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Foreword
This is the sixth annual Gas Capacity Statement to be produced by the Commission for Energy Regulation. This Statement presents a summary of the analysis and review of the impact of forecasted gas supplies into and gas demand from Ireland’s natural gas transmission system over the next seven years. The Commission has also considered potential trends over the next 20 years, taking account of the request for such an analysis in the Government’s Energy White Paper. By considering a range of possible scenarios the study constitutes our best estimate of the adequacy of the Irish natural gas transmission system to meet demand growth and enable access to European markets.

In a similar way to previous Statements, central demand and supply forecasts for Ireland have been developed, together with a range of demand and supply scenarios to test the ability of the transmission system to operate safely and securely under a range of conditions. The scenarios take account of uncertainties about the future levels of demand and supply in Ireland. Demand forecasts are lower than in last year’s Statement, primarily reflecting the economic downturn in Ireland, and lower forecasts of economic growth, together with improved energy efficiency. The future supply situation is generally stronger than last year, with Shannon LNG having secured planning permission for its terminal, subject to a range of conditions, and the Corrib partners working to agree a new route for a pipeline to the onshore terminal at Bellanaboy, although planning permission is still required for this route. The Commission is also aware of a range of exploration activity off the Irish coast and the potential development of a storage facility at Larne in Northern Ireland.

The report shows, once again, that the high pressure transmission system has sufficient capacity for supplies to meet the reasonable medium-term demand growth of the base case, and that system reinforcement is needed in onshore Ireland only for local demand growth. While the likely timing of development of indigenous gas supplies has become somewhat more certain than last year, there remains a risk of further delays, which could result in capacity limits being reached in onshore Scotland. Consistent with last year’s Statement, the Commission believes that if such issues arise they would be best addressed through performance improvement of operating equipment and commercial incentives to reduce peak-day demand, rather than high cost capital investment.

The Statement highlights a new longer term issue for network development, which may require network reinforcement in the medium to longer term. As more gas supplies are brought into the West coast of Ireland, with the largest centres of demand in the East and South, there are substantial changes to the nature of flows on the network, and in the medium term may lead to situations where adequate operating pressures cannot be maintained. Given that this is not expected to be an issue for a number of years, the Commission is asking Gaslink and Bord Gáis Eíreann to review the options to identify the most cost effective reinforcements, and will review the position for next year’s Statement.

As part of developing Common Arrangements for Gas, the Commission will be liaising with NIAUR in the coming months, with a view to next year’s Statement combining analysis for Ireland and Northern Ireland, while still fulfilling the Commission’s statutory responsibilities.

The Commission would like to thank all who contributed to the development of this Statement, and Bord Gáis Eíreann in particular. We hope you will find the information it provides useful and accessible.
1.0 Section 1 – Introduction

1.1 Background

The Commission for Energy Regulation ("the Commission") is required under Section 19 of the Gas (Interim) (Regulation) Act, 2002, as amended by the European Communities (Security of Natural Gas Supply) Regulations 2007 (S.I. No. 697 of 2007), to prepare and publish a Gas Capacity Statement each year.

This year’s Statement considers forecasts of customer demand for natural gas, the sources of supply and the capacity of the gas transmission system arising from these flows for the period 2007/8 to 2014/15. Its function is to inform market participants, regulatory agencies and policy makers of the adequacy of the Irish gas transmission network in catering for demand growth given expectations about sources of supply. It also provides an indication of likely investment projects required over the Statement period, and whether there are any wider issues relating to security of supply that might require a public policy response by Government, the Commission or other agencies.

Although the primary purpose of this year’s Statement is to fulfil the statutory requirements noted above, the Commission has extended the scope of the Statement in two main ways compared to previous years. First, the new Regulations expand the Commission’s role in monitoring security of supply. Second, recognising the longer term focus for considering security of supply issues requested in the Government’s Energy White Paper last year, the Commission has sought to take a longer term perspective for developments in the gas market, including considering supply, demand and adequacy over a 20-year horizon. Inevitably, the further into the future that developments are considered the greater the uncertainty about the outcomes, so the Statement focuses more on trends than specific forecasts. In preparing this Statement the Commission is conscious of the developments under the Common Arrangements in Gas (CAG) and the intention to produce a joint Statement next year including the Northern Ireland system.

The Commission acknowledges the assistance it has received in producing this Statement from all industry participants, including shippers, gas producers, power producers and large consumers, interested parties and industry observers. In particular, the Commission would like to acknowledge the assistance of Bord Gáis Éireann (BGÉ).
The adequacy of the gas transmission system is determined by future customer demand for natural gas and the ability of the network to transport gas to the specific centres of demand. To date the availability of gas supplies to meet demand levels has not been an issue.

To assess the adequacy of the transmission network, a base case gas demand forecast matched to a supply pattern has been developed for the statutory seven-year period of the Statement. This focused particularly on demand and supply levels for the peak-day. The base cases for supply and demand have been supplemented by alternative scenarios for supply and demand, which recognises the uncertainty associated with some aspects of market developments. Although the base cases for supply and demand, and the alternative scenarios focus on the statutory seven-year period for the Statement, they can be extended into the future, although the reliability of forecasts further into the future will be lower. The detailed modelling of the transmission system using transient network analysis software has been undertaken by BGÉ with oversight by the Commission and its advisers.

For this year’s Statement the Commission has provided BGÉ with inputs and assumptions to forecast demand and supply, and asked BGÉ to use its demand forecasting model to develop the overall forecast. For the demand forecasts the Commission specified the inputs and assumptions relating to:

- The gas-fired power stations assumed to be connected to the network in each year.
- Sources for fuel and commodity prices as required inputs for a merit order model run by BGÉ. Prevailing spot and forward prices for the UK National Balancing Point (NBP) have been used.¹
- Economic growth forecasts supplied by the Economic and Social Research Institute (ESRI), which are used to forecast industrial customer’s requirements for gas.²
- Forecasts for new housing constructions supplied by the ESRI, which are used to forecast residential demand for gas.
- Assessments of the likely impact on residential gas consumption of measures to improve energy efficiency.

The Commission’s advisers³ have reviewed BGÉ’s demand forecasting model, and in particular, the merit order model for electricity generation, and are satisfied it appropriately specifies the inputs and assumptions such that BGÉ’s model may be expected to generate appropriate demand forecasts. The Commission has also considered whether its assumptions regarding power stations are consistent with the discussions it has had with stakeholders in the electricity sector.

¹ The Commission recognises that there is a relatively high degree of volatility of some of these prices, which creates some additional uncertainty, but which can broadly be taken into account by the range of scenarios being adopted.
³ The Commission has been assisting in preparing this year’s Statement by Cambridge Economic Policy Associates (CEPA) and Advanced Engineering Solutions Limited.
The supply and demand forecast is compiled from a number of data sources in addition to consultation with existing and potential market participants. The data sources include:

- the annual questionnaire circulated by the Commission seeking information related to current and projected levels of supply and demand;
- general economic and industry forecasts. In particular, we have used information provided by the ESRI about macro-economic factors and changes in the housing market; and
- from Bord Gáis Transmission (BGT), the number of new load connection enquires and the current year’s operating experience.

Information related to measured daily pressures and profile of consumption have been used to form the first base-year network model, which was then run for the seven years of the Statement, thus making eight years of analysis for the supply/demand scenario. For this year’s Statement, the network modelling has also been extended up to 2020/21 (the limits of the BGÉ model), but recognising the increasing uncertainty further into the future, results have only been reported for a selection of years.

The individual market sectors are combined to form annual demand projections, while corresponding peak-day demands are calculated for 1-in-50 winter peak-day conditions.

Gas supply information obtained from questionnaire responses is primarily used to balance supply and demand on the basis of:

- indigenous gas production and indigenous stored gas being made available first; and
- imported supplies then being used to meet the projected balance of demand level.

The Commission has compared the supply forecasts from the questionnaire responses with BGÉ’s views about supply sources and levels as set out in its Transportation Development Statement. The Commission has sought not to take a view on the commercial viability of projects, but instead where a developer is taking a project forward by seeking the necessary consents and planning permissions the Commission has included the project in its assumptions. Projects at a very early stage of conception, such as potential new gas fields that are currently being explored, have not been included. This is explained further in subsequent sections.

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During the later stages of the preparation of this Statement Shell and its partners updated the projected production level and profile from the Corrib field. These forecasts were received too late to be taken into account in the base cases and scenarios, which are based on the previous forecast production level and profile. Nevertheless, as the updated forecast production level and profile is higher than that used in this Statement, it should in general improve the outlook for security of supply. As discussed further below, a higher production level for Corrib might increase or slightly bring forward in time the pressure issues caused by increased flows from the West of Ireland to demand centres in the East and South West, but slightly higher production levels through Corrib are unlikely to bring forward this effect substantially. Therefore, the issues can be considered again in next year’s Statement using the updated forecast production level and profile.

Any variation in the timing of new indigenous gas sources or in the rates of demand growth will generate different capacity requirements on the network. The approach taken to address the uncertainties in the planning process was to:

- develop central scenarios for demand and supply based on information gathered as described above, conducting a full network analysis to test the adequacy of the system over the relevant time horizons; and
- agree upon a number of scenarios developed by the Commission around the central supply and demand cases.

This Statement creates a ‘high’ and a ‘low’ scenario for both supply and demand, focussing on particular components of each. Specifically these components are:

**Demand** – Different assumptions about the key inputs, including connected power stations, economic growth, new housing and energy efficiency; and

**Supply** – Different assumptions about the timing of new supply and storage sources and the decline of existing supply and storage sources.

We have also considered a ‘resilience’ scenario, in which a range of supply constraints coincide. This scenario is intended to test network resilience under extreme and therefore relatively unlikely (low probability) circumstances.

Using this scenario analysis, the Commission considers whether the system is adequate to cope with a reasonable expectation of demand over the next eight years. The assumptions related to demand growth and specific results of the analysis are described in detail in the relevant section of the report.
Report Structure

Section 2 describes the BGÉ network.

Section 3 provides the central planning case projections for gas demand by market sector.

Section 4 considers the current sources of Irish gas supply, the development of gas storage, the potential for new indigenous sources, and the requirement for gas imports.

Section 5 describes the network simulation and supply-demand scenarios.

Section 6 discusses the conclusions and recommendations arising from the analysis for this year’s Statement, including implications for regulatory policy given 20-year trends, as well as interaction with the UK and EU developments.

Appendix A contains the tables and graphical data from the capacity modelling.

Appendix B explains the model testing and verification that has been undertaken.

Appendix C discusses the implications of the CAG.

Appendix D is a glossary of the terms used in the Statement.
Gas supply in Ireland is delivered via a network of around 12,063km of high pressure pipelines and distribution pipes. The integrated supply network is sub-divided into 2,298km of high pressure sub-sea and cross-country transmission pipe and about 9,765km of lower pressure distribution pipe connecting customers to the system.
Overview of the Gas Transmission System

The BGÉ onshore high pressure transmission network consists of approximately 2,019km of pipe. This excludes the North West and South-North pipelines.

The system conveys gas from two entry points at Inch and Moffat to directly connected customers and distribution networks throughout Ireland, as well as to connected systems at exit points at Twynholm in Scotland (the Scotland-Northern Ireland Pipeline, ‘SNIP’), and to the Isle of Man. There is also a South-North pipeline that can be used to transport gas from north of Dublin to Northern Ireland. The Moffat entry point, located onshore in Scotland, connects the Irish natural gas system to the National Grid system in the UK, so that gas can be imported via the UK pipeline system to Ireland through the two sub-sea interconnectors. The Inch entry point, located in Cork, connects the Kinsale and Seven Heads gas fields and the Kinsale storage facility to the onshore network. The Irish system has three compressor stations; Beattock and Brighouse Bay in southwest Scotland, and Midleton in southern Ireland near Cork.

Scottish onshore system

From the connection with the National Grid system at Moffat, the Scottish onshore system consists of a compressor station at Beattock, which is connected to Brighouse Bay by two pipelines from Beattock to Cluden and a single pipeline from Cluden to Brighouse Bay, all capable of operating at 85barg. A second compressor station at Brighouse Bay compresses the imported gas into the two sub-sea interconnectors which can operate at pressures in excess of 140barg if required. Before reaching the Brighouse compressor station, an offtake station at Twynholm supplies gas to Northern Ireland and this gas is transported to Ballylumford via the SNIP. The SNIP pipeline has a maximum operating pressure of 75barg, although there is a minimum guaranteed supply pressure into this system which is currently 56barg.
From Brighouse Bay there are two pipelines connecting Ireland to the UK gas network. Interconnector 1 (IC1), which consists of 600mm pipe, has been in operation since 1993. Interconnector 2 (IC2), which was constructed using 750mm pipe, was completed in 2002 and has been operational since January 2003. There is a sub-sea spur connection to the Isle of Man from IC2 which first supplied gas to the island in May 2003. IC1 and IC2 are connected to the onshore Irish system north of Dublin at Loughshinny and Gormanston respectively. The maximum operating pressure is declared to be 145barg.

### Subsea system

The onshore transmission system has been developed over a 25-year period. The original part of the system was built in 1978 to supply the Cork area from the Kinsale Head gas field. The connecting subsea pipeline is owned and operated by Marathon Oil Ireland Limited. The main Cork to Dublin trunk pipeline was built in 1982, with pipeline spurs constructed to intermediate locations. The onshore Irish system was expanded in 2002/3 by the completion of the Pipeline to the West which has a design pressure of 85barg. This created a ring main pipeline system which connects eastern, western and southern regions. The ring main pipeline contributes to continuity of supply by allowing customers to be supplied from an alternative direction, providing a more secure gas transportation system. It also provides some flexibility to cope with increased flows from the West coast of Ireland to demand centres in the East. The Inch entry terminal is connected directly to the Cork system and the only compressor station in the onshore Ireland system is at Midleton to boost the gas flow from Inch.

Part of the Mayo to Galway pipeline will link the Corrib gas field to the Irish market. The 149 km of 650mm diameter pipeline from Mayo to Galway will connect an onshore terminal in Bellanaboy Co. Mayo, into the Pipeline to the West at Craughwell in Co. Galway. The Mayo-Galway pipeline is fully operational and the remainder of the pipeline is to be commissioned in stages before the arrival of Corrib gas so that the Mayo towns can be supplied with gas.

The all-island network now includes the North West pipeline (112km of 450mm diameter pipeline) as part of the Northern Ireland system expansion. The recently constructed ‘South-North’ pipeline (SNP) between the IC2 land-fall at Gormanston, Co. Meath to the North West pipeline at Ballyalbanagh in Co. Antrim is 156km in length and facilitates supplies to towns and industries in the corridor from Newry to Belfast. It also has the potential to supply industrial customers in the Republic of Ireland along the route. Interaction with the transmission system in Northern Ireland is considered in further detail in Annex C.
Planning the transmission system

Under the European Communities (Internal Market in Natural Gas) (BGÉ) Regulations 2005, S.I. No.760 of 2005, the government is required to establish an independent system operator for Ireland to facilitate competition in supply. On 4th July, 2008 Gaslink was formally established as the System Operator, and BGÉ as the System Owner of the BGÉ transportation system. Bord Gáis Networks will continue to carry out the day-to-day operations of the system und the direction of Gaslink. The Operating Agreement sets out the implementation of this relationship between System Operator and System Owner.

Gaslink’s licence includes a requirement to submit a long term development plan to the Commission each year, which acts as a formal input into the Gas Capacity Statement.

Planned network components

BGÉ is not expected to undertake any major extensions to the transmission system in the near term. The Mayo-Galway pipeline (needed to introduce Corrib gas into the system) and the SNP (related to Northern Ireland interconnection) are now complete. Further developments are primarily demand-led extensions or reinforcements to the onshore Ireland system. The most notable of these reinforcements is in the South to facilitate increased demand in the southern part of the network, including the connection of new power stations at Aghada and Whitegate.

The main prospective development that will have a significant impact on the system is the proposed liquefied natural gas (LNG) import terminal on the Shannon Estuary. The view of the developer is that this terminal will be in operation by the winter of 2012/13. This timing is incorporated into our base scenario. The proposed terminal would be connected to the existing transmission system by circa 26km of pipeline. The construction of the terminal has recently received planning permission (subject to certain conditions), and applications for the necessary consents for the pipeline to the transmission system are expected to be applied for later this year.

The Department of Communications, Energy and Natural Resources recently commissioned a feasibility study on the construction of a pipeline from the Mayo - Galway Pipeline to Donegal town via Sligo. This provides the possibility that there may be future pipeline projects in this region.
When gas begins to flow through the Bellanaboy entry point from the Corrib field and the Shannon LNG project becomes operational, the direction of flows on the Irish transmission network could potentially change significantly. Currently gas flows primarily from the East Coast where the interconnectors reach Ireland and from the South coast through the Inch entry point to the main centres of demand in Dublin and Cork, but increasingly also to new towns along the Pipeline to the West. If gas from Corrib and Shannon LNG displaces gas coming through the interconnectors, increasingly gas will flow from the West of Ireland to centres of demand in the east and the South. The base supply and demand cases, and the scenarios, should help to test the implications of these potential major changes in the operation of the network.

2.7 Overview of the gas distribution system

Gas is delivered by the high pressure transmission network to above ground installations (AGI) designed to reduce the pressure to a suitable level for delivery to the BGÉ distribution system. The majority of the distribution system comprises PE (polyethylene) pipe operating in two nominal pressure tiers of 4bar and 75mbar delivering gas to more than 600,000 customers’ premises in towns and cities. Planning and development of the distribution system incorporates demand forecasts based on customer information and connection requests for individual residences and new housing schemes in addition to industrial and commercial (I&C) loads.

The distribution system design is based on 1-in-50 winter criteria applied to a standard annual load by classification of domestic residence or to customer specific information for industrial and commercial loads.

2.8 Exploration and production activity

As we discuss further below in the sections discussing gas supply scenarios, there is a significant amount of ongoing and planned exploration and production activity in the seas around Ireland. This includes drilling by Island Oil and Gas in the Celtic Sea and planned drilling by a consortium led by Shell and Statoil in the Atlantic Ocean. The nature of drilling of this type is that the prospects for finding commercially viable reserves of gas are necessarily very uncertain. We understand that the results of some of the drilling activity should be known during 2009. As we discuss when considering longer term supply scenarios, if any of the drilling activity being undertaken results in commercial finds of a considerable size then this would improve the supply scenarios in a favourable way for security of supply.
3.1 Introduction

The base demand forecast used in this Statement updates that in previous Statements by taking account of new developments and expectations of demand. These include updated projections of economic growth and resulting industrial demand, levels of new house building, derived demand from gas-fired power generation, and previously recorded demand. This methodology follows previous Statements whereby the forecast demand for natural gas in Ireland is updated through analysis of each varying component of demand and by reflecting any changes in the assumptions underpinning the modelling process that generate the central demand forecast. Discussions with stakeholders have been important in informing the Commission’s views regarding demand.

Compared with previous years, and compared with the analysis of the supply situation in the market, the prospects for gas demand have become less certain due to weaker current and forecast rates of economic growth and new house building. Although shorter term economic prospects are relatively uncertain, it appears reasonable to expect that compared to forecast growth rates for demand in last year’s Statement, demand levels over the next couple of years will be lower, and therefore the forecast growth rate will be lower. However, given the economic uncertainties, it is likely to be prudent to consider carefully again in next year’s Statement the impact of macro-economic factors on actual demand levels.

In terms of specific short term demand drivers, it is still expected that two new gas-fired power stations will become operational in the South West of Ireland in the near future, which will have a significant impact on overall demand.

3.2 Historical gas demand by sector

Table 3.1 below shows total gas demand by sector from 2002 to 2007.

*Table 3.1: Total gas demand in Ireland from 1998 to 2007 (mcm)*

<table>
<thead>
<tr>
<th>MCM/ year</th>
<th>02/03</th>
<th>03/04</th>
<th>04/05</th>
<th>05/06</th>
<th>06/07</th>
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<tbody>
<tr>
<td>Residential</td>
<td>608</td>
<td>678</td>
<td>704</td>
<td>738</td>
<td>698</td>
</tr>
<tr>
<td>Industrial and commercial</td>
<td>931¹</td>
<td>1,017</td>
<td>1,010</td>
<td>938</td>
<td>949</td>
</tr>
<tr>
<td>Power generation</td>
<td>2,613</td>
<td>2,629</td>
<td>2,327</td>
<td>2,698</td>
<td>3,140</td>
</tr>
<tr>
<td>Shrinkage</td>
<td>67</td>
<td>56</td>
<td>80</td>
<td>74</td>
<td>70</td>
</tr>
<tr>
<td>Total</td>
<td>4,245</td>
<td>4,379</td>
<td>4,122</td>
<td>4,448</td>
<td>4,858</td>
</tr>
</tbody>
</table>

¹ Industrial and commercial demand for 2002/3 is shown without demand from Irish Fertiliser Industries, which was a large gas user that ceased operation after 2002/3. By excluding this demand the comparison with future years is on a more comparable basis.
In aggregate, the last ten years has seen consistent growth in the Irish gas sector, with total demand increasing by just under 15% over the last five years alone. Growth in demand for gas for power generation and residential use have underpinned the growth in gas demand. I & C demand has been broadly unchanged over the period.

The growth in demand for gas-fired power generation has also led to its share of total demand increasing, so that it now accounts for just under two thirds of total demand. Figure 3.1 shows that aggregate growth in gas demand is largely driven by the derived demand for electricity. The share of demand accounted for by residential customers has also increased to just over 15%. It is also notable that as we move to CAG between Ireland and Northern Ireland, the importance of power generation to natural gas demand will increase given the large share of Northern Irish demand accounted for by power generation.

The large proportion of gas demand accounted for by power generation can have a particular effect on the level of peak demand, as there is a correlation between peak-gas demand and high electricity demand. Demand for gas will also be sensitive to the changes in the sources of electricity, thereby increasing the role of gas as a fuel to serve high demands where renewable energy is not available.

Figure 3.1: Composition of historical demand
Gas demand projections

Projections for gas demand are determined by developing assumptions underpinning the components of change across three sectors:

- residential demand, which is driven by features such as economic growth, new house building and improvements in energy efficiency;
- I & C demand, i.e. that originating in factories and businesses directly; and
- power generation, which arises from a derived demand for electricity across residential, industrial and commercial users and economically driven choices about fuel-types for that generation.

As explained in Section 1, the approach for the Statement was for the Commission to specify the input variables for the components of Irish gas demand and BGÉ to use these input variables to develop specific demand forecasts, particularly for I&C and residential use. In the context of network flow capacity and security of supply, the focus of analysis is on peak or high demand days.

Input variables on the demand side were provided by the ESRI, who recently published a report looking at the medium-term trends in the Irish economy. We also took account of discussions with key parties in the electricity sector, including Eirgrid, and the Commission’s understanding of likely new power station developments in Ireland.

The remainder of this Chapter lays out the base case analysis of gas demand. Consultations with market participants indicate that at least in the short to medium term, most parties consider that it is more likely that demand will be lower rather than higher compared to our base case (this applies for peak and annual demand). This is due to the slower growth expected in the Irish economy, reduced per residential premise consumption and limited prospects of energy intensive industries locating in Ireland.

Residential demand

While residential consumption remains a relatively small proportion of total demand, it is expected to continue to grow in the coming years despite a predicted economic slowdown (relative to the high growth rates seen in recent years). At the end of the 2006-07 gas year, there were 571,485 residential customers, according to the BGÉ Transmission Development Statement. Gas demand in the residential sector is driven by the number of connected customers, with weather factors influencing the peak winter load. New connections and the most recent ESRI forecast for new housing have been used to develop inputs for demand projections.
The Irish housing and construction sectors have weakened in the last year. The annual number of new households fell from a peak of more than 93,000 in 2006 to 78,035 in 2007 and is projected to settle close to an average of just below 48,000 between 2010-2015. New housing connections, i.e. those new houses that are supplied with natural gas, are assumed to be a constant proportion, 38%, of the total new homes built, although the percentage of new houses connecting to natural gas is slightly lower for 2007. As Figure 3.2 shows, the number of new connections is thus projected to be steady in the range of 17,000-18,500 from 2008 onwards.

Figure 3.2: Projected new housing connections up to 2014/15

<table>
<thead>
<tr>
<th>Year</th>
<th>Actual</th>
<th>Projected</th>
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<tr>
<td>2006/07</td>
<td>28,053</td>
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<td>2007/08</td>
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<td>2008/09</td>
<td>17,095</td>
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<td>2009/10</td>
<td>17,777</td>
<td></td>
</tr>
<tr>
<td>2010/11</td>
<td>18,203</td>
<td></td>
</tr>
<tr>
<td>2011/12</td>
<td>18,299</td>
<td></td>
</tr>
<tr>
<td>2012/13</td>
<td>18,438</td>
<td></td>
</tr>
<tr>
<td>2013/14</td>
<td>18,565</td>
<td></td>
</tr>
<tr>
<td>2014/15</td>
<td>18,563</td>
<td></td>
</tr>
</tbody>
</table>

Source: BG, ESRI

One important consideration for demand forecasting will be the trend of consumption per residential premise. There is a broad agreement among stakeholders that, in recent years, there has been a general trend reduction in the level of consumption per premise, caused by a mixture of factors:

- a greater number of empty properties;
- increased prevalence of single person occupancy, including flats and apartments that consume less gas than houses on average, and
- improved energy efficiency through building regulations in new properties, energy saving technologies, and wider awareness of the importance of energy efficiency, partly arising from higher prices.

\[\text{This reflects the views of BG based on current data.}\]
The annual quantity consumed by the average residential user has been on a downward trend and is currently 14.9MWh per year. The average for a new home and a new apartment is 15 and […] MWh per year respectively. It is assumed that new and existing residential customers make savings in energy use going forward such that the trend reduction in consumption per residence over the last five years continues. It is assumed that there is an acceleration in this reduction that would be consistent with meeting Government targets.

Table 3.2 below shows the demand projections for residential users for this year’s Statement, and compares these projections to the forecasts for the Statement’s in 2006 and 2007. Figure 3.2 shows the comparison as well. As can be seen from the table and the figure, the demand forecasts for this year’s Statement are substantially lower than those in the previous two years, with the forecasts for 2007 being lower than those in 2006. This is primarily because of improved energy efficiency and reductions in the number of new houses expected to connect to the gas network.

Table 3.2: Annual demand projections from residential users

<table>
<thead>
<tr>
<th>MCM/ year</th>
<th>07/08</th>
<th>08/09</th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006 Statement</td>
<td>947</td>
<td>1,034</td>
<td>1,083</td>
<td>1,129</td>
<td>1,171</td>
<td>1,210</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007 Statement</td>
<td>880</td>
<td>916</td>
<td>969</td>
<td>1,016</td>
<td>1,049</td>
<td>1,078</td>
<td>1,123</td>
<td></td>
</tr>
<tr>
<td>2008 Statement</td>
<td>780</td>
<td>797</td>
<td>846</td>
<td>861</td>
<td>873</td>
<td>883</td>
<td>892</td>
<td>904</td>
</tr>
</tbody>
</table>

Figure 3.3: Historical and projected demand for natural gas from residential customers

\* The Energy Efficiency Action Plan assumes an improved household annual quantity to 7.5MWh and 5.0MWh from 2008 and 2010 respectively.

\* The Statement is primarily forward looking, but it is notable that demand from residential users fell in 2006/7 compared to the previous year. This is likely to be due to a combination of higher wholesale gas prices and improved energy efficiency.
Industrial and commercial gas demand

At the end of the 2006-7 gas year, there were 20,578 I&C customers in Ireland. As a mature sector, it is assumed that real GDP growth is the driver of this component of gas demand. Historical comparison has shown that gas demand from this source grew at around half the rate of the Irish economy as a whole between 2000 and 2005, which is the assumed relationship in the modelled forecasts. This compares to a rate of two-thirds of economy-wide growth between 1990-2000, indicating that as the economy matures it is becoming less energy intensive. This trend also suggests that there may be some weakening of the link between GDP growth and I&C demand, which may be linked to changes in the mix of businesses in the economy, including an increase in the proportion accounted for by the service sector rather than manufacturing.

Projections of GDP are taken from ESRI’s forecasts in the Medium Term Review. As shown in Figure 3.4, projections of economic growth are well below recent years, with the peak of recovery in 2010 roughly equal to the trough of the previous economic cycle in 2004. Projections made by ESRI are the basis for modelling for 2008 onwards, and for 2008 they assume growth will be 1.85%.

Figure 3.4: Recent actual and projected future economic growth

ESRI has subsequently reduced its forecasts for economic growth for 2008 and 2009 in its Summer 2008 Quarterly Economic Review. This was published too late to be considered for the modeling for the Gas Capacity Statement. As the updated forecasts are a reduction in economic growth, they would reduce forecast demand, thereby having a broadly positive effect for security of supply compared to the scenarios modeled for the Statement.
I&C demand forecasts also allow for the effects of the National Energy Efficiency Action Plan for Ireland.

A total of 772 new connections were established for industrial and commercial customers in the 2005/6 Gas Year for both NDM and DM/LDM classifications. This growth was countered with the closure of a number of large loads and the total connected customers were 19,868 at the end of the 2005/6 year. This is one factor that resulted in a lower annual gas demand in 2006 compared with 2005, as shown in Figure 3.5 below, despite of wholesale gas prices reducing from the 2005 level. The projected gas demand in this sector has also included information pertaining to new large loads with lead times of up to three years for connection to the network.

The base case demand forecasts and the scenarios for demand assume that no very large industrial loads will connect to the Irish gas network in the foreseeable future. This reflects that the economics for such large loads locating in Ireland are not generally favourable given that Irish gas prices are generally higher than those in the UK, so other economic advantages would have to be sufficient to outweigh this gas price disadvantage.

Table 3.3 below shows the demand projections for I&C users for this year’s Statement, and compares these projections to the forecasts for the Statement’s in 2006 and 2007. Figure 3.5 also shows the comparison. As can be seen from the table and the figure, the demand forecasts for this year’s Statement are substantially lower than those in the previous two years, with the forecasts for 2007 being lower than those in 2006. This is primarily because of the decline in macro-economic prospects in Ireland as seen in lower economic growth forecasts from ESRI. The projected increase in demand is now much lower over the period than the forecasts in previous Statements.

Table 3.3: Annual demand projections from industrial and commercial users

<table>
<thead>
<tr>
<th>MCM/ year</th>
<th>07/08</th>
<th>08/09</th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>1,376</td>
<td>1,463</td>
<td>1,553</td>
<td>1,565</td>
<td>1,587</td>
<td>1,629</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>1,152</td>
<td>1,169</td>
<td>1,245</td>
<td>1,407</td>
<td>1,424</td>
<td>1,434</td>
<td>1,464</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statement</td>
<td>978</td>
<td>989</td>
<td>1,049</td>
<td>1,066</td>
<td>1,080</td>
<td>1,090</td>
<td>1,099</td>
<td>1,113</td>
</tr>
</tbody>
</table>

Power generation

To develop estimates of demand for natural gas arising from power generation, we have considered EirGrid’s Generation Adequacy Report 2008-2014 (GAR), talked with major generators and used merit order modelling (undertaken by BGÉ). The GAR is produced to inform market participants, regulators and policy makers of likely generating capacity in Ireland, but only includes power stations that are currently connected or have an agreement to connect. The GAR is not prepared using merit order modelling.

Figure 3.5 shows historical demand for electricity in Ireland irrespective of the fuel source used for generation.

**Figure 3.5: Historical demand for electricity (all generation fuel sources)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Electricity Sales (GWH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>20,821</td>
</tr>
<tr>
<td>2002</td>
<td>21,208</td>
</tr>
<tr>
<td>2003</td>
<td>21,891</td>
</tr>
<tr>
<td>2004</td>
<td>22,692</td>
</tr>
<tr>
<td>2005</td>
<td>23,751</td>
</tr>
<tr>
<td>2006</td>
<td>24,972</td>
</tr>
<tr>
<td>2007</td>
<td>25,830 (FORECAST)</td>
</tr>
</tbody>
</table>

**Figure 3.5: Historical and projected future demand for natural gas from industrial and commercial customers**

Graph showing historical and projected future demand for natural gas from industrial and commercial customers.
There will remain a significant role for gas for power generation in Ireland, evidenced by the two new CCGTs opening in South West Ireland in 2009. The likely closure of ESB’s oil plants in the next few years and environmental restrictions on coal generation, mean that gas will likely be the most important fuel for new conventional generation capacity in Ireland, particularly as nuclear power stations are legally prohibited.

The GAR uses an econometric approach to model demand for electricity in Ireland going forward. Non-domestic demand is driven by GDP growth, while domestic demand is driven by growth in consumption, both provided by the ESRI. The median annual growth in electricity demand is 3.1% up to 2014, which is towards the high end of expectations due to reduced confidence in economic performance going forward. The power demand forecasts used in this Statement are a downward revision on those used last year, as seen from a comparison between the GAR 2007 and the GAR 2008 in Figure 3.6.

The assumption on the profile of demand from gas-fired generation for the Statement is that gas-fired generators operate at full capacity on peak demand days. This also partly reflects the low level of generation assumed from wind generation on peak days.

In terms of the supply capacity of the Irish electricity system in 2007, the fully dispatchable capacity at the end of the year was 6,445MW. The base scenario for power generation assumes that all plants that are currently connected (including a second mixed gas-distillate oil plant IPP at Huntstown of 401MW operational from 2007), plus CCGT facilities at Aghada (431MW) and Whitegate (432MW), will be in operation over the seven-year period. The exceptions to this are ESB’s plants at Poolbeg (oil) Tarbert and Great Island, with a loss of around 1300MW. It also includes new plants in Louth (440MW CCGT) and Kilkenny (98MW OGCT) in October 2011.

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12 The Aghada IPP is located at the end of a new 450mm diameter pipeline connected north of the Midleton Compressor station, while deliveries to Whitegate are taken from a spur off this pipeline, just upstream of Aghada.

13 The GAR states that: “...it is possible that Tarbert and Great Island will be sold as going concerns and continue to operate in their current form, the assumption for the base case is that existing plant will close.”
The development of significant renewable, and particularly wind generation, in Ireland, increases the modelling challenge for electricity generation, and in particular it is necessary to make an assumption about the contribution of wind generation on peak days. EirGrid have undertaken extensive work, including with other organisations to identify the appropriate "wind credit", and this approach underpins the modelling.

Based on this analysis it is possible to observe that the target of 33% renewable generation by 2020 should not materially affect the need for additional conventional generation capacity. Since wind generation accounts for most renewables capacity, that capacity is not sufficiently reliable to replace the conventional generation which ensures sufficient capacity to meet peaks in demand. Furthermore, as Figure 3.7 shows, the large increase in the importance of renewables between 2007 and 2014 is mirrored by the reduced relative importance of coal and oil, in particular heavy fuel oil (HFO).

The amount of gas fired generation in the future will therefore depend on the extent to which gas is the primary fuel for new generation capacity, which currently appears likely to be significant even at current wholesale gas prices. A further consideration is the White Paper target of no more than 50% gas fired generation by 2020. This may act as a potential constraint when projecting gas demand much further into the future.

Figure 3.8: Actual and projected distribution of power generation by source, Indigenous export capacity in MW for 2007 and 2014

15 The total excludes industrial generating capacity (which is flat at 9MW each year), as well as capacity from the planned East-West Interconnector (250MW from 2013) and from generation in Northern Ireland, which increases from 200MW between 2007 and 2012 to 2,854MW in 2013.
16 HFO – Heavy Fuel Oil; DO – Distillate Oil; CHP – Combined Heat and Power
It is also notable that we are currently in the first year of operation of the Single Electricity Market (SEM) across Ireland and Northern Ireland. It is therefore probably too early to be confident about any significant changes in demand patterns or for electricity generation arising from the SEM, but this will be an important factor to consider in future Statements.

Table 3.4 below shows the demand projections for power generation for this year’s Statement, and compares these projections to the forecasts for the Statement’s in 2006 and 2007. Figure 3.9 also shows the comparison. As can be seen from the table and the figure, the demand forecasts for this year’s Statement are (in the earlier years) lower than those in the previous two years, although the forecasts for 2007 were higher than those in 2006. This is primarily due to lower expected demand for electricity given the declining macro-economic prospects in Ireland. The demand projections for this year’s Statement take account of the expected development of renewable energy, and particularly wind generation, but as this is expected to be a phased development, its impact on annual demand will be greater in later years.
Table 3.4: Annual demand projections from power generation

<table>
<thead>
<tr>
<th>Year</th>
<th>2006 Statement</th>
<th>2007 Statement</th>
<th>2008 Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>07/08</td>
<td>08/09</td>
<td>09/10</td>
</tr>
<tr>
<td>2007</td>
<td>3,536</td>
<td>3,712</td>
<td>4,064</td>
</tr>
<tr>
<td>2008</td>
<td>3,399</td>
<td>3,170</td>
<td>3,615</td>
</tr>
</tbody>
</table>

Figure 3.9: Historical and projected gas demand for power generation relative to previous Statements
Total annual gas demand in Ireland

Table 3.5 brings together the separate projections of residential, I & C and power generation demand for gas to give projections for Ireland. These projections are again compared with those in the 2006 and 2007 Statements, and this is shown graphically in Figure 3.10.

Table 3.5: Total annual demand projections, excluding shrinkage

<table>
<thead>
<tr>
<th>MCM/ year</th>
<th>07/08</th>
<th>08/09</th>
<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006 Statement</td>
<td>5,729</td>
<td>5,961</td>
<td>6,405</td>
<td>6,569</td>
<td>6,529</td>
<td>6,618</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007 Statement</td>
<td>5,568</td>
<td>5,797</td>
<td>6,249</td>
<td>6,877</td>
<td>6,886</td>
<td>6,849</td>
<td>6,966</td>
<td></td>
</tr>
<tr>
<td>2008 Statement</td>
<td>5,157</td>
<td>4,956</td>
<td>5,509</td>
<td>5,582</td>
<td>5,798</td>
<td>5,799</td>
<td>5,799</td>
<td>5,847</td>
</tr>
</tbody>
</table>

The slow growth for demand shown in this year’s Statement, partly reflects the use of weighted Calorific Values (CV) for conversion of energy to MCM/ year, which is necessary because of the difference in CV expected for Shannon LNG gas compared to other gas brought through the interconnectors. The same conversion factors are used throughout the Statement.

Figure 3.10: Total historical and projected demand for natural gas

17 Shrinkage is gas lost or used while gas is transported through the transmission and distribution networks.
3.4  

Peak-Day Demand Conditions

For the purposes of the Gas Capacity Statement it is necessary to convert the overall trends in annual gas demand to estimated peak-day demand levels. Figure 3.11 shows the projections for peak demand in the base case. The system has to be designed to cope with the peak-day gas delivery volume.

Figure 3.11: Projected peak-day demand compared with previous Statements

\[\text{Converted from previous Statements using a computed calorific value of the gas taken as a weighted average of gas supply from indigenous and external sources for that particular year.}\]
Gas demand scenarios

This Statement develops a central case for natural gas demand along with high, low and resilience scenarios. The base demand scenario assumes that:

- growth in both new housing and GDP is as per ESRI’s most recent forecasts (roughly equivalent to the low side of the forecast used for the 2007 Statement), accounting for modelling of residential and I & C demand;
- demand for gas from power generators is as per the GAR, but merit order modelling by BGÉ determines despatch;
- gains in energy efficiency remain along recent trends rather than government targets; and
- government renewables targets for power generation are met.

The sensitivities used in the high and low scenarios revolve around upper and lower bounds for levels of growth in new housing and GDP, the extent and source of new power generation, and trend in efficiency levels.
In contrast with the demand situation, there are perhaps fewer uncertainties surrounding the supply of natural gas to the Irish market in the next seven years. Furthermore, some of the greater uncertainties relate primarily to the potential for discoveries of indigenous natural gas or the construction of new infrastructure that would improve security of supply compared to the base case in terms of increasing available supplies. However, to the extent that more gas is landed on the West coast of Ireland and needs to be transported to the main demand centres on the East coast and in the South West, there are likely to be some implications for the transmission network, including the potential for reinforcement to be required.

Table 4.1 shows the historical sources of gas supply for Ireland. As the table shows, Ireland’s gas supply has come increasingly to be dominated by imports from Great Britain through the Moffat entry point in Scotland. The only indigenous gas supply has been that through the Inch entry point in South West Ireland.

Table 4.1: Historical gas supply in Ireland

<table>
<thead>
<tr>
<th>MCM/ year</th>
<th>02/03</th>
<th>03/04</th>
<th>04/05</th>
<th>05/06</th>
<th>06/07</th>
<th>07/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inch</td>
<td>637</td>
<td>932</td>
<td>614</td>
<td>523</td>
<td>478</td>
<td>401</td>
</tr>
<tr>
<td>Moffat</td>
<td>3,635</td>
<td>3,447</td>
<td>3,502</td>
<td>4,020</td>
<td>4,412</td>
<td>4,938</td>
</tr>
<tr>
<td>Total</td>
<td>4,272</td>
<td>4,379</td>
<td>4,116</td>
<td>4,544</td>
<td>4,889</td>
<td>5,339</td>
</tr>
</tbody>
</table>

Figure 4.1 shows historical and projected future supply by source. Compared to historical sources of supply, it is assumed that two new sources of supply will be available over the period covered by the Statement – gas from the Corrib field and gas through the Shannon LNG terminal. It is also notable that current forecasts by Marathon project that production and storage gas through Inch will cease sometime in the next five or six years. However, as Marathon has put its Irish gas interests up for sale there is a possibility that a new owner could take a different view about how best to operate the production and storage fields that use the Inch entry point. As discussed in the next section, the high supply scenario also includes a new storage facility at Larne in Northern Ireland. This project is at a relatively early stage of development, but the Commission understand that initial analysis indicates good potential for developing a storage facility at the site.
As can be seen from Figure 4.1, until 2008/9 gas through Moffat is expected to account for the vast majority of Irish gas, but once gas flows from Corrib in 2009/10 and the Shannon LNG in 2012/13, gas through Moffat is expected to decline to around one third of supply in 2009/10 and to a very small proportion by 2014/15. The percentage of supply through Moffat would be lower still, if supplies through Inch continued beyond 2012/13. While the analysis for the Statement was being undertaken, Shell and its partners updated the production level and profile for Corrib gas, which would have the effect of slightly increasing production from Corrib compared that shown in Figure 4.1, which would further reduce the amount of gas through Moffat. Although the amount of gas through Moffat is forecast to reduce for both overall and peak-day demand, it will account for a greater share of peak-day demand than average demand, as discussed later in the Statement when the results of the scenario modelling are discussed.

The development of a storage facility at Larne would primarily impact flows through Moffat on peak and high demand days. Exporting from storage would be expected to ease capacity through the primary supply routes.

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19 Projections of future supply assume that all gas to Northern Ireland comes through the SNIP, and all gas to the Isle of Man comes through the Interconnector. Therefore all of this gas comes from Moffat.
Indigenous gas production

Indigenous supply considerations revolve around:

- production entering the country through Inch Terminal; and
- flows that are projected to arrive from the Corrib field.

The Kinsale and Ballycotton gas fields have delivered gas to the Inch terminal near Cork from as early as the 1970s. These fields, however, are now in decline, similar to many European sources. The addition of gas production from the Seven Heads field (also off the Cork coast) from December 2003 has contributed to the indigenous supply albeit at significantly lower rates than originally projected and overall production has continued to decline as shown in Table 4.1.

The quantities of gas associated with the Kinsale and Seven Heads fields are not very large, so that their precise future schedule of supplies, i.e. a slightly longer or shorter life, does not materially impact upon security of supply. It will have some effect on the amount of gas brought through the Moffat entry point. The base scenario assumes that these fields decline in line with the projections of Marathon Oil and ceases in 2013. However, there is some uncertainty associated with this assumption, not least because Marathon has not yet firmly committed to ceasing supplies in 2013, but also because Marathon has placed its Irish gas interests up for sale, so a new owner might take a different approach to the use of the assets.

Flows from the Corrib field are expected to commence in the third quarter of 2009, and so are available for the winter peak in 2009-10. The nature of the Corrib field is such that its production profile is expected to decline quite sharply as shown in Figure 4.2 below. At a late stage in the development of the Statement, Shell and the other Corrib partners submitted a slightly revised production schedule for the field, that we were unable to take account of in the modelling. However, as this profile generally increases the total quantity of gas expected to be delivered from the field over its whole life and during the period covered by this Statement, it should have a positive impact on security of supply compared to the results of the modelling undertaken for the Statement. Although it might slightly bring forward the need for reinforcement of the transmission network to cope with increased West to East flows of gas.
There is a belief among gas suppliers and developers that the commercial value of storage facilities in Ireland is reducing, partly because of the extensive investment in storage facilities in the UK and the expected spare capacity in the interconnectors when projects such as Shannon LNG are completed. However, there is currently the prospect of natural gas storage at two separate Irish fields:

- The economic use of the Inch offshore infrastructure can be extended with the development of storage. However, this may only be commercially viable so long as there is production from the Kinsale and Seven Heads fields, which is scheduled to cease in 2013. As production declines, there needs to be increased revenues from the storage facilities to continue to make the operation of the assets profitable.

**Figure 4.2: projected supplies from Kinsale, Seven Heads and Corrib fields**

Source: Marathon Oil and the Corrib partners

There are several projects conducting exploration work for potential new sources of gas – one in the Celtic Sea and two others to the North West of the Corrib field (“Cashel” and “West Dooish”). Since the commercial potential of these opportunities is not known, they are not considered in the modelling process for this Statement. However, these possible opportunities are discussed further below in Section 6. At this stage it is sufficient to note that if any of them lead to commercially viable gas supplies it will benefit security of supply in Ireland compared to the projections in this Statement, which could also further reduce the need for gas through the Moffat entry point, even on peak and high demand days.

**4.2 Storage**

There is a belief among gas suppliers and developers that the commercial value of storage facilities in Ireland is reducing, partly because of the extensive investment in storage facilities in the UK and the expected spare capacity in the interconnectors when projects such as Shannon LNG are completed. However, there is currently the prospect of natural gas storage at two separate Irish fields:

- The economic use of the Inch offshore infrastructure can be extended with the development of storage. However, this may only be commercially viable so long as there is production from the Kinsale and Seven Heads fields, which is scheduled to cease in 2013. As production declines, there needs to be increased revenues from the storage facilities to continue to make the operation of the assets profitable.
There is potential for the development of salt cavities near Larne in Northern Ireland for the purposes of storage. Initial indications from exploration are positive regarding the potential to develop a technically viable storage facility.

For the purpose of this Statement, the central case assumes that there is no storage at Larne given the relatively early stages of the development. However, as discussed below, the high supply scenario takes account of the availability of a storage facility at Larne. A large storage facility at Larne could have significant implications for the quantity of gas needed through the Moffat entry point, including on peak and high demand days. A storage facility at Larne could also impact on gas demand on shoulder or summer days when the facility is being filled with gas, by increasing substantially gas demand in Northern Ireland on such days. Any implications for system security of such a facility would need to be considered if it is developed.

There are also potential substitutes for storage facilities, including potentially LNG facilities and linepack in the interconnectors.

4.3

Gas import

4.3.1

Interconnectors

Since 1993 the gas transmission system has been linked to supply routes via Scotland by means of the sub-sea interconnector, IC1. The interconnector was twinned in 2002 with the construction of IC2. The system includes onshore- Scotland pipelines and compressor stations, described in Section 2.

The interconnectors provide a secure link to European gas sources via the connection in Scotland to the National Grid (NG) exit point at Moffat. In 2007, over 90% of the demand in Ireland was met by imported gas via the SNIP and IC 1 and 2.

The heavy reliance on the interconnectors will continue for at least the next couple of years as demand in Ireland grows, albeit more slowly than expected in previous year’s Statements, and indigenous supplies are short-term or declining. The decline of indigenous resources is mirrored in the Dutch and UK sectors of the North Sea, and European markets are becoming more dependent upon longer distance supplies from the Norwegian sector in addition to imports by pipeline (from Russia) and LNG ships. However, access to European markets depends also upon the commercial arrangements at the National Grid exit point and the availability of National Grid transmission system capacity. The development of the Corrib field and the Shannon LNG terminal could radically alter the use of the interconnectors.
4.3.2 Liquefied Natural Gas (LNG)

An import terminal for LNG is being developed on the south bank of the Shannon Estuary between Tarbert and Ballylongford in County Kerry. The project has planning permission subject to satisfying a range of conditions. We understand that planning permission for the pipeline from the terminal to BGÉ’s transmission network will be sought later this year. The flows from the project are planned to commence in 2012, which is assumed in the base case. Shannon LNG is planning a gradual increase in its supply capacity as a larger part of the terminal is used.

4.4 Gas supply scenarios

This Statement develops a central case for natural gas supply together with high, low and resilience scenarios. The base supply scenario assumes that:

- production from Corrib will commence 2009/10;
- supply of LNG from Shannon will commence in 2012/13;
- flows into Inch cease from 2013; and
- no storage is available at Larne.

The primary focus of the scenarios is on the timing of new sources of gas, i.e. when gas becomes available from Corrib, whether and when the Shannon LNG project becomes operational, and the future of the gas storage project at the Kinsale field. Given that the quantities of gas associated with this latter source are small compared to demand, the precise future schedule of supplies from the Kinsale and Seven Heads fields is not particularly significant for security of supply, and has not been a focus when considering the appropriate scenarios. In other words, a slightly longer or shorter life for these fields will not materially affect security of supply in Ireland, although it will affect the amount of gas required through the Moffat entry, and therefore, the capacity used on the interconnectors.
BGÉ modelled the ability of the transmission system to meet the forecast demand levels for the years 2007/08 to 2014/15. To assist the Commission to consider a longer timescale, BGÉ also modelled selected years up to 2020/21 for some combinations of supply and demand scenarios. The modelling was undertaken using transient modelling software to simulate the operation of the gas transmission network in response to a set of boundary conditions. The boundary conditions are the inputs of supply availability and the outputs of peak-day demand on the system. In addition, a range of data are input to simulate the physical network conditions including the pipeline lengths, compressor powers, gas quality and supply pressures.

The assumptions of the base case scenario are summarised in Sections 3.5 and 4.4. Figure 5.1 below summarises the assumptions used in the cases of both low and high supply and demand scenarios.

**High Demand**
- **Residential:** Driven by the upper end of ESRI’s most recent forecasts for new housing
- **I/C:** Driven by the upper end of ESRI’s most recent forecasts for GDP growth, (including effects of a fall in gas price).
- **Power Generation:** Assumed that there are two further new plants using CCGT (combined cycle) technology
- **Energy Efficiency:** As per the base case.

**Low Demand**
- **Residential:** Driven by the low end of ESRI’s forecast, i.e. lower than previous ‘low-case’ projections of new housing.
- **I/C:** Driven by the low end of ESRI’s recent forecasts, i.e. lower than previous ‘low-case’ forecasts for GDP growth
- **Power Generation:** As per the ‘low’ scenario in the GAR, i.e. the use of coal for new plants rather than CCGT.
- **Energy Efficiency:** As per the base case.

**High Supply**
- **Inch:** Flows from Kinsale, Ballycotton and Seven Heads, as well as storage from Kinsale, are available up to 2014/15.
- **Corrib:** The new flows from the Corrib field became available as projected in the base case.
- **Larne Storage:** Storage at Larne becomes available from 2011/12.
- **LNG:** Flow of LNG from Shannon are available as per the base case (2012/13).

**Low Demand**
- **Inch:** Flows from Kinsale, Ballycotton and Seven Head’s cease, as per the base case, in 2013/14.
- **Corrib:** Flows from Corrib are delayed, only available from 2012/13.
- **Larne Storage:** There are no flows from storage at Larne.
- **LNG:** Flow of LNG from Shannon are available as per the base case (2012/13).
Assumptions of the offshore and Scottish onshore system

Beattock supply pressure

A significant parameter influencing the performance of the onshore-Scotland system is inlet pressure at the Beattock compressor station, which is the terminal between the National Grid system in the UK and the Irish pipeline system.
The Pressure Maintenance Agreement with National Grid has a contractual pressure of 42.58barg and an Anticipated Normal Operating Pressure (ANOP) of 47barg. BGÉ received a letter from National Grid in December 2005 stating that it was prepared to provide an ANOP of 47barg. On this basis the suction pressure to the Beattock Compressor Station has, since 2006, been assumed to be 45barg for modelling purposes, allowing for 2barg losses on the suction pipework. The assumed maximum discharge pressure at Beattock is 85barg.

Compressor capacities and Interconnector pipeline performance

Performance testing of the onshore-Scotland transmission system was in progress at the time of writing last year’s Statement, with testing of the compressors commencing in 2007. BGÉ anticipate the development of detailed computer models of the compressor stations piping to be completed by the end of this year. The models, together with the ongoing assessment of the machinery performance characteristics, will facilitate the determination of the capacity and performance limits of the compressors as currently installed, compared with their original design criteria.

Flow performance trials conducted on the pipelines in Scotland and the sub-sea interconnectors have yielded operational data to support the friction factors currently used in the network modelling. However, demand conditions at the time of the tests were not sufficiently high to test the system at peak flows and BGÉ intend to carry out further trials under higher flow conditions.

For the compressor capacity, the assumed operational maximum throughput of the Beattock and Brighouse Bay compressor stations are 31 MCM per day and 23 MCM per day respectively and these assumptions are used in the modelling for this study. As noted above, a study was carried out on the Beattock compressor station before the previous Statement to evaluate the effect of an inlet pressure of 45barg and it is anticipated that the outcome of the present study including the results of the compressor performance testing will be to confirm these maximum throughput capabilities. It may also identify low cost capacity developments at each of the stations that will enhance the flow characteristics without a detrimental effect on the service provided to shippers.

Twynholm flow

The network operator for the SNIP is Premier Transmission Limited (PTL), although BGÉ actually operate it as part of an agency agreement. The contractual limit on flow to Northern Ireland on the Scottish onshore system is 8.08MCM per day. This was the limit assumed in modelling the scenarios. An offtake station on the Cluden to Brighouse Bay pipeline at Twynholm supplies gas to Northern Ireland. The 8.08MCM limit was set by an inter-governmental treaty in 1993 and by subsequent corporate agreements. A second treaty in 2005 allows the possibility of increasing the limit, since there is potentially more capacity in the SNIP without reinforcement. This would be an issue to consider as part of the development of CAG.
Results of the peak-day network modelling

The results of the network modelling reported by BGÉ to the Commission are expressed in two ways:

- Would the scenarios lead to any issues on the network where pressures were outside acceptable parameters\(^{20}\), or where there is insufficient capacity to transport the necessary gas?
- What are the supply sources to meet the demand under each combination of scenarios?

BGÉ was asked to model all the possible combinations of supply and demand scenarios, i.e. all demand scenarios with all supply scenarios, which in total meant that twelve different combinations were modelled. However, in reporting the results the Commission has focused particularly on the results of the scenarios involving base and high demand, and those involving base, low and resilience supply. This is because other combinations of scenarios, such as low demand and high supply are unlikely to raise issues for network integrity and security of supply that are not highlighted by the results of other scenarios.

For all of the base, high and low demand scenarios, i.e. with high, base, low and resilience supply, appropriate network pressures are maintained at all points on the network in all years of the scenarios up to 2014/15 without the need for reinforcement, with the exception of the combination of high demand and resilience supply. For this scenario, the Beattock Compressor Station would perform outside their performance envelope in 2014/15 without reinforcement, primarily because of the large quantities of gas required to be transported through Moffat, given that this scenario assumes that Shannon LNG does not become operational. However, the precise performance envelope of the compressor station depends on further testing work that is discussed above, so the current assumption would be that reinforcement would be needed to achieve even this performance envelope.

Network pressures are also maintained within performance limits to 2020/21 for the base demand scenarios without reinforcement, with the exception of base demand together with resilience supply, where for 2016/17 and 2020/21 (the two years beyond seven years that are reported), there would only be sufficient capacity to meet demand if there was reinforcement on the Scottish onshore system because of the quantity of gas required to be transported through Moffat.

Although adequate operating pressures are maintained apart from the exceptions explained above, these scenarios do indicate where longer term problems with maintaining pressures in the network may arise. Without reinforcement, pressures at the Middleton compressor and at Waterford begin to decline towards the allowable minimum of 40barg in 2014/15 and beyond. These issues are more pronounced for scenarios involving low and resilience supply. BGÉ has begun to identify the types of reinforcement that could address these pressure issues, including some reinforcement in onshore Scotland and a Goat Island to Curleigh West pipeline loop.

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\(^{20}\) BGÉ checked all pressure requirements on the network. Reports were provided for chosen points on those part of its network where there have previously been potential concerns about pressure.
In broad terms these potential pressure issues arise because the nature of the flows on the Irish network are changing significantly with the new sources of gas from Corrib and Shannon LNG. Currently gas predominantly comes into Ireland north of Dublin from the interconnectors, which is close to the main area of demand in Dublin, with some transportation of gas West and South West. Production through Inch also helps to meet demand in the South West. Flows from the Corrib field and Shannon LNG will mean that supply is coming in on the West coast, while most of the demand is on the East coast around Dublin and in the South West around Cork. To date BGÉ’s network has not been configured to meet this pattern of supplies. We discuss further below the implications of this development for potential network reinforcement. Adequate operating pressures can be maintained in the vast majority of scenarios for at least the next seven years, without specific reinforcement to address the issues. Given this, in the short term, it would be appropriate for BGÉ to further investigate the most cost effective means to address these issues, so investment projects could be brought forward in good time to address potential issues. Bearing in mind, however, that significant additional investment should not be required to maintain system pressures in the short term.

Figure 5.2a below shows the pattern of supply to meet demand under the base demand and base supply scenario.

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21 The results for the scenarios on the peak-day are expressed in MCM’s. In order to do this it is necessary to make assumptions about the calorific value of the different sources of gas. Results are reported on a GWh basis in Annex 1. Gas demand is converted to MCM using a weighted average of calorific values as per the components of supply for a particular scenario.

22 All modeled supply categories are referenced in the legend of each chart, including those that are zero.
Figure 5.2b: Patterns of supply and demand under the base demand and base supply scenario

Figure 5.2a shows that before gas flows from Corrib, demand would be met predominantly by flows through Moffat and residual flows through Inch. From 2009/10, gas through Corrib displaces a substantial proportion of the flows through Moffat and from 2011/12 Shannon LNG displaces further flows through Moffat. As flows through Corrib begin to decline in 2012/13, the increasing flows from Shannon LNG displaces further gas from Moffat.

The results of this scenario show that even if flows through Inch cease by 2013/14, the supplies from Corrib and Shannon LNG will mean that even with increasing demand, Ireland will meet its peak-day gas needs from a more diversified set of sources than now, and with a reduced dependence on flows through Moffat. Nevertheless, on the peak-day there will still be a significant throughput at Moffat, and a greater proportion of gas will flow through Moffat compared to lower demand days.

The pattern of supplies in Figure 5.2a can be contrasted with a high supply scenario alongside the base demand scenario, which is shown in Figure 5.3.
Compared to the base supply base demand scenario, this scenario with high supply reduces further the requirements from Moffat on the peak-day in the later year’s for which results are shown. This arises because flows from Inch continue and gas can be sourced from a storage facility at Larne on high demand days.

The two most extreme scenarios that would test network integrity and security of supply are high demand alongside low supply and resilience supply. The pattern of supply under these scenarios is shown in Figures 5.4 and 5.5 below.
Figure 5.4b: Patterns of supply and demand under the high demand and low supply scenario

Figure 5.5a: Patterns of supply to meet demand under the high demand and resilience supply scenario
Network development

Statements in previous years have raised the risk that if Corrib is delayed beyond 2009/10 there is a possibility that on the peak-day it may not be possible to meet all currently firm demands in Ireland. Reinforcement of the onshore-system in Scotland would have addressed this risk. Given that this is a transitory and very short term risk (as shown again by modelling for this year’s Statement), the Commission has not previously supported such investment, and instead suggested that this risk might be addressed more cost effectively through options such as interruption contracts with power stations or larger customers. This is a particularly viable option as power stations are required to maintain minimum quantities of back-up fuel for an emergency.

The Commission remains of the view that although there is a risk that Corrib gas flows are delayed beyond 2009/10, this risk is lower than at the time of last year’s Statement, and there are likely to be more cost effective ways of managing the risk for BGÉ than investment in onshore Scotland. Furthermore, given the general economic outlook, it appears more likely that demand will be consistent with the base or low demand scenarios, than with the high demand scenario, therefore further reducing the potential scale of the issue. The Commission will continue to monitor developments regarding the timing of flows from Corrib, but at this stage does not consider that further investment in onshore Scotland is required to address this risk.
The scenario modelling for this year’s Statement does however illustrate a new potential issue that may in due course require network reinforcement. Once flows begin from Corrib, the development of flows from Shannon LNG, and ending of flows through Inch, will significantly change the direction and nature of flows on the Irish transmission network. In particular, flows will increasingly be from the West to the East coast, and to some degree the South East, compared to current flows that are primarily from the interconnectors to demand centres on the East coast, and South West, which is also served by supplies from Inch. As discussed above, reinforcement is not required within the seven year period of this Statement to maintain adequate system pressures under a range of peak-day scenarios. However, it is evident that without investment at around the end of the seven year period or shortly thereafter, allowable minimum operating pressures might not be obtainable.

Therefore, and given the substantial available lead time, the Commission is keen for BGÉ to undertake a range of modelling to identify cost effective options for longer term investment to handle changes in flow patterns. The Commission will keep this issue under review for future Statements.
Section 6 – Conclusions and next steps

Compared to last year’s Statement and indeed those in previous years, the conclusions of this Statement are generally more positive for security of supply. This is primarily for two reasons:

- Lower demand forecasts – Primarily due to the macro-economic downturn, but also because of improved energy efficiency, growth in demand for gas in Ireland is forecast to be materially lower than for previous Statements, and consequently peak-day demand is expected to be lower.

- Prospects for supply are more positive with potential for further indigenous supplies – Since last year further work has been undertaken by Shell and its partners to address the concerns of the local community regarding the pipeline to the terminal to bring Corrib gas onshore, although planning permission is still required for the new route. Shannon LNG has secured planning permission, subject to certain conditions, for its terminal and will shortly be applying for planning permission for the pipeline from the terminal to BGE’s network. Furthermore, the Commission is aware of three fields that are being explored for possible commercial finds of gas off Ireland.

Despite the more positive outlook for security of supply compared to last year’s Statement, the Commission remains vigilant, particularly given the longer term issues that may arise, and that begin to be highlighted by the scenario modelling for this year’s Statement.

Furthermore, this Statement does not consider directly the commercial incentives for further development of gas supplies in Ireland and associated infrastructure. Such considerations are an important part of the current work being undertaken to consider transmission charging as part of the CAG project.

Trends over 20 years

Following a request by the Irish Government, as part of this year’s Statement the Commission has sought to take a longer term view about security of supply issues, by considering possible scenarios up to 20 years into the future. Events up to 20 years into the future are clearly very uncertain, and therefore, while undertaking some modelling beyond the seven year period of the Statement, the Commission has primarily considered longer term issues qualitatively.

As discussed in Section 5, the longer term sensitivity modelling undertaken by BGE highlights that beyond the seven year period of the Statement, safe operating pressures for the network cannot necessarily be maintained at all points on the network, primarily because of changing flow patterns given new sources of supply on the West coast. At this stage the Commission does not consider it necessary to undertake specific investment, but the Commission would like BGE to investigate the options for cost effective reinforcement when it is required.
More generally, a number of longer term issues for security of supply have been highlighted during this year’s Statement:

- Even with the development of Shannon LNG, once supplies from Corrib decline from their initial peak, Ireland will return to a substantial dependence on supplies through Moffat to meet its peak demand. However, the role of Moffat to meet demand on lower demand days will not be particularly significant.
- Given exploration and production activity currently being undertaken off the Irish coast, there is a possibility of new finds of commercially viable gas, which would increase the contribution of indigenous gas to meeting Irish demand.
- While there is uncertainty about the future availability of storage services through Inch, particularly while Marathon’s Irish assets are up for sale, there is the prospect of a new storage facility being developed in Northern Ireland, albeit these plans are at a relatively early stage. If the storage facilities through Inch cease and the storage facility in Northern Ireland is not developed, there is a risk that on the island there is no storage facility. However, it is important to note that the linepack in the Interconnectors and the potential LNG facility at Shannon could offer potential substitutes for a storage facility.
- As discussed further in Annex C, the development of CAG has the potential to lead to a more efficient use of network assets in Ireland, which should improve security of supply and reduce costs.

Overall, the longer term prospects for security of supply appear to be relatively positive, particularly compared to previous years, as new sources of supply and the potential development of a storage facility in Northern Ireland are new developments since last year.

Interaction with the UK

While a number of the scenarios considered in this year’s Statement imply a reduced dependence on gas through Moffat, it remains likely that Ireland will continue to source a material proportion of gas from Moffat in the near term even if the higher supply scenarios materialise, and particularly for peak-day demand. Therefore, commercially and operationally the Irish gas market will continue to be heavily influenced by developments in the UK.

Statements in recent years have noted the concerns of the Commission and market participants in Ireland about the development of enduring offtake arrangements that would affect the booking of exit capacity from the National Transmission System in Great Britain at Moffat. Last year, a decision by Ofgem to accept proposals to introduce enduring offtake arrangements was overturned on appeal by the UK Competition Commission. In the light of this decision, Ofgem is re-considering a range of proposals for new arrangements, including some proposals raised since the Competition Commission’s decision. We understand that Ofgem expects to make a decision later this year, which would potentially allow implementation of enduring offtake arrangements three years later.

The Commission will continue to monitor Ofgem’s consideration of these issues, and where appropriate, make representations to Ofgem.
6.3 Assessing the need for reinforcement

Statements in previous years have raised the possibility that further investment in onshore Scotland may be appropriate in response to the risk that on the peak-day it may not be possible to meet all currently firm demands if Corrib were to be delayed beyond 2009/10. The Commission is of the view that although there is a risk that Corrib gas flows are delayed beyond 2009/10, this risk is lower than at the time of last year’s Statement, and there are likely to be more cost effective ways of managing the risk for BGÉ than investment in onshore Scotland. The Commission will continue to monitor developments regarding the timing of flows from Corrib, but at this stage does not consider that further investment in onshore Scotland is required to address this risk.

The scenario modelling for this year’s Statement illustrates a new potential issue that may in due course require network reinforcement. Flows from Corrib, the development of flows from Shannon LNG, and ending of flows through Inch, will significantly change the direction and nature of flows on the Irish transmission network. Scenario analysis shows that reinforcement is not required within the seven year period of this Statement to maintain safe system pressures under a range of peak-day scenarios. However, it is evident that without investment around the end of the seven year period or shortly thereafter, allowable minimum operating pressures might not be obtainable.

Therefore, and given the substantial available lead time, the Commission is keen for BGÉ to undertake a range of modelling to identify cost effective options for longer term investment to handle changes in flow patterns. The Commission will keep this issue under review for future Statements.

6.4 Security of supply

Since last year’s Statement, the Department of Communications, Energy and Natural Resources in Ireland along with its counter-part in Northern Ireland published the Executive Summary of a report by a consortium led by CSA Group about security of supply issues in Ireland and Northern Ireland, although this was focused primarily on opportunities for developing storage facilities. The Commission welcomes and supports some of the ideas developed in the study, but also notes that the analysis, particularly of demand and peak demand in this Statement may imply different conclusions from some of those reached by the CSA Group. In particular, the security of gas supplies in Ireland appears to have improved since the CSA Group undertook its analysis. The Commission will continue to work with the Irish and Northern Irish governments to consider the conclusions of the CSA Group report.
Conclusions and recommendations

Given the improved position for security of supply since last year’s Statement, the Commission does not consider it is necessary to undertake any immediate actions to address potential concerns about security of supply. However, in addition to monitoring developments, the Commission would like BGÉ to:

• Continue to consider more cost effective options than reinforcement in onshore Scotland to address any potential concerns about security of supply on the peak-day if flows from Corrib are delayed beyond 2009/10.

• Begin to investigate the most cost effective options for network reinforcement to deal with longer term pressure maintenance issues once flows begin to increase from East to West in Ireland with the development of the Shannon LNG terminal and flows from Corrib.
Appendix A – Scenario data sets

Peak-day data – Scenario parameters (tables and figures)
Base demand and base supply

Table A1: MCM peak-day

<table>
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<tr>
<th>Peak-day demand</th>
<th>07/08</th>
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<th>09/10</th>
<th>10/11</th>
<th>11/12</th>
<th>12/13</th>
<th>13/14</th>
<th>14/15</th>
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<td>0.37</td>
<td>0.40</td>
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<td><strong>36.17</strong></td>
<td><strong>36.19</strong></td>
<td><strong>36.60</strong></td>
<td><strong>37.43</strong></td>
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The results for the scenarios on the peak-day are expressed in MCM’s as provided by BGN/Penspen. The numbers for demand are converted from GWh. In order to do this it is necessary to make assumptions about the calorific value of the different sources of gas. Indigenous Irish Gas has a calorific value of 37.5, while imports have a calorific value of 40. Results are also reported on a GWh basis below. Gas demand is converted to MCM using a weighted average of calorific values as per the components of supply for a particular scenario.

Table A2: GWh peak-day

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Peak-day supply

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<th>09/10</th>
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23 The results for the scenarios on the peak-day are expressed in MCM’s as provided by BGN/Penspen. The numbers for demand are converted from GWh. In order to do this it is necessary to make assumptions about the calorific value of the different sources of gas. Indigenous Irish Gas has a calorific value of 37.5, while imports have a calorific value of 40. Results are also reported on a GWh basis below. Gas demand is converted to MCM using a weighted average of calorific values as per the components of supply for a particular scenario.
### Table A3: MCM peak-day

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### Table A4: GWh peak-day

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### High demand and low supply case

**Table A5: MCM peak-day**

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**Table A6: GWh peak-day**

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<td><strong>425.64</strong></td>
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</table>
Appendix B – Model testing and verification

Scenarios have been developed that represent peak-day conditions.

The peak-day conditions were based on a 19.75 composite weather variable day, having a 1 in 50 probability of occurring, i.e. the coldest day likely to occur once in 50 years. The peak-day demands for the residential and the I & C sectors are calculated by applying appropriate load factors to the annual demand projections.

Peak-day demand for Northern Ireland was taken from the work undertaken for the Pressure Report of the Northern Ireland Gas Transmission System 2007.

Network analysis

The peak-day and minimum day scenarios were presented to BGÉ in the form of tables. Each supply/demand scenario was input into a computer model of the BGÉ system and the network analysed using software (Pipeline Studio).

Pipeline Studio is a transient pipeline simulator that determines gas flows in the transmission network. This software was used to model the BGÉ transmission system in detail. Each model represents the hydraulics of gas flow within the network and enables identification of network constraints.

The base model used in this analysis included supply points at Inch, Moffat, Corrib, Shannon and Larne. The three compressor stations at Midleton, Beattock and Brighouse Bay were also incorporated. The performance of the compressor stations was taken into account when analysing the network. The Northern Ireland loads were also represented by the model.

The models were examined and reinforcement added where necessary to check that demand could be supplied during peak-day conditions.

The load information used by the network model was broken down into temperature sensitive, I & C, and power generation sectors and was distributed in accordance with geographical location. In order to ensure a reliable representation of demand up-to-date diurnal profiles were used to produce hourly load information for each individual offtake point.

Power Station loads were modelled by BGÉ using a merit order analysis that considered likely fuel costs and estimated likely within days patterns of use. Profiling of gas fired generation plant was apparent, thus confirming that the gas transmission system would be exposed to realistic patterns of power generation demand over the 24-hour peak demand periods.

Models were then run for a series of peak-days, and system linepack was taken into account in meeting the effects of diurnal demand. Transient analysis was used for all cases of this study. Transient analysis effectively models the pressure swing on the system over the day.

Simulation results were considered in the context of operating pressures at certain critical points on the system. Where an area was predicted to incur pressures less than acceptable reinforcement was considered.

Comparison between the model and measured data shows a good level of agreement. Generally, agreement between actual network data & model results was better than 2%, indicating that the model adequately reflects the actual Transmission system, for the purpose of this study.

Results

BGÉ presented the results to the Commission in the form of flow rates and pressures at key points in the system under different network configurations.
Appendix C – Issues arising from the Common Arrangements on Gas (CAG)

In April 2008, the Commission published a Memorandum of Understanding (MoU) between the Commission and NIAUR on the development of the CAG project, under the All Island Energy Market Development Framework. The CAG involves a series of measures designed to allow gas transmission networks in Ireland and Northern Ireland to be operated on a single all-island basis. Specifically, it allows stakeholders to effectively buy, sell, transport, operate, develop and plan the natural gas market north and south of the border. The aim of this process is to reach the stage where the price and conditions on which gas is bought and sold are determined by market conditions as opposed to differences in the regulatory or charging regimes.

The Northern Ireland Gas Transmission System

The BGÉ high pressure transmission network conveys gas from two entry points to directly connected customers and distribution networks throughout Ireland, as well as to connected systems at exit points in Scotland (the SNIP), and the Isle of Man. The Moffat entry point, located onshore in Scotland, connects the Irish natural gas system to that belonging to National Grid in the UK, and allows for the importation of UK gas to Ireland via two sub-sea interconnectors.

The 135km Scotland to Northern Ireland pipeline (SNIP) connects to the BGÉ system at Twynholm in Scotland, and is owned and operated by Premier Transmission Ltd (PTL). The 600mm pipeline has a maximum operating pressure of 75 barg. It comes onshore by Ballylumford Power Station, from where 35km of similar pipeline runs via Carrickfergus to Belfast. This onshore stretch was formerly owned by Phoenix Transmission, but is now part of the PTL network.

The North-West Pipeline (NWP) is owned and operated by BGÉ, and runs 112km from Carrickfergus to the power station at Coolkeeragh, Derry. Several distribution networks are being developed in towns (such as Ballymoney) adjacent to the pipeline by Firmus Energy. The 154.5km SNP, completed in 2006, connects the NWP to the Irish Sea Interconnectors in the Republic between Ballyalbanagh (12km west of Carrickfergus on the latter) and Gormanston, Co. Meath. The SNP supplies towns in the corridor from Newry to Belfast and is envisioned to support the SNIP in meeting increased demand in Northern Ireland. A further pipeline is planned to run from Kernan to Armargh to supply gas to Armagh. As with the NWP, BGÉ are the owner, developer and operator of the SNP, which is part of the Northern Ireland Transmission system.

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The Pressure Report

The Northern Ireland Authority for Utility Regulation (NIAUR) publish an annual ‘Pressure Report’ which summarises the Northern Ireland Gas Transmission study. The preparation of the Pressure Report is a requirement in the licence of the transmission system operators in Northern Ireland. NIAUR and the Commission jointly recognise the common purposes and issues between the Report and the Statement, and the potential synergies from a single approach.

“As part of this vision, we will establish and work with government to establish a single approach to Security of Supply incorporating a Single Security Standard, a Joint Capacity Statement, (and) a Single Approach to Storage, LNG and System Entry Points.”
Memorandum of Understanding between CER and NIAUR in relation to CAG under the All-island Market Development Framework.

The remainder of this appendix considers:

- how the Pressure Report compares to the Statement regarding their findings;
- the different processes involved in undertaking each of them; and
- the issues that would need to be considered if there was a move to a joint statement. This is as regards both the process of preparing a joint report or statement and the network issues associated with CAG.

Findings from the Pressure Report

The purpose of the Pressure Report is to clarify and understand the future potential of the transmission network in Northern Ireland. In addition to a ‘base case’, this year’s Report considered the following possible events, based on analysis of the engineering (rather than commercial) implications:

- a new electricity generating plant (CCGT) at Kilroot developed by AES, thus increasing demand for natural gas;
- a new electricity generating plant coming off the South-North Pipeline (SNP);
- increased demand from the existing power station at Ballylumford;
- a delay to the operation of the gas field in Corrib beyond September 2009, thus impacting the supply of natural gas;
- the development of a storage facility in Northern Ireland; and
- the operation of an LNG facility in Shannon in the Republic.

The Pressure Report concludes that the Transmission network has sufficient capacity for “significant load growth”, and that no reinforcement of capacity is anticipated before 2013. In terms of scenario testing, a delay of Corrib of one year will lead to a lowering of operating pressures under peak winter demand. The Pressure Report also finds that changes to the network’s current mode of operation (e.g. removing control restrictions at Carrickfergus) would improve the prevailing pressures in the system.

As the most important source of supply for Northern Ireland, the SNIP is a point of focus for the Pressure Report. It has the potential to flow above its existing contractual limits, which is 8.08mcm per day shared between PTL and BGÉ. Furthermore, rebalancing flows between SNIP and SNP may improve pressures on the network and so create a need to review the options and analysis for future capacity. Testing the compressors and pipelines between Scotland and Ireland will allow for a more precise limit on the system capacity to be developed.
The Approach to Preparing the Pressure Report

The approach taken to prepare the Pressure Report is to a large extent a reflection of the small size and relative simplicity of the gas transmission system in Northern Ireland. It summarises the system with some simple modelling approaches. This modelling has a small set of requirements (e.g. Coolkeeragh power station should retain sufficient pressure). BGÉ and PTL are the two transmission network operators in the North.

Unlike the Republic, there is no statutory requirement in UK law for Northern Ireland to produce a statement on its gas transmission network. The approach taken by NIAUR is for the operators, as the responsible parties, to prepare the report as follows:

- PTL writes the report, with support from BGÉ on scenario analysis.
- The Shippers, i.e. Phoenix and Firmus Energy (owned by BGÉ), as well as the power stations, make demand projections (which are not verified by the transmission operators).
- Consultants are hired by BGÉ to undertake the modelling, who for the December 2007 Pressure Report were Penspen.
- PTL separately review this modelling work

The Pressure Report is flexible in its approach. NIAUR requires the Report to cover a five-year period, but have taken a seven-year approach in anticipation of merging their approach with the Commission’s Gas Capacity Statement. This Statement builds scenarios on a base-case plus ‘high- low’ approach. However, the Pressure Report takes a ‘middle-only’ scenario, and analyses the impacts of single scenarios around this. They do not run a full spectrum of scenarios.

Issues involved in a joint-approach

In anticipation of joint statements on gas capacity and security of supply issues in Ireland on the basis of the CAG, the Commission are considering the issues that would be associated with a joint statement, in particular regarding:

- the operational issues associated with operating an all island network; and
- the process required to prepare a joint statement.

The Irish and Northern Irish systems are already linked through the SNP and at the start of the SNIP at Twynholm. Therefore, there is no intrinsic operational reason why the network cannot be operated as a single network. However, there are two contractual and commercial issues that may not be consistent with operating a single network in the most efficient way possible.

25 DTI liaise with BERR to assist in fulfilling the obligation on the UK to provide a security of supply report to the European Commission. Work is undertaken by National Grid, Ofgem and BERR for England, Scotland and Wales.
First, the status of the contractual limits on the Scottish onshore capacity reserved for Northern Ireland, may not in all circumstances be consistent with flowing gas in the most efficient way through the network. The 8.08mcm limit was set by government treaty in 1992 and subsequent corporate agreements. A second treaty in 1999 allows the possibility of increasing the limit, since there is potentially greater capacity available (PTL are in favour of upgrading SNIP to 85bar). While the limit remains in place there is at least the theoretical potential that while higher flows through SNIP would be the most efficient way to flow gas to meet demand in Northern Ireland, such flows would not take place because of the treaty limits and commercial arrangements.

The second issue regards the status for regulatory purposes of the SNP. In the context of the CAG, NIAUR regard the SNP as a conventional pipeline rather than an interconnector with a separate entry tariff, i.e. SNP would operate as a pipeline in an integrated system. There are, however, regulatory issues with the SNP. While the pipeline runs through the Republic for a significant length and is thus subject to the regulation of the Commission, it was fully funded by Northern Ireland consumers.

The way forward on each of these issues would need to be clearly articulated in the context of CAG.

An agreement with NIAUR to produce a joint Gas Capacity and Pressure Report would not require significant additional resources in terms of work and preparation relative to the current arrangement. The form this document will take is being considered by the Commission and NIAUR under the CAG.
Appendix D – Glossary

**Barg**: The unit of pressure that is approximately equal to atmospheric pressure (0.987 standard atmospheres). One millibar equals 0.001 bar.

**BGÉ**: Bord Gáis Eireann

**BGN**: Bord Gáis Networks

**BGT**: Bord Gáis Transmission

**Calorific Value (CV)**: The ratio of energy to volume measured in Mega joules per cubic meter (MJ/m³) which for gas is measured and expressed under standard conditions of temperature and pressure.

**Combined Cycle Gas Turbine (CCGT)**: A unit whereby electricity is generated by a gas powered turbine and also a second turbine. The hot exhaust gases expelled from the first turbine are fed into the heat exchanger to generate steam which powers the second turbine.

**Combined Heat and Power (CHP)**: The simultaneous generation of electricity and heat for use within buildings or processes, by recovery of the heat produced in the power generation process. As such, CHP represents the highest efficiency means of generating electricity.

**Compressor Station**: An installation that uses gas turbine driven gas compressors to boost pressures in the pipeline system. Used to increase transmission capacity and move gas through the network.

**Commission**: Commission for Energy Regulation

**Cubic Metre (m³)**: The unit of volume, approximately equal to 35.34 cubic feet. One million cubic metres is referred to as MCM.

**Cushion Gas**: The gas remaining in the storage reservoir after all of the stored gas has been withdrawn.

**Customer**: Customer in relation to natural gas means a final consumer of natural gas.
Daily Metered (DM) Customer: A customer that has a meter that is read daily by remote means.

Degree Day: A measure of the variation of one day’s temperature against a standard reference temperature of 15.5°C.

Distribution: Distribution in relation to natural gas means the transport of natural gas through local or regional pipelines at pressures below 16 bar with a view to its delivery to customers.

Entry Point: A point at which natural gas is transferred from a connected system to the onshore transportation system.

ESRI: The Economic and Social Research Institute.

Flow Rate: The instantaneous rate of flow of natural gas normally expressed in kW.


Gas Year: The Gas Year is the year between 1st October and 30th September of the following year.

Interconnector: A transmission line which crosses or spans a border between Member States for the sole purpose of connecting the national transmission systems of these Member States.

IPP: Independent Power Producer.

Kilowatt hour (kWh): The unit of energy used by the gas industry. Approximately equal to 0.0341 therms. One Megawatt hour (MWh) equals 1,000kWh, one Giga watt hour (GWh) equals 1,000,000kWh, and one Terawatt hour (TWh) equals 1012kWh.

Linepack: The storage of gas by compression in gas transmission and distribution pipelines.

Load Factor: The ratio of the average daily demand to the peak-day demand. The load factor is used to estimate the peak-day demand from the forecast annual demand.
Load Duration Curve: A representation of an annual demand profile re-ordered from maximum to minimum day loads.

Natural Gas System: The system of pipelines and liquefied natural gas and storage facilities, excluding upstream pipelines, used for the transmission, distribution, storage and supply of natural gas to, from or within the state.

NIAUR: Northern Ireland Authority for Utility Regulation, sometimes referred to as ‘U-Reg’.

Non-Daily Metered (NDM): A meter that is read monthly or at longer intervals.

NWP: North West Pipeline in the Northern Irish Onshore system.

Open Cycle Gas Turbine (OCGT): A unit whereby electricity is generated by a gas powered turbine and no use is made of the hot exhaust gases.

Own Use Gas (OUG): Gas used by BGÉ to operate the transportation system. Includes gas used for compressor fuel, heating and venting.

Peak-day Demand (1-in-50 Peak Demand): The Irish transmission system is designed to meet a 2% or 1-in-50 year requirement. Such a year’s weather pattern has a 2% probability of occurring and, as such, would be expected to be exceeded only once in 50 years.

Shipper: Any person having an entitlement by way of contract with the Transporter through a STA to transport natural gas through the Transportation System or any part thereof or off-take at an exit point, whether for its own use or for use by a third party as an end user.

Shipping: The introduction into, the conveyance by means of, or take off from the natural gas system of natural gas by persons other than the operator of the relevant pipeline or facility.

Shrinkage: Gas that is input to the system but is not delivered to consumers or injected into storage. It is either gas for own or unaccounted for.

SNP: South-North Pipeline

SNIP: The Scotland-Northern Ireland Pipeline.
Storage: The stocking of natural gas by a natural gas undertaking in a facility specifically designed for this purpose.

Supplier: A company with a Supplier’s Licence contracts with a shipper to buy gas which is then sold to consumers. A supplier may also be licensed as a shipper.

Supply: The delivery or sale of natural gas, including liquefied natural gas, to customers, and includes Shipping.

Total Electricity Requirement (TER): The GAR converts total electricity sales at the customer level for a 52-week year to TER by bringing the figure to export level (applying loss factor of 9.3%) and adding an estimate of self-consumption.

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