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BEFORE AN BORD PLEANÁLA

IN THE MATTER	**of Case GA0003**
	Gas pipeline to connect Shannon LNG Terminal at Ralappane, Co. Kerry to existing natural gas network at Leahys, Co. Limerick;
AND	**of Case DA0003**
	Application for an acquisition order for the Shannon LNG Terminal at Tarbert, Co. Kerry to the Bord Gáis Eireann Network at Foynes, County Limerick;
AND	**Proposal to locate the Shannon LNG terminal at Tarbert, Co, Kerry.**
APPLICANT	**Shannon LNG**
RESPONDENT	**Safety Before LNG**

STATEMENT OF EVIDENCE OF STEPHEN HENRY GOLDTHORPE

1. Introduction

1.1 My name is Stephen Henry Goldthorpe. I am a graduate chemical engineer with 30 years experience in technical and economic assessment of energy conversion processes. From 1979 to 1995 I worked for the British Coal Corporation in the Project Assessment and Development Branch in Cheltenham, UK.

1.2 From 1995 to 2002 I worked in New Zealand for URS Corporation as an environmental engineering consultant. For the last 6 years I have been managing director of Steve Goldthorpe Energy Analyst Ltd, which is an independent New Zealand consultancy. I am an active member of the Sustainable Energy Forum of Aotearoa Incorporated.

1.3 Since May 2008 I have been providing technical and strategic assistance to the BurningBridges Group, which is based in New Plymouth, New Zealand. That group is coordinating opposition to the creation of an LNG importing facility in the Port of New Plymouth. Through that work I have become familiar with many aspects of the LNG industry and the strategic issues surrounding the global expansion of trade in LNG. Through that work I have become acquainted with the proposal by Shannon LNG to build an LNG terminal in Ireland. Through that work I have become acquainted with the campaign by Safety Before LNG to oppose the Shannon LNG proposal.

1.4 I have observed several similarities between the situation in New Zealand and the situation in Ireland. I therefore offer An Bord Pleanála an international perspective on the matter of the proposed Shannon LNG terminal and its consequences. I propose an alternative energy strategy for Ireland. I am willing address any questions from An Bord Pleanála on this submission.[1]

1.5 I am aware that safety is the overwhelming concern of the people living near to sites that are proposed for LNG terminals; in Ireland, in New Zealand and elsewhere. Based on my research of the safety issues, I have good reason to be sympathetic with their concerns about the inherent danger associated with LNG terminals generally, and the proposed New Plymouth plant in particular. However, I will make no further comment on the safety issue in this submission.

2. Rationale for importing LNG

2.1 In both New Zealand and Ireland the creation of an LNG importing terminal would result in the introduction of a major new source of energy into the mix of energy resources available to meet the energy needs of

[1] I am unable to attend in person the An Bord Pleanála hearings at the Listowel Arms Hotel, which start on December 1st 2008, because I live in New Zealand. I would be pleased to present this submission personally to the hearing and answer questions on it via an audio or video link. Alternatively, I authorise Mr Johnny McElligott or his nominee to read this submission to the hearing on my behalf.

each country. A comparative summary of the national energy balances of Ireland and New Zealand in 2007 is shown in Exhibit 1.

2.2 In New Zealand the known domestic natural gas resources are inadequate to meet on-going essential needs in the long term, so new discoveries are needed because there are no near neighbours who could provide future gas supplies by pipeline. Modest new gas discoveries are needed to provide essential gas supplies to meet domestic, commercial and industrial needs. Major new gas discoveries would be needed to provide sufficient gas to meet and expand the discretionary use of natural gas for power generation The rationale for the creation of an LNG importing terminal in New Zealand is that it is a back-up plan in case the search for new gas fields is unsuccessful.

2.3 In the case of Ireland, indigenous energy resources fall far short of energy demand, so coal, oil and gas are imported. Natural Gas is imported via two sub-sea pipelines from the UK. Exhibit 2 shows natural gas supply and use in Ireland. Power generation accounts for over half of the natural gas use in Ireland. Additional natural gas imports will be required to meet and expand the discretionary use of natural gas for power generation.

2.4 Exhibit 2 shows a 58% increase in the quantity of natural gas imported into Ireland through the gas pipelines from the UK over seven years since the turn of the century. That rate of growth is not sustainable.

2.5 To provide context to the data in Exhibit 1, I note that the capacity of a large LNG tanker is about 3 PJ of energy. Therefore the entire supply of natural gas for power generation in Ireland in 2007 would correspond to 38 shiploads of LNG per year.

2.6 These matters provide a rationale for the creation of a natural gas importing terminal in Ireland.

3. Energy supply strategy

3.1 Although Exhibit 1 shows significant differences in the scale of indigenous energy resources, there are a number of similarities between Ireland and New Zealand, which reflect global energy supply trends.

- Natural gas is established as a significant component of the mix of energy resources used for power generation;

- The development of natural gas fired power generation has historically been based on the availability of low cost natural gas supplies;
- The indigenous supply of natural gas is declining;
- There is uncertainty about the scope for new indigenous natural gas resources to significantly change the energy supply scene;
- Future natural; gas cost will be higher than historical prices, particularly if natural gas is imported as LNG;
- The use of renewable energy resources for economically competitive power generation is limited in its scope; at least in the short term;
- The use of oil for power generation is minor and is increasingly uneconomic;
- The use of coal for power generation is an established component of the mix of resources used for power generation;
- There is no inherent shortage of coal in the foreseeable future that might result in escalation of coal price.

3.2 In the light of these observations, I conclude that it is economically and strategically advisable for both Ireland and New Zealand to move away from gas-fired electricity generation.

3.3 Whilst sustainable electricity supplies preferably need to be made from renewable resources, the scale of renewable energy resources in Ireland shown in Exhibit 1 indicates that large scale replacement of gas by renewables in the short term is unrealistic.

3.4 Accordingly, I conclude that it is economically and strategically advisable for Ireland to transition from gas to coal as its principal controllable primary energy source for power generation.

4. Cost comparison of Electricity Generation from LNG and Coal

4.1 If a state-of-the-art natural gas combined cycle power station at 52% thermal efficiency has a specific investment of €750/kWe and an equivalent state-of-the art supercritical coal-fired power station at 42% thermal efficiency has a specific investment of €1500/kWe, then, at 70 % load factor and at 15% of capex per year for capital charge and non-fuel

operating costs, the non-fuel costs of power generation would be 18 €/MWh and 37 €/MWh respectively.

4.2 If the long term imported coal price is 2 €/GJ then coal-fired power generation would be the economically preferable option if the imported LNG price is more than 5 €/GJ.

4.3 The future price of LNG is uncertain and is rising, because demand for this commodity is high and production is constrained by capacity limitations. The price of LNG is expected to track the price of crude oil.

4.4. If the long term oil price were to stabilize at about US$100/bbl (i.e. the likely cost of producing oil from coal, oil shale, tar sands etc.) and the cost of landed LNG were to stabilize at about 90% of the cost of crude oil on an energy equivalent basis, then, at an exchange rate of 1.3 US$/€ the long term price of landed LNG would be about 11 €/GJ.

4.5 A report[2] recently prepared by independent economic analysts on future energy prices indicates a likely mid-range oil price in the region of US$120/bbl from 2010-2020, subsequently rising progressively to US$200/bbl by about 2030 and US$400/bbl by 2060. This report also suggests parity between LNG and oil prices on an energy equivalent basis. These figures correspond to a likely mid-range landed LNG price rising from around €15/GJ to €25/GJ or more over a 20 year period.

4.6 These estimates of long term LNG prices are two to five times higher than the price required to be economically competitive with 2 €/GJ imported coal for power generation.

5. Greenhouse gas consequences

5.1 Coal fired power generation is more greenhouse intensive than gas-fired generation. The CO_2 emissions from the natural gas and coal power station stacks would be 360 and 780 kg CO_2/MWh respectively, based on the above comparison.

5.2 However, a more realistic assessment of greenhouse gas emission consequences is obtained using Full Fuel Cycle (FFC) methodology in which emissions from fuel production and processing is also taken into

[2] Transport fuels and other energy forms – Price forecasts to 2060; Auckland Regional Council 26th November 2008; prepared by McCormickRankinCaney; www.mrcagney.com

account. The FFC methodology typically adds about 10% to imported coal and 20% to pipeline gas CO_2 emission factors.

5.3 Using these factors the greenhouse gas emissions from gas-fired and coal-fired generation would be about 858 and 432 kg CO_2/MWh respectively. Hence power generation from local pipeline gas typically has 50% of the greenhouse gas footprint of coal-fired generation.

5.4 However, in the case of LNG a substantial amount of additional energy is used in the liquefaction process, cryogenic transportation and the regasification process.

5.5 I carried out a study in support of an environmental impact assessment for an LNG liquefaction facility in West Australia supplying LNG to gas consumers in California. In that case, I assessed the Full Fuel Cycle emission factor to be 40% greater than the combustion emission factor.

5.6 On that basis the FFC emission factor for the gas option would be 504 kg.CO_2/MWh. In other words LNG-supplied gas-fired power generation would have 59% of the greenhouse gas footprint of coal-fired generation.

6. Uncertainty of long term availability of LNG

6.1 Prudent investment in an LNG receiving terminal and commitment of the associated dedicated infrastructure has to be based on confidence that LNG will be available on demand from the global LNG market for the life of that infrastructure into the long term future.

6.2 I observe that: -

- Liquefaction of natural gas is only carried out where more lucrative local markets for natural gas resources do not exist;
- LNG production for export is in direct resource competition with the production of methanol for export, which is a potential transport fuel;
- In some cases LNG production is only carried out a means of disposing of a by-product of associated gas to facilitate access to oil resources;
- There are reports of constraints on construction capacity and specialist expertise for the construction of LNG production facilities. These constraints are reportedly unlikely to resolved for a decade;

- The shipping of LNG on the high seas in tankers is a fragile energy transport method that is susceptible to disruption by terrorism or piracy;

- There are reports from the USA of some LNG importing terminals lying idle due to the inability to source LNG at an economic price;

- There is a high demand for LNG from the USA, Japan and other major trading nations. This may cause LNG traders to be unwilling to make supplies available to small independent market players, such as Ireland and New Zealand, except at a premium price.

- The global production capability for conventional oil is showing signs of falling short of global oil demand. This phenomenon, known as Peak Oil, will exacerbate the above pressures on the global LNG market.

6.3 In view of these observations, I conclude that it would be imprudent to invest in major LNG infrastructure that relies upon a plentiful supply of LNG from the global market.

7. An alternative energy option

7.1 Instead of importing expensive and unreliable LNG to meet Ireland's energy needs in the short term, I recommend that a more sustainable energy future should be based around the construction of an additional 1800 MW of new base-load coal fired power generation capacity as I have described earlier. This approximates to two more power stations of the size of the Moneypoint power station.

7.2 That scale of coal-fired generation would reduce the importing of natural gas from to UK into Ireland to 90% of the level that it was in year 2000. It would increase annual coal imports into Ireland to 2.3 times the amount of coal imported in 2007.

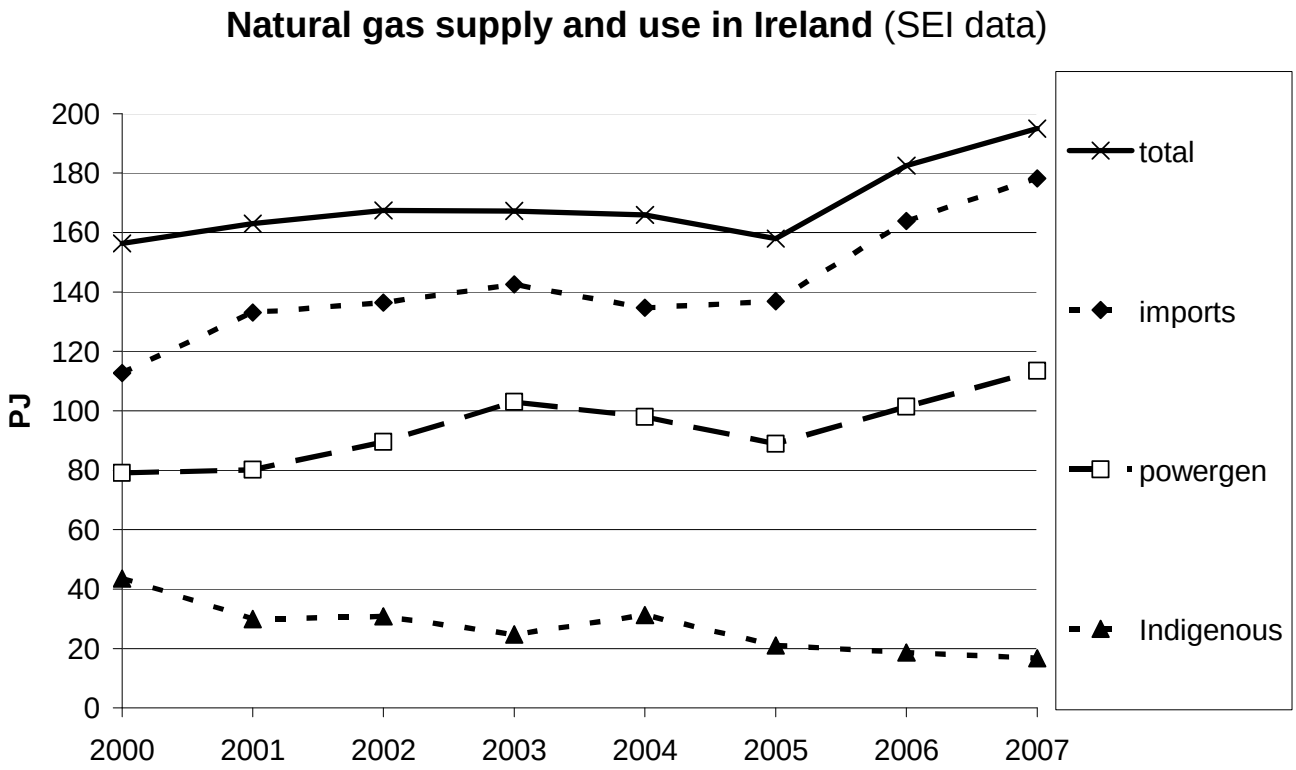
7.3 I recommend this as an economic and reliable interim energy strategy for Ireland to meet short term energy needs, whilst a longer term strategy is further developed, based on energy efficiency and conservation and renewable energy resources, to provide a sustainable energy future for Ireland in the long term.

Exhibit 1 Comparison of Energy Use in New Zealand and Ireland

New Zealand - Energy Balance 2007 (NZ Ministry of Economic Development)				
Petajoules (Gross)	**Fossil Fuels**			**Non-fossil**
	Solid	**Liquid**	**Gas**	**Renewables**
Indigenous	**125**	**93**	**170**	**229**
Imported	**-56**	**190**	**0**	**0**
Total	**69**	**283**	**170**	**229**
Power generation	**26**	**0**	**75**	**166**
All other uses	**43**	**283**	**95**	**45**
Ireland - Energy Balance 2007 (Sustainable Energy Ireland)				
Petajoules (Gross)	**Fossil Fuels**			**Non-fossil**
	Solid	**Liquid**	**Gas**	**Renewables**
Indigenous	**27**	**0**	**17**	**20**
Imported	**73**	**411**	**178**	**1**
Total	**100**	**411**	**195**	**21**
Power generation	**71**	**17**	**114**	**11**
All other uses	**29**	**394**	**81**	**10**

(In 2007 the populations in both Ireland and New Zealand were about the same at just over 4 million people)

Exhibit 2


Natural gas supply and use in Ireland (SEI data)
PJ
200
180
160
140
120
100
80
60
40
20
0
2000
2001
2002
2003
2004
2005
2006
2007
total
imports
powergen
Indigenous