, EirGrid wishes to make
27 the following observations in relation
28 to the development of the Liquefied
Natural Gas Regasification Terminal in
the previous mentioned townlands.

29 All connections to the transmission
system are subject to the terms and

1 conditions as specified by various
2 directions by the Commission for Energy
3 Regulation to EirGrid from time to time
4 pursuant to Section 34 of the
5 Electricity Regulation Acts, 1999, as
6 amended.

7 EirGrid is a licensed transmission
8 systems operator under SI 445/2000 and
9 has a public transparent connection
10 offer process which it is required to
11 comply with as part of its licence
12 conditions.

10:05

13 In compliance with our duty not to
14 discriminate unfairly between various
15 system users, pursuant to Regulation 11
16 under SI 445/2000, EirGrid does not
17 rank or discriminate between demand
18 projects.

10:06

19 This project is currently within the
20 connection offer process. Until the
21 offer to be issued is signed the scope
22 of EirGrid's transmission development
23 works cannot be finally determined. It
24 is important to ensure that there is no
25 unintended conflict between this public
26 planning process and EirGrid's
27 connection offer process in respect of
28 this development.

10:06

29 Notwithstanding this, EirGrid would
30 like to make the following
31 observations. The closest existing
32 transmission station to the project is
33 Tarbert 220kv station. As part of the
34 connection offer process initial
35 network studies have identified Tarbert
36 220kv station as adequate capacity to
37 accommodate the new facility and limits
38 the needs identified for new additional
39 infrastructure to the 110 station at
40 the terminal site and 110 circuits to
41 connect the station into the
42 transmission network. The limited
43 scale of network development to provide
44 access to this terminal indicates the
45 enhanced viability, for a transmission
46 infrastructural perspective, of this
47 connection point for a servicing of
48 this size.

10:06

10:07

49 Regards Andrew Cook.
50 Director, GDC EirGrid."

51

1 outside of urban areas. I would suggest that this
2 decision would be better placed in the application for
3 the lines, at that time.

4 **MR. FOX:** Mr. Inspector, I raised the
5 point in view of the fact 10:09
6 that I understand the Inspector can, at his discretion,
7 make a recommendation or apply a condition. We would
8 respectfully suggest this would become a condition,
9 that the cabling be placed underground.

10 **INSPECTOR:** Okay. Mr. McElligott? 10:09

11 **MR. J. McELLI GOTT:** Yes, I think that we would
12 like to object that that
13 planning application for a transmission line should
14 have been included with this current application,
15 because of the risks it can cause to safety in being an 10:09
16 ignition source for further accidents. That should
17 have been included in the QRA. So, we are both
18 objecting to the project splitting, contrary to the EIA
19 Directive, and we are objecting to the fact that the
20 risks of this high powered electric transmission system 10:10
21 is not being included in this current application.

22 **INSPECTOR:** Okay. Mr. O'Neill?

23 **MR. O' NEI LL:** In fact, Mr. Fox asked the
24 question I was going to ask
25 myself. One point I would like to make, in case it 10:10
26 escapes my attention later, Mr. Fox has suggested that
27 you would impose a condition, or the Board would impose
28 a condition, if it is of the view that planning
29 permission should be granted, requiring that the cable

1 be underground. I am not sure that you have
2 jurisdiction to impose such a condition and, in any
3 event, it would probably be inappropriate before a
4 proper assessment of the ground conditions and other
5 conditions is undertaken and completed by EirGrid. 10: 10

6 Thank you, sir.

7 **INSPECTOR:** Okay.

8 **MR. J. McELLI GOTT:** We would like a right a
9 reply to the last statement

10 by Paddy Power yesterday evening on the statement by 10: 11
11 the Minister for Energy in the Dáil. It is very brief.

12 **INSPECTOR:** Well, just bear in mind
13 that, I think, you are one
14 of the prime people who wishes to talk about health and
15 safety. 10: 11

16 **MR. J. McELLI GOTT:** Okay, yes. The statement
17 by Minister Ryan is
18 interpreted by us as the Minister giving more
19 importance to the announcement of the in Kinsale
20 storage facility being the first such storage facility 10: 11
21 in Ireland --

22 **INSPECTOR:** Mr. McElligott, I think we
23 are having a little bit of
24 difficulty here.

25 **MR. J. McELLI GOTT:** The statement by Minister 10: 11
26 Ryan in the Dáil is
27 interpreted by us as the Minister giving more
28 importance to the announcement of the Kinsale storage
29 facility being the first such storage facility in

1 Ireland and is only speaking of Shannon LNG's planned
2 development as a supporting aside. His statement read:

3 "The CER has granted a gas storage
4 licence to Marathon Oil Limited to make
5 the full capability of its depleted
6 Kinsale facility, which has a capacity
7 of 7 billion cubic feet, available to
8 third parties. This is the first such
9 storage facility in Ireland and Bord
10 Gáis Eireann has contracted to use over
11 5 billion cubic feet of it.

10: 12

12 Work is also nearing completion on an
13 All Island Study overseen by my
14 Department and the Department of
15 Enterprise, Trade and Investment in
16 Northern Ireland on a joint approach to
17 gas storage and liquefied natural gas.
18 The planned development of a merchant
19 LNG storage facility at Shannon will
20 also have a positive impact on the
21 security of our gas supply and improve
22 our connectivity to the global gas
23 market.

10: 12

24 The connection of the Corrib Gas Field,
25 with its estimated capability to supply
26 some 60% of our annual natural gas
27 requirements over a span of 15 to 20
28 years, will significantly reduce our
29 dependence on imports during that
30 period."

10: 13

31 So, we ask the Inspector to take that statement in its
32 context, because I think it was taken out of context
33 yesterday evening. It also highlighted that the
34 Minister and the Government now predict that there will
35 be 60% of our annual natural gas coming from Corrib.
36 That should be taken into account also. Thank you.

10: 13

37 **INSPECTOR:**

Thank you Mr. McElligott.

38 **MR. O'NEILL:**

39 If I may very briefly reply
40 to that. We do not accept

41 that the statement from the Minister was taken out of

10: 13

1 context at all. But I do want to put it in a proper
2 context. It is a statement by a Minister, it is not a
3 matter to which you have to have regard. You have to
4 have regard to the Government policy, the White Paper
5 on identifying the Government policy on energy is much 10: 14
6 more significant. It was included in Mr. Power's
7 submission but it does, of course, have the caveat that
8 it is simply the expression of one member of the
9 Government, the appropriate Minister, obviously. We
10 did not intend, and I do not want to give it a status 10: 14
11 that it doesn't enjoy.

12 **MR. J. McELLI GOTT:** That's why we would like to
13 say that I agree with you
14 and that the Government has put more emphasis on its
15 policy on renewable energy. Yesterday evening, before 10: 14
16 he mentioned this Dáil speech, we had said that there
17 was more emphasis at the moment being put on policy
18 for renewable energy than our fossil fuels and our
19 carbon emissions commitments under Kyoto Protocol.

20 **INSPECTOR:** Thank you, McElligott. 10: 14

21 **MR. O' NEILL:** Just very briefly on that,
22 Sir. The White Paper
23 speaks for itself. I do not accept what Mr. McElligott
24 is saying, but you will look at the White Paper, no
25 doubt, and form your own view. 10: 15

26 **INSPECTOR:** Now, do we have somebody
27 here from the Department of
28 Agriculture. Could I have the Department's full title,
29 please.

1 procedure -- in our assessment of any application for a
2 lease on the foreshore.

3
4 I just want to draw the distinction between our
5 function of granting a lease and any observations we 10: 17
6 might have to offer to An Bord Pleanála, because my
7 understand in relation to the Strategic Infrastructure
8 Act is that issues relating to navigation, insofar as
9 advice from An Bord Pleanála are concerned, would come
10 from the Minister of Transport. But I just want to 10: 17
11 emphasise, in the context of the grant of any lease
12 that we might grant, we would consult our normal
13 consultees and in that context they would include the
14 Department of Transport and the MSO, insofar as
15 navigation safety is concerned. 10: 17

16 **INSPECTOR:** What is the MSO?

17 **DEPT. OF AGRICULTURE:** It is the Marine Survey
18 Office.

19 **INSPECTOR:** I am not going to take
20 questions on that, it is 10: 18
21 just I wanted to have that information on board. So
22 thank you. Okay.

23 **MR. COUGHLAN:** I wish to make a statement.

24 **INSPECTOR:** We have got somebody from
25 the Shannon Foynes Harbour 10: 18
26 Authority.

27 **MR. COUGHLAN:** Alan Coughlan, Harbour
28 Master, Shannon Estuary.

29 In relation to the navigational safety issues, it is in

1 the first place for us to decide what we will put in,
2 in terms of navigation safety procedures and resources.
3 And that has to satisfy the MSO, they come and look at
4 what we put in and they lift from us, from our
5 template, and they advise the Marine Licence Vetting 10: 18
6 Committee. It has to be said that they can put any
7 conditions that they wish on the licence, from a
8 navigational safety point of view.

9 **INSPECTOR:** Okay.

10 **MR. J. McELLI GOTT:** Can may I ask a question? 10: 19
11 Who has primary
12 responsibility for safety tonne estuary.

13 **MR. COUGHLAN:** The Harbour Master.

14 **MR. J. McELLI GOTT:** Does the Department of
15 Agriculture have any role 10: 19
16 in undertaking a risk assessment on water.

17 **MR. COUGHLAN:** That's a question for the
18 Department of Agriculture.

19 **MR. J. McELLI GOTT:** Then a question for the
20 Department of Agriculture. 10: 19

21 **INSPECTOR:** Hang on now.

22 **DEPT. OF AGRICULTURE:** As I said, we would take
23 our advice from the MSO.

24 So, as I have said, we have a number of consultees, in
25 the same way as we would take advice from particular 10: 19
26 scientific people in relation to scientific matters we
27 would take advice in relation to navigation and safety
28 aspects from the appropriate people. I suppose, I
29 should have added, in the context of our consultees,

1 one of our normal consultees would be the Department of
2 Environment and we would consult them directly on
3 matters of environmental issues as well. That would
4 include nature conservation and underwater archaeology.

5 **INSPECTOR:** Thank you. Look, I want 10: 20
6 to press on with the health
7 and safety module, and this is one of your major
8 concerns. So, I am going to now start into that and I
9 am going to call on you, Mr. McElligott, to open
10 proceedings. 10: 20

11 **MR. O'NEILL:** Just very briefly, Sir.
12 You did raise at an early
13 stage issues that you had or issues that you wanted to
14 address in relation to health and safety, maybe if I
15 can briefly deal with one matter now it may clarify, 10: 20
16 certainly, the Developers' approach. That relates to
17 the questions as to extent of the application of the
18 Seveso Directive and the Major Accidents Regulations
19 here, and particularly whether it extends to the
20 jetties. The application of both the Seveso II 10: 21
21 Directive and the regulations are the same, they both
22 apply to the establishment, which would include the
23 jetties, the construction and unloading jetties. It
24 does not apply, both the Directive and the Regulations
25 are very clear in explicitly saying that they do not 10: 21
26 apply to the transport of dangerous substances to and
27 from an establishment. And, therefore, the extent of
28 the establishment and the extent, therefore, of the
29 assessment by the HSA under the Directive is confined

1 to the land based facilities, including the jetty. In
2 other words, the assessment of risk commences as soon
3 as the gas hits the connection between the ship and the
4 jetty. That's the fixed arm pipe.

5 INSPECTOR: Very good. Thank you for 10: 22
6 that.

7 MR. J. McELLI GOTT: We would like to say that
8 the establishment includes
9 25 acres offshore and that is included as part of the
10 proposed application. So, we would, at least, say that 10: 22
11 anything that happens in those 25 acres should be taken
12 into account. Secondly, in the interest of safety to
13 people, those safety issues coming up the estuary will
14 have to be taken into account as well.

15 INSPECTOR: Okay, Mr. McElligott, do 10: 22
16 you want to get on with
17 your presentation at this stage.

18
19 MR. McELLI GOTT PRESENTED HIS SUBMISSION ON HEALTH AND
20 SAFETY AS FOLLOWS: 10: 22

21
22 MR. J. McELLI GOTT: We requested the HSA
23 defines the "specified
24 area" subject to major accident planning regulations
25 under the Seveso II Directive, because this is not 10: 22
26 being given before the planning application is going
27 through we think that this should be done afterwards.
28 I am just going to give you a synopsis of the things I
29 have submitted otherwise it will go on forever. Is

1 that okay?

2 **INSPECTOR:** Do you have a copy here for
3 our stenographer?

4 **MR. J. McELLI GOTT:** Yes.

5 **MR. O' NEI LL:** If he has addi ti onal 10: 23
6 copi es. We were simply
7 given one copy. If Mr. McEl li gott has addi ti onal
8 copi es it wou ld be very hel pful. We have sent down to
9 provi de copi es but it wou ld be hel pful if there were
10 more copi es avai labl e. 10: 23

11 **MR. McELLI GOTT:** I have just two copi es here
12 left. I have just two more
13 copi es.

14 **MR. O' NEI LL:** I don' t know if the
15 stenographer needs one 10: 23
16 right now. We can certainly make one avai labl e to her
17 later thi s morni ng.

18 **MR. J. McELLI GOTT:** If you wou ld be so ki nd.
19 Thank you.

20 (SAME HANDED TO MR. O' NEI LL) 10: 24

21 Okay. Our submi ssi on is pret ty detai led so that is why
22 I just want to synopsi se the di fferent areas and i ssi ues
23 that we are rai si ng. I have given a complete copy to
24 the Inspe ct or and to the appl i cants, as well as the
25 local authori ty. 10: 24

26
27 Our main problem that we have is on the safety i ssi ue
28 and we feel that we are not getti ng all the safety
29 i nformati on before thi s pl anni ng appl i cati on and oral

1 hearing has commenced. The first problem was that we
2 do not know the "specified area" that will be subject
3 to major accident planning regulations under the Seveso
4 II Directive. Secondly, the Department of Agriculture
5 have requested more environmental information from the 10: 25
6 applicant and we do not have access to that information
7 either. Thirdly, we do not have a Marine Risk
8 Assessment undertaken yet by the Shannon and Foynes
9 Port Company.

10
11 We have been refused information on the SemEuro
12 petroleum storage facility and we worry about the
13 cascading effects that would have and issues on
14 cascading effects, in the case of an accident, that
15 that would raise. 10: 25

16
17 The safety issue is our main priority. We note that
18 there is no one statutory body to give overall safety
19 advice to An Bord Pleanála on overall of the project.
20 The HSA are giving land use planning advice without 10: 26
21 taking any Marine Risk Assessments into account. The
22 Marine Risk Assessments will not be carried out until
23 planning permission is given.

24
25 The HSA ignored the detailed Kilkigan Residents 10: 26
26 Association submission to it on January 10th, one day
27 before the deadline given by it for public submissions
28 because it actually ruled on January 9th that it was
29 not advising against the granting of planning

1 permission. The HSA has since agreed, on January 15th,
2 2008 -- and I include the e-mail communication in the
3 appendix -- that it will now review the material that
4 we submit with the help of three world renowned LNG
5 experts, which could alter the view of the authority. 10: 26

6
7 We object that if an exclusion zone is implemented
8 which prevents other port use and other land use of the
9 remainder of the landbank then Shannon Development will
10 have broken the aims of the land, as expressed in the 10: 27
11 County Development Plan, when they had expressed the
12 aim that the lands were going to be kept for "a premier
13 deep water port and for major industrial development
14 and employment creation". This land was sold under
15 pressure, with the understanding in the media over many 10: 27
16 years that it was being done for the common good. Less
17 than fifty jobs is not a relatively major employment
18 creation. We raised that issue yesterday but we just
19 want to enforce it.

20 10: 27
21 Dr. Jerry Havens, the world authority on LNG, has flown
22 in especially from America to attend this oral hearing.
23 We already asked the HSA and Shannon and Foynes Port
24 Company to be present so that Dr. Havens may question
25 and be questioned by them in order to ensure that as 10: 28
26 many of the safety issues as possible be covered in
27 this short timeframe. From the Killoolgan Residents
28 perspective, advice on land use planning issues do not
29 represent an independent analysis of all the safety

1 issues by any statutory body, so we would urgently
2 request that this opportunity to get a better
3 understanding of all the safety issues involved from
4 Dr. Havens in person is seized upon. Because of
5 extremely limited resources the KRA is of the opinion 10: 28
6 that our role is in only raising issues of concern to
7 us. It is the job of the statutory bodies to deal with
8 the safety issues completely and cohesively and not in
9 the piecemeal manner that seems to be taking place to
10 the date. 10: 28

11
12 Article 5.1 of the Seveso II Directive states that:
13 "Member States shall ensure that the operator is
14 obliged to take all measures necessary to prevent major
15 accidents and to limit their consequences for man and 10: 29
16 the environment".

17
18 This means that as we have found safer alternatives,
19 for example offshore, then that safer alternative
20 should be used instead of the current one. Article 12 10: 29
21 of the Seveso II Directive is more specific on this
22 when it states: "Member States shall ensure that the
23 objectives of preventing major accidents and limiting
24 the consequences of such accidents are taken into
25 account in their land use policies and/or other 10: 29
26 relevant policies. They shall pursue those objectives
27 through controls on, among other things, the siting of
28 new establishments."
29

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Now, as we have said many times, we have had no time to prepare for this oral hearing in any meaningful way because of the very short timeframe involved.

10: 29

Yesterday we talked about some of the alternatives: The offshore floating storage. The gravity based structure that is being implemented in Italy. The dock side terminal in Teesside, run by Accelerate Energy, which is currently in place. Submerged buoy technology, also run Accelerate Energy. It is in the Gulf Gateway Terminal 116 miles off the coast Louisiana. Shannon LNG questioned the acceptance of this type of technology by LNG suppliers as there is no storage. However, Accelerate Energy also has received its Record of Decision from the US Maritime Administration for approval for the companies Northeast Gateway Deepwater Port LNG Facility in Massachusetts in December. That's the scheduled to be operational soon.

10: 30

10: 30

10: 30

We also mentioned yesterday the new technology, which is catching up all the time, and that it is now possible to pump directly from an LNG carrier into salt caverns, which exist in the north of Ireland. That costs roughly 480 to 650 million dollars. The other alternatives we had raised yesterday, also, were the discussion about Corrib and the storage need being filled by the Kinsale reservoir. So, these were alternatives that are safe. Our claim is that if it

10: 31

1 can be shown here clearly today that the proposed
2 Shannon LNG site is dangerous for the people of North
3 Kerry then it is your duty to say that if other
4 alternatives exist then they should use those
5 alternatives. But it is not our job to assess those in 10: 31
6 more detail. It is up to the Board to get the
7 expertise to do that.

8
9 We have also noted that underground tanks are used in
10 Japan and were identifying as a way of reducing risks. 10: 32
11 We question that this is not considered here purely on
12 economic grounds.

13
14 As I said yesterday, also we had petitioned the
15 European Union Parliament. This is point 10. And I 10: 32
16 have included the details of this petition. It was a
17 petition for condemnation of breaches of EU Directives
18 by An Bord Pleanála and the Irish Planning and
19 Development Act, 2006, in the planning application for
20 this terminal because it is a top-tier Seveso II 10: 32
21 development. We have also petitioned for condemnation
22 of breaches of the SEA directive by Kerry County
23 Council for refusing to conduct a Strategic
24 Environmental Assessment when they rezoned the lands.

25 10: 32
26 We request that any decision on the proposed LNG
27 terminal be postponed awaiting the outcome of the
28 European Union petition.

29

1 We have also complained about the breach of procedure
2 at An Bord Pleanála, which we believe compromises the
3 independence An Bord Pleanála in dealing with this
4 application. An Bord Pleanála is also withholding
5 vital environmental information and, therefore, also 10: 33
6 safety information -- as that is how environmental
7 information is defined in the Seveso II Directive --
8 tonne intentions of SemEuro for a petroleum storage
9 facility tonne site adjacent to the proposed LNG
10 terminal. 10: 33

11
12 We have also made a formal complaint to the Office of
13 the Ombudsman concerning a serious breach of procedure
14 by Kerry County Council. That is currently under
15 investigation by the Ombudsman's officer, reference 10: 33
16 L18/07/2518. We request that any decision tonne
17 proposed LNG terminal be postponed awaiting the outcome
18 of this complaint. That was to do with the rezoning of
19 the lands.

20 10: 33
21 We have also forwarded the complaint to the Minister
22 For the Environment requesting that he overturn the
23 rezoning, as it breached the Department's own
24 guidelines. The reference number here is
25 REP4126/JG/07. We request that any decision tonne 10: 34
26 proposed LNG terminal be postponed awaiting the outcome
27 of this complaint.

28
29 Shannon Explosives Limited has applied for an

1 explosives storage facility at Charercon further west
2 of the Shannon LNG site tonne other side of the
3 Shannon, on the coast of Clare. And we are also
4 worried about -- that's currently under planning
5 application in Clare County Council. We also asked 10: 34
6 that An Bord Pleanála considers this application in
7 examining the risk of accidents that are caused -- you
8 know, the risk of cascading accidents that would be
9 caused by an accident either of the LNG tanker or of
10 the explosive devices at the Shannon Explosives Limited 10: 35
11 proposed site at Charercon.

12
13 The last thing I would like to show is the "Prime Time"
14 video of November 15th. This concluded that vapour
15 clouds do not evaporate harmlessly into the air, as was 10: 35
16 claimed by Shannon LNG. Furthermore, the company
17 sponsored trips by selected individuals to foreign
18 plants and they, as we have mentioned before, they have
19 sponsored local GAA clubs. We have questioned their
20 behaviour because what we are trying to get the point 10: 35
21 across is that when you are putting in a very serious
22 application like this, and it is a chemical hazard
23 company, you must tell every bit of the truth and be
24 completely transparent in your dealings with the
25 public. So, I think I would like to show the "Prime 10: 36
26 Time" video because it raises the issues of what they
27 had said consistently for the last one and a half years
28 about this proposal being so safe and so clean that
29 nobody else looked at the issues until it was almost

1 too late. So I would like to just show that now,
2 please.

3 **MR. O'NEILL:** Sir, I am not sure of the
4 relevance of any media
5 presentation or publication. The purpose of this 10:36
6 hearing is for you, as an Inspector of An Bord
7 Pleanála, to, obviously, consider the application and
8 listen to the objections and observations that are made
9 on behalf of parties. There is no probative value
10 whatsoever in a report compiled by RTÉ, or anyone else 10:36
11 for that matter, on an application that is being made
12 and ultimately heard by you. If I could just finish
13 please, Mr. McEligott. We have present, I understand,
14 Dr. Havens, who professes expertise and, undoubtedly,
15 he will deal with all of these issues. That may be 10:37
16 value to you. What RTÉ says can be of absolutely no
17 value.

18 **INSPECTOR:** What RTÉ says included an
19 expert opinion, but I think
20 you have had the opportunity to see this video already, 10:37
21 it is not introducing any new evidence. Is that
22 correct? Your team?

23 **MR. O'NEILL:** My team. I personally
24 haven't seen it. My team
25 may well have seen it. 10:37

26 **INSPECTOR:** Can we just confirm that?
27 It would have been made
28 available anyway.

29 **MR. O'NEILL:** Yes. But if it is

1 introducing -- insofar as I
2 personally don't know what is in it, it is difficult
3 for me to comment. But all I can say is if it is
4 introducing expert's reports, who are then not subject
5 to examination -- and experts other than Shannon LNG 10: 37
6 experts -- that is hardly an appropriate procedure. If
7 a view is to be expressed at this hearing the person
8 who is expressing that view should come here and
9 express that view. There is no provision for you to
10 take, as part of the evidence, probative evidence, 10: 38
11 information that is provided in a different forum.

12 **MR. J. McELLI GOTT:** Mr. Inspector, you have
13 great leeway and this is in
14 an informal hearing. It does have an expert opinion in
15 it, but it also gives -- it shows the context of what 10: 38
16 is taking place. We do not have the resources, as I
17 said before. Our limited resources are based on the
18 few limited resources we have. We can't afford to do
19 anything else.

20 **MR. O' NEI LL:** The comment that is made in 10: 38
21 paragraph 14 is this "the
22 "Prime Time" video concluded that vapour clouds do not
23 evaporate harmlessly". That is not a conclusion that
24 "Prime Time" is entitled to come to or has the
25 expertise to come to and cannot make that conclusion 10: 38
26 without being subjected to some examination. That
27 facility is not available here and, in those
28 circumstances, it would be a breach of the principles
29 of natural and constitutional justice to allow that

1 video be admitted without the facility to
2 cross-examine.

3 **MR. J. McELLI GOTT:** Mr. Inspector, they did a
4 lot of public
5 advertisements and they put out a lot of brochures in 10:39
6 the public domain and they did a lot of publicity and
7 they had their chance to give a public display. We
8 feel that they were wrong and now we want to show
9 contrary information, also in the public domain. So, I
10 think it is only fair that we should have a fair shot 10:39
11 at it as well.

12 **INSPECTOR:** It is what, a five minute
13 video?

14 **MR. J. McELLI GOTT:** Five minutes. Well, seven
15 I think. 10:39

16 **INSPECTOR:** I think we will allow it.

17 **MR. O' NEI LL:** You will note my
18 reservations.

19 **INSPECTOR:** Yes.
20 10:39

21 (VIDEO SHOWN)
22

23 **MR. J. McELLI GOTT:** Mr. Inspector, we submitted
24 a fairly detailed
25 submission to the Health and Safety 10:50
26 Authority... (INTERJECTION)

27 **MR. O' NEI LL:** Sorry to interrupt,
28 Mr. McElligott. Perhaps
29 Mr. McElligott could confirm that that's an unedited

1 version of the "Prime Time" presentation.

2 MR. J. McELLI GOTT: No, no, I shortened it.

3 MR. O' NEI LL: It is edited?

4 MR. J. McELLI GOTT: Yes.

5 MR. O' NEI LL: On what basis? 10: 50

6 MR. J. McELLI GOTT: On the basis that I thought

7 I had limited time to show

8 four videos.

9 MR. O' NEI LL: Or did you edit information

10 in that, that didn't suit 10: 50

11 the case that you are trying to make?

12 MR. J. McELLI GOTT: I put in all of Dr. Coxs'

13 and the expert opinions.

14 MR. O' NEI LL: Why did you not tell the

15 Inspector that you were 10: 50

16 presenting an edited version, rather than lead everyone

17 to believe that we were seeing the full "Prime Time"

18 version?

19 MR. J. McELLI GOTT: I said "Prime Time"

20 investigated, and the 10: 50

21 Inspector already has -- the full version has been

22 submitted to An Bord Pleanála anyway.

23 MR. O' NEI LL: So you didn't think it was

24 necessary to inform

25 everyone here that what we were seeing, in fact, was 10: 51

26 not the "Prime Time" production, it was your version of

27 that.

28 MR. J. McELLI GOTT: Yes. But that was

29 extremely clear from the

1 very beginning, when you saw the first five seconds, it
2 was obvious it was an edited version.

3 **MR. O'NEILL:** Not of that issue. Not in
4 relation to that issue, the
5 LNG issue, it certainly was not. But that is something 10:51
6 we will deal with later.

7 **MR. J. McELLI GOTT:** If you like, I can show the
8 full version of it.

9 **MR. O'NEILL:** It is something that I am
10 surprised and disappointed 10:51
11 that you didn't, in the sense of being open, something
12 that you have accused Shannon LNG of not being open,
13 that you yourself do not tell the members of the public
14 here, many of which support this proposal, tell the
15 members of Shannon LNG, tell the members of Meath 10:51
16 County Council (sic) and, of course, and most
17 importantly, tell the Inspector that what you are
18 showing is my selective version, edited version of the
19 "Prime Time" presentation.

20 **MR. J. McELLI GOTT:** Yes, I informed An Bord 10:52
21 Pleanála, Nicola Meehan,
22 and I asked her how long could I show a video for. She
23 said 'you will have to shorten it so that it will not
24 take too much time. Five or seven minutes would be
25 okay', she said. I told her it was 12 minutes and 44 10:52
26 seconds and I had to shorten it, according to Nicola
27 Meehan. So, I assumed that was understood. And I do
28 not have any legal advice on the intricacies of the
29 legal statements you are making and I cannot compete

1 with you, I am sorry. So I put my hands up.

2 **MR. O'NEILL:** No doubt though,
3 Mr. McElligott, you
4 understand the impression that can be given when
5 statements are taken out of context and when 10: 52
6 productions are edited. That doesn't take any legal
7 experience or training.

8 **MR. J. McELLI GOTT:** I apologise profusely. I
9 would like, also, to say
10 that we submitted a pretty detailed submission to the 10: 52
11 Health and Safety Authority and we had input from two
12 other LNG experts, James Venart, Ron Koopman, as well
13 as Dr. Havens. But I have included it as an appendix
14 and I think it would be better that Dr. Havens deals
15 with those issues, because it is pretty lengthy and I 10: 53
16 am not an expert on LNG.

17 **MR. COUGHLAN:** May I make a correction to
18 something that Johnny
19 McElligott said, please. Alan Coughlan, Harbour
20 Master, Shannon Estuary. He made reference to an 10: 53
21 explosives factory in Charercon. In actual fact, that
22 factory is at least 12 miles away from the proposed
23 site of the Shannon LNG project. Also, my
24 understanding of that facility, if it ever gets going,
25 because it is tonne planning books for quite a long 10: 53
26 time, is that two inert substances will be brought in
27 and mixed locally on site to make explosives. There
28 would be nothing of a dangerous nature passing the
29 proposed site. Thank you.

1 INSPECTOR: Thank you for that
2 clarifi cation.

3 MR. J. McELLI GOTT: I am just wondering about
4 ships passing close to
5 site. How close would the ships pass near that site? 10: 54

6 INSPECTOR: But Mr. Coughlan has just
7 told you that those ships
8 will contain inert substances.

9 MR. J. McELLI GOTT: Okay. I was thinking more
10 of when ships pass near the 10: 54
11 sites. Those explosives might be inert when they
12 arrive, but if it is an explosives storage facility
13 will they be explosive devices when they are completed?
14 I think it should be just looked into.

15 MR. COUGHLAN: May I reply? Nothing will 10: 54
16 be explosive until it
17 reaches Charercon, which is at least ten to twelve
18 miles from the proposed LNG site. Everything will be
19 inert until that time.

20 MR. J. McELLI GOTT: How far is this site from 10: 55
21 the shipping lanes?

22 MR. COUGHLAN: I have just told you.
23 Which site do you refer to?
24 The LNG site?

25 MR. J. McELLI GOTT: No. How far is the 10: 55
26 Charercon site from the
27 shipping lanes?

28 MR. COUGHLAN: That's totally irrelevant
29 to this procedure.

1 MR. J. McELLI GOTT: Thank you, I am finished.
2 INSPECTOR: Do you wish to continue?
3 MR. J. McELLI GOTT: I have put in the detailed
4 submission. Dr. Venart
5 noted that we should take into account the Buncefield 10: 55
6 site and the accidents that happened there. He says:
7
8 "In preparation for your studies you
9 might want to take a look at the UK HSE
10 Buncefield site and review the reports
11 available on that accident in 2005.
12 The review, especially the one dealing 10: 55
13 with the Explosion Mechanism Advisory
14 Group, while methane is not butane, in
15 terms of its explosive sensitivity, it
16 can be detonated. For example, with
17 the vapour cloud explosion studied by
18 Dr. Michael Hanarooski (sic)..."
19
20 He says: 10: 56
21
22 "There is some controversy regarding
23 the explosive sensitivity of C1 and, as
24 Buncefield clearly shows, a vapour
25 cloud explosion was ruled out. That is
26 it was given a probability of zero..."
27
28 And it exploded anyway.
29
30 "...in its QRA like evaluation. So,
31 despite what the Shannon QRA states, I
32 think this possibility must be
33 carefully considered."
34
35 That's what Dr. Venart submitted. Dr. Koopman, he
36 pointed out that he was happy to see that a QRA was 10: 56
37 undertaken. This is in appendix 3 by the way.
38
39 "He said he was happy to see that a QRA
40 was undertaken which was basically
41 sound (good news for the proposal). He
42 also agrees with the consequence
43 calculations of the accident scenarios

1 reviewed, find them inconsistent with
2 his work and the work of others he has
3 reviewed (also good news for the
4 proposal). He agrees that the
5 probability or risk of an accident is
6 very low, even if the consequences of
7 the worst incidents are quite severe
8 and can extend for miles downwind. But
9 he does say that "unfortunately there
10 is no equivalent QRA for LNG shipping
11 in the Shannon Estuary...and that ship
12 collisions are fairly common in and
13 around port areas."

10: 57

9 "Dr. Koopman also pointed to me in a
10 further e-mail that there is an error
11 in the QRA in the frequency estimate
12 for a large hole to a storage tank.

10: 57

11 *"Indeed, the flash fire hazard distance
12 far large hole (d) in the storage tank
13 is 11.3km downwind but the frequency
14 estimate for such a whole is 0 in table
15 A1 of annex A, therefore the risk is 0.
16 In table 3.3, page 20, in the body of
17 the report a frequency of 5E-8 is used
18 for catastrophic failure, not 0. This
19 should have been used in the
20 calculation rather than 0, but would
21 probably not change anything. The
22 tanks proposed for this project are
23 very robust and have never failed. The
24 only real possibilities for tank
25 failure that I can think of are
26 attacked with a truck bomb or shaped
27 explosive, an earthquake or a large
28 aeroplane. In all of these cases the
29 frequency is extremely low and close to
30 0."*

10: 58

10: 58

23 Our contention, as residents, is that you must get
24 everything right in a Quantitative Risk Assessment.

10: 58

26 Dr. Koopman also pointed out and he raised the
27 following issue in the same e-mail.

28 "Ship collision probabilities are
29 higher than LNG plant accidents,
especially in approaches to harbours,

1 such as the estuary. They depended
2 directly on the traffic and controls
3 put in place. Without knowing the ship
4 traffic information, numbers, speeds
and sizes, it is impossible to judge
the probability."

5 Dr. Havens then highlighted the issue that there is no 10:59
6 requirements for exclusion zones in the United States
7 of America to protect the public from LNG spills onto
8 Water. So, our claim is that this is incontrovertible
9 information that the HSA must take on board and insist
10 on awaiting the outcome of the Marine Risk Assessment. 10:59

11
12 Our position is that the fact that we have experts of
13 the calibre of Dr. Havens, Dr. Koopman and Dr. Venart
14 interested in a QRA at the other side of the world, at
15 Tarbert, in itself is proof enough that the Risk 11:00
16 Assessment of this application should not leave any
17 stone unturned and it has, indeed, raised very serious
18 issues. We should not leave any stone unturned in
19 ensuring that all safety precautions are taken and that
20 the latest scientific knowledge is not ignored. They 11:00
21 are highlighting the need to ensure that we are taking
22 accurate measurements of the true risks involved.
23 Now, there is one other point that I note. Just give
24 me a minute.

25 **MR. COUGHLAN:** As he looks for that 11:01
26 information may I make
27 another correction, please?

28 **INSPECTOR:** Okay.

29 **MR. COUGHLAN:** Alan Coughlan, Shannon

1 Foynes Port Company again. The statement by the expert
2 who claims to Mr. Koopman to say that collisions are
3 very frequent in and around port areas, and that
4 without knowing the traffic frequency you couldn't
5 possibly judge what the probability was. 11:01

6 **MR. J. McELLI GOTT:** That was Dr. Koopman.

7 **MR. COUGHLAN:** Thank you. The number of
8 traffic movements in at the
9 Shannon Estuary - 905 ships last year. That is a total
10 of 1810 traffic movements. When they go in they have 11:02
11 to come out. That's less than five ship movements per
12 day. They all meet each other end on. There is no
13 crossing. By any standards, that is a very, very low
14 incident of traffic in any port. We have never had a
15 collision in the entrance to the river and it is highly 11:02
16 improbable. Thank you.

17 **INSPECTOR:** Thank you Mr. Coughlan.

18 **MR. J. McELLI GOTT:** Yes. We had also requested
19 more time from An Bord
20 Pleanála for these LNG experts to do a site specific 11:03
21 study, but we were not accorded that time from An Bord
22 Pleanála so we had, once again, to make do with very
23 limited resources and very limited time. That
24 concludes my submission.

25 11:03
26 We have invited David Robinson to come from Wales to
27 explain and give a perspective, the Milford Haven
28 perspective, as residents there, on some of the risk
29 issues that they faced. Because we know that the HSA

1 in Ireland is the baby brother of the HSE in the UK and
2 in the absence of rules specifically dealing with LNG
3 in Ireland, under the HSA rules, they would
4 automatically look at the HSE, The Health and Safety
5 Executive, in the UK. So, we just want to point out 11:03
6 with David Robinson's submission that there are other
7 issues that are also raised in the UK. So we should
8 not take them at face value either. Thank you.

9
10 **INSPECTOR:** Mr. Fox, do you have 11:04
11 something brief to say,
12 because really Mr. McElligott has the floor.

13 **MR. FOX:** Yes, Mr. Inspector. That
14 video that was shown was
15 highly selective. The full video, when it was shown, 11:04
16 when aired on RTÉ, we regarded as being very fair and
17 balanced and we had no objection. That is the Tarbert
18 and Ballylongford Development Associations. Because we
19 know that we have over 95% of the registered electors
20 in Tarbert and Ballylongford supporting us. 11:04

21 **INSPECTOR:** No, the point really of the
22 video, or the part that I
23 was interested in, was on the expert and what he had to
24 say, and the opinions of residents, one way or the
25 other, is not a particular interest at this point, as 11:04
26 far as I am concerned. Ms. Griffin?

27 **MS. GRIFFIN:** Catriona Griffin. I just
28 want to pick up on
29 something that Mr. Fox just said. He said 95% of the

1 electoral in Tarbert are in favour of this project.
2 Well, I wasn't aware that any survey had been done in
3 Tarbert and I, my friends, my neighbours, all live in
4 Tarbert and no one from Tarbert Development Association
5 or Tarbert Chamber of Commerce have ever come to us and 11:05
6 asked for our opinion. When I am dropping my daughter
7 to school every morning I get people coming up to me
8 saying "good luck, well done", and I think it is
9 important, Mr. Inspector, that you realise that Mr. Fox
10 is not speaking for the people in Tarbert. Thank you. 11:05
11 **MR. MURPHY:** Mr. Inspector, may I reply
12 to that? Joan Murphy,
13 chairperson of Tarbert Development Association.
14 **INSPECTOR:** I want to close this
15 aspect. I am concerned now 11:05
16 about health and safety.
17 **MR. MURPHY:** Fair enough. But Mr. Fox
18 is our spokesperson for
19 Tarbert Development Association.
20 **MS. GRIFFIN:** Yeah, but not for 95% of 11:06
21 the people in Tarbert.
22 **INSPECTOR:** Closed.
23 **MS. GRIFFIN:** Okay.
24 **INSPECTOR:** Mr. Robinson, before you
25 commence. The copy you 11:07
26 have given me is marked "mine" and it has certain
27 notes.
28 **MR. ROBINSON:** Sorry.
29 **INSPECTOR:** So this is a clean copy, is

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it?

MR. DAVID ROBINSON PRESENTED HIS SUBMISSION AS FOLLOWS:

MR. ROBINSON: Good morning, Ladies and gentlemen. Can I congratulate you on your having this seminar, or whatever. 11:07

INSPECTOR: It is a hearing, oral hearing. 11:08

MR. ROBINSON: Yes. We didn't have one in Milford Haven.

At the top, where it says "Safe Haven", "to whom it may concern". My name is David Robinson. I am 61 years old. I have lived and worked all my life on both sides of Milford Haven waterway for Oil & Utilities Companies. In the 1970's, 80's and 90's I spent twelve years working in Saudi Arabia and Oman for the Oil Utilities and Mod companies. I am now retired and my last job was being a shift charge engineer at a power station in the Sultans Armed forces in Oman. 11:08

I am here today to represent Safe Haven, which is a group of concerned residents from around Milford Haven, asking about the reasonably insurmountable safety concerns we have regarding LNG receiving terminals in the world. Sorry, regarding the largest LNG terminal in the world, which Milford Haven is, namely the Exxon "South Hook" terminal and the British Gas "Dragon" 11:08

1 terminal .

2
3 Can I straight away state that we are not a group who
4 are against LNG, as we all use gas, either for cooking
5 or heating or if it is used in power stations to 11:09
6 produce our electricity. Although it is a fossil fuel,
7 which has cause for concern for climate change, it is
8 the reasonable insurmountable safety concerns and the
9 way regasified LNG will be used in large power
10 stations -- I stress large power stations -- that 11:10
11 concern us. Although, I must add at this point that in
12 the LNG producing countries around the world, the
13 liquefaction process of LNG produces one tonne of CO₂
14 for every 5 tonnes of LNG produced. That is the best.
15 The worst is somewhere about 3.5 tonnes of LNG for one 11:10
16 tonne. So I have given the best example.

17
18 I am not saying one tonne of CO₂ is not counted in the
19 CO₂ footprint in the west under the Kyoto Agreement.
20 Our preferred way of burning regasified energy would be 11:10
21 in the combined heat and power stations. This is going
22 on in Woking in this country and in Malmo in Sweden.
23 So, it is possible to do it. You can see film of this
24 on www.youtube.com. I will let you look at that in
25 your leisure. This would allow us here in the west to 11:11
26 burn half as much gas through the greater efficiency
27 that CHP allows. It allows you to burn the LNG to
28 produce electricity and the waste heat is then used to
29 heat or cool communities, as they wish. But it would

1 mean that small power stations, community based would
2 be used, would be used, as in Malmo and Woking.

3
4 There is an added bonus to this, this being that it
5 would allow more LNG to be burned by China and India, 11:11
6 who are both intent on burning high polluting low grade
7 coal, and as we all live in the same atmosphere it
8 would seem sensible.

9
10 Could I just add that I believe we are probably at 11:12
11 tipping point of the fossil fuel and renewable
12 industries. This industry, the fossil fuel industry,
13 will be on the way in the next 20 years probably.

14
15 Now, then, with regard to your deliberations in the 11:12
16 planning application for the LNG terminal at Tarbert,
17 Co. Kerry, can I be so bold as to ask the LNG companies
18 to answer a few questions. The first one:

19
20 1. Will Shannon LNG (Hess) indemnify the local 11:12
21 planning authority, the Irish Government and the EU for
22 any claim or lawsuit brought by third parties as a
23 result of damages due to an accident in an LNG
24 regasification plant or pipeline? Maybe they can't
25 answer the pipeline? 11:13

26
27 Given that this exact question was asked by the major
28 of Long Beach of the LNG Companies (Special Energy
29 Solutions (Conoco/Phillips)) planning an LNG terminal in

1 Long Beach Harbour, to which the companies answered
2 they would not indemnify. Needless to say that the LNG
3 project is not going ahead. Although it is still being
4 talked about.

5
6 Is it appropriate for me to ask at this point? Would
7 you like me to ask? Could I ask this question?

8 **INSPECTOR:** I don't think it is
9 appropriate at this point.

10 I think just continue with the presentation and,
11 possibly, the applicants will talk about this at some
12 stage during the hearing.

13 **MR. ROBINSON:** Item 2. What is the worst
14 case scenario -- and this
15 is a questions to Hess again -- what is the worst case
16 scenario for a spill of LNG on water at the jetty, that
17 QRA has been done by either the port authority, the LNG
18 companies or an independent risk assessor? Note that
19 if a proper full independent risk assessment were to be
20 done for a spill of LNG on water it would be for a 5th
21 of the cargo, which equates to 50,000 cubic metres.
22 One tank in the five in the LNG carrier.

23
24 No. 3: What would the domino effects be if an LNG pool
25 fire were to occur, that resulted in a 1, 5 or 12 metre
26 hole in one tank of the LNG carrier? Where would the
27 burning carrier be carried by wind and tide? I will
28 qualify that. Give that the pool fire burns at well
29 over 1000 degrees centigrade -- that's a low figure so

1 I have stayed within bounds -- and the LNG carrier is
2 moored with ropes made of polypropylene, which have
3 a low melting point.
4

5 No. 4. Is the deliberate ignition of any gas cloud on 11: 15
6 water being considered by the LNG companies or the port
7 authority? Who will be responsible for igniting the
8 cloud? What domino effects are expected from this gas
9 cloud ignition?

10 Note that the Sandia Report 2004 makes this statement 11: 16
11 on page 46:

12
13 "This suggests that LNG vapour
14 dispersion analysis should be conducted
15 using site specific atmospheric 11: 16
16 conditions, local topography and ship
17 operations to assess adequately the
18 potential area and levels of hazard
19 to public safety and property. Risk
mitigation measures, such as
development of procedures that quickly
ignite a dispersion cloud and stem the
leak, should be considered if
conditions exist that the cloud would
impact critical areas."

20 11: 16
21 No. 5: I think we went through this one yesterday. Do
22 you agree with the Society of International Gas Tanker
23 and Terminal Operators, SIGTTO, their statement in
24 their PowerPoint presentation, that the risk
25 differences between crude oil and LNG, if either were 11: 17
26 spilled, are as follows: Crude oil affects the
27 environment. LNG does not affect the environment, to a
28 great extent anyway, but it does affect people and
29 property.

1
2 No. 6: Do you agree with the HSE's confirmations --
3 that the British HSE -- that LNG has two properties
4 that are not fully understood? The first being rapid
5 phase transition. There is a paper here by the Society 11:17
6 of Petroleum Engineers that might be of interest. I
7 have put asterisks either side where it says that it
8 shouldn't be used in risk assessment deliberations
9 because it is an unknown phenomenon.

10 11:18
11 Rapid phase transition, RPT, this is a phenomenon when
12 LNG spills and mixes with water, causing flameless
13 explosions that have been observed to damage
14 surrounding structures. Now, that means when it is
15 coming out of the ship it is breaking in the ship, it 11:18
16 is exploding in the water next to the ship.

17
18 Computer modelling predicts larger explosions than are
19 predicted using physical spill tests of smaller
20 quantities of LNG in water. See attachment, which is 11:18
21 this one.

22
23 B. The percentage of contaminate gases in LNG that
24 make it as explosive as LPG -- I would like that
25 question answered -- at what point does the methane 11:19
26 content -- if it drops between 90%, 86%, at what point
27 does it become as explosive as LPG? This is of extreme
28 importance as when LNG is spilled on water and
29 regasified the LNG companies will lead you to believe

1 that the regasi fied LNG will not explode. Please note,
2 on the 19th January, 2004, in Ski kda, Al geri a, which I
3 believe you saw on the film, an LNG vapour cloud did
4 explode, resulted in the death of 27 souls and the
5 injury of 120 people. I have seen figures of 57, 80, 11:19
6 120, so maybe that last figure could be wrong. I don't
7 think anybody really knows, maybe because they didn't
8 know how many people were on the plant at time. I am
9 not sure.

10
11 This is known as a "Seeded" explosion. In this case a
12 steam boiler -- I think what happened was it was a
13 breakage in a pipe, a gas cloud formed and then the
14 boiler, the FD Fan, the four strap fan on the boiler,
15 sucked in some of the gas into it. Of course, it is a 11:20
16 confined space, a boiler, so it will explode there. In
17 this case a steam oil blew up under the vaporised cloud
18 of LNG. This phenomenon is not fully understood, but
19 is believed to alter the explosive range of the gas
20 cloud, which is normally 5 to 15%. It is thought that 11:20
21 that the explosive range could be altered to 5% - 45%
22 by this explosion under the cloud, a "seeded"
23 explosion. If the LNG has contaminate gases that are
24 higher than 14%. That means 86% methane, 14% a mixture
25 of butanes, ethanes and propanes. The latter three are 11:21
26 detonator gases, hence the reason for this questioning.

27
28 No. 7: Are you aware of the GAO report? You should
29 have that, this one here (indicating). Are you aware

1 of the GAO report for the United States Congress GAO --
2 I needn't read it -- "Public Safety Consequences of a
3 terrorist attack on a tanker carrying Liquefied Natural
4 Gas" needs clarification?

11:22

5
6 In your risk assessment deliberations have you taken
7 into account the relationship between "Hole size and
8 cascading tank failure"? Hole size is an important
9 parameter for modelling LNG spills because of their
10 relationship to the duration of the event. Larger
11 holes allow the LNG to spill from the tanker more
12 quickly, resulting in larger LNG pools and a shorter
13 duration of fires. Conversely, small holes could
14 create longer duration fires. Cascading failure is
15 important because it increases the overall spill volume
16 and duration of the spill. See page 11 of the report.

11:22

11:23

17
18 I have not included the whole report because it is 46
19 pages long. It can be downloaded from the internet if
20 you put in the number at the top and go to the GAO web
21 site in Washington.

11:23

22
23 In your risk assessment deliberations did you take into
24 account "Waves and Wind", which will tend to tilt the
25 LNG pool fire downwind, increasing the heat hazard in
26 that direction. Page 12 of the report.

11:23

27
28 Finally. In your risk assessment deliberations did you
29 take into account that the Surface Emissive Power of a

1 Large LNG pool fire is unknown? Page 12 in the report.

2
3 No. 8. What level of terminal radiation (flux) do you
4 expect the public to endure offsite in the event of an
5 LNG fire on land or water, given that a hot summers day 11: 24
6 gives a value of 1.2 kilowatts per metre squared? Note
7 the Gordon Milne report that is also available on the
8 Milford Haven Port Authority web site. This had to be
9 fought for through the information commissioner. On
10 page 3, under "pool fires" you will see, in the third 11: 24
11 paragraph, near the bottom, it says "1.5 kilowatts
12 metre squared is considered safe".

13
14 Mr. Gordon Milne, Senior Risk Analyst for Lloyds
15 Register of Shipping comments in the document, released 11: 25
16 under the Freedom of Information to Safe Haven,
17 entitled "explosions and gas releases from LNG carriers
18 at 1.5 kilowatts per metre is safe". Yes, at page 3 of
19 the document.

20 11: 25
21 Also, Dr. Jerry Havens, who is to talk today, is of the
22 opinion that 1.5 kilowatts metres squared is safe from
23 the public. Please ask him today. In our case, in
24 Milford Haven, the HSE have used 5kw per metres squared
25 as safe for the public. The HSE quote an OFFSHORE 11: 26
26 report (Human Vulnerability to Thermal Radiation
27 Offshore HSL/2004/04) as evidence that this level of
28 thermal radiation is safe for the public. It seems
29 perverse that when offshore workers are paid, trained

1 and clothed and have shelters to withstand such radiant
2 heat that the general public are expected to endure 5kw
3 per metres squared without being paid, trained, clothed
4 or having any shelters provided. Please note that 5kw
5 per metres squared will burn bare skin to blisters in 11: 26
6 30 seconds.

7
8 No. 9: An emergency plan in our case -- I am not sure
9 about here -- has to be in place before an LNG plant
10 can start up for onsite personnel and offsite 11: 27
11 personnel. I am not sure who is responsible for
12 writing this emergency plan in Shannon, but has
13 confounded us in Milford Haven how this can be done
14 without a quantitative risk assessment for a spill of
15 LNG on water. 11: 27

16
17 That means if you don't know the consequences of a
18 spill on water how else can you advise the public of
19 what to do.
20 11: 27

21 Finally, I have heard it said that the probability of
22 an LNG accident is so remote that it is not worth
23 worrying about. I would ask you to review the 14th
24 International Conference and Exhibition on Liquefied
25 Natural Gas, LNG 14, which took place in Doha, Qatar, 11: 28
26 on 21/4/2004, where Mr. Tony Acton of British Gas, in
27 conjunction with Tractebel LNG, Gaz de France, Osaka
28 Gas and Tokyo Gas presented a paper, "LNG Incident
29 Identification - a Compilation and Analysis By the

1 International LNG Importers Group (GIIGNL). This is a
2 good example of a thorough cooperative safety report by
3 the LNG industry. 246 incidents of releases of
4 hazardous material, near misses and other instances of
5 concern over a period 1965 to 2000 have been reported 11: 29
6 and analysed by GIIGNL members, LNG reception terminals
7 and peak shaving facilities. Only 11% of the results
8 reported resulted in an explosion, fire or rapid phase
9 transition and the frequency of reported incidents is
10 low. They 0.33, 1/3 of an incident per year, per site. 11: 29
11 So, that would mean that in three years I imagine you
12 would have one incident.

13
14 There is a trend towards a decrease in the relative
15 number of events where significant quantities of 11: 29
16 hydrocarbons have been released. GIIGNL is committed
17 both to improving further and reporting incidents and
18 to maintaining its database up to date for the general
19 good of the industry. See attached highlighted
20 document. I have only printed off one page of it. It 11: 30
21 says "LNG journal" at the top. About a third of the
22 way down, a bottom, it is the fourth paragraph up from
23 the bottom "Tony Acton BG Group". Have you got that?
24 It is worth reading the whole of the safety part, after
25 the top third. But I have highlighted on mine and the 11: 30
26 Inspector's copy from "Tony Acton" down. You will see
27 I have quoted that in my text.

28
29 Finally, a statement by the Society of International

1 Gas Tankers and Terminal Operators (SIGTTO). Zoo.

2 "Playing By the Rules:

3 Disasters are not the result of lack of
4 regulations, but the lack of
5 compliance. First and foremost, it is
6 important to enforce the rules that
already exist".

11:31

7 Remember, and this is important, remember, too, that
8 even if LNG accident happens elsewhere in the world
9 Tarbert Co. Kerry will immediately be looked on in a
10 different light. And that concludes my submission. If 11:31
11 anybody has any questions I would be pleased to answer.

12 INSPECTOR: Thank you Mr. Robinson.

13
14 END OF SUBMISSION BY MR. ROBINSON

11:32

15
16 Do you wish to present your next witness?

17 MR. J. McELLI GOTT: Dr. Jerry Havens please.

18 INSPECTOR: We will take a five minute
19 break before we have Dr.

20 Havens.

11:32

21
22 SHORT ADJOURNMENT

23
24
25
26
27
28
29 THE HEARING RESUMED AFTER A SHORT ADJOURNMENT AS

1 FOLLOWS.

2
3
4 **INSPECTOR:** Okay, we have had a very
5 long five minutes, maybe 11:50
6 it's an Irish five minutes, so if people could resume
7 their seats please. Now, Mr. McElligott, I think you
8 were about to introduce Dr. Jerry Havens; is that
9 correct?

10 **MR. McELLI GOTT:** Yes. We just invited 11:51
11 Dr. Jerry Havens. Last
12 week we were raising such serious issues about the
13 shortcuts we feel were being taken in the planning
14 process and we contacted Jerry Havens and he said he
15 would come over for just two days so he is flying back 11:51
16 to America in the morning and this is a great
17 opportunity for a world renowned LNG expert to give his
18 learned and expert opinion on the risks and safety
19 issues involved in an LNG importation terminal. I will
20 now hand out his submission. 11:52

21
22 MR. JERRY HAVENS ADDRESSED THE ORAL HEARING AS FOLLOWS.

23
24 **INSPECTOR:** Dr. Havens.

25 **DR. HAVENS:** Good morning. My name is 11:53
26 Jerry Havens, I am a
27 Professor of Chemical Engineering at the university of
28 Arkansas in the United States. I am speaking here as a
29 concerned scientist. My comments are not to be

1 attributed in any way to the University of Arkansas.

2
3 I want to thank you for allowing me to appear here on
4 behalf of the Kilcolgan Residents Association. As
5 I understand why you might question the propriety of my 11: 53
6 "butting" in on this LNG siting hearing I hope you will
7 give me a few minutes to explain my purpose.

8
9 I have spent my adult life researching the potential
10 consequences of catastrophic releases of hazardous 11: 54
11 materials, with an emphasis on fire and explosion
12 hazards. I believe you have, or at least I have
13 submitted to Mr. McElligott, my resumé which will give
14 more detail than I am time for here. I do think it
15 pertinent and hopefully of interest to you to state 11: 54
16 that I have had a close association with European
17 authorities on such questions as the one before this
18 authority since the 1970s, having first served in
19 England as a consultant to the Major Hazards Committee
20 and the Health and Safety Executive in the conduct of 11: 54
21 the heavy gas trials at Thorney Island in Hampshire in
22 the early 1980s. The Thorney Island trials were gas
23 dispersion experiments which were recommended by the
24 British Government as a result of the Flixborough
25 disaster in which there occurred a very serious 11: 55
26 explosion of a cyclohexane vapour cloud that resulted
27 in worldwide changes in regulatory practices for
28 handling of hazardous materials. Similarly, I have
29 investigated and continue to study the Bhopal gas cloud

1 disaster which occurred in India in 1984 and was
2 arguably the worst industrial chemical accident in
3 history. I was invited to participate in research
4 resulting from these catastrophic events as well as
5 other similarly directed programmes in Europe largely 11:55
6 because I was contracted by the US Coast Guard in the
7 late 1970s to develop a general purpose gas dispersion
8 model that would be particularly applicable to LNG
9 vapour dispersion, a subject that was of great interest
10 in the 1970s as it is now. 11:56

11
12 I played a seminal role in the development of the two
13 LNG vapour dispersion mathematical models that are
14 currently required in the United States to be used by
15 applicants for approval of LNG terminal sites. 11:56

16 I have also been heavily involved in the development of
17 the mathematical models that must be used to determine
18 the fire radiation safety distances that must be
19 observed for approval of LNG terminal sites. Both of
20 these modelling procedures are used in the US to 11:56
21 determine the extent of exclusion zones for safety
22 around LNG terminals.

23
24 In the US presently approval of land-based (as opposed
25 to offshore) import terminal sites is the purview of 11:57
26 the Federal Energy Regulatory Commission, whereas the
27 US Coast Guard currently plays the more formative role
28 regarding the safety aspects of the shipping side of
29 the project. I have most recently been involved in

1 continuing studies to better determine the potential
2 consequences of marine incidents involving LNG with an
3 emphasis on the studies of the consequences of very
4 large vapour clouds or pool fires that could result
5 from massive spillage of LNG on to water.

11:57

6
7 I believe that there is sufficient similarity in the
8 LNG terminal proposals under consideration that similar
9 requirements for the protection of public safety are
10 appropriate worldwide. These ventures, which involve
11 the potential for very high consequence accident or
12 intentional events, are truly international and should
13 be treated with a high degree of care and cooperation -
14 it is in everyone's best interest to be as certain as
15 practicable that we treat these issues with the respect
16 that they deserve.

11:57

11:58

17
18 I want to state before proceeding that I am neither for
19 or against any particular LNG terminal on any grounds
20 other than provision of public safety, that is the only
21 expertise I am professing here, which brings me to why
22 I agreed to appear at this hearing to speak on several
23 issues that I believe are important for you to consider
24 in the process of siting LNG import terminals.

11:58

11:59

25
26 I have three subjects that I want to talk about. You
27 will have to forgive me, I am a little bit under the
28 weather and I can't stop coughing. The first:
29 Potential consequences of LNG releases from the

1 terminal .

2
3 I will speak later about potential releases from the
4 shipping side, but I will start with potential
5 consequences of LNG releases from the terminal .

11:59

6
7 For the land based part of an LNG terminal , I believe
8 that our current understanding of the consequences of
9 releases on land, where they can be most effectively
10 contained, is sufficient in large measure - needing for 11:59
11 the most part only "maintenance" efforts to ensure the
12 propriety of that information to changing industrial
13 practices. I am not here to suggest that we
14 drastically need more study in this area. I am
15 suggesting that the information that has been made 12:00
16 available in the research programmes already completed
17 is not being brought uniformly on board in the siting
18 process. I point to perhaps, to me at least, one of
19 the most glaring examples that I have observed in
20 discussions relative to the Shannon LNG terminal 12:00
21 proposal . In discussions relative thereto I have read
22 and heard expressed at large the opinion that LNG
23 vapour, being principle methane, is lighter than air
24 and therefore will rise harmlessly into the air,
25 presumably out of danger. It is true that methane 12:00
26 vapour at ambient temperature is lighter than air
27 providing an important and widely recognised safety
28 feature of natural gas in contrast to heavier than air
29 fuel gases such as propane or butane or cyclohexane, as

1 at Flixborough. But LNG is a liquid at very low
2 temperature, about minus 165 degrees centigrade and the
3 vapour that is initially formed from LNG when it boils
4 is at the same temperature and because of its low
5 temperature it is considerably heavier than air, about 12:01
6 half again as heavy as air. The result is that an LNG
7 vapour cloud will spread laterally and remain close to
8 the ground prolonging both in distance and time the
9 potential hazards to the facility and/or to the public.
10 That hazard is primarily a fire hazard rather than an 12:01
11 explosion hazard. Now, there are reasons why I say
12 that and I will be happy to explain and quantify that,
13 the question of explosions has been touched on here
14 before, but I would like to not go on about that
15 question here until I finish because I think there are 12:02
16 other potentially more important subjects.

17
18 So one of the principal concerns that I want to
19 highlight here is that in the haste to site LNG
20 terminals, and I must say that in my opinion there is 12:02
21 some haste, we should be careful not to cut corners on
22 issues of public safety such as this glaring example
23 that is the vapour cloud rising harmlessly implies.

24
25 Let me turn my attention to the potential consequences 12:02
26 of LNG releases from ships. The shipping side of the
27 LNG importation business is more complicated in my
28 opinion if only because, and here I am speaking
29 primarily of the United States, the major emphasis on

1 regulatory requirements for public safety have
2 historically been associated with the land-based part
3 of the venture. In the United States there are
4 mandatory "exclusion zones" required for the land based
5 terminals. These exclusion zones demarcate zones in 12: 03
6 which the public is not allowed; however, there are no
7 such mandatory exclusion zones to exclude the public
8 from the vicinity of LNG ships. There are safety and
9 security zones imposed by the Coast Guard, but those
10 are not mandatory and legal requirements as are the 12: 04
11 exclusion zones that I talked about earlier.

12
13 I believe that more serious consideration should be
14 given to this gap in the provision of public safety
15 measures relating to potential ship incidents. The 12: 04
16 containment vessels, cargo tanks on LNG carriers are,
17 in my opinion, because of weight requirements
18 primarily, likely to be more vulnerable to failure due
19 to puncture damage, for example, especially if that
20 were intentional, than the more massive land-based full 12: 04
21 containment storage tanks that are currently available.
22 Whereas spills from a land-based tank are required to
23 have secondary containment features to limit spreading
24 of this spill LNG, no such measures appears to be
25 practical for spills on water. The result is that if a 12: 05
26 land spills occurs from a ship onto the water it will
27 spread until it completely evaporates whether or not it
28 is burning. If ignition does not occur early a vapour
29 cloud forms and that vapour cloud can drift significant

1 distances with the wind before it becomes diluted to a
2 concentration where it cannot be ignited. During that
3 travel if the cloud is ignited the result is a vapour
4 or flash fire which will severely endanger people or
5 property in the confines of the fire. LNG is not 12:06
6 odourised. Unlike natural gas that leaks in your house
7 or from a pipeline which is odourised you cannot smell
8 it. If ignition does occur the result -- I should say
9 also that you cannot see it except for the presence as
10 indicated by typically the condensation of water vapour 12:06
11 in the air, I will show you some examples of that if we
12 have time today -- if ignition does occur the result is
13 what we call a pool fire, basically it is just like
14 pouring gasoline or any other liquid on the water and
15 setting it on fire. Large LNG fires on water have not 12:06
16 occurred throughout the 50 to 60 years that LNG has
17 been shipped on water, none, no large LNG fire. While
18 that record is justifiably encouraging, we must not
19 encourage or allow any corner cutting here either in
20 taking adequate and appropriate measures to ensure 12:07
21 public safety. Now, all of this comes down I think to
22 the discussion which has been hinted at heretofore.
23 I want to say a few words about rationally assessing
24 the risks.

25 12:07

26 The KRA asked me to respond to the "Prime Time" video
27 by Dr. Tony Cox regarding the Shannon LNG terminal
28 proposal and I agreed to do so. Dr. Cox and I worked
29 together in the 70s and 80s in the various research

1 efforts designed to get a better understanding of the
2 potential for dense gas behaviour of LNG vapour
3 involved from spills. The video presentation by
4 Dr. Cox appears to me to be in essential agreement with
5 me as described above regarding the interpretation of 12: 08
6 dense gas behaviour by LNG vapour cloud.

7
8 However, at the close of the video Dr. Cox stated and
9 I quote:

10 "The risk is in fact extremely low and 12: 08
11 any rational person or any person who
12 is fully informed ought to be able to
13 accept then and I would."

14 As I stated earlier I have had a long association with
15 Dr. Cox which I hope to continue, but I am puzzled by 12: 08
16 his statement. I intend to talk with him about this
17 issue to get clarification on his view as I am fully
18 aware of the difficulty of expressing one's full
19 thoughts under the pressure of media scrutiny, but
20 I have been unable to do so in the very short time 12: 09
21 since agreeing to be here today. I will try to tell
22 you why I am concerned about his statement and I hope
23 that he will be willing to set me straight if I have
24 misinterpreted anything he said. Perhaps it is simply
25 in the end an disagreement between us, but I think it 12: 09
26 is important that experts be prepared to defend their
27 statements and I expect that Dr. Cox would agree.

28
29 I agree with Dr. Cox that the risk is low, but

1 I believe to say that it is extremely low, which well
2 might be interpreted by the public as justifying
3 dismissal from further careful consideration, is not
4 justified. I also agree with Dr. Cox' assertion that
5 there is no such thing as a risk free activity. That 12: 10
6 is why I believe that in our increasingly
7 technologically based society, which I think is likely
8 to continue as long as we can maintain it, we have to
9 balance the risk, that is the probability, and the
10 consequences in order to determine the acceptability of 12: 10
11 a venture such as an LNG import terminal. However,
12 adequate and quantitative balancing of risks and
13 consequences is not easily accomplished -- certainly
14 not by just making subjective statements such as
15 "extremely unlikely". 12: 10

16
17 Furthermore, even if the feared events are determined
18 to be extremely unlikely, if the consequences of the
19 event could be so severe as to raise serious questions
20 as to the acceptability of the venture anyway there may 12: 11
21 justifiably remain serious concerns.

22
23 That is the quandary I believe we have today with such
24 ventures as LNG importation. As with the difficulty in
25 arriving at a measure of acceptability of risks that 12: 11
26 plagues the nuclear industry, I believe that the
27 chemical energy industry has developed a major
28 consequence hazard identification.

1 As an example of the confusion that is rampant in this
2 area, I have heard repeatedly expressed that the energy
3 content of an LNG ship is equivalent to that of 50 or
4 more Hiroshima-yield nuclear weapons. In my opinion
5 that is an unjustified stretch. However, the statement 12: 12
6 that the energy content of an LNG ship is that large is
7 entirely true; the comparison, however, is meaningless
8 unless the time in which the energy can be released is
9 considered. In a nuclear weapon all of that energy is
10 released in a fraction of a second. In an LNG incident 12: 12
11 it is of course much longer. However, I am concerned
12 about the potential for releases from an LNG ship in
13 particular that might result in burning of all of the
14 contents of the ship in a time frame, much larger than
15 seconds, but in order minutes, less than an hour say. 12: 13
16 If that were possible then the energy could be released
17 in a time frame where it would never be equivalent to
18 50 Hiroshima bombs, but it could be a very serious
19 event associated with a heat exposure to the
20 surroundings. 12: 13

21
22 The LNG shipping industry, as is clearly the case with
23 the entire LNG industry, has an enviable record of
24 which I think they should be very proud. However, this
25 is not the time for complacency or cutting corners or 12: 14
26 patting ourselves on the shoulders. I believe that
27 serious consideration should be to recommendations to
28 the United States Congress by the Government Accounting
29 Office, this was alluded to this morning earlier. The

1 title of that document is "Public Safety Consequences
2 of a Terrorist Attack on a Tanker Carrying Liquefied
3 Natural Gas Need Clarification". Now, I am fully aware
4 that there is more concern probably about the terrorist
5 issue in the United States than there may be here. 12: 14

6 This report does not deal only with terrorist attacks,
7 it also talks about the need for these measures
8 associated with accidents as well.
9

10 If an LNGC, that is an LNG carrier, were to be attacked 12: 15
11 or suffer a severe accident, such as a collision, in
12 the proximity of the shoreline or while docked at the
13 terminal and cascading failures, that means domino
14 failures, of the ship's containments were to occur it
15 could result in a pool fire on water with a magnitude 12: 15
16 beyond anything that has been experienced, at least to
17 my knowledge, and in my opinion could have the
18 potential to put people in harm's way to a distance
19 perhaps of approximately three miles from the ship.

20 I have testified repeatedly that I believe that the 12: 15
21 parties that live in areas where such a threat could
22 affect them deserve to have a rational science-based
23 determination made of the potential for such
24 occurrences, no matter how unlikely they might be
25 considered. 12: 16

26
27 In closing I want to say that the residents association
28 assured me in requesting my presence here today several
29 things -- in fact, they had to assure me to do that

1 before I would come. They assured me that their main
2 concern has been and remains the safety aspects of the
3 LNG terminal proposed and the idea of having to live
4 with the thought of an accident, however remote, for
5 the next number of decades. They have assured me that 12: 16
6 they are not against LNG. They have endeavoured only
7 to highlight any shortcomings for completeness that may
8 exist in the quest to ensure public safety to the
9 maximum extent practicable.

10
11 Finally, they have assured me that they have attempted 12: 17
12 to be pragmatic in the consideration of what will
13 ultimately be required, tradeoffs, of the environment
14 with the economy. It is because I agree completely
15 with these sentiments and because I want only to ensure 12: 17
16 to the maximum extent practicable that we site LNG
17 terminals, as should be the case for any other major
18 hazard industry venture, in full view and observation
19 of the best scientific knowledge and guidance
20 available. It is for that reason that I happily agreed 12: 17
21 to appear here today.

22
23 Now, I have some other things that I could discuss
24 here, but I anticipate that I will get some questions
25 and if it becomes appropriate to answer those questions 12: 18
26 with some of the pages that I have brought I will do
27 so, but at this point that concludes this part of my
28 presentation.

1 END OF SUBMISSION OF DR. HAVENS TO THE ORAL HEARING

2
3 INSPECTOR: Thank you, Dr. Havens.
4 Mr. McElligott, do you have
5 a further witness to call. 12: 18

6 MR. McELLI GOTT: No, sir.

7 INSPECTOR: Okay. I think because
8 Dr. Havens is flying out
9 tomorrow morning; is that correct?

10 DR. HAVENS: That's correct. 12: 18

11 INSPECTOR: It would be appropriate
12 that he at least would be
13 questioned now and I would ask the Applicants maybe to
14 ask questions, if they have questions.

15 MR. O' NEI LL: Yes, I don't know if anyone 12: 18
16 else has questions of
17 Dr. Havens. Just looking at the sequence of events or
18 sequence of procedures that you have identified in your
19 letter, Sir, the Board's letter, perhaps other people
20 who wish to question Dr. Havens should do so first, 12: 19
21 there may be nobody else.

22 INSPECTOR: Okay. Mr. McElligott?

23 MR. McELLI GOTT: Yes, I have a question.

24 DR. HAVENS: May I make one quick
25 statement. I told you 12: 19
26 I was a little bit under the weather. The thing that
27 is bothering me worst is I have an inner ear problem
28 and I am not hearing well. Some other folks in the
29 room have the same trouble I observed yesterday so

1 I may have to ask you to repeat the question, I will
2 certainly do my best to answer it.

3
4 DR. HAVENS WAS QUESTIONS AS FOLLOWS BY THE OBJECTORS

5
6 1 Q. MR. McELLI GOTT: What I am really concerned
7 about are the exclusion
8 zones and how are the exclusion zones calculated in
9 your experience, would you expand on that please?

10 A. DR. HAVENS: Your question is how are
11 they what? 12: 19

12 2 Q. How are they determined.

13 A. I am speaking here of course at the moment about the
14 United States, I know less about your situation. In
15 the United States the term 'exclusion zone' is a legal 12: 20
16 requirement that has to be made for the determination
17 of the distances, ultimately to protect the public and
18 property, from an LNG plant that would ensure that the
19 public is not in harm's way. So there are
20 prescriptions for determining those exclusion zones 12: 20
21 that are set out in considerable detail. There are two
22 types of exclusion zone: One is for vapour cloud
23 travel, that's the one I have alluded to, how far would
24 a vapour cloud go before it became non-flammable. The
25 other is fire radiation exclusion zone. That is 12: 21
26 required in the event that there is a fire at the
27 facility which will radiate heat to some distance and
28 the safe distance to that level of heat has to be
29 determined. All of these things are determined by

1 mathematical models. I am the author of the models
2 that are used to determine the vapour cloud exclusion
3 zones. I also know about the others, but I have more
4 direct contact with the vapour cloud exclusion zone.

12: 21

5
6 At the end of the day in the US design spills are
7 specified. That simply says you must plan for an event
8 of this kind. For example, it might be that you have
9 to prepare an impoundment to catch the liquid spill

12: 22

10 from the ship unloading line, you must build an
11 impoundment to help with that volume. Then there are
12 specification of the spills that you must model to
13 determine the exclusion zones. So you go through this
14 procedure, you make a calculation of these distances,

12: 22

15 then you in the siting process provide those to the
16 authorities and they either approve or don't approve.
17 Now, in the end there is a bit of opinion associated
18 here, but the way I read the regulations in practice
19 the effect of these exclusion zones is that they cannot
20 go off the Applicant's property, they cannot extend off
21 the Applicant's property. If they do extend off the
22 Applicant's property then somebody has to grant an
23 exception or something so that's the way they are
24 determined.

12: 23

25
26 Now, the point that I was trying to make is that those
27 legal requirements in the US extend only to the land
28 part of the facility. The Federal Energy Regulatory
29 Commission is much more complicated than I could

1 explain here, but essentially the jurisdiction of the
2 Federal Energy Regulatory Commission stops at the water
3 line, it is someone else's responsibility beyond the
4 shoreline.

5 3 Q. Are there specific calculations used for LNG as opposed 12: 23
6 to other chemicals such as fertilisers as we have here?

7 A. To my knowledge the requirement for exclusion zones
8 that I have described in the US regulatory picture are
9 only applied to my knowledge for liquid fuels to LNG.
10 That's not to suggest anything other than to answer 12: 24
11 your question. I am not aware of exclusion zones being
12 required to site any other kind of facility except for
13 LNG facilities.

14 4 Q. What is in these exclusion zones, is it for businesses 12: 24
15 or are there different types, is it so that nobody can
16 go into certain areas at all?

17 A. No. Again I would have to get into more detail than
18 I think I probably should here. The regulations are
19 free for everyone to read, the specifications are all
20 open, at the end of the day, though, in practice 12: 24
21 I think it has to be the goal of the Applicant that
22 they ensure through the determination of these
23 exclusion zones that they don't extend off their
24 property. The reason being that if that is the case,
25 if the hazard cannot extend off the property then the 12: 25
26 risk is restricted to the facility. That's the idea
27 that is behind the exclusion zone.

28 **MR. McELLI GOTT:** Thank you. Mr. Inspector.

29 **INSPECTOR:** Could I have your name

1 please?

2 **MR. O' DONOVAN:** Thomas O' Donovan.

3 **INSPECTOR:** Hold on a moment, we need
4 to get a microphone down to
5 you. 12: 26

6 5 Q. **MR. O' DONOVAN:** Thank you, Mr. Inspector.
7 Thank you, Mr. Havens, for
8 a very comprehensive analysis on the safety issue.
9 I just had a couple of questions, you might not be able
10 to answer them, but we will try you anyway. It's to do 12: 26
11 with insurance and the immunity. Now, as we all know a
12 facility of this size would require a tremendous amount
13 of insurance and I would like to know were there any
14 agreements between any of the governments of the
15 facility where the LNG was placed with partial or full 12: 26
16 immunity from a potential accident or an real accident,
17 could you just maybe cover that a little bit, immunity
18 from prosecution afterwards?

19 A. I am very sorry, but I am very trouble with
20 understanding completely the question. I don't know 12: 27
21 whether it's my hearing. I can hear the tone, if
22 I came over there and you spoke and I will listen to
23 you without the microphone.

24 6 Q. My mouth is kind of dry too, I dry up when I speak in
25 public. I wanted to cover the area of immunity. To 12: 27
26 your knowledge has any government where the LNG is
27 placed did they grant partial or full immunity from any
28 potential or real accident?

29 A. I am not aware of any such thing.

1 7 Q. So in other words a government that would bring in LNG,
2 they seem to be hell bent on bringing one in here,
3 might be tempted to grant immunity to any potential
4 disaster, but you are not aware of that, you are not
5 aware of any? 12: 28

6 A. The only answer I know to give you is that I am not
7 aware of any such thing.

8 MR. O' DONOVAN: Okay, thank you,
9 Dr. Havens, thank you.

10 INSPECTOR: Mr. Robinson. 12: 29

11 8 Q. MR. ROBINSON: Yes, could I ask Jerry
12 Havens, the 1.5 kW/m² is
13 considered safe for the public by yourself and
14 Mr. Gordon Mill of Lloyd's Register of Shipping, yet in
15 other instances in Milford Haven 5 kW/m² is considered 12: 29
16 safe for the public, do you have a view on the
17 difference or what do you think should be safe for the
18 public?

19 A. A little bit of explanation about what some of terms
20 mean before I answer your question. There is a 12: 29
21 considerable unfortunately large database on burn
22 injuries and that data can be used to determine how
23 much heat over a given amount of time will cause
24 different degrees of burn injury. I am sure you
25 probably have heard of the terms first, second and 12: 30
26 third degree burns. A second degree burn is considered
27 the kind of burn that would give you a severe
28 blistering and some potential damage. Now, 5 kW/m² of
29 thermal radiation, we are talking now about if you sit

1 in front of your fire and you are not in the fire, the
2 fire itself is not burning, but the fire is radiating
3 heat to you and 5 kW/m^2 is a measure of how much heat
4 is there, it's the amount of heat per unit area in your
5 body. If a person with exposed skin, if my skin is 12: 31
6 exposed to 5 kW/m^2 of thermal radiation I will get
7 second degree burns in about 30 seconds. If I were
8 exposed to 10 kW/m^2 then I would get second degree
9 burns in a much shorter time. In 30 seconds I might
10 get a first degree burn or something, the point is that 12: 31
11 the level of heat and the time of exposure is what is
12 important. Now, I think you may have said this
13 morning, I don't know the figure, but I think that on a
14 hottest summer day, clear day the thermal radiation
15 from the sun might be somewhere around a little above 12: 32
16 1 kW/m^2 . Now, there have been determinations that have
17 been made, recommendations that have been made that you
18 would have to reduce this flux level from 5 down to,
19 say, one and a half or something in order to ensure the
20 safety of those people, if there were those people, who 12: 32
21 could not get out of the way and who had to be exposed.
22 So I have a concern that rather than say 5 kW/m^2 is a
23 safe distance, I believe that it's not in fact a safe
24 distance because you can get hurt at that distance
25 unless you can get out of the way. There may be some 12: 33
26 people that we have to be concerned about that could
27 not get out of the way. Have I answered your question?
28 **MR. ROBINSON:** Yes, thank you very much.
29 **INSPECTOR:** Gentlemen in the second

1 row.
2 9 Q. MR. LYNCH: Noel Lynch, Ballylongford.
3 In submission L011 by Kathy
4 Sinnott MEP she states that LNG plants are normally
5 located in port sites? 12: 33
6 A. Port sites?
7 10 Q. Port sites. There would normally be a lot of other
8 industry within close proximity of each other in port
9 sites, how do they fit in with your prognosis of
10 dangerous explosions and things like that? 12: 34
11 A. Are you talking about the proximity of other
12 activities?
13 11 Q. Yes, quite close to LNG plants.
14 A. I can't say that I profess an expertise in that area,
15 I am sure that there are a thousand different answers 12: 34
16 to that question depending on who that industry is and
17 who that party is. I can tell you that, and again
18 I will have to refer to the United States, one of the
19 ways that the exclusion zones has an effect in the
20 United States is that in addition to ensuring public 12: 34
21 safety it I think is intended, surely it is considered
22 to be an expression of the fact that the accidents that
23 might occur at an LNG facility would be contained on
24 that facility. So I can tell you from experience that
25 if in the United States an LNG terminal is proposed in 12: 35
26 an area where it is close to some other activities,
27 perhaps residential, perhaps industrial, and if they
28 cannot meet the exclusion zone requirement then it is
29 highly likely that the people next door would be very

1 upset and I can tell you that I don't know of anybody
2 that have gone to completion, but there surely is the
3 potential, in the United States at least, for lawsuits
4 because the adjacent property might be either
5 endangered or economically disadvantaged because of the 12: 36
6 presence. That's the best I can do. I am not an
7 expert in that area.

8 **INSPECTOR:** Sorry, the lady in the back
9 row.

10 12 Q. **FEMALE SPEAKER:** I want to ask you to your 12: 36
11 knowledge the residential
12 exclusion zones in the United States, I have read
13 someplace that it's 1.2 miles, is that the case?

14 A. Unfortunately I can't give you a specific answer to the
15 question, I need to clarify. In the US there is a lot 12: 37
16 of talk about exclusion zones, which I have just
17 described, but there is also a lot of talk about safety
18 and security zones, that's generally associated with
19 the tankers. For example, the Coast Guard specifies on
20 a site by site basis the safety zones that must be 12: 37
21 maintained around a moving LNG tanker, but those are
22 not exclusion zones in the sense that they are legal
23 requirements, okay. Now, moving to exclusion zones on
24 land, which we are talking about, the exclusion zones
25 on land are of two types, vapour cloud travel and heat 12: 38
26 radiation. The exclusion zones that are submitted and
27 approved for individual terminals are likely to be
28 different from one another. The reason -- well,
29 I don't know whether I can say that or not, but I have

1 made this observation -- the land area that is
2 available to the different terminals that are being
3 proposed in the United States varies considerably. The
4 smallest one that I know anything about is a terminal
5 that I have worked on repeatedly for some time was a 12: 38
6 proposal in Long Beach, California. If I remember
7 correctly the total terminal area was 25 acres. Now,
8 there were exclusion zones early on that were submitted
9 that said that we can contain whatever happens inside
10 the 25 acres so it might have been a distance of 100 12: 39
11 metres, okay. On the other hand, there are examples of
12 terminals that have much greater areas. In those cases
13 they are more likely to submit an exclusion zone for a
14 larger spill which might go some other greater distance
15 and not go outside the property so I can't tell you 12: 39
16 that there is a uniform value. I can tell you that
17 I am not aware of any land based exclusion zones that
18 are as long as 1.2 miles, but I can't tell you also
19 that there are none, I am not aware of any. I want to
20 be sure you understand all of my comments are to land 12: 40
21 based exclusion zones.

22 **MR. O' DONOVAN:** Thank you, Dr. Havens.

23 I have just one brief
24 question for you -- well, actually it's a statement, if
25 you like. It's from USA Today recorded in the paper on 12: 40
26 Thursday, 25 October 2007:

27 "In Mexico many people still remember
28 the November 19, 1984 explosion of a
29 liquefied petroleum gas depot that
killed 334 people in Mexico City."

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Are you aware of that?

A. Yes, I am.

13 Q. You are. We are just wondering is that a potential to happen? Thank you.

12: 41

A. The Mexico City disaster, which was a major event, was at an LPG storage facility which handled propanes, butanes, other LPGs. I assume you know what I mean by Liquid Petroleum Gas as distinguished from Liquefied Natural Gas. That's the first answer to the question.

12: 41

Now, there are some very important differences between LNG hazards and the hazards of LPG. I don't think it's to our benefit to start comparing today, I would suggest to you that that event should not be considered to be comparable to what might be possible at the LNG terminal and that we should restrict our consideration primarily to LNG with one proviso, one exception. It was alluded to this morning, and I am coming back to something that I mentioned in my talk, if you have a large release of LNG, it is dangerous of course because it catches on fire, and we wouldn't be interested if it didn't catch on fire easily and burn very nicely and burn hot, it wouldn't be the valuable fuel that it is. However, the same thing is true of LPG. LPG is normally, not always, pressurised. LPG can be stored either refrigerated, unpressurised or pressurised unrefrigerated or actually a combination of the two. LNG cannot be stored under pressure. Now, I don't think we want to get into that, but you cannot compress

12: 42

12: 42

12: 43

1 LNG enough to make it turn into a liquid. The only way
2 you can make it a liquid is cool it down to these very
3 low temperatures. [Mobile phone]

4 **INSPECTOR:** Somebody is using a cell
5 phone. 12: 44

6 **MR. O'NEILL:** Sorry, that was my phone.
7 Sorry, Sir.

8 **DR. HAVENS:** My point is that the
9 explosion hazard is
10 generally judged to be more severe for LPG than LNG. 12: 44

11 If either one of them is in a confined space, such as a
12 cloud that gets in your house, then an explosion can
13 occur, but we are talking here about an explosion of a
14 gas cloud that is outside. Now, everything that is
15 known suggests that the possibility of an LNG vapour
16 cloud explosion is very low. We also know that the
17 possibility of an LPG cloud explosion has to be
18 considered. Cyclohexane formed the vapour cloud
19 explosion at the Flixborough plant that was destroyed
20 and it was a really landmark explosion, very severe. 12: 45

21 LNG is primarily methane gas, LPG is primarily propane
22 gas, butane, ethane, heavier things. When you get LNG
23 out of the ground it typically contains LPG components.
24 In different cases, depending on the market etc., you
25 typically take those additional compounds out and sell 12: 46
26 them for a separate market and then the methane rich
27 LNG would come here, for example. However, the LNG
28 comes from a number of locations in the country so the
29 composition of the LNG that leaves different places in

1 the world headed for Shannon Ireland will differ
2 depending on its source and some other technical
3 factors. It was alluded to this morning that there is
4 data that suggests that if you do have as much as 15 or
5 more percent of LPG, like propane say, in the LNG then 12: 46
6 if that forms a vapour cloud we are not confident that
7 it could not explode. However, most LNG is restricted
8 to have less than that, and I don't know what the plan
9 is here so, therefore, under normal conditions the LNG
10 that you would expect to come in here I think would be 12: 47
11 quite likely to be lower than those concentrations. If
12 so, the primary hazard is fire rather than explosion.
13 I think all of that answers your question, I hope.

14 **MR. O' DONOVAN:** Thank you.

15 **INSPECTOR:** Mr. Fox. 12: 47

16 14 Q. **MR. FOX:** Dr. Havens, you mentioned
17 in your submission "as
18 certain as is practicable", can you tell me what that
19 means?

20 A. Containment is not practicable? 12: 48

21 15 Q. You said in your documentation:
22 "It is in everybody's best interest to
23 be as certain as is practicable."

24 A. Which page are you on?

25 16 Q. The first paragraph of the second page, bottom of the 12: 48
26 first paragraph.

27 A. I am still having trouble, I am sorry.

28 17 Q. Page 2, paragraph 1.

29 A. Page 2 paragraph 1.

1 18 Q. Bottom line.

2 A. It is in everyone's best interest?

3 19 Q. Yes.

4 A. Well, I believe that's in all our interests,

5 industry's, ours, yours, to be as certain as is 12: 49

6 practicable that we treat these issues with the respect

7 they deserve. I am simply saying that we could spend

8 ourselves all out of money so that we wouldn't have

9 enough left to eat if we studied this problem to death.

10 That's the sense in which I am saying 'practicable'. 12: 49

11 I do think it is practicable, surely it is practicable

12 to pay attention to all of the information that we

13 already know and make good use of it and it may even be

14 necessary to find some answers to some other questions

15 which we don't know enough about, but in the end 12: 49

16 I guess what I am trying to say is we have to be

17 practical about it. There is no way that we can assure

18 absolute safety.

19 **INSPECTOR:** Any further questions?

20 Okay. Foynes harbour -- 12: 50

21 sorry, Shannon Foynes harbour authority.

22 20 Q. **MR. COUGHLAN:** Whatever. Dr. Havens, can

23 you hear me?

24 A. Yes.

25 21 Q. Okay. Your bibliography at the back gives an awful lot 12: 50

26 of information about vapour dispersion models that you

27 have worked on?

28 A. Yes.

29 22 Q. Is there in your opinion any reliable vapour dispersion

1 model available?

2 A. Yes.

3 23 Q. Where can we get it?

4 A. Well, I realise that was maybe not a good response.

5 Let me start here. I developed under contract to the 12: 51

6 US Coast Guard starting in the 80s a model called

7 Degadis. It's an acronym for dense gas dispersion. It

8 is applicable to LNG spills. It is the model that is

9 required to be utilised -- one of the models required

10 to be utilised in the US. There is another model that 12: 51

11 is also approved called FEM 3 which is what we would

12 call a very complex computational fluid dynamic model.

13 It has received very little use yet in the US so the

14 primary use in the US for LNG vapour dispersion for

15 determining exclusion zones is the Degadis model. Now, 12: 51

16 there are a number, I have had a brief look, a very

17 brief look at some of the documents that were provided

18 here and I think that in some of the documents there

19 were provided some information about gas dispersion

20 models that had been used to make predictions 12: 52

21 associated with the Shannon venture. I frankly don't

22 remember what they were, I could probably know what

23 they were if I was refreshed, but let me answer the

24 question this way: The models that are accepted like

25 Degadis and similar models in the UK which would, for 12: 52

26 all practical purposes in my opinion, be very similar,

27 give similar results, they are restricted in their

28 applicability somewhat and the way they are restricted

29 is they are what we call flat earth models, they are

1 designed so that you specify an amount of LNG vapour
2 that goes into the atmosphere from some area source,
3 you specify the conditions of the atmosphere, wind,
4 etc, and the programme calculates the distance that
5 that gas will go before it drops below a concentration 12: 53
6 level that makes it not similar. These models cannot
7 account directly for complex effects such as flow
8 around a tank, flow in a ditch, flow over a mountain
9 etc so they are restricted in that use; nevertheless,
10 those are the ones that are used currently in the 12: 53
11 United States and I believe -- you shouldn't be
12 surprised to hear me say this -- I believe that they
13 are adequate to the task as long as the restrictions on
14 their applicability are observed.

15 24 Q. Could I follow up on that please and ask you are they 12: 54
16 of value in modelling cloud dispersion over water?

17 A. Are they applicable to that? My answer is yes.
18 I developed this model in fact for the US Coast Guard
19 and their requirement was obviously that it be
20 applicable over water. In fact some of the 12: 54
21 simplicities that it requires like flat land are met
22 better over water than they are in a complex plant
23 environment.

24 **MR. COUGHLAN:** Thank you.

25 **INSPECTOR:** Do we have anybody from the 12: 55
26 Health and Safety
27 Authority? Do you wish to ask any questions.

28 A. No.

29 **INSPECTOR:** Okay. What about the

1 planning authority?
2 A. No.
3 INSPECTOR: Do you have a fire officer
4 present?
5 A. Yes, no questions. 12: 55

6
7 END OF QUESTIONING OF DR. HAVENS BY THE OBJECTORS

8
9 INSPECTOR: I take it the Applicants
10 have quite a lot of 12: 55
11 questions?

12 MR. O'NEILL: I have quite a lot of
13 questions. I was going to
14 suggest it is now five to one, perhaps we could leave
15 it until 2 o'clock and in fact it may limit the 12: 55
16 questions that I will ask.

17 INSPECTOR: Okay. We will reconvene at
18 2 o'clock please. Thank
19 you for your attention.

20 12: 55

21

22

23

24

(LUNCHEON ADJOURNMENT)

25

12: 55

26

27

28

29

1 THE HEARING RESUMED, AS FOLLOWS, AFTER A LUNCHEON

2 ADJOURNMENT

3
4 **INSPECTOR:** Good afternoon everybody.
5 It is just 2 o'clock, so if 14:02
6 you could resume your seats please.

7
8 I am now going to call on the applicants to put
9 questions to the third party. Because Dr. Havens is
10 with us just for this afternoon I would ask that you 14:02
11 would concentrate your question on him.

12 **MR. O'NEILL:** Good afternoon. Thank you
13 sir. And in fact, having
14 considered the matter over lunch, despite the
15 barrister's normal anxiety to ask questions, in fact I 14:03
16 am not going to ask any questions of either Dr. Havens
17 or Mr. Robinson. I think Mr. Robinson's précis or
18 address is more, in fact, in the line of questions
19 which will be addressed by the applicant's witnesses in
20 due course. I don't have any issues that I need to 14:03
21 raise with Mr. Havens.

22 **INSPECTOR:** Fine. Does the planning
23 authority want to ask any
24 questions?

25 **MR. SHEEHY:** No, not at this stage. 14:03

26 **INSPECTOR:** Okay. Does the planning
27 authority have a submission
28 on the issue of health and safety?

29 **MR. SHEEHY:** Mr. Inspector, we don't

1 have the expertise of that detail. The HSA is what we
2 were relying on to inform you on that issue.

3 **INSPECTOR:** Okay. Then I will call on
4 the applicant to make their
5 own submission. 14:04

6 **MR. J. McELLI GOTT:** Sorry?

7 **INSPECTOR:** Sorry, Mr. McElligott, I
8 can't hear you.

9 **MR. J. McELLI GOTT:** Can we ask Dr. Havens
10 another couple of 14:04
11 questions, please?

12 **INSPECTOR:** Yes.

13 **MR. J. McELLI GOTT:** Dr. Havens was talking to
14 Alan Coughlan of the
15 Shannon and Foynes Port Company and he was explaining 14:04
16 to him about the Degadis cloud dispersion, vapour cloud
17 dispersion model. I am asking Dr. Havens how would you
18 put in the Degadis model into a quantitative risk
19 assessment in a marine environment?

20 A. **DR. HAVENS:** Firstly, the Degadis model 14:05
21 is a consequence model
22 only. It would normally be used in conjunction with
23 some other kind of probability assessment in order to
24 arrive at some measure of risk. But my understanding
25 of the assessment of risk, it is usually divided into 14:05
26 two parts. You identify what the potential
27 consequences might be and then you seek to determine
28 what the likelihood or probability of those occurrences
29 might be. And in the end the accepted measure of risk

1 is some multiple of those two.

2

3 So, for example, if you get an exclusion zone that is
4 so many miles, or so many feet, then you must also say
5 but the probability of that event is very low or very 14:06
6 high or something and you must assign some numerical
7 values to that. Now, I personally feel that's
8 problematical, but it is the best thing we have and it
9 is the thing that I think should be done.

10 14:06

11 But in direct answer to your question: The Degadis
12 model could only be used to determine what the
13 potential consequences would be and that, specifically,
14 the distance to which a vapour cloud travel might occur
15 that could still be flammable, that is coincident with 14:06
16 the danger distance, if you will. So, to use the
17 Degadis model to do that -- and I assume your question
18 is associated with a marine incident.

19 **MR. J. McELLI GOTT:** Yes.

20 **DR. HAVENS:** So I need to clarify that 14:06
21 the -- I think perhaps I
22 did earlier -- that there is no reason why the Degadis
23 model is inapplicable to vapour cloud travel over
24 water. In fact it may be even more applicable because
25 the water is flat. 14:07
26

27 Now, the requirements to put into the model are,
28 basically, of two types. The most important one
29 probably is that you must tell the model, you must

1 input into the model how much LNG vapour goes into the
2 atmosphere. You must specify the rate at which it goes
3 in, the area that it is coming off of and the time
4 schedule for it going into the air. Beyond that you
5 need only to specify what atmospheric conditions you
6 want to do the dispersion model for and then it will
7 essentially calculate the distance for you.

14:08

8
9 Now, I probably should insert here, it is something,
10 again, that's peculiar to the US regulations and may
11 not apply here but we need to be clear about it. The
12 lower flammable limit of methane gas is generally
13 considered to be 5%. What that means is that one part
14 of methane and 19 parts of air is flammable. That's
15 the lower flammable limit. If the concentration of
16 methane falls below 5% then it won't ignite. It is
17 lean. The upper flammable limit is about 15%.

14:08

14:09

18
19 Now, by contrast, for example, propane has a lower
20 flammability limit of, if I remember correctly, about
21 2%. So, propane gas stays flammable longer than does
22 methane.

14:09

23
24 However, there is another complication. In a vapour
25 cloud that would be formed the concentration in the
26 cloud as it moved downwind is not uniform. There are
27 pockets of gas that have higher concentrations and
28 pockets of gas that have lower concentrations. In
29 order to take that into account, in the US regulations,

14:09

1 you are required to calculation the distance the cloud
2 will follow go before the concentration drops to
3 one-half of the LFL. So, to 2.5%. The reason is that
4 the gas models can only calculation average
5 concentrations.

14: 10

6
7 So, as a safety factor, if you want to call it that,
8 they argue that you calculate, use the model to
9 determine the distance where the average concentration
10 is 2.5%. Then they argue that there might be pockets
11 of gas that could be 5%. So, with that clarification,
12 that's the way the exclusion zone is determined.

14: 10

13
14 Now, in the case of a marine spill, the only thing that
15 you would have to do differently is to determine how
16 much gas you want to be concerned about going into the
17 atmosphere. That may have answered part of your
18 question.

14: 11

19 **MR. J. McELLI GOTT:** Yeah. So, if I understand
20 correctly, the model
21 depends on what you put into the model?

14: 11

22 **DR. HAVENS:** It depends entirely on the
23 amount that you put in.

24 **MR. J. McELLI GOTT:** So it has to be credible;
25 is that correct?

14: 11

26 **DR. HAVENS:** Yes. Well, we would not
27 want to put an amount into
28 the model that was impossible, or incredible.

29 **MR. J. McELLI GOTT:** Can you give us an example

1 of credible events from the marine side that would be
2 used to calculate exclusions zones, on the marine side?

3 **DR. HAVENS:** The subject of credible
4 events is any man's
5 argument. However, I believe that there is good reason 14: 12
6 to accept, and I have accepted in all of the testimony
7 that I have given, the assessment the Sandia Report --
8 which I think, perhaps, has been mentioned here
9 before -- of 2004, in which for marine spills from an
10 LNG tanker they deem credible a release of one-half of 14: 12
11 one tank onto the water. Now, one-half of one tank
12 depends on the size of the tank, obviously.

13
14 I don't know what ships would serve this terminal,
15 there are different size ships. The typical LNG ship 14: 13
16 is a 125,000 cubic metres ship. The typical ship.

17 **MR. J. McELLI GOTT:** They are planning for the
18 biggest ships in the world,
19 the 265,000 cubic metres.

20 **DR. HAVENS:** The biggest? 14: 13

21 **MR. J. McELLI GOTT:** The Ouflex (sic) or the --

22 **DR. HAVENS:** Well, let me tell you,
23 there are plans for,
24 perhaps some even under construction, I can't tell you
25 exactly, for ships, that are being considered, for up 14: 13
26 to 265,000 cubic metres. But the typical ships that
27 are sailing are 125,000 cubic metres. Maybe a bit
28 bigger, but that is a typical size. Now, those typical
29 ships, if they are one particular kind of ship that I

1 am most familiar with, which is a Moss Tanker, and I
2 just use it for illustration, they might have five
3 tanks. Each tank would contain 25,000 cubic metres.

4
5 Now, you are probably more familiar with cubic metres 14: 14
6 than gallons, I am not sure, but 25 cubic metres is
7 around about or a little more than 6 million gallons.
8 So, the ship contains close to 33 million gallons of
9 LNG.

10
11 What Sandia did was to say it is incredible that all of
12 that material could be spilled at once. It couldn't
13 happen. It is so unlikely to happen that it is
14 incredible. But they did say it is credible that you
15 could have a massive spill from one of the tanks. Then 14: 15
16 they say, for technical reasons, part of that tank
17 would be below the water level, and so all of that tank
18 can't easily spill into the water. If there is a hole
19 in it at the top it can't all easily spill into the
20 water. So, they said we deem credible a one-half one 14: 15
21 tank spill. That's 12,500 cubic metres. 30 million
22 gallons, a little more.

23
24 It is that spill that they analysed, using models like
25 the ones I have just discussed, to determine what the 14: 15
26 vapour cloud distances might be and, also, what the
27 pool fire radiation distances might be if it were
28 ignited when it spilled.

1 Now, I can't speak authoritatively without a copy of
2 what they predicted for the vapour cloud distances.
3 But it was some few miles.

4
5 What most people, and I agree with this, if there were 14: 16
6 an event that caused a massive spillage like that I
7 believe that the real likelihood is that the event
8 would cause the material to ignite as it was released.
9 So, that would mean that I consider the pool fire
10 formation more probable than the vapour cloud 14: 16
11 formation. I cannot rule the vapour cloud formation
12 out, but I consider the pool fire more probable.

13
14 Now, the pool fire from a 12,500 cubic metre spill has
15 been calculated by Sandia to cause 5kw per square metre 14: 17
16 exposure, out to about 1 mile.

17
18 So, I think the original question was: How would you
19 suggest you take models and calculate an exclusion zone
20 around a ship? My first answer would be I have 14: 17
21 endorsed the calculations like that, that have already
22 been made by Sandia, as being reasonable and they would
23 be easily repeatable if anyone wanted to apply the
24 Degadis model, for example, to that spill.

25 **MR. J. McELLI GOTT:** Okay. Can I just make sure 14: 17
26 I understood correctly so.

27 A credible spill from a tanker could have an exclusion
28 zone around it -- the effect would be have an exclusion
29 zone of what, if there is a credible spill around a

1 tanker, with a credible spill of half a tank? What
2 would be the credible exclusion zone to have around
3 that?

4 **DR. HAVENS:** I am confused with your
5 question a bit. Here is 14: 18
6 what I have said. Sandia, not me, Sandia has said 'we
7 believe it is credible that there might occur at 12,500
8 metre spill' -- that's one-half of one tank -- 'on to
9 water'. So that's their starting point for the
10 determination of the hazard distance. They would 14: 18
11 calculate the hazard distance for that spill with a
12 vapour dispersion model, like Degadis. In fact, I
13 think you will find if you go into the Sandia Report
14 they did that. In fact, they calculated it for a
15 number of different models, including Degadis. 14: 19
16 However, they also calculated a hazard distance -- call
17 it exclusion zone if you will, but there is no
18 requirement for such a thing now legally -- they
19 calculated a hazard distance associated with a fire
20 radiation from that same spill if it caught on fire 14: 19
21 instead of drifted downwind. That gave the mile
22 distance for the fire radiation. The distance for the
23 vapour cloud travel is more than a mile.

24 **MR. J. McELLI GOTT:** Okay. Would that have an
25 affect then on siting 14: 19
26 decisions by other industries within that one mile
27 distance? Would it have an affect on ships and
28 creating other shipping facilities within that one mile
29 distance, and other industries working on the landbank?

1 DR. HAVENS: The one mile distance is
2 predicated on a heat level
3 of 5kw per square metre. That particular distance and
4 that particular heat level is not going to destroy a
5 ship, or other activities. It will, however, result in 14: 20
6 burns to people, who are unprotected, at that distance.
7 Now, at closer distances there will be higher heat flux
8 levels. The Sandia Report specifies all that
9 information as well. For example, they would tell you
10 how close you could have to be to that fire before you 14: 21
11 might, perhaps, even endanger a ship or something.

12
13 So, I think it is fair to say that, that is an
14 estimation for that spill size of what would be a
15 reasonable danger zone that you should observe. 14: 21

16 MR. J. McELLI GOTT: How much bigger do you
17 think that hazard zone
18 would be for ships that are twice the size as the ships
19 you just mentioned? Because they are planning ships up
20 to 265,000 cubic metres. 14: 21

21 DR. HAVENS: It is not an easy question
22 to answer, however, let me
23 put it this way: It is my understanding that if you
24 had a ship that were twice the size of the ones we are
25 talking about it would be my expectation that the ships 14: 22
26 would be similar -- similar, generally similar -- to
27 the ones that we have now, except just bigger. What
28 that would probably mean is that we might have a
29 similar number of tanks. So, that means each tank

1 would be bigger, and roughly by, say, a factor of 2.
2 So, if you had one of those twice as big a tank, I
3 think, based on the arguments that Sandia is making,
4 which I agree with, that all of the stuff in the tank
5 can't spill out easily, some of it is below the water 14: 22
6 line, it might be below the hole in the vessel, etc.
7 but you might lose half of it. They consider that is
8 possible or credible. So, that means that if the tank
9 were twice as big then half of the tank would be twice
10 as much as what I said before. 14: 23

11
12 Now, how would that affect it? It would not double it.
13 It would go up some fractional amount. I can't tell
14 you, without doing the calculations, exactly how much
15 it would be, and I would prefer not to guess. 14: 23

16
17 The concern that I have, that I mentioned here, is not
18 so much what would happen -- although that's a
19 consideration, I think, that needs to be kept in mind,
20 that bigger ships may come in, but that is not my 14: 23
21 primary concern. My primary concern is that we have
22 some good indication, that I think is indicated clearly
23 by the GAO report, and there is some expert agreement
24 on the fact that if you have a one-half tank spill and
25 it caught on fire there is a very real possibility that 14: 24
26 the ship would not be able to survive that event and
27 there would be cascading failures.

28
29 Now, if cascading failures occurred that can do nothing

1 but make the situation worse. The question is how much
2 worse, and how fast? And that gets into very complex
3 considerations. I think I have already mentioned,
4 however, so I will say it again, in my judgment, to be
5 prudent, and this is my opinion only, if a conventional 14: 24
6 ship were to be in a fire like this, from the spillage
7 of half a tank, I believe that the ship would very
8 likely be in jeopardy, to total loss.

9
10 If it were a total loss, and if the cascading failures 14: 25
11 occurred rapidly, I won't qualify rapidly, but if they
12 occurred reasonably rapidly, then my calculations
13 indicate that the one mile distance from the half tank
14 spill might increase, and I believe, up to possibly
15 about 3 miles. All of that is still based on the 5kw 14: 25
16 per square metre.

17 **INSPECTOR:** Mr. Robinson?

18 **MR. ROBINSON:** Mr. Inspector, could I ask
19 Jerry Havens one question?

20 The gas cloud from the spill from one tank is 14: 26
21 travelling across the water, the HSE reckons it could
22 travel, before the methane contents lifts, 4.25 miles.
23 I am not sure what the Sandia says. I believe it is a
24 figure roughly the same. But the LNG is made up of,
25 let's say, 90% methane and 10% contaminate gases, with 14: 26
26 are butanes, propanes, and ethanes. Those gases are
27 heavier than air at ambient temperature.

28
29 As the gas cloud goes across the water it picks up heat

1 and when the methane gets to about minus 100 it does
2 start to lift off, I believe. That is leaving the
3 detonator gases, the butanes and propanes, on the
4 water. Are they still a danger?

5 **DR. HAVENS:** When the LNG mixture is 14: 27
6 spilled on the water it
7 will boil at a rate that is determined by the heat
8 input to it. The primary heat input to it is the water
9 below it. The air above it puts a little bit of heat
10 in but it is not very much. Most of the heat that 14: 27
11 causes the vapour [inaudible] is from the water under
12 the LNG.

13
14 In the early days there was a great deal of speculation
15 that the water under the LNG would freeze and that 14: 28
16 would decrease, with time, the boiling rate. The
17 conventional suggestion in most modelling today is that
18 because the water will circulate under the LNG it will
19 not freeze sufficiently to cut down on that boiling
20 rate. 14: 28

21
22 Now, when it boils, if it is a mixture -- if it were
23 pure methane, pure methane would come off. If it is a
24 mixture of propane and butane and methane, then, as
25 chemical engineers would say, the methane is more 14: 28
26 volatile, boils more easily than does the propane and
27 butane. That does not mean that the methane will
28 separate and leave the other behind. What it means is
29 it will preferentially boil and the gas that comes off

1 is higher concentration methane. So, as it boils off
2 the boiling pool will enrich in the heavier compounds.
3 All right?

4
5 Now, you made a statement, I believe, that if the 14: 29
6 methane comes off first when it reaches 110 degrees it
7 would be boiling. I can't verify that here, but that
8 may be true. However, that is not what would happen.
9 As the gas comes off of the boiling pool it mixes with
10 air, in fact you can't keep it from mixing with air, it 14: 29
11 is going to whether you wish it or not. Now, if we
12 look at the thermodynamic properties -- and here I will
13 talk about methane only -- if we mix methane at its
14 boiling point, which is minus 165 degrees Fahrenheit,
15 if we mix that with air, for the moment let's say dry 14: 30
16 air -- you don't have dry air here, but let's say dry
17 air -- if you keep adding air the mixture will get
18 lighter. It makes sense. But, unless you add heat to
19 it somehow it will never get lighter than air. All it
20 will do is it will go from a density of about one and a 14: 30
21 half times air, when it is pure LNG vapour, up to the
22 density of air, when it becomes nearly all LNG
23 vapour -- I mean all air. So, the notion that part of
24 the gas would get to be 110 degrees and rise up is
25 fallacious. 14: 31

26
27 What all this means is, and I think Dr. Cox stated this
28 before, it is well known that these clouds will stay
29 heavier than air unless there are some unusual

1 circumstances which, somehow or other, heats the cloud
2 up tremendously. Which is not likely to happen in the
3 marine environment around here. I think he stated, and
4 I would agree with him, they will not lift off until
5 after they have become non-flammable. 14: 31

6 **MR. J. McELLI GOTT:** Could you explain, just to
7 the general public, the
8 importance of the Sandia Report? Secondly, were the
9 tests in Sandia done with pure methane, or pure LNG, or
10 with contaminants. 14: 32

11 **DR. HAVENS:** Was it pure LNG or? In
12 what? In the calculations?

13 **MR. McELLI GOTT:** In the calculations.

14 **DR. HAVENS:** In Sandia?

15 **MR. J. McELLI GOTT:** Yes. 14: 32

16 **DR. HAVENS:** Sandia considered that LNG
17 does contain other things.

18 I suspect that I would have to verify this. I suspect
19 that they calculated these distances that they showed,
20 which was, somebody said, a few miles, and I don't 14: 32
21 remember the numbers, but I suspect they calculated it
22 for pure methane. They may have calculated for certain
23 specific concentrations of the other components as
24 well. I don't know the answer to that.

25 14: 33
26 I do know this: In the US regulations you are allowed
27 to assume that the LNG that is spilled is pure methane.
28 For purposes of calculating the exclusion zone you are
29 allowed to do that.

1 MR. J. McELLI GOTT: What is the importance of
2 Sandia? I mean, Shannon
3 LNG have based their calculations on Sandia. So, just
4 for to the general public, what does Sandia mean? What
5 is so special about that? 14: 33

6 DR. HAVENS: Why is Sandia important;
7 is that what you are
8 saying?

9 MR. J. McELLI GOTT: Yes. What is so special
10 about Sandia report as 14: 33
11 opposed to other reports?

12 DR. HAVENS: I think it is fair to say
13 that the Sandia Report was
14 a result of 9/11. I think that's a fair statement.
15 After 9/11 there was a growing concern about the 14: 33
16 increased activity in the LNG area and there was
17 increased concern about the fact that there were many
18 proposals for putting terminals in urban areas. Now,
19 we only have one terminal in the United States that
20 would realistically, I think, now be considered to be 14: 34
21 an urban area. That's the one in Boston. It is the
22 oldest one I guess, or if not, close to it.
23

24 Following 9/11 there was a big concern in the United
25 States about what were the actual hazards of these 14: 34
26 ventures. One of the things that was done, in fact
27 probably one of the first ones and ones of the major
28 ones, was that the Sandia Report was published in 2004.
29 There have been other reports that Sandia has prepared,

1 but they have been on specialised subjects, like
2 offshore terminals. There are some other Sandia
3 Reports which are classified. But the Sandia Report
4 that we have referred to here, 2004, is important, I
5 think, to everyone, and I make no bones about hanging 14: 35
6 my hat on it, because the Sandia Report in relation to
7 the United States was prepared by the Sandia National
8 Laboratory, which is a Government National Laboratory.
9 It used to be a weapons laboratory, it still is a
10 weapons laboratory, but they have a much greater 14: 36
11 mission today. So, they are considered, at least by
12 the US Government and everybody else, a credible
13 agency.

14
15 So, I have made many calculations of how far a vapour 14: 36
16 cloud would travel, but I realised, and still realise,
17 that I can do nothing but get into arguments with other
18 vapour dispersion modellers, and the public, on how far
19 I think something should come. So, I decided I am not
20 going to try to push my product, I am just going to say 14: 36
21 that these calculations by Sandia are reasonable to me
22 and that they are sufficient for planning purposes.
23 There are other people, I am sure, that think they are
24 too extreme.

25 **MR. J. McELLI GOTT:** Okay. Can we move on to 14: 37
26 just another question.

27 **INSPECTOR:** Mr. McElligott, I would
28 just like to clarify
29 something with Dr. Havens. The Sandia Report arose out

1 of concern about a terrorist attack, is that purely on
2 LNG ships, or was it on the terminals as a whole and
3 the ships?

4 **DR. HAVENS:** I don't want to get this
5 wrong. I believe that the 14: 37
6 Sandia Report 2004 directed specifically to LNG ships.

7 **INSPECTOR:** Thank you.

8 **MR. J. McELLI GOTT:** Dr. Havens, in an article
9 in the Journal of Hazardous
10 Materials, February 20th, 2007, Volume 140, you stated: 14: 37

11 "It is clear that the offshore option
12 can, under the right circumstances,
13 obviate the onshore public safety
14 concerns. The authors of this paper,
15 believing that updating the Consequence
16 Assessment Procedures to consider post
17 9/11 hazard separation distances, will
18 result in a finding that people onshore
19 will be out of harms way from offshore
20 LNG terminals of the size presently
21 being considered if sited ten or more
22 miles offshore." 14: 38

23 Now, my question to you is: Yesterday Shannon LNG
24 rubbished the idea of offshore terminals as one 14: 38
25 alternative, possibly, to an onshore terminal. Now,
26 this is not to say that there is anything wrong with
27 onshore terminals. But could you give us an
28 explanation or your view of the feasibility of building
29 offshore terminals? Is this really the way it is 14: 39
30 going? What is the industry thinking on this matter?

31 **DR. HAVENS:** Let me answer this way.
32 When I wrote that article
33 for that journal I had just finished another

1 involvement in another LNG project in the United
2 States, that I can tell you just a little bit about and
3 it will provide an answer to your question.

4
5 This was the terminal application to build an LNG 14: 39
6 terminal in the Port of Long Beach, California. I was
7 hired by the California Public Utilities Commission as
8 an expert and I testified and filed testimony very
9 widely, which is all available on the FERC web site.

10 At the time the proposal in Long Beach was being 14: 40
11 considered there were also being considered three
12 offshore terminals, offshore California. One of them
13 was the Woodside Terminal that was discussed here
14 yesterday. There were three. One was a proposal to
15 build a storage facility on a disused platform, oil 14: 40
16 platform. That situation is still alive, still under
17 consideration. The other two were floating storage
18 gasification units. I believe both of them were the
19 type that were anchored to the bottom, so they were
20 floating. 14: 41

21
22 There is a classification of offshore that is,
23 basically, if the water is shallow enough you build a
24 big rig, concrete, and you just sink it into water and
25 it sits on the bottom. In any case, they had 14: 41
26 simultaneously a proposal for one in Long Beach. Three
27 offshore. The California Government was wrestling with
28 all of the questions, I think, that you all are in. Do
29 we need all that gas? If we don't need it all, which

1 way is the best way to do it? Etc. Etc. Etc. It
2 became very clear that the California Government wanted
3 me to give them my opinion on the relative safety of
4 these two kinds of ventures. And at the end of the day
5 I testified that I believed that if there were
6 alternatives to putting the terminal in the port of
7 Long Beach they should be considered.

14: 42

8
9 They asked me the question: Do you think that if these
10 terminals were ten miles or more offshore -- which
11 happens to be the minimum distance of the three that
12 were under consideration -- do you think there is
13 anyway that the public onshore could be endangered by
14 that placement? I testified that I did not.

14: 42

15
16 It was at that same testimony that I opined that in the
17 port that, given the potential for incidents, like some
18 of which I have discussed today, I believe people could
19 be in harms way up to about 3 miles. So I am labouring
20 to try to keep what I am saying here today entirely
21 consistent with what I have said at, at least three or
22 four different places.

14: 43

14: 43

23 **MR. COUGHLAN:** May I ask a question?
24 Dr. Havens, the GAO report
25 is predicated on a terrorist attack?

14: 44

26 **DR. HAVENS:** Is what?

27 **MR. COUGHLAN:** Predicated on a terrorist
28 attack?

29 **DR. HAVENS:** Is what predicated?

1 MR. COUGHLAN: The GAO report. Sandia in
2 other words.

3 DR. HAVENS: No. As I have said, my
4 understanding is that we
5 might not have it if it hadn't been for 9/11 but it 14: 44
6 does address both accidental events and terrorist
7 events.

8 MR. COUGHLAN: Okay.

9 DR. HAVENS: For example. It has a
10 considerable discussion 14: 44
11 about ship collisions, energy required on and off.

12 MR. COUGHLAN: Well, the issue of ship
13 collision is something
14 that's the subject of an assessment at the moment. So
15 I can't comment on that. 14: 44

16 DR. HAVENS: I understand. And I tried
17 to say in the beginning
18 that I am not making any judgments here about the
19 relative risks of this particular site. All I am
20 saying is that these are things that you need to 14: 45
21 consider when you make these judgments. I also
22 testified, and I am sure that somebody will remind me,
23 that I did not believe that we should completely
24 exclude the possibility of further placement of LNG
25 ships in the United States onshore. But I also said 14: 45
26 that I believe that if we can we should observe greater
27 distances around them than we are tending to do, and
28 furthermore, if we have an alternative that is
29 acceptable to the onshore then I believe that, all

1 other questions aside, we can obviate the problem of
2 public safety, by putting it offshore.

3 **MR. J. McELLI GOTT:** Do you believe the industry
4 is capable of building
5 offshore terminals? 14: 46

6 **DR. HAVENS:** I am not an offshore
7 expert, but I know this: I
8 have been working with this area seriously since 1976.
9 In 1976 there were proposal to build offshore
10 terminals. They never went anywhere. Probably one of 14: 46
11 the main reasons is that before anybody got anywhere
12 the gas bubble burst and there was no interest in LNG
13 in the United States for a period in importation. We
14 have about 100 peak shavers, like you all talked about,
15 and that's big time business. But there was no 14: 46
16 interest until about the year 2000.

17
18 Now, at that time, at the beginning, there was
19 literally no discussion of offshore terminals. And you
20 could read articles that said it is too difficult, too 14: 47
21 expensive, for all the reasons that have been talked
22 about here, it is more advantageous to put it on land.
23 Now, the only thing I can tell you now is that, as I
24 have observed, that as concern has grown about these
25 issues there are a lot of people stepping up to the 14: 47
26 table and saying 'we will build an offshore terminal'.
27

28 Now, there are three under consideration off the coast
29 of California. There is one operating, as has already

1 been specified, way out in the Gulf of Mexico. It is
2 only a gasification ship, no storage. There is another
3 one like that planned up off of Massachusetts and
4 another one second one like that planned off of
5 Massachusetts. So, I think that's six right there. 14: 48

6 There is an offshore floating storage and gasification
7 unit planned in the middle of Long Island Sound, mid
8 way between Connecticut and New York, and that would be
9 operated and built by Shell. It has just received

10 approval from FERC for going ahead. I believe that's 14: 48

11 accurate. But in any case, it is definitely still in
12 the works. So, anyway, we have six or more that I know
13 of in the United States. I know also, because I am a
14 consultant to the Regional Government of Tuscany, in
15 Italy, that they are considering building an offshore 14: 49
16 terminal off of the port of Livorno. I suspect there
17 are others, but those are the only ones that come to my
18 mind.

19
20 So, and I don't mean this facetiously, but either these 14: 49
21 people don't know what they are talking about, they are
22 bluffing, or they intend and, in fact, are already
23 starting to build it.

24
25 By the way, I do remember and acknowledge the report 14: 49
26 that Exxon is considering. I don't know the details on
27 that. I think it is probably true that they have not
28 made any application or anything that has been
29 announced.

1 spill area. The vapour fence would not -- these
2 facilities have concrete sumps or [inaudible] sumps,
3 bunds, but that is to retain the liquid from spreading.
4 It has been postulated that if you put a vapour fence,
5 perhaps even on top of the bund, that it would lessen 14: 53
6 the travel distance of the vapour that was evolved. So
7 this was a set of experiments to study that. So, in
8 essence, it is hold up of vapour, how much would a
9 structure hold this vapour and prevent it going down
10 wind. 14: 53

11
12 There were five tests that were conducted. I will show
13 you a still picture of one. It is the only picture I
14 have with me. But the reason I will show you it is to
15 show you the effects of the density of the gas. Okay? 14: 53
16 So you will be looking at an LNG cloud, you will be
17 looking at it staying close to the ground etc. etc.
18 This first slide, I won't delay with the details, but I
19 will provide it to you if you wish. I will read it
20 quickly at the top so that we will all know what I am 14: 54
21 talking about.

22
23 The "Falcon" test series involved five moderate scale,
24 that is 20 to 66 cubic metres, releases of LNG into a
25 fenced vapour containment area, with dimensions 44 14: 54
26 metres, 88 metres by 10 metres tall. It, basically, is
27 just a square fence. Table 1 shows the LNG volume
28 spilled in each test. Along with the volume of the LNG
29 vapour, at its boiling point, that would be evolved.

1 If you take LNG liquid you change it to vapour. At its
2 boiling point it is about 270 times as large. You take
3 it all the way to ambient temperature it is closer to
4 600 times. But at the boiling point it is about 270
5 times.

14: 55

6
7 The last column shows what I have called the vapour
8 fill ratio. Now, all the numbers are small from 0.14
9 up to 0.46. What that means is that all of the liquid
10 that is spilled in there formed a certain amount of
11 vapour and that vapour, if it remained pure, didn't mix
12 with air, would not fill up the fence, would not
13 overflow. In the US currently I believe that there is
14 still being used technology, in doing vapour cloud
15 explosion models, that assumes that the gas from a
16 spill will fill up as a pure gas and overflow, rather
17 than being scooped out by the wind, for example.
18 The point of this is that the flammable gas mixtures,
19 in spite of these numbers, all overflowed the fence and
20 flammable gases went downwind to some considerable
21 distance. I think that the 2.5% concentration extended
22 to about 250 metres in the first test. We can get the
23 numbers for all the others but that's the only one I
24 have.

14: 55

14: 56

14: 56

14: 56

25
26 Now, this is a three quarter view looking down onto
27 this enclosure. So, I will point at what you are
28 looking at. That is the fence, it is 10 metres tall,
29 it goes all the way around here. There is a pipe

1 coming here from storage tanks, going through the
2 fence, coming out to this thing they call a spider
3 network. Basically, it is a distribution pipe system.
4 They pump the LNG through the long pipe out into that.
5 It had a bunch of holes in it. It was a way to rapidly 14: 57
6 spill onto water. That's water underneath. So they
7 built a pond -- this is in the middle of the desert but
8 they built the pond. The LNG is virtually sprayed, if
9 you like, down onto the water.

10 14: 57
11 Now, this is one of the tests. Frankly, I don't know
12 which one but I could find out. But it is one of one
13 through four. You can see the up wind fence end in
14 this picture. Right here. And the wind is coming in
15 this direction, I think it is clear. You see a big 14: 58
16 white cloud. Now, I have said before this cloud does
17 not pose a toxicity hazard. If it weren't too cold,
18 and it wouldn't be unless you were really, really close
19 to it, it wouldn't hurt you, unless the concentration
20 of the methane, for example, were high enough that you 14: 58
21 could be asphyxiated. But that is not likely to occur
22 very close either. So, the toxicity problem is not a
23 current concern. You couldn't smell it. You couldn't
24 see it.

25 14: 59
26 What you see here is condensed water vapour. Now, this
27 is in the desert and the humidity was only about 5%.
28 But still, it was hot and that is enough water vapour
29 to condense all of this white material. So, the next

1 question comes in. There is no assured coincidence
2 between the visible cloud and the flammable cloud. In
3 this case the visible cloud probably does not extend as
4 far as the vapour cloud. The vapour cloud, flammable
5 vapour cloud, probably extends further than the visible 14: 59
6 cloud.

7
8 Now, you will notice that it is going in this
9 direction. What is happening is its building up inside
10 the fence, the wind is coming from this direction, you 15: 00
11 can see it folding it over. It is running over the
12 top -- I mean the far end -- and then it is dropping
13 down on the ground. All of that is a clear indication
14 that the cloud is heavier than air.

15 15: 00
16 Now, I come to the video. We are looking down into the
17 same enclosure and we are going to look at a video of
18 the last spill. The video will illustrate two or three
19 things that have been discussed. It will illustrate
20 the growth of the filling up of the enclosure. It will 15: 01
21 also illustrate, and I will point out to you, a number
22 of Rapid Phase Transitions. Rapid Phase Transitions
23 are sometimes called flameless explosions. What
24 happens is if you take a super cold material and plunge
25 it into the water it will absorb the heat from the 15: 01
26 water and it will do, what we call in thermodynamics,
27 it will super heat. It will get higher in temperature
28 than its boiling point. Then, when it reaches a kind
29 of instability, it will evaporate extremely suddenly,

1 which causes an explosion or a pressure wave.

2
3 Now, I want to show this film for three reasons. I
4 think they are all important. The first one. You have
5 already seen a still picture that shows you that this 15:02
6 gas does not rise up in the air. This will be a motion
7 picture that will show you the same thing. It will
8 also indicate to you what Rapid Phase Transitions look
9 like. We can discuss how violent they were and
10 everything after you see the film. 15:03

11
12 Finally, however, this was the number five test in this
13 series, which inadvertently caught on fire, and you
14 will see the fire in this picture. The point that I
15 would make with this is not to alarm you, to scare you 15:03
16 or for any other bad reason, it is simply to tell you
17 that it is a consideration, certainly is to me. I was
18 involved in this test programme and I can assure you
19 that we went to great lengths to see that we had no
20 fire. And yet we had an accidental fire. 15:03

21
22 I think, maybe, the thing to do is run it all the way
23 through and then if there are specific things that I
24 can help with. You will see the gas forming. It is
25 spraying out violently. The intent here was to have 15:04
26 very rapid evaporation, that's why it was spilled on
27 water. The climbing up the fences on the side, running
28 over down there. Right over in this area (indicating),
29 before very long you will see the first RPT, Rapid

1 Phase Transition. I don't know exactly where it is,
2 but it is somewhere around there. There's the first
3 one. Second one. Third one. You can count then, but
4 there are somewhere around a dozen that occur there,
5 generally all over the place, before it is over. Now, 15:05
6 watch over in this area. You will see a little flash
7 and then a fire. There is one more little piece on the
8 end of another camera angle and, unfortunately, that's
9 the best photographic coverage that I know that exists
10 of this fire. This ended that experimental programme. 15:05

11
12 There are voluminous reports on all of this that are
13 available, including reports that are available on the
14 investigation of the fire. I don't know that questions
15 like this are ever completely settled for everybody's 15:06
16 satisfaction, but there are more than one theory about
17 what actually happened. I can tell you that one of the
18 principle theories was that this was a plastic fence,
19 mounted on metal around the container, and the RPTs
20 through objects, including concrete blocks, and some 15:06
21 people think that the concrete blocks striking the
22 electrostatically charged fence started the fire.

23
24 Now, that's all I was going to do. I will be happy to
25 try and answer your questions. That's the only film I 15:07
26 have, too. I guess my point of this and reason for
27 showing it is simply that these are things that I am
28 sure we all would agree, an LNG cloud is reasonably
29 easily ignited. You have to take good care, and of

1 course they will, to try to ensure that it doesn't get
2 ignited if it does give out. It does have some special
3 characteristics. The number one, I would say, is the
4 fact that it is a much denser than air gas. Even
5 though methane gas normally is lighter than air. LNG 15:07
6 vapour is not.

7 **INSPECTOR:** Okay, the questioner down
8 the back.

9 **UNKNOWN SPEAKER:** Thank you, Dr. Havens. I
10 would like to just, maybe, 15:08
11 bring your attention to another report, another
12 article in that report I mentioned earlier.

13 Mr. Schwarzenegger of California rejected even an
14 offshore facility, LNG facility. I think it is also
15 reported in the Irish Examiner a couple of days ago 15:08
16 that Senator Edward Kennedy from Massachusetts, at the
17 other side of the United States, also objected to a
18 facility, an onshore facility. Helped, I might add, by
19 the Coast Guard, who were very concerned about it. So,
20 have you any comments to make on that? I mean, both 15:09
21 sides of the United States are rejecting it and, you
22 know, obviously there is something seriously wrong when
23 Senators object to it. Thank you.

24 **DR. HAVENS:** I didn't understand all of
25 your question, but the 15:09
26 first part, I think, had to do with Governor
27 Schwarzenegger, who I am not going to fight with. He
28 has made a ruling, as I understand it, I think this is
29 on what is called the Cabrio Port Project, which

1 happens to be off of Malibu, which is the movie star
2 community. That community mounted an extremely
3 affective opposition, not much based on safety, but
4 mostly based on environmental concern, including even
5 things that they didn't want to be able to see from 15: 10
6 their beach front homes. At the end of the day this
7 gets into much higher politics than I know anything
8 about. But I can tell you that, in my opinion, that
9 terminal, or any other exposed offshore terminal that
10 they are talking about, would not pose any hazard to 15: 10
11 the people onshore.

12 **UNKNOWN SPEAKER:** Can I just come in on that?

13 **DR. HAVENS:** We have a similar situation
14 in New York, with the Broad
15 Water Terminal. It appears that when you go offshore 15: 10
16 the concerns are more on the part of the environmental
17 issues and much less, in fact very few, on the safety
18 side.

19 **UNKNOWN SPEAKER:** I would just like to
20 continue on that. It has 15: 10
21 been reported in the paper that the Coast Guard off of
22 Massachusetts, the State of Massachusetts, were very
23 concerned about, you know, the shipments in and out and
24 the community got together, with Senator Kennedy, to
25 object to it, basically. Thank you. 15: 11

26 **DR. HAVENS:** Again, your question is a
27 bit broad. I know only
28 this: I have also worked on, in addition to the Long
29 Beach proposal, I have worked on the Fall River

1 Massachusetts Proposal , which is also a Hess project.
2 That process has gone through the draft Environmental
3 Impact Statement stage, the final Environmental Impact
4 Statement stage and FERC has approved the terminal .
5 Some of what I am going to say someone may want to 15: 11
6 correct me. But in the United States, following FERC
7 approval , one of the last things that has to be done is
8 they have to receive what is called a "Letter of
9 Recommendation" from the US Coast Guard. That Letter
10 of Recommendation is essentially the Coast Guard's 15: 12
11 control , as I understand it, over whether they consider
12 acceptable all of the shipping aspects to and from the
13 terminal . So, they are talking about safety of
14 navigation and all kinds of things.

15
16 Now, it is a bit of a fluid situation. Some month or
17 two or three months ago the Coast Guard issued a
18 negative Letter of Recommendation and said that the
19 Fall River site is not suitable for the navigational
20 requirements that they need. Mr. Shearer could 15: 13
21 probably tell you more than I know. But anyway, that's
22 the status of that, as far as I know.

23 **UNKNOWN SPEAKER:** Thank you, Dr. Havens.

24 **INSPECTOR:** Does that conclude the
25 questi oning. 15: 13

26 **MR. J. McELLI GOTT:** Yes, sir.

27 **MR. O' NEI LL:** Sir, I have just one
28 questi on arising out of
29 those extra issues that were raised this afternoon.

1 Good afternoon, Dr. Havens. I just want to ask you in
2 relation to the Sandia Report, and just to clarify,
3 because there seemed a little bit of confusion in
4 question that Mr. McElligott asked you, Sandia didn't
5 seek to introduce or recommend the introduction of an 15: 13
6 exclusion zone; isn't that right?

7 **DR. HAVENS:** That is correct.

8 **MR. O'NEILL:** And Sandia, you say, wasn't
9 focussed or wasn't directed
10 towards terrorist attacks. But it did look at multiple 15: 14
11 attack scenarios, as you say perhaps predicated by
12 9/11.

13 **DR. HAVENS:** I don't think I said they
14 didn't address it. I said
15 they didn't address it exclusively. 15: 14

16 **MR. O'NEILL:** It wasn't set up
17 specifically for that
18 purpose, that's correct. As I say, what Sandia did
19 look at was multiple attack scenarios. Even in that
20 scenario we are dealing with a heat hazard distance of 15: 14
21 one mile. In other words, it didn't adopt a cascade
22 effect. It can't anywhere in the report suggest that
23 the heat hazard would extend to the two or three miles
24 that you have mentioned; isn't that right?

25 **DR. HAVENS:** No. 15: 15

26 **MR. O'NEILL:** That's correct you mean?

27 **DR. HAVENS:** That's not correct. They
28 discussed in the 2004
29 report the potential for successive failures. They

1 made the statement that in their opinion the successive
2 failures would be limited, in their judgment, to no
3 more than three times. But that's cascading failures.
4 They also opined about what difference that would make.
5 So that's the first point. I have forgotten the other 15: 15
6 ones.

7 **MR. O'NEILL:** Sorry, perhaps they did.
8 Yes, they did talk about
9 damage to up to three tanks. But they didn't extend
10 the heat hazard distance any further than one mile, 15: 15
11 approximately 1 mile.

12 **DR. HAVENS:** I could find this out, but
13 I think they made the
14 statement that the affect would be primarily to prolong
15 the fire rather than to increase the distance, 15: 16
16 importantly. That's what they stated. Now, on that
17 issue. That was 2004 and since 2004 there has been a
18 growing concern about whether the statements that were
19 made in the 2004 report to the extent of it being
20 limited to three tanks has been called into question. 15: 16
21 That was called into question in the GAO Report. The
22 GAO Report recommends that we need to find out what is
23 the real story about the potential for cascading
24 failures that might lead to the entire loss of the
25 ship. 15: 16

26 **MR. O'NEILL:** And the GAO report is
27 essentially dealing with
28 terrorist issues?

29 **DR. HAVENS:** No, I don't think so. It

1 deals with collisions as well.

2 **MR. O'NEILL:** Sorry, I say essentially,
3 and indeed in your written
4 précis the title talks about terrorist attack.

5 **DR. HAVENS:** It is fair to say, I think, 15:17
6 the concern is importantly
7 related in the United States to terrorist attack.

8 **MR. O'NEILL:** What Sandia doesn't deal
9 with, and, indeed, in any
10 calculations you carry out, you must look at the risk. 15:17

11 **DR. HAVENS:** I am sorry?

12 **MR. O'NEILL:** You must consider what it
13 doesn't -- what it doesn't
14 do, it is talking about a consequence rather than
15 looking at the risk. In other words, if it is a 15:17
16 terrorist attack or if it is an accident you have to
17 consider the probability of that attack, that accident
18 occurring; isn't that right?

19 **DR. HAVENS:** Well, I have told you here
20 that my business is not 15:17
21 calculating probabilities, as important as I understand
22 they are. I would, however, suggest that if you can
23 tell me, or anybody else, how we can calculate the
24 probability or estimate the probability of a terrorist
25 attack it would be a very valuable thing to know. 15:18

26 **MR. O'NEILL:** Indeed. Isn't that really
27 a matter for the security
28 personnel in a particular administration, the An Garda
29 Síochána, the Department of Defence in our case.

1 DR. HAVENS: Are you suggesting that
2 there is no concern here
3 for terrorists? Is that what you are saying?
4 MR. O'NEILL: I am saying that the risk
5 assessment, would you not 15: 18
6 agree that the risk assessment is not something, and
7 you don't claim any expertise, and I fully accept that,
8 in relation to risk assessment. But if one is talking
9 about a terrorist attack, the person who is best placed
10 to assess that risk, or the people who are best placed 15: 18
11 are the security forces.
12 DR. HAVENS: The security forces? No, I
13 don't agree with that. The
14 reason I don't agree with that is because I don't see
15 how the security forces can make a determination of 15: 19
16 that unless they know what they are up against. All I
17 am talking about here is the consequences that they
18 might be up against.
19 MR. COUGHLAN: May I offer a
20 clarification, please. As 15: 19
21 Harbour Master I also happen to be the Port Security
22 Officer for the Shannon Estuary. That authority relies
23 very heavily on the issuing of threat level warnings
24 from the State, the security services, the police, and
25 the police are the only power with which we interact. 15: 19
26 Now, if this project was to go ahead we would have to
27 ensure that an incidents plan was put in place at the
28 jetty to secure the ship and the jetty interface
29 against unwanted intrusion. Secondly, if, as Port

1 Security Officer, it came to my attention that there
2 was heightened threat level to an incoming ship that
3 ship would remain outside, it would not be brought into
4 the port at all. Now, I know that Shannon LNG may not
5 like to hear this, but that's a fact. And the ship 15: 20
6 would not come in until such time as the State military
7 arm, the police, the navy, the army, or anybody else,
8 had put resources in situ to deal with the situation.
9 That's our main mitigating factor against a terrorist
10 attack. Thank you. 15: 20

11 **DR. HAVENS:** May I address that point?
12 What got the ball rolling
13 on all of this question was the fact that following
14 9/11 an LNG ship was held outside of Boston for several
15 days, because there was concern that they should not 15: 20
16 let it enter Boston. This was right after 9/11. In
17 fact, it was made on the same day that it occurred.
18 Eventually, that ship did not go into Boston, but was
19 diverted Elba Island instead, I think, to off load.
20 There was a period of study which, presumably, was done 15: 21
21 to determine whether or not they should start to allow
22 it to come back in. It was a rather rapid study and in
23 the end, in two or three weeks, they started bringing
24 ships in. They are continuing to come in. They come
25 in with very heavy security. There is a lot of 15: 21
26 arguments about who is supposed to pay those bills,
27 etc. etc. etc. There is a growing concern, at least in
28 our country, about the requirements for bridge closing
29 and other up-sets and so on. I don't think you have

1 any bridges, but I am just talking about the fact that
2 the provision of the security measures is not to be
3 taken lightly. One of the concerns that I have is
4 that, and I hesitate to get too far into the terrorist
5 thing, because I fully understand, I think, that a lot 15: 22
6 of you believe that you may not be as vulnerable to
7 that as we are, for our own past behaviour, but I can
8 tell you that in the United States right now it is
9 getting to be a big concern, about whether or not
10 somebody would ratchet up this threat and it would 15: 22
11 begin to control the security requirements for ventures
12 that are in downtown Boston.

13
14 I mean, they have already had bridge closes, where
15 somebody has called in and said 'you better watch it, 15: 23
16 in the next 15 minutes' etc. This kind of stuff. Now,
17 the emergency authorities have a hard time dealing with
18 that kind of thing, and I don't want to go on too long
19 about this. But I suspect, in fact I see in the
20 newspapers all the time, that many of the LNG companies 15: 23
21 are now coming and saying, you know, we can solve this
22 problem, we are proposing to build one offshore. It is
23 not me that wants to build it, they are lining up to
24 build them. I certainly think that is something that
25 suggests that. 15: 23

26
27 My bottom line is I am not against putting an LNG
28 terminal anywhere, except for the reasons that I feel
29 that I have already discussed. But if it were me, and

1 I want to make it clear, if it were me and I had
2 alternatives so that I did not have to endanger a
3 population, and I did not have to bring it up in an
4 estuary, or into Long Beach Harbour, I think that
5 should be seriously considered. That's all I am 15: 24
6 saying.

7 **MR. COUGHLAN:** Well, the only comment I
8 make on that is that there
9 is a vast, vast difference between the two situations
10 of which you are speaking. 15: 24

11 **DR. HAVENS:** A vast difference
12 between?

13 **MR. COUGHLAN:** Between the two
14 locations of which you
15 speak, downtown Boston and the Shannon Estuary. That's 15: 24
16 my only comment in reply.

17 **DR. HAVENS:** Absolutely. I acknowledge
18 that and I don't want to
19 leave the other impression. I acknowledge everything
20 you have said about that. 15: 24

21 **MR. J. McELLI GOTT:** Dr. Havens, I would just
22 like to point out, first of
23 all, that Hess LNG is an American company so there is
24 some connotations to be taken from the American
25 soldiers going through Shannon Airport. As somebody 15: 24
26 once interpreted that. The second point I really want
27 to make is that, and we are going back now to the
28 planning issue, the planning issue on safety grounds is
29 that the HSA has done a land based risk -- well,

1 Shannon LNG has done a land based risk assessment,
2 there is nobody doing a QRA on the marine side and
3 everybody seems to say 'oh, there is no real risk
4 there', but my question would be how... (INTERJECTION).
5 **MR. O'NEILL:** Sorry, I 15: 25
6 think... (INTERJECTION)
7 **MR. J. McELLI GOTT:** Sorry, I have the
8 microphone please. I am
9 sorry, I am talking.
10 **MR. O'NEILL:** I think the question has to 15: 25
11 be accurate. Dr. Havens
12 hasn't had the opportunity of looking at the EIS and
13 all the documentation, I have no doubt, and in those
14 circumstances I think it is only that if a question is
15 being put it is an accurate question. There is an 15: 25
16 assessment of marine risk, as Mr. McElligott well
17 knows.
18 **MR. J. McELLI GOTT:** Yes, purely for marine
19 risk. But I am saying how
20 can you calculate the probability of an accident on 15: 25
21 water, how can you know the probability of an accident
22 going to happen if you do not calculate that
23 probability? Would you agree that it is difficult to
24 say it will never happen if you do not calculate the
25 probability? 15: 26
26 **DR. HAVENS:** You are asking me a
27 question that, like a lot
28 of questions, I have trouble with because I just got
29 here last night and I have not looked at things. But I

1 quickly looked at, I think what you call the QRA, and
2 it was very quick. It appeared to me that there were a
3 number of -- I think this was prepared by Dr. Franks.
4 It appeared me, and correct me if I am wrong, that
5 there are numerous risk assessment calculations, 15: 26
6 probability calculations in there. I did not see any
7 that dealt with a major event like a half tank spill.
8 If it is in there I would be interested in seeing it
9 and considering it, but I didn't see it. So, I don't
10 know whether it has been done or not. I believe that 15: 27
11 if it hasn't been done it should be done. Because I
12 believe that you should consider all reasonable,
13 credible event that need to be considered. And if that
14 one hasn't been considered then the only justification
15 for not considering it is for you to decide that Sandia 15: 27
16 is not a credible agency. Maybe they are not. But I
17 am going to assume they are for one.

18 **MR. J. McELLI GOTT:** Thank you. No more
19 questions.

20 **INSPECTOR:** Does that conclude the 15: 27
21 questioning of Dr. Havens?

22 It is half 3: 30 now, maybe we will take a brief break.
23 So five minutes. This time I would request that people
24 be back by 3: 35.

25 15: 28

26 **SHORT ADJOURNMENT**

27
28
29

1 THE HEARING RESUMED, AS FOLLOWS, AFTER A SHORT
2 ADJOURNMENT

3
4 INSPECTOR: Everybody it is now 3:40,
5 if we could resume our 15:41
6 seats. Okay, I will now call the applicant to commence
7 their presentation in terms of health and safety.
8 Mr. O'Neill?

9
10 THE APPLICANTS PRESENTED THEIR SUBMISSION ON HEALTH AND 15:42
11 SAFETY AS FOLLOWS:

12
13 MR. O'NEILL: Thank you, Mr. Inspector.
14 The first witness we are
15 presenting is Mr. Leon Bowdoin, who is going to deal 15:42
16 with design, construction operations, maintenance,
17 safety, security and training. Obviously in context of
18 the safety module that we are now in, there may be a
19 little bit of overlap in the context that some
20 description of the site has to be given for the purpose 15:42
21 of assessing the safety aspects.
22 I think Mr. Bowdoin's report is being circulated and I
23 would ask him to bring you through it, sir.

1 MR. BOWDOIN PRESENTED HIS SUBMISSION AS FOLLOWS:

2

3 MR. BOWDOIN: Good afternoon

4 Mr. Inspector. My name is

5 Leon A. Bowdoin Junior. I hold a Bachelor of Science 15: 43

6 Degree in Mechanical Engineering from Northeastern

7 University in Boston MA, US, and a Masters Degree in

8 Business Administration in 1988 from Bryant University

9 in Smithfield, Rhode Island, also in the United States.

10 I am a member of the American Society of Mechanical 15: 43

11 Engineers, the Instrument Society of America, the

12 National Association of Corrosion Engineers

13 International and the National Fire Protection

14 Association (NFPA), where I am a full voting member of

15 the Technical Committee on Liquefied Natural Gas, the 15: 43

16 standards writing committee responsible for developing

17 the internationally recognised standard NFPA 59A,

18 "Standard on the production, storage and handling of

19 Liquefied Natural Gas (LNG)".

20 15: 44

21 I am Vice President of Operations the Weavers Cove

22 Energy, a subsidiary of Hess LNG. My main areas of

23 expertise are in the design, construction, operation,

24 maintenance, fire protection, safety and security of

25 LNG facilities in natural gas transmission pipelines. 15: 44

26 Over the past 30 years I have been involved in the

27 design, operation and permitting of a number of LNG and

28 natural gas projects and in the compilation of a

29 number of EIS statements and applications for licensing

1 of both LNG and natural gas pipelines facilities in the
2 United States as well as in Canada.

3
4 I have over 35 years experience in the LNG and natural
5 gas industry in engineering, operations and management. 15: 45
6 Before joining the Hess team five years ago, I was
7 employed by Duke Energy Corporation, a US energy
8 corporation, and its affiliates in various engineering
9 and operation and management positions for over 30
10 years, having responsible positions in LNG and natural 15: 45
11 gas pipeline facility design, construction, operation
12 and maintenance, including holding positions as the LNG
13 Plant Manager for the company's LNG facility in
14 Providence, Rhode Island, in the 1980's and as Director
15 of Pipeline Operations for Algonquin Gas Company in the 15: 45
16 1990's.

17
18 My evidence of brief will discuss the development of
19 the Shannon LNG project in the following areas:

- 20 15: 46
- 21 - Design and layout of the facility
 - 22 - Construction of the facility
 - 23 - Operation of the facility
 - 24 - Maintenance of the facility
 - 25 - Safety, security and fire protection of the facility 15: 46
 - 26 - Personnel training

27
28 **Involvement in the project**
29

1 I have been involved in the Shannon LNG project
2 beginning with the initial evaluation of the project by
3 Hess LNG in 2005. I have overall responsibility for
4 technical matters relating to the Shannon LNG project
5 which encompasses facility design, construction and 15: 46
6 operations. I have managed, overseen, conducted,
7 participated in or reviewed the following engineering
8 work and assessments, including:
9

- 10 - The preliminary suitability assessment of the site 15: 46
11 in 2005 conducted by Hess LNG.
- 12 - Conceptual design performed by Chicago Bridge & Iron
- 13 - Civil and geotechnical engineering, seismic and
14 environmental studies and analysis conducted or
15 managed by Arup Engineering and by ERM in the US and 15: 47
16 their subcontractors.
- 17 - Development of the project QRA by ERM for
18 submissions to the HSA.
- 19 - Technical analysis and engineering covering facility
20 layout, process selection, safety, security, fire 15: 47
21 protection, operations, maintenance and training
22 requirements for the Shannon LNG terminal
- 23 - Assessment of the impacts of the proposed
24 development during construction and operation phase
25 of the development 15: 47
- 26 - Recommendations of the mitigation measures necessary
27 to avoid, reduce or remedy the adverse environmental
28 impacts identified.

1 This conceptual design work and engineering
2 investigations have been undertaken using world class
3 engineering design firms and have been performed in
4 accordance with Irish national and/or international
5 standards, codes, regulations and best practices for 15: 48
6 the design, construction and operation of LNG
7 facilities.

8
9 I have participated in the development of or the review
10 of all of the sections of the EIS, and in particular 15: 48
11 with sections 2, 3, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16,
12 17 and 18. As one would imagine, these sections were
13 prepared in conjunction with the input and advice of
14 many technical experts employed by Shannon LNG in the
15 various disciplines required to conduct a thorough and 15: 48
16 complete assessment. A more complete list can be found
17 on pages VII through VIII, Volume 2 of the EIS.

18
19 Section 3 - Description of the LNG and proposed Shannon
20 LNG project design construction operation and 15: 49
21 decommissioning

22 23 **Description of LNG**

24
25 I will begin my evidence with a short description of 15: 49
26 LNG and natural gas.

27
28 LNG is natural gas that has been cooled to
29 approximately minus 160 degrees centigrade, at which

1 point it becomes a liquid at atmospheric pressure. As
2 a liquid the volume of natural gas is approximately 600
3 times less than the volume of the equivalent amount in
4 the gaseous state -- excuse me, the volume of LNG is
5 600 times less -- making it more manageable for storage 15: 50
6 and ocean transportation. LNG is stored and the
7 transported in insulated tanks operating at pressures
8 slightly above atmospheric pressure.
9

10 LNG is delivered to the regasification terminal by 15: 50
11 ship, is unloaded into storage tanks, converted back
12 into gas and transported to consumers via the natural
13 gas pipeline system.
14

15 Shannon LNG design objectives 15: 50

16
17 The principle design objectives for the Shannon LNG
18 terminal are: -

- 19
- 20 - Unload, store and regasify LNG at the site. 15: 50
 - 21 - Provide a gas supply to Ireland with a throughput of
22 11.3 Sm³ per day or (400 MMscfd) 400 million
23 standard cubic feet per day, readily expandable to
24 17 million Sm³ per day or 600 MMscfd in the initial
25 phase, eventually increasing to 28.3 Sm³ per day or 15: 51
26 1 Bscfd. There is a table of these energy unit
27 conversions in Appendix 1A, Volume 4 of the EIS.
 - 28 - Provide storage for between 200,000 m³ and 400,000 m³
29 of LNG in one or two tanks respectively, increasing

- 1 in later phases of the project up to 800,000 m³ in
2 four tanks.
- 3 - Comply with all statutory requirements.
 - 4 - Connect to the BGE pipelines network in order to
5 transport the natural gas from the site to the 15: 51
6 National Grid.
 - 7 - Provide a marine berth, LNG unloading facilities,
8 process piping and equipment, vaporisers and
9 related buildings and facilities to convert the LNG
10 from liquid back to gas at pipeline pressures. 15: 52
 - 11 - Minimise the environmental impacts by incorporating
12 Best Available Practices (BAT) (refer to section
13 3.11 of the EIS), and recognising Ireland's
14 commitment to the Kyoto Protocol and the impact on
15 CO₂ emissions. 15: 52
 - 16 - Optimise operational efficiency
 - 17 - Provide security measures to deter, detect and
18 prevent any attempts at unauthorised access to the
19 jetty or the plant.
 - 20 - Provide a minimum design life of 50 years. 15: 52

21

22 Design constraints

23

24 As discussed in chapter 3, Volume 2 of the EIS, the
25 Shannon LNG site design and layout has been undertaken 15: 53
26 with careful consideration of the requirements of the
27 Irish and EU regulations, recommended standards and
28 good engineering practices. My colleague Ian Vinescombe
29 will provide evidence concerning this subject.

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The Shannon LNG Facility

As described in section 1.4, volume 2 of the EIS, the proposed Shannon LNG terminal will consist of a number of components as illustrated in figure 1.3, Volume 3 of the EIS and discussed below:

15: 53

You can refer to the slide up there, which shows that figure.

15: 53

LNG jetty - this jetty will be capable of receiving and providing secure berthing for LNG ships up to 265,000 m³ cargo capacity. My colleague Blair MacIntyre has already provided the details of the LNG jetty design, construction, operation and safety so I won't repeat the information here. In fact, I believe he will be following me in some regards to that which he hasn't already discussed.

15: 54

15: 54

The LNG Storage Tanks

Again, you can see them on the figure. There will be up to four full-containment LNG tanks each with a usable capacity of 200,000 m³. I will speak to the siting issues of the tank and their placement aboveground in a low terrace cut into the hillside on the site. Ian Vinecombe will provide details of their design and construction.

15: 54

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Vapori sation Process Equipment

This equipment will convert the LNG from a liquid to a gas state. This equipment will be located to the south of the storage tanks. I will speak to the selection process to be used in the design. Ian Vinecombe will speak to the details of the vapori sation process, equipment, design and construction.

15: 55

15: 55

Admi ni stration bui l di ng, securi ty bui l di ng, stores, workshop and vari ous other bui l di ngs and process equi pment, Ian Vinecombe will also provide details for their design and construction.

15: 55

15: 55

There will be a **pond and embankment**. A pond will be created to provide a water supply for construction and operation of the terminal. It will be located on the existing stream within the site, Eoghan Lynch will provide details of its design and construction.

Material s Jetty

Blair MacIntyre has already provided some information on this, I believe, and what he hasn't he will be providing additional detail in this segment.

15: 56

Figures 3.6 to figures 3.14 in Volume 3 of the EIS illustrate the various components listed above. Figure

1 3.8, Volume 3 of the EIS is a more detailed view of the
2 LNG tanks and process areas where the individual
3 locations of equipment can be easily identified.

4
5 A simplified schematic of the process is shown in 15: 56
6 figure 3.4, Volume 3 of the EIS and shows the major
7 components of the facility. The schematic shows in
8 general terms the flows of the main process streams in
9 the facility and I am going to sort of walk through
10 them right now. Unfortunately, I can only use my 15: 57
11 pointer on the slide behind you so I apologise if you
12 have to look in both directions.

13
14 - LNG will be pumped from the ship to the shore tanks.
15 The unload rate will be up to 14,000 m³ per hour and 15: 57
16 will take approximately 16 hours to off load the cargo
17 in the ship.

18
19 - there will be a cold vapour line -- this white line
20 going back to the tank -- which will flow back to the 15: 57
21 ship, as shown.

22
23 - boiloff gas (gas that is produce from heat leaked
24 through the installation systems) and any remaining
25 vapour produced from ship unloading flows from the tank 15: 57
26 to the boiloff pressures and then on to pressure
27 vessels to recondense the gas into the LNG pump out
28 stream from send out. So, the boil off gas goes from
29 the tank into the compressor, and from the compressor

1 into the recondensers.

2
3 I am going to skip lines now.

4
5 LNG that is pumped from the tank will go to the boil off 15: 58
6 recondensers, where it will pick up the vapour and then
7 move on to the high pressure pumps, on to the
8 vaporisations and then on out to the natural gas grid.

9
10 the vaporisation system consists of the seawater flow 15: 58
11 loop where seawater flows up to approximately 20,000 m³
12 per hour, and that's at peak send out rates, it is
13 taken in through inlet structures and then pumped to
14 plate & frame heat exchangers, where the heat from the
15 estuary is exchanged or transferred to a glycol (MEG) 15: 59
16 system intermediate fluid.

17
18 The MEG is pumped in a closed loop between the plate &
19 frame exchanger and the shell and tube vaporiser where
20 the heat is exchanged for the LNG to warm the gas. So, 15: 59
21 the water will come in here, be pumped to plate & frame
22 exchangers, go back to the sea. The MEG system, which
23 is this loop right here, is pump in a closed loop and
24 exchanges heat from the sea to the gas to convert it
25 back from a liquid to a gas. There is a supplemental 15: 59
26 heating system here, these are fired heaters which are
27 designed to provide heat during those period of time
28 when the sea water system is insufficient.

1 **Site Layout Alternatives**

2
3 I will now direct my evidence to the discussion of the
4 site layout alternatives. As described in section 2.5,
5 Volume 2 of the EIS, and shown in figures 3.5 through
6 3.8 in Volume 3 of the EIS, the site layout of the
7 Shannon LNG terminal was largely determined by the
8 identification and avoidance of sensitive environmental
9 areas and the proximity of deepwater along the
10 shoreline of the site.

16:00

16:00

11
12 There are a number of designated areas of environmental
13 concern located in the overall Shannon Development
14 Landbank. The location of the proposed Shannon LNG
15 facility was chosen after careful consideration to
16 minimise the potential disturbances to these areas,
17 minimise the visual impacts to the immediate neighbours
18 to the south and to provide the safest, most efficient
19 and economical plant design and layout.

16:00

16:01

20
21 The location of the designated areas of environmental
22 sensitivity is shown in figures 10.1, Volume 3 of the
23 EIS, which is slide 6, and discussed in chapters 10 and
24 11 in Volume 2 of the EIS. A number of people will be
25 providing evidence relating to the site ecology and
26 environment, including Simon Burrow, Stephan Craven,
27 Karl Dixon, Eoghan Lynch and Dr. Rory Doyle.

28
29 As Blair MacIntyre has already discussed the jetty,

1 I will not repeat his evidence here but refer to it in
2 the siting of the remaining facilities.

3
4 I am going to discuss now the LNG tank location. As
5 discussed in section 2 volume 2 of the EIS -- if you 16:03
6 were to give me one second I want to switch fonts here,
7 I am having a little trouble reading the small print.
8 Thank you.

9
10 As discussed in section 2.5, volume 2 of the EIS the 16:03
11 LNG storage tanks are best sited as close as possible
12 to the jetty in order to minimise the length of piping
13 through which the LNG is transferred from the ships to
14 the tanks. The deep water is shown to be on the
15 eastern end of the site and was elaborated in the 16:03
16 statement of evidence by Blair MacIntyre.

17
18 Figure 1.3 volume 3 of the EIS (slide 7) shows the
19 proposed location of the tanks and the LNG jetty at the
20 eastern end of the site. This location for placement 16:04
21 of the tank offers several advantages in addition to
22 its proximity to the jetty. The tanks will be
23 constructed in sequence with the first tank being built
24 closest to the jetty and the subsequently tanks built
25 to the west of the first tank. 16:04

26
27 Other potential locations and layouts for the LNG tanks
28 on the Shannon Development Landbank given preliminary
29 evaluation where areas to the west of the cSAC and pNHA

1 designations, approximately one kilometre from the
2 identified preferred jetty location. Referring to
3 figure 3.2 volume 3 of the EIS, that's slide 8, this
4 area is at the extreme western side of the property
5 close to the road on the western boundary and that 16:05
6 would be in this area in here (indicating) so that area
7 is the area we are talking about here. The western
8 portion of the site was investigated and the rejected
9 as it would bring several undesirable considerations
10 into play; those being greater environmental impacts, 16:05
11 significantly longer jetty lengths and/or plant piping
12 systems and increased visual impacts caused by locating
13 the tanks where no screening was provided by adjacent
14 higher ground.

15
16 Again referring to figure 3.2 volume 3 of the EIS a 16:05
17 more central location on the site (Knockfinglas Point)
18 including several layout options was evaluated as well
19 and rejected for many of the same reasons. That is in
20 this area in here (indicating), this area right in 16:06
21 here, (indicating) just to make sure I get it right and
22 avoiding environmentally sensitive areas to the west.
23 The sensitive areas to the west is this area in here
24 that we are trying to avoid. (Indicating)

25 16:06
26 The proposed jetty length would be approximately 350
27 metres -- I am sorry, I skipped a line. The visual
28 impacts of this location were also found to be greater
29 with the tanks located at higher elevations to the

1 north of the stream valley and the cSAC and pNHA
2 affording little opportunity to incorporate features to
3 screen the view of the facility. Jetty lengths were
4 longer here than at the eastern end of the site and
5 process layouts and piping systems would remain
6 considerable. 16:07

7
8 The eastern end of the site near Ardmore Point was
9 found to be the best location in terms of efficient
10 process plant layout, minimising the visual impact by 16:07
11 utilising natural screening and by avoiding
12 environmentally designated areas to the west. As shown
13 in figure 1.3 volume 3 of the EIS, and this is on slide
14 9, the eastern portion of the site is also closest to
15 the natural deep water and preferred jetty landing area 16:07
16 along the shoreline. The proposed jetty length would
17 be approximately 350 metres as opposed to 600 metres or
18 more for the Knockfinlas Point or the western portion
19 of the site. This shorter jetty provides for efficient
20 plant design to improve ship security when berthed, 16:07
21 minimises visual impacts of the jetty and ship in the
22 estuary and provides a cost efficient design solution.

23
24 As is shown in figure 3.8, which is slide 10, locating
25 the tanks on the most eastern portion of the site 16:08
26 allows the designers to use higher ground directly to
27 the south to partially screen the tank from views to
28 the southeast, south and southwest. That's this hill
29 that sits right across here. (Indicating) On figure

1 3.9 volume 3 of the EIS, slide 11, the visual benefit
2 obtained through this terracing feature can be seen in
3 the cross section through the tank and process area.
4

5 I am referring to the illustration on the top of the 16:08
6 slide. You can see the (indicating) water line on the
7 right and the top of the hill on the left and the
8 effect that the terracing has. There will be more
9 discussion of that in the visual impact sections.

10 16:09
11 I am going to move on to tank design. The selected
12 design layout allows for the placement of up to four
13 tanks along the shoreline, each of which is
14 approximately 96 metres in diameter. In accordance
15 with EU LNG design codes, the tanks must be separated 16:09
16 by a minimum distance of one half of the tank diameter.
17 The tanks have been located as close as practicable to
18 each other and to the shoreline so as to minimise
19 visual impact. The resulting LNG tank area is in the
20 order of 10 hectares or 25 acres in area, including 16:09
21 access roads, associated pipe-racks and equipment as
22 well as required jetty structures and a security
23 perimeter zone.

24
25 Selection of the base elevation of the tank was 16:10
26 considered from both a process and aesthetic
27 perspective. Several alternative base elevations were
28 considered with the final elevation selected to be at
29 10 metres OD Malin. This elevation was determined to

1 be the lowest safe elevation that is sufficiently high
2 above the predicted tides, wind generated waves and
3 potential storm surges, plus an allowance for the
4 projected impacts of global warming on sea levels
5 during the planned operational life of the facility. 16: 10

6
7 The selection of the 10 OD Malin for the tank area base
8 elevation offers considerable impact benefits by
9 reducing the tank visibility. To further illustrate
10 visual impact, the proposed LNG tanks are proposed to 16: 11
11 be of a low profile design meaning their height is
12 lower than for normal LNG tanks of similar capacities
13 offset by wider tank diameters, but consistent with
14 confirmed technical feasibility. Ian Vinecombe will be
15 providing evidence regarding the tank design and 16: 11
16 conventional limitations.

17
18 As shown in figure 3.14 volume 3 of the EIS (slide 12)
19 the Shannon LNG tanks will have a nominal outer
20 diameter of 96 metres and a height at the top of the 16: 11
21 outer wall of 40 metres above grade or above its base.
22 The total height to the top of the domed roof will be
23 circa 50.5 metres above grade. By comparison, a more
24 'normal' profile tank of this capacity would be
25 approximately 86 metres in diameter, with a 45 metre 16: 12
26 wall height and 60 metres to the top of the roof. The
27 selection of the low profile design tank has the effect
28 of reducing the overall tank height to the top of the
29 dome by about 9 metres. My colleague Thomas Burns will

1 be providing evidence as to the visual impacts of the
2 higher tanks.

3
4 LNG storage tanks up to 96 metres have been designed
5 and built at other locations and are proven from actual 16: 12
6 design construction and operating experience. There
7 are at present no known tanks either in service or in
8 construction with a diameter that exceeds 100 metres.
9 Further description of the visual impact of the project
10 is contained in Chapter 5 Landscape and Visual 16: 13
11 Assessment in volume 2 of the EIS.

12
13 Buried Tanks Alternative.

14
15 As discussed in section 2.5 volume 2 of the EIS, 16: 13
16 burying or partially burying the tanks was evaluated.
17 Under certain soil and subsoil conditions LNG tanks
18 have been built in-ground in Japan and Korea and a few
19 other countries. The feasibility of an in-ground tank
20 is largely dependent upon the geotechnical conditions 16: 13
21 at the site and a cost benefit analysis of that design
22 approach as compared to conventional designs.

23 In-ground tanks can be placed in a pit partially buried
24 or completely buried. In all cases the soil
25 surrounding the tank must be free of excess water to 16: 14
26 prevent large lateral hydrostatic forces and buoyant
27 forces being applied to the tank. The soil surrounding
28 the tank must either be completely impervious or an
29 impervious cut-off wall or curtain wall must be

1 installed around the tank to a sufficient depth to
2 exclude water from the in-ground tank. Deep wells may
3 be required to remove water from the surrounding soil.
4

5 In the case of the Shannon LNG site, the soils 16: 14
6 investigation work has shown that the ground below the
7 initial overburden layer is essentially hard rock with
8 some fracturing. The geotechnical analysis is found in
9 chapter 12 volume 2 of the EIS. Designs utilised to

10 date for buried tanks have been in softer soils that 16: 14
11 are more easily excavated. No known tanks have been
12 constructed in subsoil conditions consisting of hard
13 rock such as identified at the site. In order to
14 prepare the site for a level tank base it will be

15 necessary to remove the solid rock. This means that a 16: 15
16 buried tank would have to be built into the base of
17 bedrock. To excavate or partially or wholly bury the
18 tanks below the terrace elevations proposed would
19 require significant below ground excavation and the
20 removal of huge quantities of rock. Significant 16: 15

21 blasting would be required and it would be necessary to
22 handle large volumes of ground water during the
23 construction and operation of the tank (particularly
24 because the tanks would be so close to the shoreline
25 and the base of the buried tanks would be well below 16: 15

26 sea level). Because of the LNG tank bottom insulation
27 systems are susceptible to certain low frequency
28 vibration loads, blasting is not generally recommended
29 in this close proximity to an existing tank. This

1 means that rock excavations for all four tanks would be
2 required in the initial phase of the project whether
3 the additional tanks are ultimately built or not and at
4 a considerable cost and ongoing expense to maintain the
5 excavations in a dewatering condition. Lastly, removal 16: 16
6 of the massive amounts of excess rock from the site
7 from the excavation for the four tanks would result in
8 considerably increased road traffic during the site
9 preparation phase of the project.

10
11 In addition, the glacial till and underlying near
12 surface rock at the site is not impervious. An
13 impervious cut-off wall or curtain would be required to
14 extend down to solid impervious rock. The soil borings
15 of the site encountered ground water near the surface 16: 17
16 and some artesian well conditions, that is water at the
17 surface once the wells were drilled. Thus the ground
18 water conditions at the site would be likely to
19 significantly complicate the isolation and de-watering
20 systems and render in-ground tanks impractical or 16: 17
21 uneconomical.

22
23 Most partially or completely buried tanks are
24 surrounded by soil and cannot be readily inspected,
25 maintained or repaired if required. In addition, a 16: 17
26 heating system is required not only for the tank bottom
27 but also for all buried portions of the tank shell to
28 keep the soil surrounding the tank from freezing.
29 Freezing of soils would impose large uncontrolled

1 forces on portions of the tank below grade. The
2 heating system and control systems are difficult to
3 maintain and repair and must be designed, therefore, to
4 operate for the life of the tank. These conditions may
5 require the tank to be taken out of service for 16: 18
6 maintenance which means Shannon LNG would have to
7 install excess tankage beyond normal operating
8 requirements to allow for uninterpreted service in the
9 event of a major maintenance requirement rendering one
10 tank unserviceable. Above-grounds tanks do not carry 16: 18
11 this risk.

12
13 Tanks placed in excavated pits do allow access to the
14 outer tank wall for inspection and repair. A tank
15 within an excavated pit does not need a heating system 16: 19
16 on the tank shell provided sufficient spacing is
17 allowed to promote air circulation. However, pit
18 excavations must then be larger than for similarly
19 sized buried tanks resulting in even larger volumes of
20 excavated rock, more blasting, more ground water 16: 19
21 handling and increased traffic to remove the excess
22 material from the site. Additionally, the pit must be
23 protected from surface water intrusion either with a
24 sufficiently high retaining wall at the surface or a
25 cover from the edge of the pit to the roof of the wall 16: 19
26 of the tank. The excavation pit must be designed and
27 constructed such that they are stable over the life of
28 the facility without risk of degradation and strength
29 collapse or falling rocks any of which would have

1 adverse impacts on the LNG tank located within its
2 walls. Ground water management would be a major cost
3 and reliability issue over the life of the facility.
4 The curtain wall or cover must be designed to withstand
5 any storm or wave surges that may be experienced during 16: 20
6 the life of the tank.

7
8 Above-ground tank design and construction technology is
9 well understood, tried and tested because it has been
10 used extensively and successfully in the LNG industry 16: 20
11 all over the world. There are fewer in-ground tank
12 designs and these having often been developed for the
13 site specific ground conditions. The design and
14 construction of an above-ground tank is far less
15 complex and less technically risky than a buried tank 16: 20
16 or a tank in a pit. Construction time for above-ground
17 tanks is significantly less than that required for
18 buried tanks or tanks in the pit thereby minimising any
19 temporary environmental impacts during the construction
20 phase. 16: 21

21
22 Above-ground tanks can be decommissioned and demolished
23 in a conventional manner whereas the removal of a
24 buried tank or a tank in a pit is problematic.

25 16: 21
26 For all these reasons above-ground tanks were selected
27 for this project.

28
29 **Vaporisation Process Selection.** Just to turn to slide

1 13. I will now turn to the subject of selection of the
2 vaporisation process design for use at the proposed
3 Shannon LNG scheme. LNG terminals commonly use one of
4 several types of LNG vaporisers: Seawater Open Rack
5 Vaporisers (ORV); submerged combustion vaporiser (SCV); 16: 22
6 Shell and Tube Vaporisers (STV) or a combination or
7 variation thereof.

8
9 As discussed in chapter 5, volume 2 of the EIS
10 selection of the optimal vapour process design is 16: 22
11 designed dependent upon many factors including size and
12 type of facility proposed, local environmental
13 conditions and technological constraints, local laws
14 and regulations and technological constraints including
15 availability and suitability of the various 16: 22
16 technologies developed.

17
18 In the determination of the type of system we would
19 propose to use for the Shannon LNG project, Shannon LNG
20 engaged CB&I to review the available technologies 16: 23
21 against the several design, environmental and legal and
22 code and technological constraints to advise as to the
23 benefits, drawbacks, cost and environmental cons of the
24 several options.

25 16: 23
26 As illustrated in the simplified schematic on figure
27 3.4 volume 3 of the EIS, Shannon LNG selected a hybrid
28 Shell and Tube (STV) to heat and regasify the LNG.
29 STVs are a popular process option in the natural gas

1 industry for regasification of LNG and can use a
2 variety of heat sources. Because of Shannon LNG's
3 desire to minimise greenhouse gas emissions, the
4 process was chosen to extract as much useful heat as
5 practicable from the sea water throughout the year 16: 24
6 whilst at the same time minimising operation of fire
7 gas heaters and their production of greenhouse gases.
8 The hybrid scheme was developed to maximise available
9 heat energy from the sea water when temperatures in the
10 estuary are sufficiently warm to vaporise the LNG and 16: 24
11 use supplementary heat from natural gas heaters when
12 the estuary temperatures are too cold to provide
13 reliable operation. A glycol /water (monoethylene
14 glycol or MEG) mixture is proposed for use as the
15 intermediate fluid at the Shannon LNG terminal. The 16: 24
16 MEG mixture is either heated by the sea water in a
17 series of plate and frame heat exchangers, by a series
18 of natural gas fired heaters, by any available waste
19 heat sources or a combination of these heat sources
20 depending upon seawater temperatures and operating 16: 25
21 conditions. The system offers several operating and
22 environmental advantages. While it represents a higher
23 capital cost alternatives to the other methods such as
24 SCV or a simple STV design, it will produce much lower
25 greenhouse gas emissions than these designs, offer 16: 25
26 excellent reliability and good process control and
27 turndown capability. In addition, it has lower
28 operational costs than a fired natural gas only
29 solution. Further, the design allows Shannon LNG to

1 capture waste heat from various internal heat
2 generating sources thus improving the overall plant
3 thermal efficiency and minimising the use of fired heat
4 as a supplemental source of heat to the subsystem.

16: 26

5
6 If a power plant was later proposed adjacent to the LNG
7 terminal consideration would be given to incorporating
8 waste heat from that plant into the LNG vaporisation
9 process. However, no decision has been made on such a
10 process and it would be speculative to pursue the
11 terminal design on this basis. If a power plant was
12 developed we expect the overall facility design would
13 be quite similar to what is now shown or what is now
14 proposed.

16: 26

15
16 Water supply and pond. Construction of an LNG facility
17 requires large amounts of fresh water to be provided
18 for construction and operations. Shannon LNG proposes
19 to construct a pond and embankment for the purposes of
20 storing sufficient water to meet construction and
21 operational needs. A pond size to hold approximately
22 150,000 to 160,000 cubic metres is proposed and is
23 shown in figure 1.3 volume 3 of the EIS and is on slide
24 14. Eoghan Lynch will provide the details of the
25 alternatives for the fresh water supply and the
26 construction of the pond in his statement of evidence.

16: 26

16: 27

16: 27

27
28 **Spill Impoundment.**

29

1 The LNG process areas will be provided with a spill
2 impoundment system and sump, designed to collect
3 credible spills of LNG as defined by the Qualitative
4 Risk Assessment. Refer to sections 3.10.1.1 for
5 details of the provisions to control an LNG spill and 16: 27
6 to appendix 3E for a summary of the QRA. Dr. Andrew
7 Franks of ERM will be providing evidence regarding the
8 QRA. Additionally, Dr. Phani Raj of TMS Inc. will be
9 providing evidence regarding his assessment of the
10 safety and suitability of the proposed site and layout. 16: 28

11
12 Per EN 1473, the European standards governing LNG plant
13 design, each process area spill containment sump is
14 required to hold a minimum volume of 125m³ of LNG.

15 Shannon LNG is proposing that the sumps be sized with 16: 28
16 approximately 400m³ of capacity. The first sump will
17 be centrally located just to the south of the LNG
18 storage tanks, tanks 1 and 2, and north of the process
19 area. A second sump is proposed between tanks 3 and 4
20 to collect any spills from piping systems associated 16: 29
21 with those facilities when they are constructed.

22 **Figure 3.8** volume 3 of the EIS shows the locations of
23 the two sumps. One of them is right in that area
24 (indicating) and the other one is right in that area.
25 (Indicating) 16: 29

26
27 Spillways will be designed to conduct any spilled LNG
28 to the sumps and minimise spill surface areas. The
29 sumps and spillways will be designed using low density

1 concrete to minimise heat transfer from the ground to
2 the LNG minimising vapour generation. Refer to CBI
3 drawings C406 found in the Planning Drawing Set and
4 shown on slide 16 for details of the design. You can
5 see on slide 16 (indicating) that they are sort of 16: 30
6 highlighted out there in grey, (indicating) let me show
7 them. They are right here and right there and again
8 right here and right there (indicating) so those are
9 the spillways.

10 16: 30
11 LNG sumps will be fitted with high expansion foam
12 system designed to blanket the sump and reduce the rate
13 of vapour production should a spill occur.

14
15 The sumps will contain pumps to remove any collected 16: 30
16 storm water. Storm water collected in the spill
17 containment system will be routinely pumped from the
18 impoundment sumps to the site storm water management
19 system. LNG sumps will be equipped with automatic
20 level control activators and low temperature sensors 16: 30
21 and switches to prevent operation of the pump-out
22 systems in the event of an accidental release of LNG to
23 the sump.

24
25 **Health and Safety.** 16: 31

26
27 As elaborated in section 1.8 in volume 2 of the EIS
28 Shannon LNG recognises and accepts its responsibility
29 for ensuring the health, safety and welfare of its

1 employees, contractors, visitors and members of the
2 public who may be affected by its activities. Shannon
3 LNG is permitted to compliance with all applicable
4 Irish health, safety and environmental HSE laws and
5 regulations.

16: 31

6
7 Shannon LNG will provide appropriate health, safety and
8 environmental HSE training and guidelines to employees
9 and contractors to enable them to meet the standards of
10 performance.

16: 31

11
12 Shannon LNG, through its training régime, will ensure
13 every employee and contractor is aware of his or her
14 responsibility to work safely, adhere the safety rules
15 and work procedures, use safety equipment provided, is 16: 32
16 environmentally responsible and play an active role in
17 Shannon LNG's drive for continual improvement in HSE
18 performance. Shannon LNG will implement a HSE
19 management system and will use regular audits to ensure
20 its controls are effective. Shannon LNG aims to 16: 32
21 minimise the health, safety and environmental impact of
22 its activities and prevent pollution by utilising a
23 structured risk management approach which includes
24 establishing standard operating procedures for all
25 aspects of operation, personnel training of personnel 16: 32
26 including for emergency preparedness and contingency
27 planning. All new activities will be assessed for
28 environmental impact and appropriate health and safety
29 provision and ongoing activities will be subject to

1 periodic review. Health, safety and environmental
2 protection will be given equal priority to the business
3 objectives of the company.

4
5 Shannon LNG is committed to effective communication and 16:33
6 consultation on health, safety and environmental
7 matters with all interested parties and will make its
8 policies available to them subject to appropriate
9 privacy and business confidentiality protections.

10 Shannon LNG will routinely monitor, assess and report 16:33
11 on its health, safety and environmental performance
12 with data on the rate of lost time injuries and
13 occupational injuries.

14
15 Construction safety as discussed in chapter 7 volume 2 16:33
16 of the EIS is also of vital importance to Shannon LNG.
17 This subject will be addressed in the statement of
18 evidence from Ian Vinecombe and Eoghan Lynch.

19
20 **Construction Phasing.** 16:34

21
22 It is anticipated that the terminal will be developed
23 in several phases. During the initial phase one or two
24 of the 200,000m³ tanks will be constructed in addition
25 to vapourisation equipment and other facilities. In the 16:34
26 initial phase, the normal operating flow rate of gas
27 from the terminal into the gas transmission grid will
28 be approximately 11.3 Sm³ per day or 400 MMsfd. In the
29 initial phase sufficient capacity will provided to

1 enable a peak regasification and send out of 17 million
2 Sm³ per day or 600 MMscfd.

3
4 It is expected that the construction for the initial
5 phase will commence at the end of 2008, subject to 16: 35
6 planning and other factors as discussed by my colleague
7 Gordon Shearer. It is envisaged that the terminal will
8 be operational by the end of 2012.

9
10 Because of the synergies between the initial and later 16: 35
11 phases, the extent of additional process equipment
12 required for subsequent phases will be somewhat less
13 than that required for the initial phase. The planning
14 application and the Environmental Impact Statement
15 cover the initial and later phases up to a total of 16: 35
16 four tanks.

17
18 In the future between one and three additional
19 200,000m³ for an overall total of up to four may be
20 constructed. Vaporisation equipment and other 16: 35
21 facilities will be installed to increase the sendout
22 rate to 28.3 million Sm³ a day or 1 Bscfd per day. To
23 facilitate the phased development, Shannon LNG is
24 seeking a ten year planning permission.

25 16: 36
26 During the construction of the initial phase of the
27 terminal approximately 650 people will be employed on
28 site at peak. While some of the construction personnel
29 will be specialists who will travel from the outside

1 area, it is intended that many of the jobs will be
2 filled by personnel recruited in the region with
3 appropriate training provided as necessary. Economic
4 benefits will arise during this phase in the provision
5 of accommodation and services for construction workers. 16: 36

6
7 The proposed LNG terminal will require certain permits
8 and consents and Shannon LNG must give certain notices
9 prior to commencement of construction and operation.

10 **Section 1.4** volume 2 of the EIS provides a listing of 16: 36
11 the major permits needed.

12
13 **Decommissioning.**

14
15 **Section 3.12** volume 2 of the EIS addresses general 16: 36
16 decommissioning issues associated with the proposed
17 development.

18
19 Notification will be provided to the required Irish
20 authorities of any plan to abandon all or part of the 16: 37
21 Shannon LNG facility. Prior to abandonment of all or
22 part of the LNG facility, an abandonment plan that will
23 include procedures covering decommissioning and site
24 restoration will be submitted to the appropriate
25 authorities. 16: 37

26
27 The facility will be designed, built and maintained to
28 operate safely and efficiently throughout its actual
29 life span which is anticipated to be a minimum of at

1 least 50 years. At the end of all or part of the
2 facility's useful life, which will be determined at a
3 future date, it will be decommissioned and the site
4 will be restored in accordance with an abandonment plan
5 that will be developed by Shannon LNG and approved by 16: 38
6 all applicable Irish regulatory authorities. The plan
7 will incorporate measures to satisfy all regulatory
8 requirements and to achieve targeted environmental
9 goals. All abandonment works will be executed in
10 accordance with a change management plan and with the 16: 38
11 requirements of ISO 9001.

12
13 The extent of decommissioning and restoration may be
14 full or partial and in all cases will be as required by
15 the approved plan. Items to be considered will include 16: 38
16 the LNG tanks, process equipment, utilities equipment
17 and jetty, ship unloading equipment, seawater intake
18 and discharge structures, all buildings and structures,
19 roads, security fences and the fire water pond.

20 16: 38
21 Decommissioning of the tanks and associated pipe work
22 and process equipment may involve removing all LNG
23 liquid and vapour, warming up to atmospheric
24 temperature, purging with inert gas (nitrogen) and
25 aerating. All hazardous and non-hazardous process 16: 39
26 substances will be removed from the system prior to
27 progressive dismantling and removal of equipment.

28
29 Utilities will be drained of all potential pollutants

1 such as lubricant oils or sealed to prevent leakage if
2 being removed off site for re-use elsewhere.

3
4 The LNG unloading equipment may be removed from the
5 jetty, the access trestle and jetty head decks may be 16: 39
6 removed and the piles extracted or cut below the mud
7 line. The sea water intake and discharge structures
8 may be lifted and floated off site or demolished in
9 situ and removed as appropriate.

10 16: 40
11 Building and structures may be dismantled for use
12 elsewhere or demolished in situ and removed. Roadways
13 may be broken up and removed and security fences and
14 gates dismantled. Unused reinforced concrete
15 foundations may be demolished and removed to below 16: 40
16 grade level where possible. The pond may be drained
17 and the embankment may be removed to the extent that it
18 will allow the original line of the stream to be
19 re-established and to ensure that there will be no
20 potential for the stream to become blocked. On 16: 40
21 completion of safe decommissioning of equipment, the
22 domestic and fire water and electrical supplies may be
23 disconnected, removed or abandoned in place.

24
25 Salvageable material will be disposed of or reused in 16: 40
26 other facilities. Solid waste will be disposed of in
27 an approved manner and hazardous waste will be
28 collected and disposed of at an appropriately licensed
29 facility.

1
2 Restoration will in principle require that all
3 disturbed areas be landscaped and revegetated in
4 accordance with environmental standards applicable at
5 the time.

16: 41

6 7 **Staffing of Personnel , Operations and Training.**

8
9 As discussed in **section 3.8** volume 2 of the EIS Shannon
10 LNG will employ about 50 permanent staff, some of whom
11 will work in shifts as the plant will be operational 24
12 hours a day, seven days a week. Additional contract
13 staff and service personnel will be utilised as needed.
14 Personnel will perform the following functions:

16: 41

15
16 Management and administration; operations; maintenance;
17 marine operations; health, safety security and
18 environment; finance and accounting; sales and
19 marketing.

16: 41

20
21 Managerial staff will be experienced personnel from the
22 LNG, petroleum, chemical or similar process industries.
23 Operations, maintenance and support staff will be
24 recruited locally to the extent possible prior to or
25 during construction. Staff will be given extensive
26 training which will include in-plant training or
27 experience in another operating LNG facility. All key
28 personnel will be trained in the properties of LNG,
29 handling cryogenic fluids, proper operation of all

16: 42

16: 42

1 equipment, workplace safety and incident response,
2 including leaks, spills and fires.

3
4 The LNG terminal maintenance staff will carry out
5 routine inspections, maintenance and repairs as well as 16: 43
6 major equipment overhauls, where applicable. Certain
7 major overhauls and maintenance will be handled by
8 contract maintenance personnel. Security personnel,
9 pilots, tug and mooring personnel and catering and
10 cleaning personnel will be provided by third parties. 16: 43
11 Warehouse personnel may be contract staff. Shannon LNG
12 will operate and maintain the LNG terminal to meet or
13 exceed all applicable Irish and EU regulations.
14 Shannon LNG will prepare, maintain and update a
15 comprehensive set of operations, maintenance, safety 16: 43
16 and emergency response manuals. All operations and
17 maintenance personnel will be trained in accordance
18 with procedures in these manuals.

19
20 After the start of operations, Shannon LNG operating 16: 43
21 and maintenance personnel will be included in ongoing
22 safety, operations and maintenance training.
23 Operations, maintenance and emergency response
24 procedures and manuals will be subject to regular
25 review and will be updated to reflect the best industry 16: 44
26 practices or to reflect the addition of new procedures
27 or equipment or other facilities at the terminal.

28
29 **Fire Safety Certificate.**

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Fire safety certificates will be required from the Chief Fire Officer of Kerry County Council prior to construction of the facility for each building on the site. Shannon LNG has initiated discussions with the Chief Fire Officer regarding the facility's proposed fire protection systems and preparation of an Emergency Response Plan being implemented for the facility that includes training and firefighting responsibilities taking into account capabilities of both facility personnel and KCC fire department emergency responders.

16: 44

16: 44

I will now address responses to submissions to An Bord Pleanála.

16: 45

Submission L037 Ballylongford Enterprise Association. *Commenter is relying An Bord Pleanála, the HSA and other regulatory bodies to ensure that all up to date safety procedures, work procedures, secure methods etc. are in place.*

16: 45

Submission L009, Geraldine Carmody. *As a local resident as of now I am not entirely satisfied that international best practices for such plants in the area of safety is being applied to the planned Kilcolgan plant. I appreciate further assurances in this area.*

16: 45

L024 John Fox. *Safety and environmental systems must*

1 *be of the highest standard. Proper consideration given*
2 *to health and safety issues. Proper written procedures*
3 *for dealing with plant operations, emergencies and*
4 *response training must be agreed and in place.*

16: 46

5
6 Response: We agree. As stated in my evidence and in
7 the EIS volume 3 section 2 of the EIS, Shannon LNG will
8 repair and maintain operations, maintenance, safety,
9 security and emergency policies and procedures,
10 institute a comprehensive HSE plan at the facility and 16: 46
11 ensure that all personnel are properly trained in those
12 programmes. Also as stated in volume 1 of the EIS near
13 the end of section 2 under the heading Best Available
14 Practices:

15
16 "Best available techniques have been 16: 47
17 included in the design of the terminal
and will be applied in its ongoing
operation and control."

18
19 Shannon LNG has stated that it will prepare and follow
20 operating manuals in the EIS. Reference EIS volume 2 16: 47
21 page 3-16:

22
23 "Shannon LNG will operate and maintain
24 the LNG terminal to meet or exceed all
25 applicable European Union and Irish
26 regulations. Shannon LNG will prepare,
27 maintain and update a comprehensive set
28 of operations, maintenance, safety, and 16: 47
operations and maintenance personnel
will be trained in accordance with the
procedures in these manuals."

29 Submission L009, Geraldine Carmody. Also I have

1 *concerns regarding the levels of pollution emitting*
2 *from the plant, both air, that is noise, and maritime.*
3 *I would appreciate further assurances that maximum care*
4 *be applied should the application be successful to*
5 *minimising the level of emissions.*

16: 48

6
7 Response: As stated in volume 1 of the EIS near the
8 end of section 2 under the heading Best Available
9 Practices:

10
11 "Best available techniques are
12 techniques recommended by the EU for
13 use in designing plants to minimise
14 pollution."

16: 48

14 Submissi on L009, Geraldine Carmody; L018, Tarbert
15 Development Associ ati on; L024, John Fox; L025 Ken
16 Murphy; L036 Kirbys Lanterns Hotel ; L039, Thomas and
17 Mary O'Connell ; L040 Eamonn O'Connell . *Up to date*
18 *technologies, all necessary precautions taken to ensure*
19 *safety of all . Safety should be ensured inside the*
20 *plant both during construction and operation and apply*
21 *to the immediate locality and a large radius of the*
22 *surrounding area. Proper written procedures must be in*
23 *place.*

16: 48

16: 49

24
25 We agree. As stated in this statement of evidence
26 above and in sections 2.1, 3.2 and 4.0 and as described
27 in **sections 1.8, 3.8 and 7.0** of the EIS, Shannon LNG
28 will employ best practices and all applicable national
29 and international regulations and standards in the

16: 49

1 design, construction, operation and maintenance of the
2 facility.

3
4 Submission L054, Killochan Residents Association.
5 *Object to any movement by road of LNG.* 16: 50

6
7 Response: Shannon LNG has not proposed to move LNG by
8 truck in this application. Refer to section 1.2 of
9 volume 2 of the EIS page 1-2 where it says:

10
11 "Once the LNG is delivered to the 16: 50
12 gasification terminal, the liquid will
13 be unloaded into storage tanks,
14 converted back into gas and transmitted
15 via the gas pipeline system or
16 distributed locally as liquid by road
17 truck. (In the case of the Shannon LNG
18 Terminal the gas will be transmitted by
19 pipeline only - a road tanker
20 distribution system is not proposed)." 16: 51

21
22 Submission L051 Department of Environment. *During*
23 *construction and operations ensure that a contingency*
24 *plan is in place to deal with any eventuality of the*
25 *introduction of petrochemicals from fueling etc. is in* 16: 51
26 *place and made available to the NPWS.*

27 Response: We agree. As stated in section 1.8 and 7.13
28 of the EIS, Shannon LNG will develop and implement a
29 comprehensive HSE system which will include handling of 16: 51
oil spills during construction and operation. As
stated in section 1.8 Shannon LNG will implement an HSE
management system which will include setting of
objectives and targets, measuring progress, reporting

1 results as a commitment for continual improvement and
2 fostering a culture where incidents are reported and
3 investigated and lessons learned and shared through the
4 organisation. We will use regular audits to ensure
5 that its controls are effective. It will provide 16: 52
6 appropriate health, safety and environmental training
7 and guidelines to employees and contractors to enable
8 them to meet the required standards of performance.
9

10 Shannon LNG aims to minimise the health, safety and 16: 52
11 environmental impacts of its activities and prevent
12 pollution by utilising a structured risk management
13 approach, which includes emergency preparedness and
14 contingency planning. All new activities will be
15 assessed for environmental impact and appropriate 16: 52
16 health and safety provision and ongoing activities will
17 be subject to periodic review. Health, safety and
18 environmental protection will be given equal priority
19 to business objectives of the company.
20

21 Shannon LNG is committed to effective communication and 16: 53
22 consultation on health, safety and environmental
23 management with all interested parties and will make
24 its policies available to them subject to appropriate
25 privacy and business confidentiality protections.
26

27 Shannon LNG will routinely monitor, assess and report
28 on its health, safety and environmental performance
29 with data on the rate of lost time injuries and
occupational injuries.

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As stated in 7.13.6 surface water and ground water on or adjacent to the site could become contaminated by silt or debris during the construction phase.

16: 53

The employment of good construction practices will serve to minimise the risk of pollution of soil, storm water runoff or ground water. The Construction Industry Research and Information Association (CIRIA) in the UK has issued a guidance note on the control and management of water pollution from construction sites, "Construction of Water Pollution from Construction Sites, Guidance For Consultants and Contractors". (Masters-Williams et al 2001).

16: 54

16: 54

The construction management of the site will take into account the recommendations of this document to minimise as far as possible the risks of soil, ground water or surface water contamination.

16: 54

Submission L054, Kilcolgan resident association. *A detailed ruling must be made on the type of plant (onsite & offsite) must be made including information on early warning systems to all residents within a 12.4 kilometre radius.*

16: 54

Response: Shannon LNG will develop an emergency response plan in cooperation with the Kerry County Chief Fire Officer. It will include all notifications

1 as determined in these sessions.

2
3 L055. *Clare County question the mitigation measures*
4 *for uncontrolled emissions venting towards Co. Clare.*

5 16: 55

6 Response: The LNG tank and process plant is equipped
7 with several vent systems which have been described in
8 the EIS in section 3.6.8.4. As described in this
9 section:

10 "These systems are designed to safely
11 collect and dispose of boil-off vapours
12 that need to be handled during abnormal
13 events."

16: 55

14 There will be no deleterious effects from the operation
15 of these vent systems on the residents of Co. Clare or
16 residents more local to the site, hence no mitigation
17 is required in the event of the operations of these
18 systems.

16: 55

19
20 L003, Adam Kearney Associates; L004, Mary Kelly-Godley;
21 L054, Killorgan Residents Association. *Why cannot LNG*
22 *be buried as is done in South Korea, Japan and Belgium?*
23 *Tanks are buried in other locations because it is*
24 *safer.*

16: 56

25
26 Response: The answer to this submission has been
27 addressed in my statement of evidence and has also been
28 addressed in section 2.5.2.6 volume 2 of the EIS. To
29 summarise these: Burying LNG tanks at this site is not

16: 56

1 feasible.

2

3 Submission L054. *Object to tanks being 50.5 metres*
4 *high. Height of tanks versus level of tanks in the EIS*
5 *states that tanks are 50.5 metres high but the drawings* 16:57
6 *show that the top of the tanks are 60.5 metres and the*
7 *stacks are 70.1 metres high. This is very misleading.*

8

9 This was also the subject of oral discussion.

10

16:57

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Figure 3.9 volume 2 shows the tank and appurtenances as

1 measured in reference to OD Malin, thus the numbers to
2 the top of the tank dome are correctly shown as 60.5
3 metres above OD Malin. In summary, both sets of
4 numbers are correct, but measured from different
5 references.

16:59

6
7 Submissi on L004 Mary Kelly-Godley and L054 Kilcolgan
8 Residents Associati on. *Closed loop vaporisation system*
9 *should be used as it has less environmental impacts.*
10 *There are alternative vaporisation systems that were*
11 *ruled out as too costly.*

16:59

12
13 Response: As discussed in section 2.5.3.6 closed loop
14 vaporisers are not suitable for use in the Shannon
15 Estuary as the build-up of marine organisms onto the
16 exterior surfaces would render the devices inoperable
17 after a short period of time and that would be loss of
18 heat transfer capability from fouling. The example
19 cited by the Kilcolgan Residents Association, the Bayou
20 Casotte Energy project is located in the Gulf of Mexico
21 which has completely different ecology and marine
22 considerations than the Shannon Estuary. The EIS
23 carries out a full comparison of the various systems
24 that were considered and the rationale for the system
25 chosen.

17:00

17:00

17:00

26
27 Submissi on L018 Joan Murphy and L024 John Fox. *Ensure*
28 *safety systems and controls use best available*
29 *technology is employed at the site.*

1
2 This issue has been addressed in **section 3.9** volume 2
3 of the EIS and I will quote:

4 "The integrated control and safety
5 system ICSS will be a distributed control system that will provide
6 process control, fire and gas detection, event logging and emergency
7 shutdown ESD functions. The functions will be fully integrated in
8 standardised hardware and software will be utilised throughout the system as
9 far as possible. The system is intended to minimise the need for
10 communication gateways or bridges between software systems, thus
11 improving system reliability and increasing operational flexibility.

17:01

17:01

12 The system chosen will be well proven
13 but of up to date design.

14 The primary objective of the design of
15 the ICSS is to provide high reliability and availability. The system will
16 provide safe, efficient and reliable equipment of proven design. The system
17 will use current technology with modern diagnostic capabilities to increase
18 failure reporting and maintenance requirements."

17:02

19
20 Submissi on L056 County Kerry. *All nickel steel used in* 17:02
21 *constructi on of gas tanks/pi pelines to be independently*
22 *certi fi ed as to nickel concentrati on and purity and*
23 *compl iance wi th specs. Summary of resul ts of*
24 *i ndependent testi ng of si te materi als to be suppl ied to*
25 *the pl anni ng authori ty on a quarterl y basi s. Any* 17:02
26 *di gressi ons from speci fi cati ons shoul d be hi ghli ghted.*

27
28 Response: Shannon LNG agrees in principle with this
29 recommendati on wi th the fol l owi ng cl ari fi cati ons and

1 explanations. All nickel steel (9% nickel and
2 stainless steel) is subject to mill certification
3 testing requirements of the applicable fabrication
4 specifications to which it is formed. The mill's
5 certification process involves the accreditation of the 17: 03
6 mill inspectors by an independent body (such as the DMV
7 or Lloyd's Register etc.), that the steels are
8 manufactured as per the particular specification
9 referenced. Regular inspection of the composition and
10 purity of the steel is conducted by certified 17: 03
11 inspectors (who may be either mill employees or third
12 party personnel and accepted by the certifying agency).
13 The documentation is available and can be supplied or a
14 summary to any agency as appropriate.

15
16 Shannon LNG requests that these modifications be
17 adopted in the recommendations of Kerry County Council.
18 In the circumstances we suggest that the relative
19 conditions should read as follows:

20 "All nickel steel used in the 17: 04
21 construction of LNG tanks and LNG or
22 gas pressure piping to be independently
23 certified as to nickel concentration
24 and purity in compliance to its
25 specification by personnel holding
26 accreditation from recognised third
27 party agencies. Summary of results of
28 the independent testing of site
29 materials to be supplied to the 17: 04
30 planning authority on a quarterly
31 basis. Any digressions from
32 specifications should be highlighted."

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Submission L056, County Kerry. *All wells and
fabrication of gas tanks or pipelines should be x-rayed*

1 *as to quality and fitness.*

2
3 Response: Shannon LNG agrees in principle with this
4 recommendati on wi th the fol lowi ng clari ficati ons and
5 expl anati on. Shannon LNG agrees wi th the submi tter 17: 05
6 that all wel ls shoul d be subj ect to an exami nati on for
7 fi tness of servi ce i n accorda nce wi th the appl icabl e
8 regul atory requi rements of the weldme nts bei ng made.
9 Addi ti onal ly, Shannon LNG i ntends that all pressure
10 components of the LNG tank and LNG and natural gas 17: 05
11 pi pi ng shoul d be subj ect to non-destructi ve testi ng
12 (NDT testi ng) i n accorda nce wi th the appl icabl e
13 standa rds of the weldme nts bei ng fabri cated. Shannon
14 LNG woul d l i ke to clari fy that not all welds l end
15 themsel ves to meani ngful eval uati on by the x-ray 17: 05
16 techni que and that some of the weldme nt types whi ch may
17 be exami ned by x-ray may be better eval uated by other
18 techni ques that are permi tted by thei r constructi on
19 speci ficati on. Shannon LNG i ntends to perform 100%
20 non-destructi ve testi ng on all LNG and natural gas 17: 06
21 pi pel i ne gi rth welds. Shannon LNG requests that these
22 modi ficati ons be adopte d i n the recommendati ons of
23 Kerry County Council. The rel evant condi ti on coul d
24 read as fol l ows:

25 "All welds in fabrication of pressure
26 components in the LNG tanks and in the
27 LNG and natural gas piping should be
28 non-destructively tested as to their
quality and fitness."

29 Submi ssi on L024, John Fox; L056, County Kerry. An

1 *appropriate firefighting appliance and suitably trained*
2 *crew shall be provided on site and available at all*
3 *times in the event of an emergency. These measures are*
4 *to be agreed with the fire authority, fire*
5 *commissioning of the plant. The sizes and capabilities* 17:07
6 *of the proposed fire water pumps are to be agreed with*
7 *the fire authority prior to commissioning of the plant.*
8 *The Applicant shall provide and agree with the fire*
9 *authority the fire safety measures to be taken during*
10 *the construction phase of the plant. A comprehensive* 17:07
11 *management system is to be put in place for the safe*
12 *operation of the plant.*

13
14 Response: Shannon LNG agrees. As stated in my
15 statement of evidence Shannon LNG will have both fixed 17:07
16 and portable fire protection equipment on site.
17 Shannon LNG employees will be trained in all emergency
18 response actions including LNG and natural gas spill,
19 leak and fire situations. Fire safety certificates
20 will be required from the Chief Fire Officer of Kerry 17:08
21 County Council prior to construction of the facility
22 for each building on the site. Shannon LNG has
23 initiated discussions with the Chief Fire Officer
24 regarding the facility's proposed fire protection
25 systems, training and firefighting responsibilities 17:08
26 taking into account the capabilities of both the
27 facility personnel and Kerry County fire department
28 emergency responders and the preparation of a
29 comprehensive emergency response plan to be implemented

1 for the facility and community that includes
2 notification of the public and response to potential
3 instances.

4
5 Conclusion. Accordingly I am of the view that the 17:08
6 proposed LNG facility can and will be designed,
7 constructed, operated and maintained in accordance with
8 Irish and European laws and regulations in a safe
9 environmental acceptable manner.

10 17:09
11 Mr. Inspector, I have two other verbal submissions
12 I would like to respond to. One was: *How will LNG of*
13 *different densities be managed into the land storage*
14 *tanks.*

15 17:09
16 Response: As discussed in section 3.6.4 volume 2 of
17 the EIS each LNG storage tank will be provided with
18 tank internals and piping connections so that the LNG
19 can be filled either from above (top fill) or from
20 below (bottom filled) the volume of liquid already in 17:09
21 the tank. This will provide operational flexibility to
22 permit the mixing of LNG cargo being unloaded which may
23 be of a different density and/or composition.

24
25 The basic procedure is to determine the composition of 17:10
26 loaded cargo. From this the LNG density and
27 temperature and composition upon arrival can be
28 predicted. Measurements of the LNG cargo at unloading
29 will confirm these values. This information, along

1 with information on the composition temperature and
2 density of the LNG in the tank, can be used to
3 determine whether to top or bottom fill the cargo being
4 received. To promote mixing it is generally considered
5 desirable to top fill heavier LNG using gravity to 17: 10
6 promote mixing and to bottom fill lighter LNGs.

7
8 Additionally, and described in section 3.9.1 volume 2
9 of the EIS, specific application software will be used
10 for tank level and roll over monitoring. This type of 17: 11
11 software which is available from several vendors uses
12 tank level density and temperature measurements made in
13 the liquid column to model and predict mixing
14 behaviour. These systems are used throughout the
15 industry. 17: 11

16
17 The second verbal submission. *Regasified LNG*
18 *introduced to the Washington Gas Light Company (WGL)*
19 *distribution system was responsible for leaks that*
20 *developed subsequently in that system.* 17: 11

21
22 Response: In November 2005 it was alleged in a Federal
23 Energy Regulatory Commission filing by Cove Point LNG
24 that regasified LNG from the Cove Point terminal was
25 the cause of an increase in leaks in its distribution 17: 11
26 system. The claim triggered a comprehensive
27 investigation and multiple submissions by Washington
28 Gas Light and Cove Point as well as by the supplier of
29 the coupling identified as being the cause of the

1 Leaks. In June 2006 FERC issued a certificate for Cove
2 Point to expand its operation and issued its
3 determination dismissing Washington Gas Light's claim.
4 In a June 15, 2006 press release FERC stated:

5 "The Commission is convinced that
6 Washington Gas Light's use of hot tar
7 as a method of corrosion protection was
8 a significant contributing factor that
9 resulted in an increase in leak rates
through Prince George's County MD."

17: 12

10 The Commission said:

17: 12

11 "We find the application of hot tar and
12 the increase in operating pressures on
13 WGL's distribution system were more
14 significant causative factors of leaks
15 experienced in Prince George's County
Point LNG terminal.

17: 13

16 In view of these considerations we find
17 that the claims raised by Washington
18 Gas Light's November 2, 2005 filing
provide no basis to deny authorisation
requested for the Cove Point expansion
project."

19
20 Mr. Inspector, that ends my submission.

17: 13

21
22 END OF SUBMISSION OF MR. BOWDOIN TO THE ORAL HEARING

23
24 INSPECTOR: Thank you, Mr. Bowdoin.

25 MR. O'NEILL: The next submission is by
26 Mr. Ian Virecombe who will

17: 13

27 deal with design construction and commissioning.

28 I know this is slightly removed from health and safety,
29 but it does form the basis in which a health and safety

1 assessment is then undertaken.

2 **INSPECTOR:** Mr. O'Neill, how many more
3 submissions you have?

4 **MR. O'NEILL:** I have going to have five,
5 after Mr. Vincombe I am 17:14
6 going to have four more submissions.

7 **INSPECTOR:** Okay.

8 **MR. O'NEILL:** The next submission after
9 that will be safety and
10 design construction and operation of the terminal, then 17:14
11 marine safety and then the QRA and then the independent
12 assessment of the QRA by Dr. Phani Raj. Subject to
13 your ruling I think it would be preferable. I know
14 it's a long stint of many submissions, but I think it
15 would be more helpful from everyone's point of view if 17:14
16 the submissions were finished before the questioning
17 started and then the appropriate expert can be
18 identified and questioned.

19 **INSPECTOR:** It is just that the Health
20 and Safety Authority wish 17:15
21 to make a statement sometime tomorrow morning.

22 **MR. O'NEILL:** Obviously they can be
23 fitted in at any stage that
24 is convenient to you, Sir.

25 **INSPECTOR:** Okay, we will go on with 17:15
26 your next submission.
27
28
29

1 MR. VINECOMBE ADDRESSED THE HEARING AS FOLLOWS

2
3
4 MR. VINECOMBE: Mr. Inspector, my name is
5 Ian Vincombe. I hold a 17: 15
6 Bachelors Degree in Chemical Engineering from the
7 University of Exeter in the UK, awarded in 1992. I am
8 a Chartered Engineer registered with the Engineering
9 Council of the UK since 2000 and hold full membership
10 of the Institution of Chemical Engineers of the United 17: 15
11 Kingdom.

12
13 I am a Project Engineering Manager working for CB&I UK
14 Ltd. and have worked in this capacity since 2003.
15 Prior to working as an Engineering Manager I was 17: 16
16 employed as a process engineer for twelve years, seven
17 years of which was spent leading on-project process
18 engineering teams. Whilst employed by CB&I I have
19 worked on three world class LNG Import and
20 Regasification Terminal projects, during both the 17: 16
21 design and construction phases as well as leading a
22 number of conceptual design studies for new LNG
23 facilities including the LNG terminal development at
24 Shannon. Before joining CB&I UK Ltd. in June 2006,
25 I was employed as a process engineer by Fluor Daniel UK 17: 16
26 Ltd. and prior that by Snamprogetti UK Ltd., also as a
27 process engineer.

28
29 CB&I builds on average more than 500 projects each year

1 and is one of the world's leading engineering,
2 procurement and construction EPC companies specialising
3 in projects in the energy and natural resource
4 industries. With more than 70 proprietary licensed
5 technologies and 1,500 patents and patent applications, 17:17
6 CB&I is uniquely positioned to take projects from
7 conceptual design through technology licensing,
8 engineering and construction and final commissioning.
9 Drawing upon the global expertise and local knowledge
10 of approximately 17,000 employees in more than 80
11 locations CB&I safely and reliably executes projects
12 world wide.

13
14 CB&I specialises the refrigerated liquid gas storage
15 and handling terminals. These applications extend from 17:18
16 low temperatures refrigerated system to cryogenic
17 storage and processing applications. Refrigeration is
18 typically used for liquid gas storage terminals
19 handling LPG, propane, propylene, butane, butadiene,
20 anhydrous ammonia and other similar products. Storage 17:18
21 terminals for cryogenic products such as LNG and
22 methane, ethylene, ethane, liquid elements of air and
23 other similar products having critical temperatures
24 below normal ambient temperature usually include
25 boil-off handling or reliquefaction process systems. 17:18
26 These products are stored at or near atmospheric
27 pressure and are not refrigerated.

28
29 CB&I has extensive experience and is a leader in the

1 design and construction of turnkey LNG, LPG and other
2 liquefied gas storage facilities including LNG import,
3 export, transfer and storage terminal facilities.

4 CB&I's turnkey liquid gas storage experience includes:

5
6 Low temperature and cryogenic terminal facilities;

7 Low temperature and cryogenic field erected tanks.

8 The combined total of such facilities is more than
9 1,000 facilities and tanks.

10
11 The purpose of my evidence is to provide an overview of
12 the preliminary design, construction and commissioning
13 aspects of the LNG storage tanks and the LNG receiving,
14 regasification, vaporisation and export facilities of
15 the Shannon LNG Terminal development specifically:

16
17 LNG storage tanks; processing system vaporisation;

18 alternative vaporisation system evaluation; process

19 support facilities; seawater system; process control

20 and monitoring system; emergency shutdown system; and

21 fire and gas detection and protection system.

22
23 My involvement in the project.

24
25 I have been involved in the Shannon LNG Terminal

26 development since January 2007.

27
28 I was responsible during the initial design study phase
29 of the project for the leadership of a multi-discipline

1 CB&I engineering team which contributed the following
2 initial engineering work and assessments for the
3 development including:

4
5 Basis of design development; preliminary process design 17: 20
6 studies; plant layout studies; assessment of a proposed
7 process control and monitoring system; emergency
8 shutdown system and fire and gas detection and
9 protection and system for the Shannon LNG Terminal ;
10 assessment of the construction options for the LNG 17: 21
11 storage tanks and process facilities; assessment of the
12 potential impacts of the process plant/development
13 options during the construction and commissioning
14 phases of the development; recommendations for the
15 mitigation measures necessary to avoid, reduce or 17: 21
16 remedy any potential adverse environmental effects
17 identified; provision of support to other specialists
18 employed by Shannon LNG covering other aspects of the
19 project development.

20
21 The conceptual design work and engineering studies have
22 been performed in accordance with national and/or
23 international standards, codes, regulations and best
24 practices for the design and construction of the LNG
25 facilities. 17: 22

26
27 My team participated predominantly in the development
28 of sections 2, 3 & 7 of the EIS. These sections were
29 prepared in conjunction with many technical experts

1 employed by Shannon LNG in the various disciplines
2 required to conduct a thorough and complete assessment.

3
4 **Main findings.** This section of my brief of evidence
5 addresses the design, construction and commissioning of 17: 22
6 the LNG facilities, specifically the LNG storage tanks,
7 processing and plant and site buildings.

8
9 **Design.** Sections 1.4, 3.4, 3.5, 3.6 and 3.7 of the
10 development EIS address the generation design overview 17: 22
11 and details of the proposed development. The initial
12 design of the facilities, specifically in LNG storage
13 tanks and processing facilities, has been undertaken at
14 a level of sufficient detail to allow the potential
15 impacts to the environment to be assessed. 17: 23

16
17 The proposed Shannon LNG Terminal design comprises a
18 number of significant components, specifically:

19
20 LNG storage tanks. There will be up to four full 17: 23
21 containment LNG storage tanks, each with a useable
22 capacity of 200,000m³;

23
24 Process plant. The process plant receives LNG pumped
25 from the LNG storage tanks, vaporises the LNG from a 17: 23
26 liquid to a gaseous state and conditions the gas for
27 export. The equipment will be located to the south of
28 the storage tanks;

1 Administration and security building, stores, work
2 shops, various other buildings and utility equipment.

3
4 Other areas of design, such as marine facilities design
5 and ground works designs are addressed in the brief of 17: 23
6 evidence of others.

7
8 The site layout and scheme description is provided in
9 detail in chapter 3, Site and Scheme Description, of
10 the EIS. It is further illustrated in figures 1.3 and 17: 24
11 3.8 of the EIS. The overview and details of the site
12 layout has been covered by the brief of evidence of
13 Mr. Leon Bowdoin of Shannon LNG.

14 15 **LNG Storage Tank Design.** 17: 24

16
17 Section 3.6.4 of the development EIS addresses the
18 general design overview and details of the initial
19 design of the LNG storage tanks for the proposed
20 development. 17: 24

21
22 The size of the LNG storage tanks is determined
23 primarily by the throughput capacity of the terminal,
24 the frequency and the size of the LNG ships that would
25 service the terminal and LNG storage capacity which may 17: 24
26 be required to serve peak demands. Up to four
27 200,000m³ LNG tanks of the proven, high integrity,
28 above ground full-containment design are proposed for
29 installation on the site.

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As can be seen from the EIS figures 3.9 and 3.14, each LNG storage tank will comprise an inner tank and an outer tank. This is known as 'full-containment' as both the inner and the outer tank are independently capable of containing the LNG. Thus, the outer tank will provide 100% back-up in the event of the leakage from the internal tank wall or floor. The inner tank, fabricated out of the 9% nickel steel, will be the primary container for the LNG. The outer tank base will be constructed using a reinforced concrete with the wall being constructed of prestressed concrete. The roof will be constructed using steel and reinforced concrete. The outer tank will be internally lined with a steel vapour barrier, which will be the integrated with a cryogenic quality secondary bottom-thermal corner protection system. The outer tank will also serve to contain the pressure at which the LNG is stored, that being slightly above the atmospheric pressure which is noted slightly later in my evidence.

17: 25

17: 25

17: 26

17: 26

The insulated tank will be designed to store LNG at a temperature of approximately minus 160. The annulus between the inner and outer tanks, approximately one metre wide, will be filled with perlite insulation material and a fibreglass blanket will be installed on the outside of the inner tank wall. The deck covering the inner tank will be suspended from the roof of the outer tank. The top of the deck will be insulated with

17: 26

1 fibreglass blanket or rock wool. The bottom of the
2 tank will be insulated from the tank base with foam
3 glass insulating blocks.

4
5 This type of tank has been proven in service in many 17: 27
6 facilities around the world. It is been chosen for
7 this project because it complies with the highest
8 standards of safety and because there are tried and
9 tested European design codes for LNG facilities and LNG
10 tanks to which this type of tank complies. 17: 27

11
12 Each tank will be provided with tank internals and
13 piping connections so that the tank can be filled
14 either above or below the level of the LNG already
15 present in the tank. This capability, which is in 17: 27
16 accordance with recognised proven practices, will
17 provide operational flexibility to permit the mixing of
18 LNG cargoes of different densities.

19
20 All piping connections into and out of the tank will be 17: 27
21 through the roof, avoiding any penetrations through the
22 tank walls or floor, therefore eliminating the
23 potential for leakage at such locations. The LNG tanks
24 will be protected and vacuum and overpressure relief
25 devices and will operate at slightly above atmospheric 17: 28
26 pressure. Typical tank operating pressure will be in
27 the 100 to 275 mbar gauge range. These are gauge
28 pressures, that is pressures above atmospheric
29 pressure.

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Each tank will be provided initially with three in-tank low pressure LNG send out pumps for transferring the LNG from the tank to the process equipment. These pumps will be installed in the tank wells which allow the pumps to be located at the bottom of the tank while installed from the top of the tank. Provision will be made for the installation of a fourth and fifth pump in the future, to meet the future gas export rate.

17: 28

17: 28

The proposed tanks will be located as close as practicable to the LNG jetty at the eastern end of the proposed site. This will minimise the length of the cryogenic LNG pipework.

17: 29

To minimise the visual impact, Shannon LNG proposes to cut a bench (a flat area) into the side of the hill on the site to lower the base elevation of the tanks as far as practical, to approximately 10 metres OD Malin (above ordnance datum Malin Head). Due to the nature of the ground conditions on the site (predominantly rock below the glacial till at the surface), its proximity to the estuary, and construction and operational complications it would create it is not considered feasible to construct the tanks below ground level, (this is discussed in detail in section 2.5.2.6 of the development EIS) and has been addressed in the brief of evidence of Leon Bowdoin of Shannon LNG.

17: 29

17: 29

1 To further minimise visual impact, the tanks will be of
2 low profile design. They will have a nominal outer
3 diameter of 96 metres and a height at the outer wall of
4 40 metres. The total height to the top of the domed
5 roof will be 50.5 metres above the adjacent tank grade. 17: 30
6 The chosen diameter and roof dome radius are nominally
7 industry maximums which are in keeping with current
8 technology of historically completed projects. This
9 diameter and roof radius combines to provide the lowest
10 feasible profile for the tanks. 17: 30

11
12 **Process System Design.** Section 3.6.5 of the
13 development EIS addresses the general design overview
14 and details of the initial design of the processing
15 system for the proposed development. 17: 31

16 **Low Pressure LNG Sendout Pumps.**

17
18
19 As detailed in the section 3.6.5.1 of the EIS, three
20 low pressure LNG pumps will be provided in each LNG 17: 31
21 tank. Provision will be made to add two pumps per tank
22 to meet the future gas export rate. LNG from the
23 storage tanks will be pumped to a pressure of
24 approximately 8 barg. The LNG discharge from the low
25 pressure LNG sendout pumps will flow through process 17: 31
26 piping where it will go to either the boil-off gas
27 condenser, the BOG condenser vessel, or to the jetty
28 unloading line for recirculation to keep the line in a
29 cooled down state. During the initial phase at peak

1 send out it is expected that only three of the in-tank
2 LNG pumps will be required to be operating at any one
3 time

4 **Boil-Off Gas BOG Handling.**

17: 32

6
7 As detailed in the section 3.6.5.2 of the EIS, the LNG
8 storage tanks will be highly insulated to minimise heat
9 ingress. Since 100% efficient insulation is not
10 achievable, a small amount of heat, often referred to
11 as 'heat leak' will enter the tanks and cause a small
12 portion of the LNG to boil off, be converted from a
13 liquid to a vapour. This resulting gas will be the
14 main contribution to the normal boil-off gas flow rate
15 in the terminal.

17: 32

17: 32

16
17 During the unloading of a ship, the LNG discharged from
18 the ship will tend to warm up because the pumping
19 energy supplied to the LNG and because of the heat leak
20 into the unloading lines. These factors contribute to
21 the further generation of boil-off gas in the facility.
22 In addition, during ship unloading, natural gas will be
23 physically displaced from the LNG tanks by the incoming
24 LNG. Because of these additional contributions the
25 boil-off rate during ship unloading can be
26 significantly different than that during normal, i.e.
27 no ship unloading periods.

17: 33

17: 33

28
29 The purpose of the boil-off gas handling system will be

1 to collect the process all of the boil-off gas in a
2 closed system. All boil-off not returned to the ship
3 during ship unloading will be compressed by the BOG
4 compressors and directed to the BOG condenser where it
5 will be absorbed into the LNG or will be used as fuel 17: 34
6 in the process operation. Initially four low pressure
7 approximately 8 barg discharge pressure BOG compressors
8 will be provided. Up to five BOG compressors will be
9 installed in the final phase. Additionally it is
10 anticipated that a single high pressure compressor will 17: 34
11 be required to process normal boil-off gas volumes in
12 the event that there is an interruption in gas sendout.

13
14 No venting of boil-off gases will occur under normal
15 operations conditions. 17: 34

16 17 **Boil-Off Gas Condenser.**

18
19 As detailed in section 3.6.5.1 of the EIS, the LNG from
20 the low pressure sendout pumps is sent to the BOG 17: 34
21 condenser either directly or via recirculation of the
22 jetty unloading line. In the BOG condenser boil-off
23 any required nitrogen for gas quality conditioning
24 known as BTU ballasting will be recondensed (absorbed)
25 into the LNG, which will then flow to the suction of 17: 35
26 the high pressure LNG booster pumps. Initially one BOG
27 condenser will be provided. In the final phase a
28 second BOG condenser may be required to process the
29 volumes of boil-off gas generated from operations and

1 any nitrogen for BTU ballasting of the sendout gas.

2
3 **High Pressure LNG Booster Pumps.** As detailed in
4 section 3.6.5.1 of the EIS, the LNG exiting from the
5 BOG condenser, which will include the absorbed boil-off 17: 35
6 gas and any nitrogen injected will flow to the high
7 pressure LNG booster pumps. The high pressure LNG
8 booster pumps will increase the LNG to a pressure of
9 approximately 100 barg and will discharge into the
10 process piping going into the LNG Shell and Tube 17: 36
11 Vaporisers, STVs. Three high pressure LNG booster
12 pumps will be installed during the initial phase and up
13 to two more in the later phase or phases.

14
15 **Shell and Tube Vaporisers, STVs.** 17: 36

16
17 As detailed in section 3.6.5.1 of the EIS the
18 pressurised LNG will be vaporised in three Shell and
19 Tube Vaporisers STVs. This process involves converting
20 the LNG back to a gaseous phase and warming to it 17: 37
21 approximately 4 degrees Celsius. This type of
22 vapouriser will be constructed as stainless steel tubes
23 through which the LNG/vaporised gas flows surrounded by
24 an intermediate heating fluid between the tubes and the
25 vessel shell. After leaving the vaporisers the high 17: 37
26 pressure gas, now at sufficient pressure to be
27 introduced into the national gas transmission pipeline
28 system, will be metered and will flow into the pipeline
29 connecting the terminal to the existing natural

1 transmission system.

2 3 **Process Heating (Vaporisation)**

4
5 As detailed in section 3.6.5.1 of the EIS, heat for the 17:37
6 STVs will be provided by a closed water/monoethylene
7 glycol MEG mixture with a temperature of up to
8 approximately 17 degrees Celsius circulating through
9 the heat exchanger shell. The MEG fluid temperature
10 will be maintained by either heat exchange with sea 17:38
11 water in plate and frame heat exchangers or when the
12 sea water is not warm enough by additional heat to the
13 MEG mixture via up to seven gas fired heaters.

14
15 The heaters will each be rated for approximately 23 MW 17:38
16 and will be equipped with low nitrogen oxide burners.

17 18 **Alternative Vaporisation System Evaluation.**

19
20 Section 2.5.3 of the development EIS addresses the 17:39
21 studies undertaken into alternative vaporisation
22 systems before the initial design was arrived at.

23
24 A number of options were considered by the design team
25 before selecting the proposed vaporisation design. LNG 17:39
26 terminals commonly use one of several types of LNG
27 vaporisers: The Seawater Open Rack Vaporiser (ORV),
28 Submerged Combustion Vaporiser (SCV) and Shell and Tube
29 Vaporisers (STV) or a combination thereof.

1
2 **Open Rack Vaporiser ORV.**

3
4 An ORV system is designed to extract heat from the sea
5 water and use that heat to vaporise LNG. Sea water 17: 40
6 quality and the range of sea water temperatures are
7 critical requirements for successful utilisation of an
8 ORV system.

9
10 ORVs were considered for use in this project because 17: 40
11 they offer several attractive design attributes. They
12 have relatively low environmental impact, produce low
13 greenhouse gas emissions and have relatively lower
14 operating costs than many other schemes. However, ORVs
15 also have a design limitation in that they require a 17: 40
16 minimum sea water temperature to be feasible. If the
17 sea water is too cold, an ice layer can build up on the
18 tubes resulting in reduced heat transfer from the sea
19 water to the LNG so ORVs have generally only been
20 selected for areas of the world where the sea water 17: 41
21 temperature can be guaranteed to be above 8 degrees
22 Celsius throughout the year. Whilst the Shannon
23 Estuary remains above 8 degree for much of the year,
24 records show that it can be lower than this minimum
25 threshold for some periods of the winter. Because the 17: 41
26 water temperature during the winter months in the
27 Shannon Estuary is known to be low as 6 degrees Celsius
28 there is uncertainty about the performance, efficiency
29 and viability of the ORVs during the coldest days of

1 the year.

2
3 Consideration was given to piping hot sea water from
4 Moneypoint power station. The power station is some
5 3 kilometres away from the Shannon LNG site on the 17: 41
6 other side of the estuary so to bring the water to the
7 LNG plant would require a large insulated pipeline to
8 be laid, either on or under the seabed. Whilst
9 technically possible, it was considered that this could
10 have a considerable environmental impact on the 17: 42
11 estuary, as well as being difficult and extensive to
12 install and operate. The water would need to be pumped
13 which would require considerable electrical horsepower.

14
15 Because the power station and the LNG terminal would 17: 42
16 have to be able to operate independently, some form of
17 supplemental heating would in any case still be
18 required in the event that the power station was shut
19 down temporarily or permanently. The ORV option as a
20 sole means of vaporisation has, therefore, been 17: 42
21 discounted.

22 23 **Submerged Combustion Vaporisers (SCV)**

24
25 An SCV vaporises LNG inside stainless steel tubes 17: 43
26 immersed in a heated water bath. A portion of the
27 vaporised gas is combusted (burned) in a burner system
28 and the hot products of combustion are bubbled through
29 the water bath thus providing the necessary heat for

1 vaporising natural gas. The SCV can be started quickly
2 and thus provides a good response to load fluctuations.
3 It is also easily controlled over a wide range of
4 operating throughput. These features combine to make
5 it popular for use in both base load and peak shaving
6 LNG applications. 17: 43

7
8 As a source of heat SCVs use natural gas as fuel. Thus
9 the SCV option has a higher operating cost than ORV
10 designs, especially if that fuel has significant 17: 44
11 economic value, as it will have in this case. Although
12 they require the combustion of fuel, SCVs have inherent
13 design features that ensure a thermal efficiency
14 approaching 100%. Furthermore, the emissions from the
15 SCVs are relatively low compared to other fuels since 17: 44
16 they use clean natural gas for combustion.

17
18 One variation on using only fired heat is to introduce
19 hot water into the bath from other sources and to
20 supplement the heat by firing only when the water 17: 44
21 temperature drops. Consideration was given to piping
22 hot sea water from Moneypoint power station on the
23 other side of the estuary. For the reasons noted above
24 this was discounted.

25 17: 44
26 The combustion gases from the SCVs are discharged to
27 the atmosphere, at a temperature close to ambient
28 temperature, which can give rise to the steam plume
29 under the certain atmospheric conditions.

1
2 The SCV option both by direct firing only, or combined
3 with taking hot sea water from the Moneypoint power
4 station are viable schemes, but were not selected due
5 to the impact on the estuary that a large sea water 17: 45
6 pipeline laid on the river bed would have as well as
7 the volumes of greenhouse gases produced as compared to
8 alternative schemes.

9 10 **Combination of ORVs and SCVs.** 17: 45

11
12 Consideration was given to using ORVs for the summer
13 months and SCVs for the winter months. Because the
14 units operate in entirely different ways, two complete
15 sets of equipment would be needed to process the full 17: 46
16 required sendout capacity of the plant. This scheme is
17 an expensive and inefficient process design option
18 requiring two systems and their requisite capital and
19 operating costs. This option was discounted as a
20 result. 17: 46

21 22 **Shell and Tube Vaporiser Configurations**

23
24 Shell and Tube Vaporisers are a popular option in the
25 LNG industry for regasification of LNG. STVs come in a 17: 46
26 wide variety of design configurations, but normally
27 employ one of two systems to provide the heat source
28 required. Seawater can be utilised as the heat source
29 similar to the ORV design discussed previously.

1 Alternatively, an intermediate fluid can be used to
2 exchange the heat between the sea water and the LNG.
3 This is often done to improve the operability and
4 efficiency. One of the benefits of an intermediate
5 fluid STV is that lower sea water temperatures can be 17: 47
6 utilised to extract useful heat. In this alternative,
7 the heat source for the exchangers is provide by hot
8 water supplied from industrial gas fired heaters.
9 Finally, supplemental heat from the fired heaters or
10 other sources can easily be accommodated into the sea 17: 47
11 water exchanger design providing a combined solution
12 using both processes in combination.

13
14 Because of Shannon LNG's desire to minimise emissions
15 of greenhouse gases to the atmosphere, a system was 17: 47
16 chosen to extract as much useful heat from the seawater
17 throughout the year as practicable whilst at the same
18 time minimising operation of gas fire heaters and their
19 production of greenhouse gases. A hybrid scheme was
20 developed where heat from the estuary sea water is used 17: 48
21 to vaporise LNG when sea water temperatures are
22 sufficiently warm and supplementary heat from the
23 natural gas heaters is used when the estuary water
24 temperatures are too cold.

25
26 A glycol /water (monoethylene glycol or MEG) mixture is
27 proposed for use as the intermediate fluid at the
28 Shannon LNG Terminal. The MEG mixture is either heated
29 by the sea water in a series of plate and frame heat

1 exchangers or by a series of gas fired heaters or a
2 combination of these heat sources depending on the sea
3 water temperatures. The system offers several
4 operating and environmental advantages. While we
5 estimate it represents a higher capital cost 17: 49
6 alternative to other methods, such as SCV design or
7 simple STV design, it will produce much lower
8 greenhouse gas emissions than for these designs, offers
9 excellent reliability and good process control and
10 turndown capability. In addition, it has lower 17: 49
11 operational costs than a fired natural gas only
12 solution.

13
14 Further, the design allows Shannon LNG to capture waste
15 heat from various internal heat generating sources, 17: 49
16 thus improving overall plant thermal efficiency
17 minimising the use of fired heat as the supplemental
18 source of heat to the subsystem. The design,
19 therefore, meets a primary design objective being to
20 minimise as far as possible the impacts on the 17: 49
21 environment.

22 23 **Other Vapouriser Options Considered.**

24
25 Three other options were considered for supplying all 17: 50
26 or part of the heat requirements for the regasification
27 of the LNG.

28
29 The fourth option was the installation of a small

1 commercial electric power plant with a single cycle gas
2 turbine generator. Heat from the gas turbine exhausts
3 would be extracted and used to provide heat to an SCV
4 water bath or the glycol water loop. These units are
5 less thermally efficient than SCVs alone so their use 17: 50
6 throughout the year is not attractive because of higher
7 CO₂s. With the glycol water loop because supplemental
8 heating is only required for a few months of the year,
9 the power plant would only be in operation during the
10 winter months and would be a significant incremental 17: 50
11 investment for only a limited additional electrical
12 supply.

13
14 The fifth option considered was to circulate the MEG
15 through a heat exchanger located on the seabed. This 17: 51
16 design scheme would enable the heat to be extracted
17 from the sea water without the need to circulate sea
18 water through a pumped circuit. However, additional
19 pumping capacity and additional inventory of MEG would
20 be required to operate the scheme. A very large heat 17: 51
21 exchanger surface area would be required and dispersion
22 and mixing of the cold sea water in contact with the
23 heat exchanger would be limited to natural convection
24 resulting in a large zone of low temperature sea water
25 around the unit. Fouling of the heat exchanger would 17: 51
26 be virtually impossible to prevent and underwater
27 cleaning would be extremely difficult or impossible to
28 perform. Because of these problems this approach was
29 considered not to be feasible. Consequently this

1 approach was not pursued further.

2
3 The sixth option considered was to extract heat from
4 the atmosphere. In some particularly hot climates this
5 has proved to be effective. The Shannon project site 17: 52
6 does not have the necessary air temperatures during
7 most months of the year to make this process efficient
8 or feasible so this option was not considered further.

9
10 **Process Support Facilities Design - gas conditioning** 17: 52
11 system.

12
13 Section 3.6.8.1 of the development EIS addresses the
14 initial design of the nitrogen generation system to
15 provide any gas conditioning required for the proposed 17: 52
16 development.

17
18 It is anticipated that the LNG will come from a number
19 of different locations each of which will have its own
20 composition. Some compositions of the LNG may not meet 17: 53
21 all the gas quality requirements specified by Bord Gáis
22 Networks, BGN Code of Operations. In order to bring
23 the vaporised LNG quality to within the BGE
24 specifications, a small volume of inert gas such as
25 nitrogen may need to be added to the send-out gas. 17: 53
26

27 The nitrogen required for this purpose will be
28 generated on site by either the use of cryogenic or
29 membrane type air separation units or other appropriate

1 technology. The nitrogen used will be compressed to a
2 pressure of approximately 8 barg and introduced into
3 the BOG condenser along with the boil-off gas.

4
5 **Vent System.** Section 3.6.8.43 of the development EIS 17: 54
6 addresses the initial design of the vent collection
7 system for the proposed development.

8
9 The vent systems will be designed to collect and safely
10 dispose of boil-off gas vapour that needs to be 17: 54
11 processed during abnormal conditions when normal
12 boil-off handling using the BOG compressors is either
13 not adequate or the BOG system is not operational.
14 Redundant system, (systems with installed operational
15 back-ups) will be installed and each is described here. 17: 54
16 During normal operating conditions all gas generated in
17 the processes will be recovered through the BOG system
18 and no venting will occur. Venting of gas is not
19 expected other than in emergency or upset conditions.

20 17: 55
21 The warm gas vent system has been designed and
22 incorporated into the facility layout to release gas
23 safely into the event venting may be required.
24 Additionally a back-up cold gas discretionary vent
25 system will be provided on each tank giving redundant 17: 55
26 venting capacity should it be required. The warm vent
27 system will be designed to safely handle discharges
28 from the LNG tanks and related low pressure equipment
29 and piping when the pressures in these low pressure

1 systems approaches the tanks relief valve set point
2 which would otherwise would start to operate.

3
4 The cold gas vent system will be a redundant tank
5 relief system provided on each LNG tank and will 17: 55
6 operate in the event that the warm boil-off gas system
7 is not available or unable to handle the gas volumes
8 being generated.

9
10 The third safeguard on the tanks will be the tank 17: 56
11 overpressure relief valve systems that will be provided
12 on each tank. These pressure relief valves, designed
13 in accordance with applicable regulations, will
14 discharge the maximum volume generated in an upset
15 condition and prevent the tanks from being subjected to 17: 56
16 overpressure.

17
18 Any gas released from these systems will not be ignited
19 in a flare.

20 17: 56
21 **Seawater System.**

22
23 Section 3.6.3 of the development EIS addresses the
24 initial design of the sea water system which supports
25 the proposed vaporisation system. Figure 3.6 of the 17: 56
26 development EIS shows the location of the proposed
27 intake and outfall.

28
29 In the LNG vaporising process, the sea water will be

1 circulated through plate frame heat exchangers to
2 exchange heat with the LNG process system intermediate
3 fluid. The sea water circulation system will include
4 an intake and pump house structure and an outlet
5 structure, each situated adjacent to the jetty access 17: 57
6 trestle. Piping connecting the intake pumps to the
7 plate frame exchangers and back to the discharge
8 structure will be installed along the east side of the
9 trestle.

10
11 It is intended to install three 4,000 m³/hr pumps 17: 57
12 initially to circulate up to 12,000 m³/hr of sea water
13 for the initial peak LNG vaporisation capacity of
14 17 million Sm³ per day, that is 600 MMSCFD peak. With
15 two spare bays for expansion to accommodate two 17: 58
16 additional similar sized pumps to be able to vaporise
17 28.3 million Sm³ per day, that is 1BSCFD, the maximum
18 rated capacity of the pumps will in the order of 20,000
19 m³/hr, that is 5.6 m³/s utilising five pumps.

20
21 The jetty pumphouse intake structure will have two 17: 58
22 20,000 m³/hr capacity, that is 5.6 m³/s, resolving band
23 screens to prevent the debris in the sea water entering
24 the heat exchangers. It will be possible to take one
25 screen out of service while the other screen is in 17: 58
26 operation. The screen mesh will be approximately 3
27 millimetres by 3 millimetres.

28
29 The band screens will be protected by a raked bar

1 screens. The bar screens will extend across the whole
2 width of the front of the pumphouse. The material,
3 primarily seaweed collected from the screens, will be
4 returned to the estuary. It is expected that any silt
5 entering the sea water circulating water system will
6 remain in suspension and be carried right through the
7 system.

17:59

8
9 An electrochlorination unit located at the pump house
10 will generate sodium hypochloride from sea water for
11 injection at a controlled dosage rate into the sea
12 water circulation system. This will act as a biocide
13 to reduce and control the level of fouling within the
14 system. The unit will consist of cells housing
15 platinised titanium electrodes between which a direct
16 current (DC) electric current will flow. The sodium
17 chloride salts in the sea water passing between the
18 electrodes will dissociate to form sodium
19 hypochlorite without the addition of any chemicals. As
20 it passes through the system and is discharged back
21 into the estuary, the hypochlorite will dissipate back
22 into the sea water from which it is produced.

17:59

18:00

18:00

23
24 The proposed water management system, including the
25 anti-biofouling mechanism proposed, is based on the
26 fact that the system is designed to be a cold water
27 circuit with temperatures somewhat lower than ambient.
28 This has the double effect of significantly reducing
29 reaction rates and normal cooling water circuit

18:00

1 bio-fouling where the circuit is elevated in the
2 temperature relative to ambient. However, should more
3 detailed evaluation indicate that further measures such
4 as pulse dosing, which is the most common additional
5 step used in similar circumstances, be required the 18: 01
6 project will be address this in full prior to the
7 application for the IPPC licence as it pertains to an
8 emission related matter exclusively and is subject to
9 direct control under IPPC regulations. At present it
10 is not possible to ascertain accurately what such a 18: 01
11 requirement might be. Any such proposal would be
12 subject to full EPA scrutiny and approval under the
13 pertinent regulations as a separate statutory process.

14
15 The pumps and associated equipment will have a weather 18: 02
16 proof structure for protection, maintenance and sound
17 attenuation. The structure will be of sufficient
18 rigidity to withstand exposure to high wind forces.

19
20 Up to two outlet pipes will discharge into a concrete 18: 02
21 caisson sited on the east side of the LNG jetty trestle
22 approximately 100 metres sea ward of the pumphouse.
23 Initially, for the 17 million Sm³ (600 MMSCFD) design
24 case it is anticipated that only one pipe will be
25 required. Ultimately for the 28.3 million Sm³ per day, 18: 03
26 that is 1BSCFD, maximum output case, an additional pipe
27 will be installed to discharge into the caisson. To
28 limit the environmental impact of discharging treated
29 water into the sea the returned sea water will be

1 discharged into an open basin within the caisson. The
2 presence of light within the basin even in the
3 intensities of only a few percent of full midday sun
4 will significantly affect the mechanism and increase
5 the rate of dissipation of chlorine in seawater. 18: 03

6
7 The discharge ports of the caisson will be at an
8 elevation of between -13 metres and -20 metres relative
9 to OD Malin Head with outset velocities circa 1.5
10 metres per second directed outward along the jetty 18: 04
11 trestle axis. The ports will be designed to promote
12 initial dilution without causing a localised jet which
13 could cause scour in front of the outlet structure or
14 affect a berthed ship. Because of the free surface in
15 the outlet box there will be no influence on the pumped 18: 04
16 water system by variations in head due to tide and wave
17 height.

18
19 The sea water discharge outfall location has been
20 confirmed by three dimensional mathematical models (by 18: 04
21 others) (refer to aqua-fact report appendix 11B of the
22 development EIS) to ensure no adverse environmental or
23 operational impacts will result from the proposed
24 design. Refer to chapter 11 marine and estuarine
25 ecology of the development EIS. 18: 05

26
27 A seawater discharge monitoring system will be provided
28 to ensure that an acceptable chlorination dilution and
29 temperature stabilisation have been achieved.

1
2 **Other Plant Utility Systems**
3

4 Section 3.6.10 of the development EIS addresses the
5 initial design of the supporting plant utility systems 18:05
6 for the proposed development.
7

8 Diesel powered emergency generation capability will be
9 installed on site to provide power for essential uses
10 in the event of a failure of the site power supply. 18:05
11

12 Diesel fuel tanks for both emergency generator and fire
13 water pumps will be stored in bunded areas. The area
14 where the diesel trucks will be parked during refueling
15 operations will also be bunded. Thus, any accidental 18:06
16 spillage during refilling operations will be contained
17 within the bunded areas.
18

19 Nitrogen will be used for purging and inerting of
20 various items of equipment and piping during both 18:06
21 operation and maintenance activities. Nitrogen for
22 purging and inerting and gas conditioning will be
23 produced in the nitrogen generation plant.
24

25 Fuel gas will be needed mainly for the fired heaters, 18:06
26 and also for certain other minor uses such as domestic
27 heating. The fuel demand will be either met by
28 withdrawing a small stream from the high pressure
29 sendout or by using a portion of the compressed boiler

1 off gas or by a combination of the two.

2
3 Compressed air for instrument use and for service and
4 maintenance use will be generated on site.

5 18: 07
6 **Buildings.** Section 3.6.6 of the development EIS
7 addresses the initial designs of LNG terminal facility
8 buildings.

9
10 The terminal will have an administration building, 18: 07
11 process buildings, electrical substations, security
12 buildings, a maintenance warehouse equipment buildings.
13 The administration building will also accommodate a
14 visitor centre. The buildings will be constructed
15 using three main building types. These are: 18: 07

16
17 All buildings will be type 1 with the exception of
18 electrical substation buildings and administration
19 buildings. These will be steel framed buildings with a
20 combination of concrete strip, raft and piled 18: 08
21 foundations. The walls will consist of a composite PVC
22 Plasticol laminated, insulated vertical and profiled
23 modular steel cladding. The roofs will consist of a
24 composite PVC Plasticol laminated insulated membrane
25 with integral steel supporting decking. 18: 08

26
27 The electrical substation buildings will be type 2.
28 These buildings will be similar to the type 1 except
29 that the transformer bay walls will be constructed

1 using reinforced concrete with fair finished formwork
2 or similar.

3
4 The administration building will be type 3,
5 predominantly masonry and steel frame construction with 18:08
6 a cut stone and rendered external finish and a zinc
7 roof. The foundations will be a combination of
8 concrete strip, raft and piled.

9
10 **Process Control and Monitoring.** 18:09

11
12 Section 3.9 of the development EIS addresses the
13 initial Process Control and Monitoring System.

14
15 The plant will be operated from a main control room 18:09
16 (MCR) which will be located adjacent to the process
17 area. From the MCR it will be possible to monitor and
18 adjust all of the plant equipment and instrument
19 control systems including all safety control systems.

20 18:09
21 The process and utility systems will be automated to
22 support centralised monitoring and operations. Local
23 controls to start, stop, or adjust instrumentation set
24 points will be provided where local operations are
25 desired. All actions will be under the supervision of 18:10
26 MCR operations staff. All critical process operations
27 will be monitored and recorded. An integrated control
28 and safety system (ICSS) will be provided.

1 It is anticipated that some process equipment will
2 operate with its own control system hardware and
3 software which will be integrated into or interfaced
4 with the main ICSS system.

18: 10

5
6 Specific application software will be used for tank
7 contents level and density monitoring. Fire
8 protection systems and the facility's emergency
9 shutdown systems. Adjacent to the MCR will be the main
10 equipment room that will house the ICSS main control
11 and safety system processing hardware and software.

18: 10

12
13 A ship mooring line tension monitoring system will be
14 installed at the jetty. A jetty monitoring room will
15 monitor the systems at the jetty. The jetty monitoring
16 room will house control and safety system processing
17 hardware and software for this system.

18: 11

18 19 **Integrated Control and Safety System.**

18: 11

20
21 As detailed in section 3.9.2 of the EIS, the Integrated
22 Control and Safety System, ICSS, will be a distributed
23 control system that will provide process control, fire
24 and gas detection, event logging and emergency shutdown
25 ESD functions. The functions will be fully integrated
26 and standardised hardware and software will be utilised
27 throughout the system as far as possible. The system
28 is intended to minimise the need for communication
29 gateways or bridges between software systems thus

18: 11

1 improving the system reliability and increasing
2 operational flexibility.

3
4 The equipment chosen shall be well proven but of an up
5 to date design. 18: 12

6
7 The primary objective in the design of the ICSS is to
8 provide high reliability and availability. The system
9 will use current technology with modern diagnostic
10 capability to increase failure reporting and reduce 18: 12
11 maintenance requirements.

12
13 Dual redundant architecture will be used to avoid
14 common mode failure points and increase availability.

15 18: 12
16 **Alarm Management.**

17
18 As detailed in section 3.9.3 of the EIS, the alarm
19 system will form an essential part of operational
20 interface with the ICSS. It will provide vital support 18: 13
21 to the operators managing complex systems by warning
22 them of situations that need their attention.

23
24 If there are significant disturbances that may push the
25 terminal into the upset state, from which the control 18: 13
26 system is not able to effect a recovery without
27 operator intervention, an alarm or alarms will be
28 provided to enunciate the need for operator
29 intervention and action.

1
2 If the upset is not corrected satisfactorily by the
3 operator and the terminal condition approaches a state
4 where the process sup upset cannot be returned to
5 normal operations or where damage or danger to the 18: 14
6 specific equipment or process can occur, the ESD
7 systems will intervene and suggest down the process
8 affected. The operator's role will be to take
9 complementary action to minimise the size of any
10 process upset, check that the automatic shut down 18: 14
11 action takes place safely and initiate manual shutdowns
12 or other process equipment or the entire LNG facility
13 if required. The operator will be trained to take the
14 necessary steps to bring the terminal to a safe state.
15 Alarms will be provided to inform of shutdown 18: 14
16 conditions or other abnormal situations requiring
17 operator action.

18
19 Additionally the ICSS will provide for recording of all
20 critical process parameters and the state of all 18: 15
21 critical operating and valves and equipment.

22
23 **Emergency Shutdown System.**
24
25 Section 3.10.1.5 of the development EIS addresses the 18: 15
26 general design overview and details of the initial
27 emergency shutdown system for the proposed development.

28
29 The proposed LNG terminal will have an emergency

1 shutdown EDS systems that will isolate and shut off
2 sources of flammable gas and automatically shut down
3 process equipment. ESD push buttons will be located at
4 various locations through the LNG terminal to manually
5 activate a shutdown of the ship unloading facility or a 18: 16
6 shutdown of overall LNG terminal. The ESD could
7 also be activated automatically by the fire and hazard
8 detection system (see section 3.10.1.2 of the
9 development EIS). Upon confirmed detection of a fire
10 or a release of combustible gas, when an ESD is 18: 16
11 activated audible alarms will be activated throughout
12 the facility and visual alarms will be activated in the
13 main control room and jetty control room. After an ESD
14 normal operations will be suspended until the emergency
15 is resolved. 18: 16

17 **Fire and Gas Detection and Protection System.**

18
19 Section 3.10 of the development EIS addresses the
20 initial design of the fire and gas detection and 18: 17
21 protection system for the proposed development.

22 **Hazard Detection System**

23
24
25 As detailed in section 3.10.1.1 of the EIS, a hazard 18: 17
26 detection system will be provided which will include
27 flammable gas and low temperature detectors to monitor
28 for potentially hazardous conditions arising from LNG
29 spills, gas leaks or fires and to quickly indicate the

1 general location of a release or fire. High
2 temperature, smoke and ultraviolet/infrared flame
3 detectors will be provided to monitor for fire. The
4 integrated hazard detection system will be monitored
5 from the main control room and will affect emergency 18: 17
6 shutdown via the ESD system in the event that a hazard
7 is detected.

8
9 Detectors will be installed on the storage tank relief
10 valves, the warm gas vent system and the cold gas vents 18: 18
11 of each LNG storage tank to detect a fire at any of the
12 discharges. Low temperature detectors will be
13 installed in the spill impoundment sumps and spillways
14 to detect the presence of LNG and to prevent the
15 start-up of the storm water discharge system should an 18: 18
16 accidental release of LNG be detected. Additional low
17 temperature detectors will be installed in the spill
18 collection trenches, process/vapourisation areas,
19 unloading platform, jetty, storage tank roof platform.

20 18: 19
21 Shannon LNG will install a closed-circuit television,
22 (CCTV) monitoring system to provide additional visual
23 monitoring of all the process areas, the LNG storage
24 tanks and ship unloading platform. CCTV monitors will
25 be installed in the guard house and main control room. 18: 19
26 This system will be used to provide observation of
27 normal operations and visual evidence of LNG releases,
28 fires and/or other emergencies as well as to monitor
29 for site security.

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Hazard Control Sytem.

As detailed in section 3.10.1.2 of the EIS, both passive and active measures for hazard prevention or control will be incorporated into the design of the LNG terminal. Passive measures will be designed to prevent or minimise a hazard and will include spill impoundment systems, ignition source control and fireproofing.

Active fire protection control measures will be implemented in the event of a release of LNG or a fire and will include the following fire fighting systems and equipment:

An underground fire water system; local high expansion foam systems; portable, wheeled and skid pointed dry chemical units will be placed strategically throughout the process areas and jetty for fire fighting capability; a dry chemical extinguishment and/or nitrogen gas snuffing system will be located on the pressure relief valves and cold vents on the LNG storage tanks and the warm vent discharge to extinguish a potential fire.

Fire Protection

As detailed in the section 3.10.1.3 of the EIS, the LNG terminal will be designed and constructed so as to minimise the possibility of a loss of containment of

1 flammable or hazardous substances. In the unlikely
2 event that an LNG leak does occur, the spill will be
3 channelled to a secondary containment structure to
4 minimise both the liquid surface area and the size of
5 any vapour cloud. Flammable gas and fire detection 18: 21
6 systems will be installed throughout the facility where
7 leaks or spills or fires could potentially occur. A
8 fire water system will be installed in the on shore
9 terminal. The fire water system will consist of fire
10 water pumps, a 600 mm 24 inch diameter approximate ring 18: 22
11 main to serve hydrants, hose line cabinets, fire
12 monitors and other fire water needs of the facility.
13 The pond constructed within the site will provide the
14 fresh water supply for fire fighting. Additionally,
15 the terminal will install high expansion foam systems 18: 22
16 at spill containment sumps to mitigate and control
17 vapour generation or radiant heat flux levels. The
18 design of the spill containment sumps has been
19 addressed in the brief of evidence of Leon Bowdoin of
20 Shannon LNG. 18: 23

21
22 Portable fire fighting extinguishers and emergency
23 response equipment will be also provided for first aid
24 firefighting and for support of energy response
25 personnel. 18: 23
26

27 **Construction.** Section 7 of the development EIS
28 addresses the general construction issues associated
29 with the proposed development. The initial design of

1 the facilities has been undertaken at a sufficient
2 level of sufficient detail to allow the potential
3 impacts of the construction phase to be assessed.
4 My brief of evidence covers the construction aspects of
5 the LNG facilities for three specific areas of work: 18: 23

6
7 LNG storage tank construction; installation and
8 erection of process utility equipment, piping and
9 instrumentation; construction of buildings and site
10 landscaping. 18: 24

11
12 Site construction will follow a traditional sequence
13 consistent with LNG industry practices:

14
15 Earthworks and site preparation will be the early focus 18: 24
16 of activities commencing with site set-up, access
17 roads, bulk earthworks to create the various benches,
18 graded areas, for the LNG tanks process equipment and
19 building foundations. These construction aspects are
20 covered in the brief of evidence of Eoghan Lynch of 18: 24
21 Arup.

22
23 Marine works will comprise the construction of the LNG
24 jetty, mooring dolphins and associated equipment and
25 the materials jetty. These construction aspects are 18: 24
26 covered in the brief of evidence of Blair MacIntyre of
27 Poten Partners.

28
29 Drainage system and power, instrumentation conduits

1 will be installed along the placement of concrete
2 foundations for the LNG tanks, process equipment and
3 the terminal buildings.

4
5 The erection of LNG storage tanks and steel structures 18: 25
6 and associated buildings will follow.

7
8 Later stages of the initial phase will see the
9 installation of major mechanical and electrical
10 equipment, instrumentation and process piping. 18: 25

11
12 Final stages of the initial phase will see the fit-out
13 and completion the buildings, completion of site access
14 roads and landscaping.

15 18: 25
16 The facilities will then be ready for testing and
17 commissioning prior to the facilities commencing
18 operations.

19
20 The overall construction duration for the first phase 18: 25
21 of the development is covered in the brief of evidence
22 of Eoghan Lynch of Arup.

23 24 **Construction Safety.**

25 18: 25
26 As required by the Irish regulations, a Health and
27 Safety Plan will be prepared which will address health
28 and safety issues from the design stages through to the
29 completion of the construction and maintenance phases.

1 This plan will be reviewed as the development
2 progresses. The contents of the Health and Safety Plan
3 will comply with the requirements of the Safety, Health
4 and Welfare at Work (Construction Regulations)
5 2001-2006.

18: 26

6
7 Safety on site will be of paramount importance. During
8 the selection of the relevant main construction
9 contractor and the respective sub-contractors their
10 safety records will be investigated. Only contractors
11 with the highest safety standards will be permitted to
12 bid on construction work.

18: 26

13
14 Prior to working on site, each individual will receive
15 a full safety briefing and will be provided with all
16 the safety equipment relevant to the tasks the
17 individual will be required to perform during his
18 employment on site.

18: 26

19
20 Safety briefings will be held regularly and prior to
21 any onerous or special task 'toolbox talks' will be
22 held to ensure all workers are fully aware of the tasks
23 to be undertaken and the parameters required to ensure
24 that the task will be successfully and safely
25 completed.

18: 27

18: 27

26
27 All visitors will be required to wear PPE (personal
28 protective equipment) prior to going on to the site and
29 will undergo a safety briefing by a member of the site

1 safety team.

2 Regular site safety audits will be carried out
3 throughout the construction programme to ensure that
4 the rules and regulations established for the site are
5 complied with at all times. 18: 27

6
7 At any time that a potentially unsafe practice is
8 observed the Site Safety Manager has the right as well
9 as the responsibility to halt the work in question,
10 until a safe system of working is again put in place. 18: 27

11 12 **LNG Storage Tank Construction.**

13
14 The LNG storage tanks will comprise a tank of 9% nickel
15 steel housed within a second tank of reinforced 18: 28
16 concrete with a steel vapour barrier liner. The
17 concrete outer tank, which will be constructed first,
18 and will be post-tensioned, i.e. have a prestressed
19 wall. The tank foundations will be a mat, slab or pad
20 type of reinforced concrete. Piling is not expected as 18: 28
21 the existing grade will provide the necessary
22 supporting capacity without piling.

23
24 Construction of the LNG tanks is specialist work.
25 Shannon LNG will permit only contractors with a proven 18: 28
26 track record of constructing these types of tanks in a
27 safe and timely manner to bid on this phase of the
28 construction.

1 Typically the construction of the LNG tanks will begin
2 with the placing of the reinforced concrete
3 foundations. After the foundation has gained
4 sufficient strength, the construction of the reinforced
5 concrete walls will begin. The walls may be 18: 29
6 constructed using a slip form technique with
7 approximately 1.5 metre of vertical wall height
8 completed per day. The slip-form operation, if used,
9 will continue for up to 30 days, without interruption
10 for each tank. 18: 29

11
12 The steel dome roof of the tank will then be fabricated
13 within the concrete tank. The roof will be constructed
14 from steel plates and will be a fully welded structure.
15 Once the roof is complete it will be raised using 18: 29
16 high performance fans and upon reaching the top it will
17 be securely fastened to a steel collar preinstalled at
18 the top of the concrete outer wall. A steel liner will
19 then be welded to embedments on the inside of the
20 concrete outer wall to form a vapour barrier. 18: 30

21
22 On top of the steel roof an outer concrete roof will be
23 poured in situ. The steel liner will be an integral
24 part of the composite roof, as it will be connected to
25 the concrete with preinstalled shear connection studs, 18: 30
26 the roof will be constructed with openings to allow the
27 pipe and pumps to be fitted within the tank.

28
29 On completion of the concrete roof, the 9% nickel steel

1 inner tank will be fabricated inside the concrete tank.
2 The inner steel tank will be of fully welded
3 fabrication and will be mostly welded using an
4 automatic welding technique. The area below the
5 secondary tank bottom and the foundation will be 18: 31
6 insulated with high density foam glass blocks.

7
8 The tank will be hydrotested by filling it with fresh
9 water from the pond to approximately 5/8ths its depth.
10 This test usually takes about 28 days which includes 18: 31
11 filling, emptying and cleaning. The annulus between
12 the inner steel tank and the outer steel membrane will
13 then be filled with the fibber glass blanket and then
14 filled with the perlite insulation and the deck blanket
15 insulation will be installed. 18: 32

16
17 The in-tank pumps and risers and associate piping and
18 equipment and instrumentation installation will
19 commence after placement of the concrete roof. This
20 work will be on-going until after the hydrostatic test. 18: 32

21
22 The tank will next be ready for nitrogen purging and
23 commi ssi oni ng.

24 **Process Plant and Equipment Constructi on.** 18: 32

25
26
27 Considerati on will be given to the modularisati on of
28 some of the facilities, standardisati on of components
29 and prefabricati on of equipment in order to reduce

1 on-site construction time and to minimise local
2 disruption during the construction phase.

3
4 The prime objectives will be to maintain the highest
5 safety standards, to achieve high quality and 18: 32
6 productivity and to minimise work at height and
7 scaffolding requirements.

8
9 Prefabrication works will generally be carried out at
10 the various vendor/supplier facility. Consideration 18: 33
11 will be given to:

12
13 Skid mounting the vessels; skid mounting pumps;
14 predressing vessels (that is equipping them with pipes,
15 valves and electrical/instruments); preassembling vents 18: 33
16 in transportable sections; prefabricating and
17 preinsulating piping for the jetty and on-shore
18 pipework; prefabricating pipe racks; delivering
19 equipment paint and finish-coated; prepackaging
20 assembled process heaters and heat exchangers. 18: 33

21 22 **Structural Steel Pipe Rack and Pipe Supports**

23
24 Extensive structural steel pipe racks and supports will
25 be required to carry the piping from the unloading arms 16: 40
26 at the jetty head to the storage tanks and from the
27 tanks to the process areas. Details of the anticipated
28 major structures are included as elevation drawings in
29 the planning application and are shown on the cross

1 section drawings.

2 3 **Building Construction**

4
5 The building types, as noted above, will be constructed 16: 41
6 in accordance with the normal good practice.

7 8 **Equipment for Construction on-Shore.**

9
10 As detailed in the EIS section 7.3.7 typically the 16: 41
11 construction equipment would include compressors,
12 mobile cranes, tower cranes and generators, hoists and
13 gantries and various types of excavators, loaders,
14 trucks trailers advance etc.

15
16 Other equipment required will include a concrete 16: 41
17 batching plant, a rock crusher and screening plant,
18 diesel fuel tanks, gas storage cages, electric power
19 supply, mechanical repair shops etc.

20
21 A number of tower cranes and a second concrete batching 16: 42
22 plant will be required for the erection of the LNG
23 tanks, hard standings will be required for these.

24
25 Fuel will be required for the diesel power plant and 16: 42
26 equipment. To minimise the numbers of fuel deliveries,
27 one or more sizeable diesel fuel tanks will be
28 installed on site to contain the fuel for the diesel
29 powered plant. These will be strategically located on

1 a concrete plinth and will be banded.

2 3 **Commissioning**

4
5 Section 7.11 of the development EIS addresses the 16: 43
6 general commissioning phase issues of the proposed
7 development.

8
9 The initial design of the facilities has been
10 undertaken at a level of sufficient detail to allow the 16: 43
11 potential impacts of the commissioning phase to be
12 assessed.

13
14 Following completion of construction and installation
15 of equipment, and before the terminal commences 16: 43
16 operations, there will be a testing and commissioning
17 phase. This phase will comprise:

18
19 Installation compliance checks; precommissioning
20 activities; commissioning tests; pre start-up safety 16: 43
21 audit; cool down of ring main, tanks and process
22 systems; performance demonstration tests.

23 24 **Installation Compliance Checks**

25
26 This will be a process of systematically checking that
27 all systems and equipment have been constructed,
28 assembled aligned and installed correctly, in
29 accordance with the design specifications and drawings

1 and that all interconnecting pipe work cabling and
2 wiring has been installed in compliance with the design
3 specifications and drawings.

4 **Pre-Commissioning of Systems**

16: 44

6
7 After the various systems are constructed and the
8 installation checks completed, these systems will be
9 subject to pre-commissioning activities.

10
11 Pre-commissioning is defined as an activity or a group
12 of activities that are performed for the cleaning,
13 testing and excitation of each equipment item and
14 system to verify the manual, automatic and sequence
15 controls and interfaces.

16: 44

16
17 All electrical and instrumentation systems will be
18 checked, process and utilities lines cleaned
19 mechanically or by blowing, flushing etc. to verify
20 cleanliness of each systems to prepare the
21 equipment/systems for further tests to ensure that each
22 system complies with its design functional intent.

16: 45

23 **Commissioning Tests**

24
25
26 The function of each item of equipment and each system
27 will be tested and verified in a systematic manner, as
28 being in accordance with the design and specifications.
29 All the alarm and control systems and instrumentation

16: 45

1 will be tested to demonstrate that they are functioning
2 correctly. Following these tests each system will be
3 checked to ensure that it is ready to be commissioned
4 under operating conditions including using real process
5 fluids, temperatures, pressure and voltages. 16: 46

6 7 8 **Pre Start-Up Safety Audit**

9
10 Prior to the admission of hydrocarbons into the 16: 46
11 facility an audit will be conducted to ensure that all
12 systems are ready for commissioning and start-up.
13

14 **Cool Down of Ring Main, Tanks and Process Systems**

15 16: 46
16 The piping between the LNG unloading arms and the
17 storage tanks will be progressively cooled down using
18 either nitrogen or LNG vapour from the LNG tanker ship
19 to the required temperature and checked for leaks as
20 the piping cools down. This will be followed by the 16: 46
21 cool down of the LNG tanks to the required temperature
22 by either introducing nitrogen or LNG into the tanks
23 and the eventual filling of the tanks. This operation
24 will be carried out over a period of approximately one
25 week. Following cool down of the initial LNG storage 16: 47
26 tank, the process facility will be cooled down, using
27 LNG from the storage tanks.
28

29 **Performance Demonstration Tests**

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29

In the start-up phase the individual items of equipment and systems will be operated using the normal process fluids and temperatures, pressure and voltages monitored for various pieces of equipment and systems.

16: 47

An operations/performance test shall be conducted when all parts of the facility are at design conditions. Satisfactory completion of these tests will confirm that the design intent of the facility can be achieved.

16: 48

The terminal's safety and fire prevention systems and the emissions monitoring systems will be subject to the same rigorous testing protocols as the other systems in the plant.

16: 48

Commissioning Phase Impacts

The impacts on the environment from the installation compliance and commissioning tests will be insignificant. In the performance test phase, the impacts will be similar in nature, but smaller in scale than the impacts from the terminal in full operation.

16: 48

Response to submissions to An Bord Pleanála

16: 48

A number of LNG storage tank and process facilities design, construction and commissioning related submissions have been made to An Bord Pleanála. In

1 several instances the same issue was raised in a number
2 of submissions. The following, where appropriate,
3 combines and paraphrases the issues, and provides
4 Shannon LNG's response.

16: 49

5
6 **Submission:** A number of submissions have raised an
7 issue that the selected vapourisation scheme may not be
8 the most appropriate environmentally and some suggest
9 the selection may have been driven purely by economic
10 considerations. This was raised in submissions L002 by 16: 49
11 Kathleen Kelly; L003 Adam Kearney Associates; L004,
12 Mary Kelly-Godley; L014, Chloe Griffin; L034, Morgan
13 Heaphy and L054, Killochan Residents Association.

14
15 **Response:** Shannon LNG completely disagree with these 16: 50
16 suggestions. Any potential vapourisation scheme will
17 have some form of environmental impact. The studies
18 undertaken have assessed the estimated impacts and have
19 been used to develop the design for the facility. The
20 primary criteria for evaluation was a desire to have as 16: 50
21 low an overall environmental impact as practical but
22 not choosing one set of impacts at the expense of all
23 others. Clearly the use of sea water as a warming
24 medium allows greenhouse gas emissions to be minimised,
25 but sea water was only selected after the extensive 16: 50
26 impact studies had been completed and the impacts were
27 judged to be insignificant. The environmental impact
28 of the sea water usage at the facility is addressed
29 until the brief of evidence of others. Having

1 established a preferred technical solution with minimal
2 environmental impact, Shannon LNG next sought to cost
3 optimise the design. It is, therefore, both unfair and
4 incorrect to suggest cost rather than environmental
5 considerations were the primary driver for selection of 16: 51
6 the proposed vapourisation scheme. Indeed, the cost to
7 install the sea water system exceeds the cost to
8 construct a solely gas fired vapourisation system.
9 Shannon LNG have, to the best of their ability,
10 selected the most appropriate vapourisation scheme for 16: 51
11 the location of the terminal.

12
13 **Submi ssi on:** The HAZOP study is not available and this
14 was raised in submi ssi on L054 by the Kilcolgan
15 Resi dents Associ ati on. 16: 52

16
17 A HAZOP study, which is an industry abbreviation for
18 Hazard and Operability study, is one of a number of
19 techniques used during the design phase of a project to
20 assess the potential hazards and operability issues 16: 52
21 associated with the design of a process facility. The
22 HAZOP study is only part of a programme of safety,
23 environmental and operability controls and reviews
24 employed on a well executed project. The design work
25 undertaken to date in definition of Shannon LNG 17: 57
26 Terminal has yet to reach the appropriate stage for a
27 HAZOP study to be conducted. This study requiring a
28 detailed design which can be analysed using formal
29 HAZOP techniques. A HAZOP will be undertaken at the

1 appropriate phase of the development.

2
3 **Submi ssi on:** All vehicles leaving the construction
4 areas of the site shall pass through the wheel wash,
5 this was raised in submission the KCC report. 17: 57

6
7 The response is that is agreed.

8
9 **Submi ssi on:** Proposed condition - all tank and drum
10 storage areas on the sites shall as a minimum be bunded 17: 58
11 to a volume not less than greater of the following (a)
12 110% of the capacity of the largest tank or drum within
13 the bunded area or (b) 25% of the total volume of
14 substances which could be stored within the bunded
15 areas. 17: 58

16
17 All fuel storage areas and cleaning areas, particularly
18 for concrete trucks, shall be rendered impervious to
19 the stored or cleaned materials and shall be
20 constructed to ensure no discharge from the areas. 17: 58

21
22 The response is agreed. However, in certain
23 circumstances double wall tanks will be used in
24 reference to bunding.

25 17: 58
26 **Submi ssi on:** Proposed condition - the developer shall
27 main on the sites for the duration of the construction
28 period, oil abatement kits comprising of booms and
29 absorbent materials. The precise nature and extent of

1 the kits shall be agreed in writing with the planning
2 authority prior to commencement of development. This
3 was raised by Kerry County Council.

4
5 The response is agreed.

17:59

6
7 **Submission:** Proposed condition - wash out of concrete
8 mixers shall be contained and properly disposed of.
9 Again raised in submission KCC report. The response
10 from Shannon LNG is agreed.

17:59

11
12 **Submission:** Proposed condition - powered compressors
13 shall utilise sound attenuation, raised in the Kerry
14 County Council report. The Shannon LNG response is
15 agreed.

17:59

16
17 **Submission:** Proposed condition - concrete used in the
18 construction of the tanks, foundations etc. should be
19 independently tested and a summary of results
20 highlighting any problems encountered and remedial
21 measures taken forwarded to Kerry County Council and
22 the Health and Safety Executive on a quarterly basis
23 raised in submission KCC report.

18:00

24
25 Shannon's response is agreed.

18:00

26
27 **Submission:** Proposed condition - the size and
28 capacities of the proposed fire water pumps are to be
29 agreed with the fire authority prior to commissioning

1 of the plant. Raised by Kerry County Council. Shannon
2 LNG's response is agreed.

3
4 **Submi ssi on:** Proposed condi ti on - the Appli cant shall
5 provide and agree with the fire authority the fire 18: 00
6 safety measures to be taken during the constructi on
7 phase of the plant. Raised by Kerry County Council in
8 their report. Shannon LNG's response is agreed.

9
10 **Concl usi on** 18: 01

11
12 The design work undertaken in support of the proposed
13 development has been completed in line with
14 international best practices. The design work has
15 studied and assessed alternatives to arrive at a 18: 01
16 proposed plant and facilities which, in outline, is the
17 best solution for developing an LNG import facility at
18 the Shannon site. The design work has applied national
19 and international codes and standards as well as good
20 engineering practices having been completed by 18: 01
21 competent and professional engineers well experienced
22 in the design of world class, safe and environmental
23 conscious LNG facilities.

24
25 The initial design of the facilities has been 18: 01
26 undertaken at a level of sufficient detail to allow the
27 potential impacts of the construction and commi ssi oni ng
28 phase of the devel opment to be assessed. The
29 construction and commi ssi oni ng impacts have been

1 assessed by competent and professional construction
2 personnel well experienced in the safe and
3 environmentally conscious construction of world class
4 LNG facilities.

18: 02

5
6 Accordingly, I am of the view that the potential
7 impacts of the proposed LNG terminal development as
8 presented in the development EIS are accurate given the
9 commitment by Shannon LNG to employ competent and well
10 experienced engineering and construction contractors to 18: 02
11 develop the facility.

12
13 That's my submission.

14
15 **END OF SUBMISSION OF MR. VINECOMBE**

18: 33

16
17 **INSPECTOR:** Thank you, Mr. Vinecombe.
18 Mr. O'Neill, I am a bit
19 doubtful about the value of reading lengthily from
20 reports such as these which to an extent duplicate what 18: 34
21 is in the EIS and also in this case duplicated a lot
22 said by the previous speaker so maybe you could adopt a
23 more focussed approach tomorrow.

24 **MR. O'NEILL:** Yes. Most of the
25 statements are in 18: 34
26 reasonably final form, but perhaps if we could take
27 areas that have been covered by other speakers or
28 indeed in the EIS, perhaps it could be taken as read
29 and we can deal with that as we go along, but I will

1 pass on the message.

2 INSPECTOR: I appreciate that.

3 MR. O'NEILL: It is taking a long time
4 certainly to go through the
5 statements and I do appreciate you sitting a little bit 18:34
6 late this evening to finish this statement.

7 INSPECTOR: Right. Sorry, you wish to
8 make a brief statement?

9 MR. McELLI GOTT: Yes, it's a quick comment
10 as well. We are listening 18:34
11 to that for the last two hours. It is just that they
12 are slipping in a few comments here and there that are
13 not in the EIS. Like everything should have been
14 accepted as read and it has made a few people leave now
15 that couldn't actually ask the questions so there is a 18:35
16 tactic going on there too which is boring us to death.
17 They are the experts, they should know, you had already
18 written that it was supposed to be accepted as read so
19 we object to that.

20 INSPECTOR: Okay. 18:35

21 MR. O'NEILL: There is no tactic of the
22 type suggested by
23 Mr. McElligott and he knows that is incorrect.

24 MR. McELLI GOTT: Eileen O'Connor just wants
25 to ask one question. 18:35

26 INSPECTOR: Sorry, I can't hear you.

27 MR. McELLI GOTT: Eileen O'Connor wants to
28 ask one question because
29 she has been waiting for the last two hours to ask.

1 **I NSPECTOR:** Okay.

2 25 Q. **MS. O' CONNOR:** In section 3.9 page 19

3 of Leon Bowdoin's statement

4 he states that Shannon LNG accepts responsibility for

5 the health and safety and security of the facility for 18: 35

6 employees, contractors and visitors, so I want to ask

7 Mr. Bowdoin would he consider it appropriate, as the

8 person in charge of health and safety and security,

9 would he consider it appropriate to have myself and my

10 children and my husband John O'Connor, vets, agents for 18: 36

11 the Department of Agriculture, traversing the site

12 while it is under construction and forevermore while it

13 is in operation? If we are will we be required to wear

14 the personal protection equipment and to go through the

15 wheel wash etc. Partly that question is for Shannon 18: 36

16 Development.

17 **MR. BOWDOI N:** I believe your question

18 raises the issue of the

19 existence of a right of way across the property and the

20 use of the right of way if it does exist. Let me 18: 37

21 address it in two ways: If there is a right of way

22 that does exist, and that issue has been raised but

23 I think unresolved at this point, there will be an

24 appropriate pathway made that will avoid the

25 construction areas of the facility and again that is 18: 37

26 subject to the right of way being shown to be in

27 existence.

28

29 To answer the second half of the question which was

1 would you be permitted or your family be permitted to
2 walk freely upon the areas of the construction of the
3 site, all persons, visitors, employees, guests will be
4 required to comply with all of the health and safety
5 requirements while they would be on the active areas of 18: 38
6 the LNG site.

7 **MS. O'CONNOR:** In response I would like to
8 say that if we were given a
9 right of way we would presume that it would not be
10 through a construction area as that would not be 18: 38
11 acceptable to us and I think that you are presuming
12 agreement, an agreement which has not even been
13 started. Also it has been stated that construction
14 will begin by the end of 2008, I am not presuming any
15 agreement will be forthcoming before then. It should 18: 39
16 not be presumed that an agreement will be forthcoming.

17 **MR. O'NEILL:** Perhaps I can deal with
18 that, Sir. That is
19 something that has been raised and it has been
20 suggested that this issue in relation to the right of 18: 39
21 way of which Shannon LNG don't have any knowledge is
22 something that has to be resolved with Shannon
23 Development. The position is clear legally, if the
24 right of way exists it has to be respected and of
25 course it will be respected. In circumstances where 18: 39
26 there would be any interference, temporary interference
27 with that right of way an appropriate path getting from
28 the first point to the second point; in other words,
29 where the right of way leads of course will be

1 provided. Clearly that will be provided in
2 circumstances where it didn't interfere with the
3 construction or indeed expose the users of the right of
4 way to any unnecessary risks.

5 **INSPECTOR:** Mr. McElligott. 18: 40

6 **MR. McELLI GOTT:** Yes. There was a
7 pre-consultation meeting
8 between Shannon LNG and An Bord Pleanála and there are
9 two versions of the minutes of that meeting. The first
10 version of the minutes are the minutes that An Bord 18: 40
11 Pleanála took down and the second version of the
12 minutes are the requested amendments by Shannon LNG to
13 amend the minutes of the meeting. The An Bord Pleanála
14 version said:

15 "The prospective Applicant explained 18: 40
16 the ownership issue. See the rectangle
17 outlined on page 5 of the display
18 board's booklet and stated this area is
owned by a local person."

19 After the meeting it came back and they asked it to be
20 changed to: 18: 41

21 "Is claimed to be owned by a local
22 person."
23

24 Now, we feel that the real minutes were what was
25 actually said and that what the amendments that were 18: 41
26 requested to be changed were requested on legal advice
27 so we are saying that that was already an admission of
28 total ownership by somebody else, but now they know the
29 consequences of that land being owned by somebody else.

1 Thank you.

2 **INSPECTOR:** Do you want to say anything
3 on that?

4 **MR. O'NEILL:** I don't know if any
5 response is needed to that. 18: 41

6 The reality of the matter and the position has been
7 clear from day one -- first, the ownership issue. As
8 I understand it Shannon Development do not claim to be
9 the owners of this 1.8 acres of land, somebody else has
10 to be the owners. Who they are is not of great 18: 41
11 significance, it's an ownership outside the ownership
12 of Shannon LNG and obviously Shannon Development. What
13 we have been talking about, however, is a right of way
14 presumably leading from some public area to the lands
15 in question, that's a different matter altogether and 18: 42
16 I am not sure if that was addressed at the meetings.
17 The issue in relation to the different versions of the
18 notes, or memos of the meetings, is something I think
19 that has been addressed already by the Board.

20 **MR. McELLI GOTT:** It is becoming like 18: 42
21 Lesotho in the middle of
22 South Africa, it is surrounded by the site so they say
23 they can do what they like inside in the site, but it
24 is completely surrounded.

25 **MR. O'NEILL:** I think that would come 18: 42
26 better from the owner of
27 the lands rather than Mr. McElligott.

28 **MS. O'CONNOR:** May I speak. I think
29 Shannon Development should

1 give a response at this stage. They have made no
2 contact with us for 18 months. We have attended all
3 the public consultation meetings and we have spoken to
4 Shannon Development and Shannon LNG representatives and
5 we have been referred to An Bord Pleanála and to 18: 43
6 Shannon Development and we have had no contact with
7 Shannon Development and I am wondering if Shannon
8 Development would care to comment at this point.

9 **MR. MORAN:** If I may. My colleague has
10 gone away, but I will tell 18: 43
11 you what I do know about it. My name is Ogie Moran,
12 sorry, Shannon Development. The land that we have
13 optioned to LNG, we own all of that land ourselves.
14 I think the land that Ms. O'Connor is referring to is a
15 right of way that may go through our land and I think, 18: 43
16 I understand I could be wrong on this, I think you have
17 written to Shannon Development through your solicitor
18 claiming a right of way through that and I think that
19 they are looking for you to provide evidence of that
20 right of way, I could be wrong on that, but that's my 18: 43
21 understanding of it, that you have written to us, they
22 have written to us claiming a right of way and we have
23 responded back saying there is no evidence on that.

24 **MR. O'CONNOR:** I am landlocked
25 [Inaudible]. 18: 44

26 **MR. MORAN:** The land that you own
27 yourself is your own
28 business, I suppose, the land we own, we have optioned
29 our land to LNG and only our land.

1 MR. O' CONNOR: We have a right of way down
2 through it.
3 MR. MORAN: As far as I know we have no
4 evidence of that.
5 MR. O' CONNOR: We are [Inaudible]. 18: 44
6 MR. MORAN: If you produce the
7 evidence.
8 INSPECTOR: I think we need to
9 terminate this discussion
10 now. It has been indicated by the Applicants that if a 18: 44
11 right of way exists it will be maintained in some
12 reasonable form so can we conclude matters for this
13 evening and we will meet again at 10 o'clock tomorrow
14 morning. Thank you, everybody.

15 18: 44

16 THE HEARING WAS ADJOURNED TO THURSDAY, JANUARY 24TH
17 2008 AT 10:00 A.M.

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29

'**exclusion**' [1] - 63:15
'**full**' [1] - 179:4
'**full-containment**' [1] - 179:4
'**heat**' [1] - 183:11
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