Shannon LNG – Economic Benefits to the Irish Economy

FINAL REPORT

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EXECUTIVE SUMMARY

Context

Demand for natural gas in Ireland is growing strongly, because of the technical, economic and environmental advantages of gas over other fuels. Even with the Corrib field coming on stream, we estimate there will be a gas capacity deficit in Ireland as early as 2013/14.

As demand for gas has grown, Ireland has become increasingly dependent on imports - currently 90% comes via the UK. Ireland's growing import dependence is being mirrored in the UK itself and across Europe. Gas supplies are coming from ever further afield, which has implications for security of supply.

Most other countries with high import dependence rely on LNG capacity to help meet their demand, and a number of EU Member States are increasing their investment in LNG terminals to improve storage capacity and security of supply.

The proposed Shannon LNG terminal between Tarbert and Ballylongford on the Shannon estuary is projected to come on-stream in late 2012. It will import natural gas in liquid form by ship, store it and regasify it for supply into Ireland, to complement supplies through the UK-Ireland interconnectors and indigenous sources. It will represent a significant addition to Ireland's energy infrastructure, and will make a major contribution to meeting gas demand over the coming decades.

Ireland is situated within economic transportation distance of over 70% of global gas reserves, which at current production levels will last for in excess of 60 years. Shannon LNG will make it possible to source natural gas from a diverse range of countries, including ones not supplying Ireland by pipeline. Shannon LNG will thus significantly improve Ireland's security and diversity of supply, as well as bringing a range of other economic benefits.

The terminal will be developed on a merchant basis, which means that no risk will be imposed on Irish taxpayers or consumers. The alternative investment, reinforcement of the UK-Ireland interconnectors, would have to be financed by the Irish public sector, and the commercial risk would be passed onto either consumers or the taxpayer.

National Economic Benefits of Shannon LNG

A range of benefits will flow to the national economy from the Shannon LNG project, most importantly:

- Impact on Gross National Product (GNP)
- Exchequer impacts
- More competitive gas prices, though increased supply into the market
- Security and diversity of supply
- Benefits in the electricity market, though improving the economics of electricity generation
- Environmental benefits, through encouraging a switch from other fossil fuels.

We conservatively estimate the benefit to Irish GNP over a 30-year timeframe will be approximately **€1.35 billion** in 2007 prices (discounted present value approximately €820 million). This is an under-

estimate of the economic impact, as it excludes benefits in terms of lower gas and electricity prices, as well as environmental benefits. The benefit to Exchequer revenues would be conservatively **€410 million** (discounted present value €210 million).

The most important benefit of this project, however, is that it gives Ireland access to the world market for natural gas, and confers very significant security and diversity of supply benefits. It insures Ireland against exposure to supply disruptions and large hikes in price, due to infrastructural breakdown or geopolitical difficulties. This value of this benefit is difficult to measure, but is very considerable. The social and economic consequences of a disruption in natural gas supplies for even a short period of time would be extremely serious.

Regional and Local Benefits

Shannon LNG will be a major economic player in the South-West of Ireland, and will generate significant employment and expenditure in the local area, including:

Local Spend

Shannon LNG is expected to generate 600 jobs at peak construction, and 100 permanent jobs when operational (60 direct and 40 spin-off), as well as being a major purchaser of goods and services in the region. We estimate that, in aggregate, Shannon LNG will generate regional expenditure of €42 million per annum during the construction phase and €21 million per annum when operational. The benefit to the regional economy over a 30-year timeframe will be approximately €610 million in 2007 prices (discounted present value approximately €370 million).

Local/Regional Benefits from Availability of Natural Gas

Shannon LNG will extend the national gas grid, and reinforce the grid in the region, improving the viability of supplying gas to local towns. It will also increase the viability and reliability of a powergen facility in the region, which would enhance its general economic attractiveness, notably for FDI. The possibility of a carbon levy at some point in the future increases the importance of having the option to switch to gas.

Regional Development Context

The *National Spatial Strategy* and the *Kerry County Development Plan 2003-2009* highlight the importance of both Tralee and Killarney as linked hubs. The increased scope to supply natural gas to these and other towns (as well as potentially improved electricity supply) will help to underpin the medium to long term economy of the region.

1. Background & Introduction

The Irish economy and population have been on an exceptional growth path for more than a decade, and all indicators are that strong growth will continue for the foreseeable future. Demand for energy has grown in tandem, with natural gas capturing an increasing market share for a range of technical and environmental reasons, notably in the powergen sector.

Secure competitively priced natural gas supplies are thus a vital requirement for the economic competitiveness of Ireland[1]. However, domestic sources of gas are rapidly running out, and Ireland has become overwhelmingly dependent on gas imported through the UK. This will continue to be the case, even after Corrib comes on-stream. The situation is mirrored in the UK, which itself recently became a net gas importer, and in other EU States, most of whom import the bulk of their natural gas requirements from increasingly distant countries such as Russia and Algeria.

At the same time, energy has become a key source of insecurity internationally, with both price and supply being subject to variation as a result of political and natural disruptions.

This is the broader context for the proposed LNG terminal between Tarbert and Ballylongford on the Shannon estuary. The facility will be a major addition to Ireland's energy infrastructure, and is expected to commence operations in late 2012. It will import natural gas in liquid form by ship, store it and regasify it for supply into Ireland, to complement supplies through the UK-Ireland interconnectors and indigenous sources.

The peak send-out capacity of the terminal will initially be 17 million standard cubic metres per day (mcmd), with the potential to increase this to 28.3 mcmd. Subject to market conditions, Shannon LNG could put 4.3 billion cubic metres (bcm) per annum into the Irish market for the base case terminal, and 7.2 bcm per year for an expanded terminal.

Ireland is situated within economic transportation distance of 70% of global gas reserves[2], which at current production levels will last for in excess of 60 years[3]. Shannon LNG will make it possible to source natural gas from a diverse range of countries and suppliers, and specifically countries other

[1] This has been acknowledged in a number of recent policy documents, including The National Development Plan 2007-2013, The Energy White Paper 2007, Forfás Annual Competitiveness Report 2006, The All-Island Energy Market Development Framework 2004, The All Island Joint Gas Study (due late 2007).

[2] Robbi Luxbacher, director Europe, ExxonMobil Gas & Power Marketing, *Risks Facing Europe in a Global Gas Market*, Presentation given by at European Autumn Gas Conference., London, November 22, 2005. http://www.exxonmobil.co.uk/UK-English/Newsroom/UK_NR_Speech_RL_221105.asp

[3] BP Statistical Review 2007. At the end of 2006, the natural gas reserves-to-production ratio stood at 63.3. http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/reports_and_publications/statistical_energy_review_2007/STAGING/local_assets/downloads/pdf/table_of_proved_natural_gas_reserves_2007.pdf

than those from whom we will source supplies by pipeline. Shannon LNG can thus be expected to significantly improve Ireland's security and diversity of supply, as well as bringing a number of other economic benefits.

In view of this, DKM Economic Consultants have been commissioned by Shannon LNG to assess the socio-economic benefits to Ireland of the project[4].

The report is set out as follows:

Section 2 describes the market context for the project.

Section 3 analyses the economic benefits to Ireland of Shannon LNG.

Section 4 considers how the national benefits filter down to the regional and local level.

Our conclusions are in the Executive Summary at the front of the report.

[4] This is one of two reports commissioned on the project, the other being a study of the competition aspects of Shannon LNG: Article 22 Analysis of the Shannon LNG Terminal, The Brattle Group, July 2007.

Section 2: Market Context

This section of the report examines recent demand and supply trends and possible future scenarios. This is followed by a discussion of recent trends in gas prices and security of supply issues.

2.1: Gas Demand & Supply – Trends and Prospects

Recent Trends

While economic growth is a major driver of energy demand, the two have decoupled somewhat in recent years. Total energy usage has increased by on average 2.7% per annum over the past decade compared with 6.5% per annum growth in GNP.

However, gas demand over the period has increased on average by 5.9% per annum, almost in line with GNP growth, with the result that gas has been rapidly increasing its share of the total energy market.

A major driver has been the growth of gas-fired electricity generation. Gas accounted for 27% of Ireland's Total Primary Energy Requirement (TPER) in 2006, compared with oil at 52% and coal at 12%. In the case of powergen, however, gas accounted for 49% in 2006 compared with oil at 14% and coal at 24%[5].

Future Prospects

The most detailed projections for gas demand and supply in the Irish economy are presented in the annual Gas Capacity Statement (GCS) published by the CER. The 2006 GCS projects demand growth out to Winter 2012/13 as follows[6]:

[5] In 2006 alone demand from powergen increased by 18.4% due to the commissioning of new gas-fired power stations by Tynagh Energy Limited (384MW) and Aughinish Alumina (161MW). Further gas plant capacity will be added in the fourth quarter of 2007 with the addition of Huntstown 2 (401MW).

[6] Other projections have been produced by the ESRI Medium Term Review December 2005 and Sustainable Energy Ireland Energy in Ireland 1990-2025, November 2006.

Table 2.1: Projected Annual Growth in Gas Demand 2006/07 to 2012/13

2006/07	11.1%
2007/08	16.5%
2008/09	4.0%
2009/10	7.1%
2010/11	2.9%
2011/12	-0.6%
2012/13	2.0%
2006/07to 2012/13 average	6.0%

Source: GCS 2006, CER.

The pressures of environmental policy and the current economics of electricity generation mean that for the foreseeable future all new thermal generation plant is likely to be gas-fired. Further contributory factors include:

1. The planned closure of 1,300 MW of oil-fired capacity by the ESB at Tarbert, Great Island and Poolbeg.

2. With the increased use of renewables for powergen, particularly wind, the requirement for back-up generation will increase[7].

3. Beyond 2020 older plant like Moneypoint will be approaching the end of their useful lives and that capacity will require replacement.

As a result, it is estimated that two-thirds of non-renewable capacity will be dependent on gas by 2013[8]. This is leading to some concerns that the sector could become over-dependent on gas (see Section 2.4). However, the availability of LNG would reduce concerns about fuel diversity in the Irish powergen sector.

Beyond 2012/13, we estimate that gas demand will grow by 2.5% per annum out to 2019/2020, and by 1.2% per annum thereafter to 2029/30.

[7] The Report 'Impact of Wind Generation in Ireland on the Operation of Conventional Plant and the Economic Implications' from ESB National Grid (February 2004) concluded: "The capacity credit of wind powered generation (WPG) has been confirmed to be considerably less than that of conventional thermal plant, and declines incrementally to saturation. Therefore as WPG increases additional or 'surplus' generation capacity is required if security of supply is to be maintained. There are significant costs associated with having 'excess' capacity on the system. Therefore the capacity surplus that results from WPG adds to the total generation costs" (Page 36).

[8] Independent TSO Eirgrid Generation Adequacy Report 2007-2013, December 2006.

Projections for the Island of Ireland

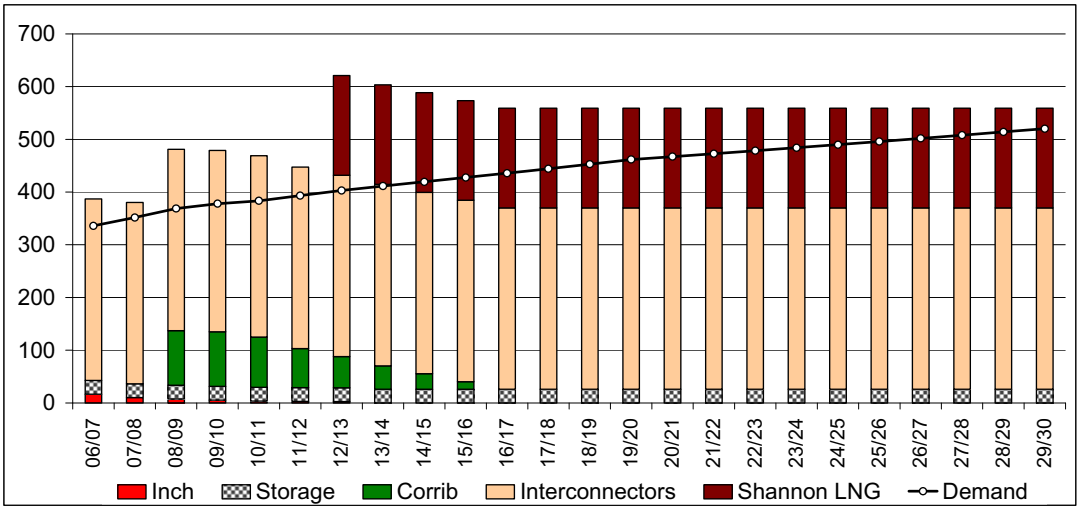
Over the medium term, it is appropriate to consider the market for the island of Ireland, given the interconnection between the two markets, their dependence on the same import infrastructure and the intention of the two Governments to create a single gas market for the island[9].

Figures 2.1 and 2.2 summarise our peak day and annual demand and supply capacity forecasts for the island of Ireland, out to 2030 (supply capacity as per the CER Gas Capacity Statement 2006).

Based on our projections for the ROI market (see above) and the NI projections generated by Brattle (2007)[10], we estimate that total gas demand on the island of Ireland will grow by just over 2% per annum to 2012/2013, and by 1.5% per annum thereafter.

Figure 2.1 illustrates that, assuming Corrib and Shannon LNG come on stream and no additional pipeline capacity, there continues to be a surplus of peak-day supply capacity over peak-day demand until 2029/30.

Figure 2.1: All-Island Gas Supply Demand Balance– Peak Day (GWh/day)



Source: CER *Gas Capacity Statement 2006* and The Brattle Group (2007) to 2012/13, except demand post 2012/13, estimates from DKM.

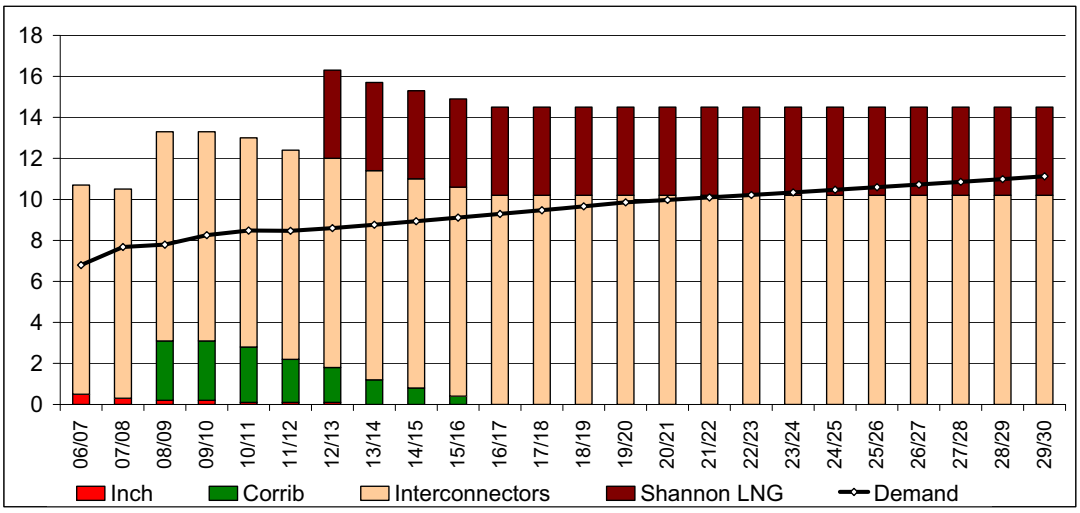
Without Shannon LNG, and even if Corrib comes on-stream as planned, there would be a capacity shortage as early as 2013/14. Thus there would be a requirement for new gas infrastructure by 2013/14.

[9] This is to follow the creation of a single electricity market on the island, to commence in November 2007.
[10] *Article 22 Analysis of the Shannon LNG Terminal*, The Brattle Group, June 2007

2.2: Recent Trends in Wholesale Gas Prices

Given Ireland's dependence on imports through the Scotland interconnectors, for current purposes we can say that Ireland and the UK effectively form a single gas market, and the gas price facing the Irish market is determined at the national balancing point (NBP) in the UK[11].

Figure 2.2: All-Island Gas Supply Demand Balance – Annual Data (bcm/year)[12]



Source: CER *Gas Capacity Statement 2006* and The Brattle Group (2007) to 2012/13, except demand post 2012/13, estimates from DKM.

Gas prices have increased considerably over the past three years due to a range of factors, including rising oil prices, the decline in UK gas production, weather and security of supply concerns.

Figure 2.3 reviews UK wholesale gas prices since October 2004. The halving of prices since the peak in Winter 2005/2006 is due primarily to the commissioning of the Langeled pipeline, which delivers Norwegian gas to the UK. This highlights the potential of large new supply to reduce market prices. A number of projects are underway or planned reflecting that will add further gas import and storage capacity in the UK over the coming years. These developments reflect ongoing UK concerns over security of supply[13].

[11] One might argue that, given the UK's own increasing dependence on imports and integration into the Continental gas market, the relevant market for our purposes actually extends beyond Ireland and the UK.

[12] Assuming an energy content of 40 MJ per standard cubic metres, 1 bcm is equal to approximately 11,100 GWh.

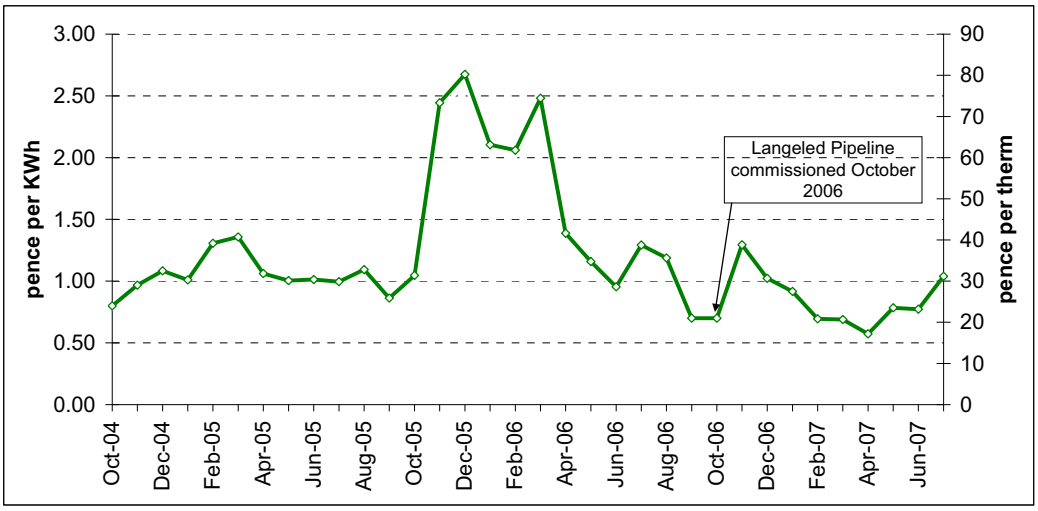
[13] These developments, however, will only have limited benefit for Ireland in terms of security of supply, as our dependence on other countries for supply will be unchanged.

2.3 Security of Supply

Importance

Given the importance of gas as a basic economic commodity and the variability of demand, security of gas supply is an essential economic requirement. Security of supply in the broad sense incorporates diversity and flexibility of supply. Diversity of supply is addressed by securing gas availability from a range of independent sources. Flexibility of supply is addressed by putting in place adequate system capacity to meet peak demand[14].

Figure 2.3: UK Wholesale Gas Prices Oct 2004 – July 2007 (monthly average)



Note: Prices are in £ Sterling and are the system average. *Source: National Grid*

The need for flexibility of supply arises because natural gas, in common with electricity, is a basic commodity that has to be available "on tap" in the quantities required at each moment of the day. Also in common with electricity, demand displays strong seasonal, daily and within-day variations. This is being reinforced by two trends in gas demand:

1. The increasing market share of natural gas as a primary energy source in powergen. The large seasonal, daily and hourly swings in electricity demand are thus increasingly falling on gas-fired plants. These plants will in turn require more flexible natural gas supplies.

2. Greater dependence on wind power generation requires an increased level of flexible back-up generation capacity, to fill the gap when the wind is not blowing. This capacity will largely be provided by gas-fired stations, which will further increase the need for flexibility in gas supply.

[14] DIRECTIVE 2003/55/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2003 also defines 'security' as incorporating technical safety. Technical safety includes, for example, maintenance of sufficient pressure through the system at all times.

Security of Supply in the Irish Market

The Irish market is particularly vulnerable to security of supply concerns, as a net importer of natural gas (and other fuels), and as a price taker at the western end of the European pipeline network. Currently, 90% of Ireland's total gas requirements are imported, as the Kinsale Head and Seven Heads fields approach the end of their operational lives. Imports will continue to meet a high proportion of our needs even after the Corrib field comes on-stream (Figures 2.2 and 2.3).

Ireland currently relies on the UK for 90% of its gas supplies but the UK itself became a net importer of gas in 2005. The most recent *Gas Transportation Ten Year Statement* from the UK's National Grid forecasts that:

- The UK will have an import dependency of 77% by 2015/16;
- By 2025 over 70% of EU gas demand will be imported;
- Russian gas will be meeting over 30% of this demand, with Algeria and Norway meeting approximately 14% each.

As the UK must draw its gas supplies from ever further afield over time, Ireland's vulnerability is heightened. We have noted already that a number of LNG terminals have been established or are planned in the UK, to cater for their ongoing import requirements.

Increasing dependence on imports is a common theme across the EU: in 2005 ten Member States met all their gas requirements from imports and a further four States imported between 90 and 100% of their gas. Of the EU25 only Denmark and the Netherlands are net exporters[15]. In common with the UK, a number of other European countries currently have proposals for LNG terminals[16]. It is in this context that an LNG terminal in Ireland is being proposed.

2.4 Summary

Ireland is a rapidly growing economy and society. Demand for natural gas has been increasing strongly over the last decade, and growth is expected to continue into the future for a range of technical, economic and environmental reasons, particularly in the powergen sector.

While our demand for gas grows, so too will our dependence on imports, and the uncertainty surrounding the security of these imported supplies. Ireland's growing import dependence is mirrored in the UK and across Western Europe. Most other countries with high import dependence rely on LNG capacity to help meet their demand, and a number of EU Member States are investing in further LNG terminals to improve storage capacity and address security of supply concerns. This gives the context for the proposed LNG terminal in Ireland.

[15] Eurostat 2007, European Gas Market Indicators of the Liberalisation Process 2005-2006.
[16] Including proposed projects in Germany, Poland, Netherlands and Italy (UK National Grid Gas Transportation Ten Year Statement 2006).

Section 3: Economic Benefits to Ireland

A range of benefits will flow to the Irish economy from the Shannon LNG project. In this Section we consider the following:

1. Impact on Gross National Product (GNP)
2. Exchequer impacts
3. More competitive gas prices
4. Security and diversity of supply
5. Benefits in the electricity market
6. Environmental benefits.

The GNP and Exchequer impacts can be estimated quantitatively, while benefits 3 to 6 are discussed more qualitatively, with illustrative values given. They will also have positive impacts on GNP, additional to those quantified here under benefit 1. The Exchequer impacts form part of the GNP benefits, as they are levied on these benefits.

3.1 Impact on Irish GNP

GNP is benefited during both the construction phase of the project and the subsequent operational phase. There are three kinds of GNP impacts – direct (in Shannon LNG itself), indirect (in firms supplying Shannon LNG) and induced (in the wider economy). See box overleaf for further discussion.

Impact during Construction Phase

It is estimated that Shannon LNG will cost in the region of €500 million (2007 prices), with construction commencing in 2009 and the facility becoming operational in time for the Winter 2012/2013 (a construction period of 42 months). The investment will be in the form of Foreign Direct Investment (FDI) into Ireland, and is estimated to split 60:40 between Irish and imported spend[17], i.e.

[17] The average import content of construction work in Ireland is 29%, according to the CSO's 2000 Input-Output Tables. However, Shannon LNG would not be a typical construction project, and would include a large element

€300 million on Irish materials, services and labour, and €200 million on imports. Of the Irish spend, some €60 million represents labour costs[18].

Measuring Economic Activity

A range of terminology is used in this report to measure economic activity, namely GDP, GNP and GVA.

GDP or Gross Domestic Product is the value of output generated in Ireland. **GNP** or Gross National Product is the value of output accruing to Irish residents; it differs from GDP because it excludes the profits of foreign-owned firms operating in Ireland, and includes profits of Irish-owned businesses overseas.

In most countries these two flows more or less cancel each other out, so GDP and GNP are interchangeable, and the most often-quoted figure is GDP. Given the nature of the Irish economy, however, GNP and GDP vary considerably, and GNP is generally considered a better measure of economic well-being.

GVA or Gross Value Added is basically GDP at individual business level, and comprises payroll plus profit before depreciation and tax. The sum of GVA for all businesses in the State equals GDP.

When evaluating the economic impact of a project such as Shannon LNG, we measure the additional GVA, i.e. the additional income, it generates. This can be considered under three headings:

a) Direct - generated in Shannon LNG itself (excluding profits except to the degree they are subject to tax, as Shannon LNG is not Irish-owned).
b) Indirect - generated in the Irish businesses supplying Shannon LNG.
c) Induced - further economic activity as the incomes generated in a) and b) are spent elsewhere in the economy.

This represents the indirect impact (there is no direct impact during the construction phase as Shannon LNG itself is not operational at this point). To this must be added the induced impact. An often-used rule of thumb for this multiplier is 1.5, i.e. for every €1 of income spent, another 50c is added to net economic output[19]. On this basis the induced impact would be €300 million x 0.5 = €150 million, to give a total impact of €450 million.

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of specialised imported plant. In discussion with Shannon LNG, we believe 40% is a reasonable estimate of the import content for the project.

[18] Based on average construction wages per CSO Earnings & Hours Worked in Construction Q2 2007.

[19] The Department of Finance Proposed Working Rules for Cost Benefit Analysis (1999) recommend when carrying out socio-economic Cost Benefit Analysis of a publicly funded project, that direct, indirect and induced effects should be valued net of displaced economic activity elsewhere in the economy. Where the economy is fully employed, such displaced activity (or opportunity cost) would be close to or equal to the value of the effects from the project in question.

Our analysis of the impacts of the Shannon LNG project does not take into account displaced economic activity elsewhere in the economy, for two reasons: (i) the project is a private sector Foreign Direct Investment, so it does not displace domestic capital; (ii) with freedom of movement of labour there is greater scope for Irish

Assuming the expenditure takes place evenly over the three-and-a-half year construction period, the project will increase Irish GNP by €129 million per annum, as follows[20]:

TABLE 3.1: Impact on GNP During Construction Phase

	Total € Million	Per Year of Construction € Million
Total Construction Cost	500	143
Less: Imported Element	200	57
Indirect Impact	**300**	**86**
Induced Impact	150	43
Total Impact on GNP	**450**	**129**
Indirect Impact made up of		
Payroll	60	17
Non-Payroll	240	69

Source: Shannon LNG, CSO, DKM estimates

Section 2 of this report highlighted that in the absence of Shannon LNG, there would be capacity shortages in the Irish gas market by 2013/2014. Therefore some other investment would need to be put in place. The most likely alternative is that Ireland would attempt to meet its increasing long term gas demand through reinforcement of the UK-Ireland interconnectors.

The 2006 Gas Capacity Statement (GCS) highlights the specific investments needed to achieve this, estimated to cost €215 to €245 million in total. This investment would be by an Irish company (Bord Gáis Networks), in physical assets in Scotland. As such, it would have no impact on Irish GNP in the years of construction.

Impact during Operations

Shannon LNG will generate additional Gross Value Added (GVA) directly and indirectly in the Irish economy. Annual spend during operations will be approximately €30 million per annum.

Benefits will be generated over the project lifespan, which for current purposes we take to be 30 years. In reality the lifespan of the project is likely to be considerably longer[21], so the estimates here can be considered conservative.

labour supply to increase in response to increased demand, and thus there is less likelihood of displacing domestic labour.

[20] This effectively uses the Expenditure method of measuring GNP, as opposed to the Output method, which would aggregate Gross Value Added (GVA) from all the inputs to the project (direct and indirect). The two methods give the same result, but the expenditure method is more convenient when measuring capital investment.

[21] The project sponsors estimate a lifespan of in the region of fifty years.

As indicated in the box on p.11, GVA is effectively made up of profits plus payroll, i.e. the additional incomes generated in the economy, and comprises Direct, Indirect and Induced effects. We estimate that these three impacts will add approximately €33 million per annum to Irish GNP.

Summary of GNP Impact

In summary, we estimate that Shannon LNG will add in the region of €129 million per annum to Irish GNP during its construction phase, and €33 million per annum during its operational phase (in 2007 prices).

On this basis the benefit to Irish GNP of the Shannon LNG project over 30 years will be approximately €1.35 billion (in 2007 prices). The present value of this benefit, using BGÉ's regulated cost of capital of 5.2%, is roughly €820 million.

3.2 Exchequer Impacts

The Exchequer will benefit from Shannon LNG in the form of increased revenues under the following headings - Corporation Tax, Income Tax/PAYE/PRSI, and Commercial Rates (i.e. local property tax)[22].

Table 3.2 sets out in summary our estimates of the additional Exchequer revenues as a result of Shannon LNG.

Table 3.2: Estimated Exchequer Impact of Shannon LNG, Per Annum

	Construction Phase € million	Operational Phase € million
Corporation Tax	1.1	5.2
Income Tax/PAYE/PRSI	15.0	5.8
Commercial Rates	-	2.0
Total	**16.1**	**13.0**

The value of this benefit to the Exchequer prices over a 30 year lifespan is approximately €410 million, in 2007 prices. The present value of this benefit is approximately €210 million (using a discount rate of 5.2% for consistency with the estimate of the GNP impacts).

[22] We do not consider the impact of VAT since Shannon LNG will be registered for VAT and will be able to reclaim all the VAT on its expenditure, and we assume that Shannon LNG will not sell to residential consumers, and thus the VAT it charges will also be recoverable.

3.3 More Competitive Gas Prices

As discussed in Section 2, Ireland and Britain effectively form a single gas market, and the price facing the Irish market is determined at the national balancing point (NBP) in the UK. Section 2.2 also highlighted the very considerable impact of new supply in the UK on market prices.

Shannon LNG will add supply into the Ireland/UK market, and as such will have a beneficial impact on price. However, as discussed in Brattle (2007)[23] the impact is likely to be modest in the context of the overall market.

Any reduction in gas prices will reduce general costs in the economy, and will make it more attractive to convert to natural gas, with environmental and other benefits.

Should difficulties arise with supply through the UK, itself now a gas importer, Shannon LNG will have a considerable beneficial impact, maintaining supply and keeping prices lower than they would otherwise be. The security of supply benefits are discussed in more detail below.

As an indicator of the potential impact under this heading, we estimate that the total expenditure on buying gas in 2006 in Ireland was approximately €850 million (gas supply excluding transmission). Thus even a 1% reduction in gas prices would reduce costs in the economy by €8.5 million per annum.

3.4 Security of Supply

3.4.1 Economic Impact

Section 2.3 discussed the importance of security of supply, including the need for diversity and flexibility of supply.

The internal strength of the Irish gas grid will be improved significantly by the presence of Shannon LNG. It represents an additional major input to the grid in the South-West of the country, and this will become more important as the Kinsale/Seven Heads fields continue to run down. It will also improve the viability of supplying parts of the country not currently receiving gas (e.g. Tralee, Killarney, Listowel).

Perhaps more importantly, Shannon LNG represents a significant improvement in Ireland's external security and diversity of supply. It will be a new supply input that can source gas from any one of a number of international locations, including many not previously available to Ireland and the UK. Unlike an indigenous gas source, this capacity is only limited by the worldwide LNG supply capacity, and is thus subject to depletion only at the same rate as global reserves.

The alternative investment, i.e. reinforcing the UK-Ireland interconnectors, increases pipeline capacity, but does not improve security of supply to anywhere near the same degree as Shannon LNG, because: (1) it impacts on an existing input to the system, so any security issues upstream of that point are not addressed, and (2) it generates no improvements in diversity of supply.

[23] Article 22 Analysis of the Shannon LNG Terminal, The Brattle Group, June 2007.

Shannon LNG will also address the flexibility of supply issue by enhancing the Irish peak supply system capacity more effectively:

1. By siting an LNG terminal within Ireland, the need for additional Interconnector capacity to meet peak day requirements, and which would otherwise be unutilised, would be avoided, and costs to the Irish consumers minimised.

2. The LNG terminal has a potential to provide more reliable pressure to the system as it is located closer to the point where pressure is required. This would be cheaper than pressure provision at more remote locations.

Over time, the security benefits of Shannon LNG will increase, as Western European gas sources decline, and the gas coming into the Irish market from Scotland is sourced from ever more remote origins. The risk and consequences of disruption, whether natural, technical or political, will heighten, and Shannon LNG will provide an increasingly important additional source of gas. In this context Shannon LNG may also contribute to a postponement of consideration of nuclear power in Ireland.

Thus Shannon LNG provides the Irish economy with an "insurance policy" against supply disruption, which is better than the insurance gained by reinforcing the UK-Ireland interconnectors. Apart from the better security that can be delivered, the cost implications are potentially lower, as expanded on in Table 3.3 overleaf.

It is difficult to isolate *ex ante* the monetary value of the security of supply benefits of Shannon LNG, but one can imagine the impacts of a serious disruption in gas supply through the interconnectors, where the economy is solely or primarily dependent on their supply.

As an indicator of the potential impact, a 2006 report for the UK Department of Trade & Industry assessed the economic cost of gas supply interruption in the UK[24]. It estimated the short term cost of a 3-6 week supply interruption at between 0.18% and 0.81% of UK GDP. Further long term costs would arise for certain heavy industries where production stoppages cause damage to plant.

One cannot translate this figure directly to an Irish context because of differences in industrial structures and in particular lower diversity of energy supply in Ireland (i.e. no nuclear). However, as an illustration, an interruption that caused a 1% reduction in Irish GNP would cost the economy approximately €1.5 billion (based on 2006 GNP).

[24] ILEX ENERGY Consulting (2006), Economic Implications of a Gas Supply Interruption to UK Industry, report for DTI.

Table 3.3: Security of Supply & Cost Implications Comparison: Shannon LNG, Indigenous Gas and Interconnectors			
	Shannon LNG	**Indigenous Gas**	**Interconnectors**
1) Gas supply	Can provide better security of supply (compared to Interconnectors) and diversity of supply (compared to Indigenous)	Best option for national interest but constrained by lack of exploration success and by production profile (volume and life)	Supply of gas needs to be addressed separately. Gas availability is subject to UK Supply/Demand circumstances.
2) System capacity			
2.1) Pipelines	Minimisation of investment in very low utilisation capacity by shortening length of pipeline (i.e. siting within the market)	length not controllable - determined by location of production	Longest pipeline system including pipelines in the UK. Therefore entails larger low utilisation capacity. Very expensive per unit of transportation capacity.
2.2) Pressure	Can be provided as required. Pressure provision point is within the market.	Can provide pressure as long as production continues	Can be provided as required. Pressure provision point is in UK and thus is subject to external risks.
Potential impact on prices for Irish gas consumers	Investment costs largely absorbed by Shannon LNG in order to be competitive in market; therefore **no price increase, potential price fall;**	Investment costs largely absorbed by producer in order to be competitive in market; therefore **no price increase, potential price fall;**	Investment costs will be passed on to consumers, leading to **price increase**.

EU Policy

The EU has taken a strong interest in the question of gas security and storage capacity in Member States, as demonstrated in the EU Security of Gas Supply Directive (2004)[25] the EU Energy Green Paper (2006)[26] and a Staff Working Paper on regulation of the gas and electricity sectors (2007)[27].

The Security of Gas Supply Directive states that "The completion of the internal gas market necessitates a minimum common approach to security of supply", and It sets the following minimum "security of supply standards":

"Member States shall ensure that supplies for household customers inside their territory are protected to an appropriate extent at least in the event of:

a. a partial disruption of national gas supplies during a period to be determined by Member States taking into account national circumstances;

b. extremely cold temperatures during a nationally determined peak period;

c. periods of exceptionally high gas demand during the coldest weather periods statistically occurring every 20 years."

These standards apply in the first place to residential customers, but Member States have the option to extend them to others who cannot switch their energy consumption from gas.

The Directive lists a number of mechanisms for meeting the security of supply standards, including gas storage, and pipelines, as well as diversification of supply sources. The Directive recommends that each State should set minimum targets for gas storage.

Member States must report on the levels of gas storage capacity and incentive mechanisms they have in place for LNG, and they are required to enact the requirements of the Directive by May 2006, and to report to the Commission the actions taken.

The Energy Green Paper notes that the EU dependence on imports is rising, in many cases on supplies from regions affected by insecurity. Section 2 of the paper highlights six priority areas for action, including a new legislative proposal concerning gas stocks.

The Staff Working Paper reiterates the benefits of LNG from the point of view of security and diversity of supply and of promoting competition:

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[25] COUNCIL DIRECTIVE 2004/67/EC of 26 April 2004 concerning measures to safeguard security of natural gas supply

[26] COM (2006) 106 final. A European Strategy for Sustainable, Competitive and Secure Energy

[27] Brussels, 10.1.2007 SEC(2006) 1724 VOLUME III COMMISSION STAFF WORKING DOCUMENT Accompanying the COMMUNICATION FROM THE COMMISSION Inquiry pursuant to Article 17 of Regulation (EC) No 1/2003 into the European gas and electricity sectors (Final Report) {COM(2006) 851 final} C. SECOND PHASE OF THE SECTOR INQUIRY.

"A number of factors explain the interest of many energy companies in importing LNG and that of governments in facilitating such investments –

- First, it allows diversification of their gas purchasing portfolio, thus contributing to a diversification of sources of imported gas.
- Second, the flexibility potential of LNG can contribute to developing spot markets.
- Third, LNG can be beneficial in optimising the performance of grids.
- Fourth, LNG can be an option for supplying geographical regions far from existing gas grids."

The Austrian Presidency of the EU in 2006 placed a strong emphasis on energy policy. A press release by the Presidency highlighted that Ireland has one of the lowest levels of gas storage in the EU, and welcomed a proposal from the Energy Commissioner that each country should have stocks to bridge at least two months' consumption[28].

3.4.3 Irish Government Policy

The Irish Government also places significant weight on the importance of security of supply, as expressed notably in the March 2007 White Paper *Delivering a Sustainable Energy future for Ireland – the Energy Policy Framework 2007-2020*. The paper lists a number of Strategic Goals to ensure security of energy supply, and actions to achieve these goals, including:

- Setting "an explicit security of supply standard for the natural gas system from 2008";
- Investing in the "gas network for security of supply .... through BGÉ's investment programme of over €1.7 billion under the NDP";
- "Actively encourage(ing) private sector interest in investing in gas storage facilities and LNG and review(ing) the potential role for Government intervention in the event of market failure";
- "Putt(ing) in place an all-island strategy by 2008 for gas storage and LNG facilities".

These point to the importance the Government places on the issue, particularly in terms of BGÉ investing to improve security of supply and the Government intervening in the market if there is a perceived market failure. It is clear that the Government places a high economic value on security of supply, albeit it is difficult to place a monetary value on this.

[28] http://www.eu2006.gv.at/en/News/Press_Releases/January/0901bartenstein.html?month=3&day=1

3.5 Benefits in the Electricity Market

The electricity market potentially benefits from Shannon LNG due to more competitive gas prices and improved diversity and security of supply. As indicated above, we believe the impact of Shannon LNG on gas prices is likely to be modest. However, it will materially improve diversity and security of supply, in a market where power stations are the largest consumers.

Better diversity and security of supply will reduce uncertainty in the market, and thus reduce the cost of capital in the power generation sector. This should encourage new investment in power generation, which will lead to additional cost reductions through greater technical efficiency. It will also indirectly improve reliability of electricity supply.

Increasing competition generated by new entrants and the actions of the CER should lead to these cost reductions being passed through to electricity consumers.

As with security of supply, it is difficult to place a monetary value on this benefit. As an illustration, however, we estimate that the aggregate sales value of electricity Ireland in 2006 was approximately €3 billion. A 1% reduction in price would thus reduce costs in the Irish economy by €30 million per annum.

3.6 Environmental Benefits

Natural gas is a relatively benign fuel from an environmental point of view, generating fewer CO_2 and NO_x emissions than other fossil fuels, and no SO_2 emissions. Therefore to the degree that the Shannon LNG project encourages a switch to natural gas, environmental benefits will ensue. This could happen because Shannon LNG's entry to the market -

(i) lowers gas prices in Ireland,

(ii) enables or strengthens supply to certain parts of the country, or

(iii) Increases security of supply, reducing uncertainty particularly in the power generation sector, and encouraging new entrants.

As indicated, we believe the impact of Shannon LNG on price may be modest, but extending supply and increasing security could have a sizeable impact.

Apart from the values attached to reduced emissions, there are also benefits in terms of meeting various international environmental obligations, including the EU Large Combustion Plant (LCP) Directive[29] and the EU National Emissions Ceiling (NEC) Directive[30].

[29] 2001/80/EC.

[30] 2001/81/EC.

3.7 Summary

We estimate that a wide range of benefits will flow to the national economy from the Shannon LNG project, most importantly:

- Impact on Gross National Product (GNP)
- Exchequer impacts
- More competitive gas prices
- Security and diversity of supply
- Benefits in the electricity market
- Environmental benefits.

We conservatively estimate the benefit to Irish GNP over a 30-year timeframe will be approximately **€1.33 billion** (in 2007 prices, discounted present value approximately €820 million). The benefit to Exchequer revenues would be conservatively **€400 million** (discounted present value €210 million). In addition, as a private sector Foreign Direct Investment into Ireland, the project risk is not being absorbed either by Irish consumers or by the State.

The presence of Shannon LNG should have some downward impact on gas prices, by increasing supply and competition in the Ireland-UK market, albeit the impact is likely to be modest given the overall size of the market. That said, recent experience in the UK highlights the potential of new supply to have a considerable impact on price, as demonstrated in Section 2.2.

Improved security, diversity and flexibility of supply is a major benefit. In the event of supply disruptions elsewhere, Shannon LNG would generate substantial benefits for the economy in terms of maintaining supplies and moderating prices.

These benefits should furthermore improve the economics of electricity generation and encourage an increased switching from other fossil fuels to gas, with concomitant environmental benefits.

Section 4: Regional and Local Benefits

In this chapter we assess how national benefits filter down to the regional and local level. We consider expenditure and employment impacts, more general benefits from the availability of natural gas, and the regional and spatial development context.

4.1 Regional Employment and Expenditure Impacts

These consist of benefits arising from construction and ongoing operations, as well as the various multiplier effects from local expenditure. The impacts are summarised below.

4.1.1 Employment/Payroll

There will be a considerable employment impact from the development of Shannon LNG, both in its construction and long-term operations, as indicated in Section 3.

Construction Phase

It is estimated that the labour cost element of the construction of the Shannon LNG Terminal will be €60 million over three and a half years, i.e. €17 million per annum. There would be, on average, 350 persons working on the site (peak 600). Inevitably a largescale project of this nature will have some requirement for specialist workers that may not be available locally. However, a high proportion of the workforce is likely to come from the surrounding region - Kerry, Cork, Limerick and Clare. Thus the project will have a significant employment impact at a regional level. Using reasonable norms for proportions of income spent locally we estimate that local spending by workers during the construction phase of Shannon LNG would be €7.5 million per annum.

Operational Phase

In ongoing operations, it is estimated that there will be employment for 50 operating staff and 10 general and administration (G&A) staff, with a further 40 spin-off jobs. The total Shannon LNG payroll is estimated at €5.4 million per annum with a further €2 million per annum on spin-off employment. Over the long run, it is likely that most of these employees will move to the Tarbert/Ballylongford area and surrounding towns, and will generate significant local benefits. Using the same approach as for the construction phase, we estimate that the annual regional expenditure in the operational phase would be €3.9 million.

4.1.2 Non-Payroll Expenditure

As discussed in Section 3, Shannon LNG will also generate significant non-payroll expenditure.

During construction, there will be an Irish spend of €300 million of which €60 million will be labour. That leaves €240 million in non-wage expenditure, or €68.6 million per annum. Based on discussions with the industry, we would expect approximately 30% of this to be sourced within the region, i.e. €72 million or €20.6 million per annum.

During the operational phase, there will be significant annual expenditure. If we assume that 50% of operating costs and 25% of ongoing capital costs are sourced in the region, in addition to all of the port charges, the total local spend would amount to €10.2 million per annum.

4.1.3 Summary

We have estimated above the spend by Shannon LNG on employment and goods and services in the regional economy (direct and indirect impacts). In addition, there will be a sizeable induced impact, as this expenditure percolates through the local economy and generates further economic activity. The fact that there will be an on-going operation generating significant employment and spending will encourage the establishment of local businesses to serve the requirements of Shannon LNG. In this report we have worked on the basis that the induced impacts represent 50% of the direct/indirect impacts.

Table 4.1 summarises the regional financial impact of Shannon LNG, including the induced impacts.

Table 4.1: Regional Economic Impact of Shannon LNG

	Construction Phase		Operational Phase
	Total	**per annum**	**per annum**
	€ million	**€ million**	**€ million**
Employees Net Local Cash Spend	26.3	7.5	3.9
Non-Payroll Related Local Spend	72.0	20.6	10.2
Sub-total	**98.3**	**28.1**	**14.0**
Induced impacts (50%)	49.2	14.0	7.0
Total	**147.5**	**42.1**	**21.0**

Note: Doesn't sum due to rounding.

Shannon LNG could be expected to generate approximately €148 million in total or €42 million per annum in regional spend while under construction, and €21 per annum when operational.

On this basis the benefit to the regional economy over a 30-year timeframe will be approximately €610 million (in 2007 prices). The present value of this benefit, using BGÉ's regulated cost of capital of 5.2%, is roughly €370 million.

4.2 Local/Regional Benefits from Availability of Natural Gas

In general the introduction of natural gas in a region increases the options for businesses and households with regard to energy source. New businesses and households establishing in the region are very likely to choose gas as their energy source, and a proportion of existing ones would switch to gas over time.

The location of Shannon LNG at Ballylongford is 25km from the existing national grid, so the facility does not extend the national grid greatly, although it would improve the viability of providing gas to towns in Co. Kerry somewhat.

A significant benefit of Shannon LNG, however, as indicated in Section 3, is that it will strengthen the national gas grid in the region. Internal security of supply in the South-West and Mid-West regions will be increased, which will have beneficial impacts on all users in these regions, and would encourage gas-using industry to establish in the region, or existing industry to switch to gas.

One major potential user of natural gas in the region would be an electricity generating plant. There already exists an oil-burning station at Tarbert, which the ESB has recently announced it will close by 2010. The long term prospects for the site are unclear, but it would be an obvious location for a new gas-fired power plant, and this would strengthen the national electricity grid in the region, which would also increase the region's economic attractiveness[31].

As a final point, the *Programme for Government* (June 2007) includes a commitment to introduce a carbon levy over the lifetime of the current Government, with the revenues raised being returned to the economy in the form of reduced general taxes. The size of this tax is not specified, but the Green Party Manifesto for the recent election indicated a carbon levy of €20 per tonne of CO_2. This would have a potentially significant impact on businesses and households, depending on the fuel they use. Oil is approximately 35% more carbon intensive than natural gas, and coal and peat are over 70% more carbon intensive. The ability to convert to natural gas thus has the potential to directly reduce the cost of living and doing business in the region.

4.3 Regional Development Context

The National Spatial Strategy (NSS) designates both Tralee and Killarney as linked hubs, towns that are earmarked to act as a supporting role to the Gateways and in turn to energise smaller towns in the region. The two towns are seen as having significant synergies in terms of employment, tourism and higher education.

The *Kerry County Development Plan 2003-2009*[32] has as one of its strategies to promote the development of the Tralee-Killarney Corridor "as a means of strengthening the economic base of the

[31] The coal-fired plant at Moneypoint, the largest power station in the country, is situated across the estuary from Ballylongford, but it exclusively supplies the eastern region of the country.
[32] http://www.kerrycoco.ie/planning/devplan03.asp

county and acting as a focus for inward development" (p.14), and as "an economic driver for the county" (p.17). It also includes Castleisland as part of a growth axis with Tralee and Killarney (p.59).

The 2006 *Gateway Investment Priorities Study*[33] for the designated gateways under the NSS examined their investment needs and the critical requirements for economic success. The key characteristics of a successful gateway were defined under five headings, one of which was economic infrastructure[34]. This was defined as "good basic infrastructure, including public infrastructure in areas of transport, communications, water, waste, housing and energy".

The study also concluded that there is substantial agreement among researchers and policymakers internationally on the factors that contribute to competitiveness. Infrastructure broadly defined is highlighted as a critical factor for delivering regional competitiveness and economic development.

The importance of high quality infrastructure for regional economic growth is further underlined by the Chief Executive of IDA Ireland[35], who recently stated that Ireland had not "lost any significant investment because of the quality of our infrastructure but it is difficult to sell some regional locations for the really high quality investments because of limitations in infrastructure".

The Enterprise Strategy Group report *Ahead of the Curve* (2004) profiles Ireland's enterprise/industrial base, currently and in the future. Three categories dominate:

1. Internationally Traded Services - notably financial and software sectors;

2. High Value-Added Manufacturing, with fewer numbers than in the past and employing mainly highly educated and skilled workers;

3. Domestically-Traded Sector - mainly business/financial, distribution and consumer services. This sector accounts for the majority of employment in the Irish economy.

It is probably fair to say that the energy priorities of these sectors are more likely to focus on a high quality electricity supply than on a gas supply *per se*. That said, a strong and secure energy supply is a prerequisite to continued national and regional development, and Shannon LNG will make a significant contribution to this going forward. More specifically, a strong and secure supply of natural gas is a prerequisite for adding power generation capacity in a particular region[36], and given Ireland's ongoing need for new power generation capacity going forward, Shannon LNG will help underpin the medium to long term economic growth of the South-West and Mid-West of the country.

[33] Implementing the NSS: Gateway Investment Priorities Study, Fitzpatrick Economic Associates & Brady Shipman Martin, International Centre for Local and Regional Development (ICLRD) for the Department of the Environment, Heritage and Local Government, August 2006.
[34] The other four were Enterprise & Economy; Labour Force, Skills & RTDI; Quality of Life; and Local Capacity and Leadership.
[35] Irish Times, 3rd January 2007.
[36] Given the unlikelihood of nuclear power being adopted in the short to medium term at least.