Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

# Electricity Security of Supply Report 2010

Submitted to the European Commission

Pursuant to
Directive 2003/54/EC and Directive 2005/89/EC

July 2010

Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

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# Executive Summary

The Commission for Energy Regulation (the CER) is required to produce and submit a report to the European Commission every two years on the details of its monitoring arrangements with respect to security of supply of electricity. This is the third such report and is produced to meet the legal obligations set out in European legislation (Directive 2003/54/EC and Directive 2005/89/EC). These directives have been transposed into Irish Law by Statutory Instrument 60 of 2005 (SI 60). From 31 March 2011, Directive 2003/54/EC will be repealed by Directive 2009/72/EC which will require transposition into Irish law by the Government. However, Article 4 of Directive 2009/72/EC does not contain security of supply reporting requirements above that required in Article 4 of Directive 2003/54/EC.

The monitoring of security of electricity supplies is a key legal obligation and priority for the CER. The CER has formal monitoring and reporting arrangements in place with EirGrid as Transmission System Operator to examine the security of supply position in the short term, medium term and long term. The main components of this monitoring are fuel and other power sources, the balance between supply and demand and the electricity network. In addition to EirGrid, there are a number of other stakeholders involved in the security of supply framework including the European Commission and the Department of Communications, Energy and Natural Resources.

A noticeable feature of the generation portfolio in Ireland is the significant reliance on imported fossil fuels. In 2008, 82% of electricity generation came from imported fuels of which 61% was natural gas, 17% was coal and 4% was oil. This is compounded further by the fact that Ireland imports more that 90% of gas requirements and 100% of oil and coal requirements. While in terms of security of supply these fuels have consistently proved reliable it highlights Ireland's exposure to world fuel prices and vulnerabilities that may arise in stocks and flows of fuels used for generation.

Based on EirGrid's assessment of supply and demand of electricity there is expected to be an increase in surplus capacity in the coming years peaking in 2015. This surplus capacity is expected mainly because of a drop of around 4% in demand over the last two years, the advent of over 870MW of CCGT generation capacity in 2010, improved connection with Northern Ireland, a new 500MW interconnector in 2012 and over 400MW of renewable generators connected to the system over the last two years (with ongoing new connections) that more than offsets the closure of 1020MW of generators. However, the availability of generators when they are needed is of critical importance. The CER also monitors EirGrid's and ESBN Network's investments to deliver sufficient network capacity to ensure that generators can service demand. Also, it is expected that the flexibility of new plant will become more important as more intermittent generation connects to the system.

One of the key targets of current Government energy policy is to generate 40% of Ireland's electricity consumption from renewable sources by 2020. To help achieve this and to promote and accommodate longer term security of supplies the CER (in conjunction with the Utility Regulator in Northern Ireland in many instances) has endeavoured to implement a framework conducive to new market investment. The Single Electricity Market went live on 1st November 2007. The SEM is a bi-jurisdictional gross mandatory pool market with an explicit capacity payment. In addition the CER has

developed a gate connection process for new generation capacity. The latest gate decision allows for the connection of 3900MW of renewables and over 1300MW of conventional plant.

The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious targets for renewable generation and maintaining an integral system. To this end, EirGrid as transmission system operator completed and launched a study into the future needs of the high voltage electricity grid. This in-depth study named Grid 25 suggests that the biggest challenge facing EirGrid is the development of the high voltage transmission grid to meet the country's demand for more economical, reliable and environmentally friendly electric power. EirGrid also suggests that the cost of implementing Grid 25 will be in the region of €4 billion.

To promote the security of electricity supplies there is a framework in place under which the system is operated. For example, the rules governing the physical operation of the electricity system are set out in the Grid Code. In addition, the CER has implemented a scheme of performance incentives for EirGrid to run through 2009 and 2010. The transmission and distribution system operators are also required to report annually on their performance against agreed targets. These performance reports are published annually. EirGrid also has a set of Operating Security Standards, which set out the criteria to which the TSO aims to operate the system at all times.

There are a number of additional initiatives in place to protect the security of electricity supplies. EirGrid as TSO has ancillary services contracts in place with a number of generators. These ancillary services include operational reserve, reactive power and black start capabilities. The rates for ancillary services require regulatory approval. There is also a requirement on generators to hold additional fuel stocks on their sites. Gas fired generation for instance, must be capable of running on an alternative fuel. The number of days that generators must hold stocks depends on the type of plant. For example, baseload gas generation must hold five days distillate in storage.

At present there is a tie line in place between Ireland and Northern Ireland with a North to South transfer capacity of 450MW (400MW South to North). In addition EirGrid is currently developing a second tie line to enhance the integrity of the systems. Although not directly connected to Irelands system, the 450MW Moyle interconnector connects the Northern Ireland and Scotland systems. EirGrid is currently building an electricity interconnector linking the Ireland and Great Britain power systems. The East West Interconnector will have bi-directional capacity of 500MW and is schedule for completion in 2012.

The level of renewable generator penetration in Ireland has increased to approximately 15% of delivered energy on an annual basis in 2010. The CER has requested that the system operator analyse the effect of increasing penetration level of renewable generations on security of supply and will use the findings to inform the development of the electricity market.

In order to accommodate increased levels of interconnection and to ensure compliance with EU rules on congestion management the CER and the Utility Regulator have cited the efficient use of current and future SEM interconnectors with neighbouring markets as a key priority. Considerable work has been carried out in this area over the last year and

will continue in the coming year to ensure that appropriate market changes are in place to accommodate increased interconnection.

**Conclusion**

The CER is confident that the current monitoring arrangements are sufficient to identify credible threats to the security of supply of electricity and that no such threats currently exist. The CER is also satisfied that the market framework in place is appropriate to encourage new investment and enhance security of supply. However, given the vital importance of Ireland's security of supply the CER will continue to assess the appropriateness of the current framework and identify where any improvements can be made.

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## Legislative Basis

The Commission for Energy Regulation (the CER) is required to produce and submit a report to the European Commission every two years on the details of its monitoring arrangements with respect to security of supply of electricity. This is the third such report and is produced to meet the legal obligations set out in European legislation (directive 2003/54/EC and directive 2005/89/EC). These directives have been transposed into Irish Law by Statutory Instrument 60 of 2005 (SI 60). However, Article 4 of Directive 2009/72/EC does not contain security of supply reporting requirements above that required in Article 4 of Directive 2003/54/EC.

Directive 2003/54/EC
This Directive was transposed into Irish law by Statutory Instrument 60 of 2005, which was signed by the then Minister for Communications, Marine and Natural Resources. This directive placed monitoring duties for electricity security of supply on Member States and, in Ireland, SI 60 placed those obligations on the CER.

SI 60 expanded the statutory duties and functions of the CER and the TSO in relation to security of supply. The specific security of supply provisions are set out in Regulation 28 (Part 10) of the SI. The provisions can be summarised as follows:

Regulation 28(1) states that it is the duty of the CER to monitor security of supply of electricity.

The specific matters required to be monitored under SI 60 are contained in Regulation 28(2). The following is required to be monitored:

- Balance between demand and supply;
- Level of expected future demand;
- Envisaged additional capacity being planned or under construction;
- Quality and level of maintenance of transmission networks;
- Measures to cover peak demand; and,
- Measures to deal with shortfall of capacity by suppliers.

Regulation 28(3) and 28(4) places a duty on the TSO to report to the CER on issues relating to security of supply.

Regulations 28(5) – (10) of SI 60 details the CER's role with regard to necessary measures to be taken to protect the security of supply. In summary:

- The CER is given the power to take measures necessary to protect security of supply; and,
- These include the running of competitions to acquire additional generation capacity and/or securing the provision of energy efficiency/ demand side measures.

Regulation 28(11) requires the CER to publish a report every two years on its monitoring of security of supply and the measures taken or envisaged to address any issues identified. This report must be submitted to the European Commission. The specific monitoring and actions taken under SI 60 are detailed in section 1.

Directive 2005/89/EC

This directive strengthens the provisions in directive 2003/54/EC and establishes measures aimed to further safeguard security of supply and to ensure the proper functioning of the internal market for electricity. This directive contains the following requirements:

- Article 2 states that this report should be prepared in close cooperation with the TSO and that, if appropriate, the TSO should consult with neighbouring TSOs.
- Article 3 requires Member States to define all the roles and responsibilities of competent authorities.
- Article 4 addresses operational network security. It requires minimum operational rules and obligations on network security. Under this article, Member States are required to ensure that transmission operators set and meet quality of supply and network security performance objectives.
- Article 7 (reporting) refers to this report which is to be submitted to the European Commission. It details the reporting requirements regarding:
    - Operational network security;
    - The projected balance of supply and demand for the next five-year period;
    - The prospects for security of electricity supply for the period between five and 15 years from the date of the report; and,
    - The investment intentions, for the next five or more calendar years, of transmission system operators and those of any other party of which they are aware, as regards the provision of cross-border interconnection capacity.

In relation to part (d) of Article 7, the arrangements need to take account of:

(a) The principles of congestion management, as set out in Regulation 1228/2003/EC;
(b) Existing and planned transmission lines;
(c) Expected patterns of generation, supply, cross-border exchanges and consumption, allowing for demand management measures, and,
(d) Regional, national and European sustainable development objectives, including those projects forming part of the Axes for priority projects set out in Annex I to Decision 1229/2003/EC.

# Structure of this Report

The purpose of this report is to present findings and messages arising from monitoring required under Section 11 of S.I 60 and Article 7 of Directive 2005/89/EC. These reporting requirements include:

- Operational network security;
- The projected balance of supply and demand for the next five-year period;
- The prospects for security of electricity supply for the period between five and 15 years from the date of the report; and,
- The investment intentions, for the next five or more calendar years, of transmission system operators and those of any other party of which they are aware, as regards the provision of cross-border interconnection capacity.

The report is structured around the key reporting requirements in the applicable legislation. The remainder of the report is set out as follows:

### *Section 1: Security of Supply Framework*

This section sets out the high level security of supply reporting framework employed by the CER. It also sets out some security of supply initiatives currently in place.

### *Section 2: Balance between Supply and Demand*

This section takes a forward looking view at the prospects for electricity supply and demand balances for the next five years. The section also contains details of the peak demand reduction initiatives both in place and planned. This section also includes a case study on the current smart metering trial being undertaken in Ireland.

### Section 3: Future Market Investment

This section examines the prospects for future investment in generation in Ireland. Part of the section details the overall framework for new connections. The section also examines current investment plans and the market mechanisms that are in place to incentivise the required generation in the future.

### Section 4: Transmission Networks

This section contains an overview of Ireland's transmission system. The section also contains information on the transmission system investment program planned over the next number of years.

### Section 5: Operational Network Security

This section also examines the operational security of the network and details the incentives and requirements placed on the TSO in operating the system.

### Section 6: Interconnection and Regional Market Integration

This section contains a description of current interconnector development plans in Ireland and any market changes that will be required to accommodate increased interconnection. As part of this a case study is included on the East West Interconnector which is currently being constructed. Plans for future regional market integration and regulatory treatment of interconnectors are also summarised.

# 1.0 Security of Supply Framework

Security of electricity supplies is of paramount importance in building and sustaining the long term economic health of the country. For this reason the ongoing monitoring of security of supply is of great importance. Given this importance it is critical that a joined up approach is taken by all involved parties right through from the law makers to the market players.

As stated previously, the CER's security of supply monitoring obligations were established in Directive 2003/54/EC which was transposed into Irish law through SI 60 of 2005. In addition, Directive 2005/89/EC placed further obligations and reporting requirements on the CER.

In response to the legislative requirements a security of supply monitoring framework has been established. The framework sets out the items that are reported on and the frequency of reporting. The framework is useful for interested parties in understanding what level of reporting is available and what information can be accessed. The purpose of this section is to set out and explain the monitoring framework at a high level.

## *1.1 Key Stakeholders*

### 1.1.1 The European Commission

The European Commission has been working to create an internal electricity market in Europe. It states that a key objective for the successful operation of the internal market is "*the guarantee of a high level of security of electricity supply*[1]*."* Securing European energy supplies is therefore high on the EU's agenda. Besides promoting energy efficiency, the EU promotes a broad mix of energy sources[2]. One of the key roles of the European Commission in security of supply is the pan European legislation it develops to foster market integration and eliminate congestion at cross border interconnection.

### 1.1.2 Department of Communications, Energy and Natural Resources

The Department of Communications, Energy and Natural Resources (DCENR) has an overarching policy formation role, as prescribed in the Electricity Regulation Act 1999, in relation to promoting the continuity, security and quality of supplies of electricity. Furthermore, certain specific actions, which may be taken by the CER with respect to measures to protect the security of supply, require the consent of the Minister of that Department.

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[1] Introduction to Directive 2005/89/EC.

[2] From the European Commission Energy Website
http://ec.europa.eu/energy/security/index_en.htm

### 1.1.3 The Commission for Energy Regulation (CER)

The CER is the independent statutory body responsible for regulating and overseeing the liberalisation of the electricity and natural gas sectors in Ireland. Its primary functions are granted primarily under the Electricity Regulation Act 1999 and the Gas (Interim) Regulation Act 2002, as amended.

In carrying out its duties under the Electricity Regulation Act 1999, the CER must have regard to the need to promote the continuity, security and quality of the supply of electricity. The CER is responsible for ensuring that the appropriate measures are in place for the monitoring, assessing and managing security of supply. The CER is also responsible for taking any necessary actions to protect security of supply.

### 1.1.4 EirGrid Transmission System Operator

The Transmission System Operator (TSO) in Ireland, EirGrid, is the entity with operational control of the electricity system – the scheduling and dispatch of generators and the development, maintenance and operation of the transmission network. The TSO, under section 28(4) of SI 60, has a specific duty to report and advise the CER if it is of the view that security of supply is threatened or likely to be threatened. In the preparation of this report the CER has consulted in depth with EirGrid and has relied on them for all operational information.

### 1.1.5 Other Market Participants

The collective market participants are key in ensuring security of electricity supplies in Ireland. Participants provide the required generation to meet demand and also many of the required demand side measures and ancillary services. The Distribution System Operator also plays an active role in ensuring security and continuity of supplies to customers.

## *1.2 Security of Supply Monitoring*

The CER has established formal monitoring and reporting arrangements with EirGrid that are categorised in terms of short term, medium term, long term and other reporting activities. Figure 1-1 below sets out the CERs monitoring activities at a high level.

| ***Scope of Monitoring*** | ***Inputs/Activity*** |
|---|---|
| Short Term Monitoring | Operational Report<br>Weekly Generation System Reports<br>Additional Monitoring |
| Medium Term Monitoring | Operational Reports<br>Monthly Availability Reports<br>Winter Outlook Reports<br>Adhoc Reporting |
| Long Term Monitoring | Generation Adequacy Reports<br>Transmission Forecast Statement<br>Transmission Development Plan |
| Other Monitoring | Other Networks Monitoring<br>Fuel Monitoring |

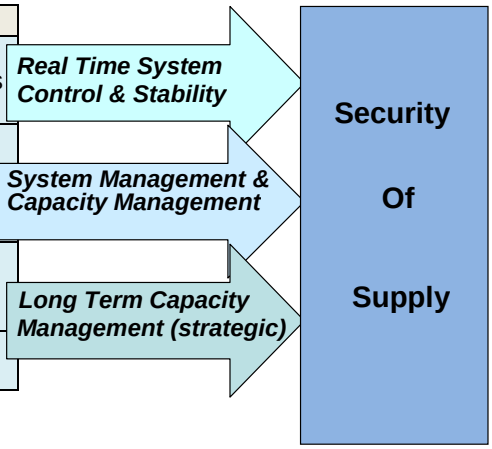


Figure 1-1 Security of Supply Monitoring Framework

The primary outputs of the above monitoring activities are a number of reports produced mainly by EirGrid but also by the Distribution System Operator and other market participants. Many of the EirGrid published reports are referred to later in this report and include the Generation Adequacy Report, Winter Outlook Reports, the Transmission Forecast Statement and the Transmission System Performance Report. These reports feed into the security of supply monitoring activities of the CER (and other stakeholders) and are available on the EirGrid website[3]. In addition, the published reports are important for existing and potential market participants in assessing the viability of existing and new projects.

## *1.3 Security of Supply Initiatives*

Ensuring security of electricity supply continues to form an important part of the CER's activities. In 2008, 60% of electricity generated in Ireland was produced from natural gas. Over 90% of gas supplied to Ireland is imported from GB via two subsea interconnectors. This reliance on the GB source has implications for maintaining the supply and security of this important resource.
As a result of the security of supply monitoring framework, a number of areas have been identified for further consideration. For example it was identified that a specific group needed to be put in place to monitor communications between key stakeholders and also to examine arrangements in place in the case of emergencies.

### 1.3.1 Task Force on Emergency Procedures

The Task Force on Emergency Procedures was established in 2005. The Task Force comprises representatives from the CER, the Department of Communications, Energy and Natural Resources, Gaslink, Bord Gáis Networks, EirGrid and ESB Networks. A major focus of the Taskforce has been the creation of mutually agreed procedures and chain of communications in the event of emergency events, with specific focus recently on a gas emergency. The testing of these procedures has been carried out by Bord Gáis Networks, EirGrid and Gaslink in cooperation with UK authorities, through a series of organised paper drills.

In late 2008, the National Gas Emergency Plan was approved by the CER Gaslink is the Natural Gas Emergency Manager; the coordinator for Ireland in the event of a gas emergency announced in the UK.

The Task Force continues to meet on a regular basis to address the different emergency concerns and formulate joint action plans in order to manage such situations.

### 1.3.2 Construction Reports

As part of its security of supply monitoring the CER receives quarterly updates on the progress of new plant construction and the large scale refurbishment of older large plant. The large generation projects monitored by the CER recently include:

- ESB 431 MW CCGT plant at Aghada,
- Bord Gáis 445 MW CCGT plant at Whitegate,
- Bord Na Mona 112 MW Distillate Peaker, Edenderry,
- Moneypoint Coal Unit Refurbishment Project

[3] http://www.eirgrid.com/aboutus/publications/

**Key Messages**

1. The CER has developed a security of supply monitoring framework to satisfy obligations in Directive 2003/54/EC and Directive 2005/89/EC.
2. There are a number of key stakeholders involved in security of supply in Ireland including the European Commission, the DCENR, the CER and the TSO
3. The CER is of the view that the monitoring arrangements currently in place are comprehensive and are adequate to assist the CER in protecting Ireland's security of supply.

# 2.0 Balance between Supply and Demand

The requirements in Directive 2005/89/EC build upon the 2003 directive and require Member States to take appropriate measures to maintain a balance between the demand for electricity and the availability of generation capacity. More specifically, the Directive 2005/89/EC requires Member States to encourage the establishment of a wholesale market framework that provides suitable price signals for generation and consumption and to require transmission system operators to ensure that an appropriate level of generation reserve capacity is available and/or to adopt equivalent market based measures.

In order to provide a framework for new generation investment, the CER and the Northern Ireland Authority for Utility Regulation have developed a Single Electricity Market which went live on 1st November 2007. This is a gross mandatory pool market with an explicit capacity payment mechanism. The new wholesale market arrangements are discussed further in Section 3.2.

The remainder of this section sets out the projected electricity supply and demand balance for the next seven years. This section also lists some of the demand side initiatives currently being undertaken in Ireland.

***EirGrid Generation Adequacy Reports***

EirGrid, as TSO produces an annual Generation Adequacy Report (GAR). The GAR forecasts the demand for electricity in a forward seven year period, the likely production capacity that will be in place to meet this demand, and assesses the consequences in terms of the overall supply/demand balance. The outputs from the current EirGrid GAR are the main inputs to this section of the report. Several findings from the GAR are presented in this report.

## *2.1 Ireland's Fuel Mix*

At the outset it is useful to set out the fuel mix of electricity generated. As Ireland has a combined wholesale electricity market with Northern Ireland the fuel mix figures are now compiled on an all-island basis. The most recent mix published refers to 2008 and are set out in Figure 2-1 below.

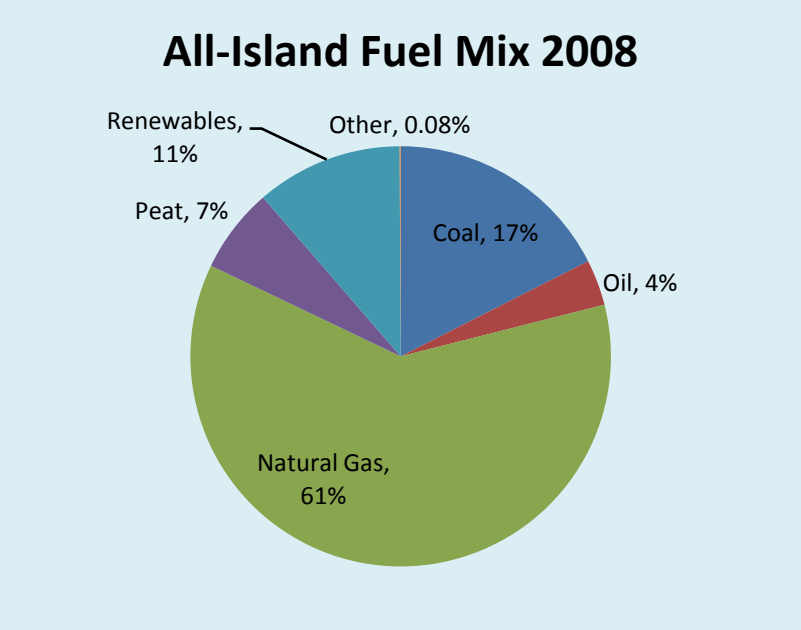


Figure 2-1 All-Island Fuel Mix 2008

The above fuel mix highlights the exposure to world fuel prices and logistics that exists for Ireland's electricity customers given the significant reliance on fossil fuel generation that exists in Ireland. This is compounded further by the fact that Ireland imports more that 90% of gas requirements and 100% of oil and coal requirements. All of the peat used is indigenous from Ireland's bogs and this generation is underwritten by the public service obligation levy until 2015. The level of wind generation capacity is increasing steadily and stands at 1379MW as of 24th May 2010. Ireland has a renewable generation target of 40% by 2020. Future investment in generation capacity is discussed further in Section 3.

## *2.2 Electricity Generation*

This section examines the level of generation capacity connected to the system. At present EirGrid looks at Ireland only when examining levels of capacity available to the market. It should be noted that from 2013 EirGrid and SONI (System Operator Northern Ireland) will assess generation adequacy on an all-island basis as it is planned that the Ireland and Northern Ireland systems will be fully interconnected at that time. This is reflected in the figures and tables in the following sections.

*Categories of Plant*

- When the TSO examines the plant available for planning and operations purpose there is a distinction between certain categories of plant. Dispatchable plant is generation capacity that can be monitored and controlled by EirGrid. This would typically include thermal plants such as gas fired CCGTs and coal stations. Larger wind farms (above 5MW) can also be monitored and partially controlled.
- In addition to dispatchable plant, there is generation connected to the system whose output is not currently monitored by EirGrid and whose operation cannot be controlled. This non-dispatchable plant and includes small wind farms, small scale hydro and demand side units.

EirGrid Generation Assumptions

*Dispatchable Plant*

In their Generation Adequacy Report, EirGrid carries out a review of the expected new plant and retiring of old plant over the next 7 years. This analysis is summarised below. Further to this, Section 5.3 of this report examines the future generation market investment expected over the next number of years. Table 2-1 below sets out the expected new and retired plant as per the EirGrid Generation Adequacy Report 2010-2016.

Table 2-1 Expected new and retired Generation Capacity 2010-2016

| | Capacity (MW) |
|---|---|
| New Plant with Connection Agreements | 1944[4] |
| Confirmed retiring Plant by 2012 | 1025 |

Table 2-1 above shows that there is close to 2000MW of new capacity expected on the system by 2016. The majority of this plant is gas CCGT with 432MW of the capacity already fully operational in Cork. The EirGrid forecasting also expects the retirement of 1025MW of plant. The majority of this capacity is heavy fuel oil fired plant. Table 2-2 below pulls the previous information together and sets out EirGrid's expected trend in the levels of dispatchable plant out to 2016.

Table 2-2 Expected Dispatchable Capacity out to 2016

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| Capacity Added | | 1060 | 115 | 98 | 98 | | | |
| Capacity Retired | (28) | (219) | | | (806) | | | |
| Northern Ireland Reliance | | | | | (200) | | | |
| All-Island Portfolio | | | | | 2723 | | 440 | (540) |
| East West Interconnector | | | | 250 | | | | |
| Minor Degradation | | (2) | | (2) | | (2) | | (2) |
| Net Impact | (28) | 839 | 115 | 346 | 1824 | (2) | 440 | (542) |
| Change from 2009 | | 839 | 954 | 1300 | 3124 | 3122 | 3562 | 3020 |
| Dispatchable Capacity | 6171 | 7010 | 7125 | 7471 | 9295 | 9293 | 9733 | 9191 |

Source: EirGrid

Table 2-2 above shows an expected year on year increase in dispatchable plant out to 2015 with a reduction in 2016. This suggests a positive net generation security of supply position in Ireland for the next number of years.

*Non Dispatchable and Partially Dispatchable Plant*

As part of their annual Generation Adequacy Reports, EirGrid carries out substantial analysis and forecasting of future levels of both partially and non-dispatchable plant. The technologies examined by EirGrid include industrial generation, small scale CHP, small scale hydro, Biomass/LFG and wind generation. Wind forms the highest percentage of plant in this category and substantial analysis is being carried out on future levels of

[4] Not all plants have confirmed connection dates

wind and also the credit this generation can be given when planning for the future. This detailed analysis is set out in the Generation Adequacy Report[5]. Table 2-3 below sets out EirGrid's assessment of partially and non-dispatchable plant.

Table 2-3 Assessment of Partially and Non-Dispatchable Plant

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Industrial Generation | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| Combined Heat and Power | 126 | 131 | 136 | 141 | 146 | 154 | 156 |
| Small Scale Hydro | 22 | 22 | 22 | 22 | 22 | 22 | 22 |
| Biomass | 43 | 52 | 61 | 70 | 79 | 88 | 97 |
| Wind Generation | 1,943 | 2,062 | 2,442 | 2,862 | 3,282 | 3,701 | 4,121 |
| Partially/Non-Dispatchable Capacity | 2,143 | 2,276 | 2,670 | 3,104 | 3,538 | 3,971 | 4,405 |

Source: EirGrid

### 2.2.1 Importance of Plant Availability

In the sections above the total capacities of various plant types are shown. Having ample capacity on the system is very important but it is equally important that the installed capacity represents a reliable supply of generation when required. For this reason the availability of generation plant is very important. In general each power station goes on an annual planned outage for required maintenance. This is coordinated and planned with the TSO so that not all plant is unavailable at the same time and that there is sufficient plant available to meet demand. For example, if all baseload power plants went on annual outage in June there may not be enough remaining capacity left to satisfy demand or the remaining plant may be much more expensive to run causing price spikes. EirGrid publishes an annual schedule of power station planned outages which is updated monthly throughout the year.

In addition to planned outages there are unexpected or forced outages that occur throughout the year. These are where part or all the output of a power station is unavailable for generation due to an unforeseen problem. There may be many reasons for such outages. EirGrid monitors the overall levels of these forced outages. They also communicate with generators about forced outages to understand the underlying causes. Figure 2-2 below shows the historic and forecast outage rates in Ireland.

[5] See EirGrid Website www.eirgrid.com

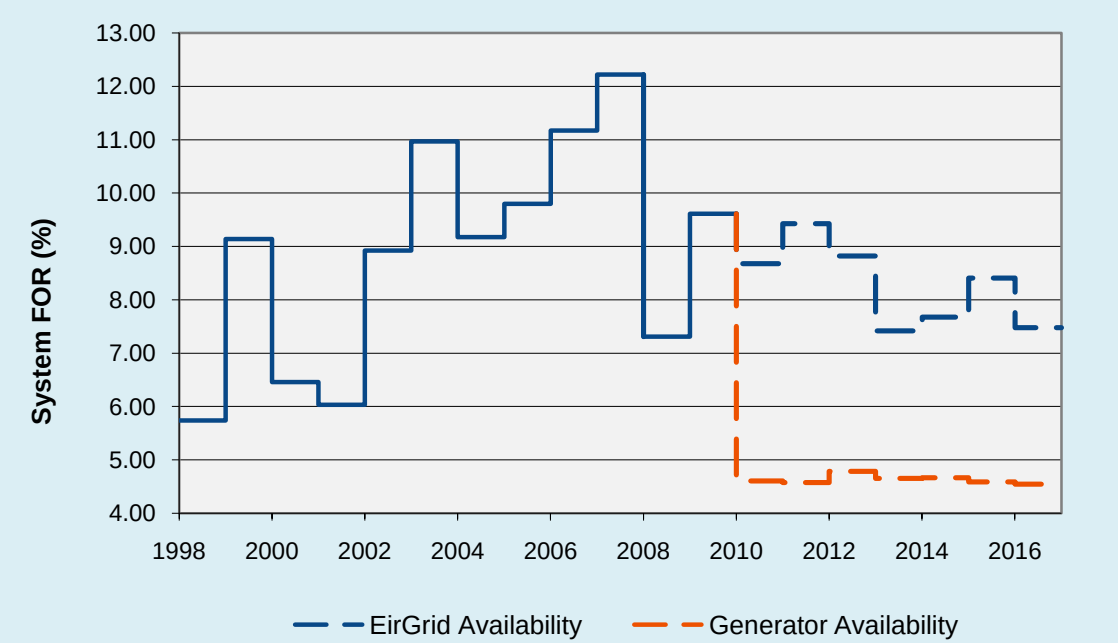


Figure 2-2 Historic and Forecast Forced Outage Rates

As can be seen from the graph above, the forced outage rate peaked in 2007. The reductions from 2007 onward were caused by a combination of factors, including new generators joining the system, older generators decommissioning, and upgrading of existing plant. As can be seen from above, EirGrid expects that the forced outage rate will continue to drop as new efficient plants come on line. The graph also shows the generators' view of future forced outage rates which is much more optimistic than the EirGrid assessment.

## *2.3 Demand*

In developing the annual Generation Adequacy Report, EirGrid carries out detailed analysis on future electricity demand forecasts using their electricity forecast model. The model is explained in detail in the Generation Adequacy Report and put simply at a high level predicts electricity sales based on changes in Gross Domestic Product (GDP), Personal Consumption of Goods and Services (PCGS) and population.

Since the last CER Security of Supply Report in 2008 there has been a decrease in electricity demand. This has been the result of the major economic downturn experienced in 2008 and 2009 and represents the first drop in year on year electricity demand in decades. Such was the speed of the downturn that EirGrid produced an update to their 2009 Generation Adequacy Report to reflect the changing economic reality.

As stated previously, adequacy assessment will be carried out on an all-island basis with Northern Ireland from 2013 by which time the second major transmission link with Northern Ireland is expected to be completed

In carrying out their forecasting EirGrid explores three scenarios;

- Median (Base) Scenario
- High Demand scenario

- Low demand Scenario

**Results of EirGrid's Forecasting**

*Total Electricity Requirement*
Figure 2-3 below sets out historic and forecast annual electricity requirement from 2004 to 2016. From 2013 on all island values are included.

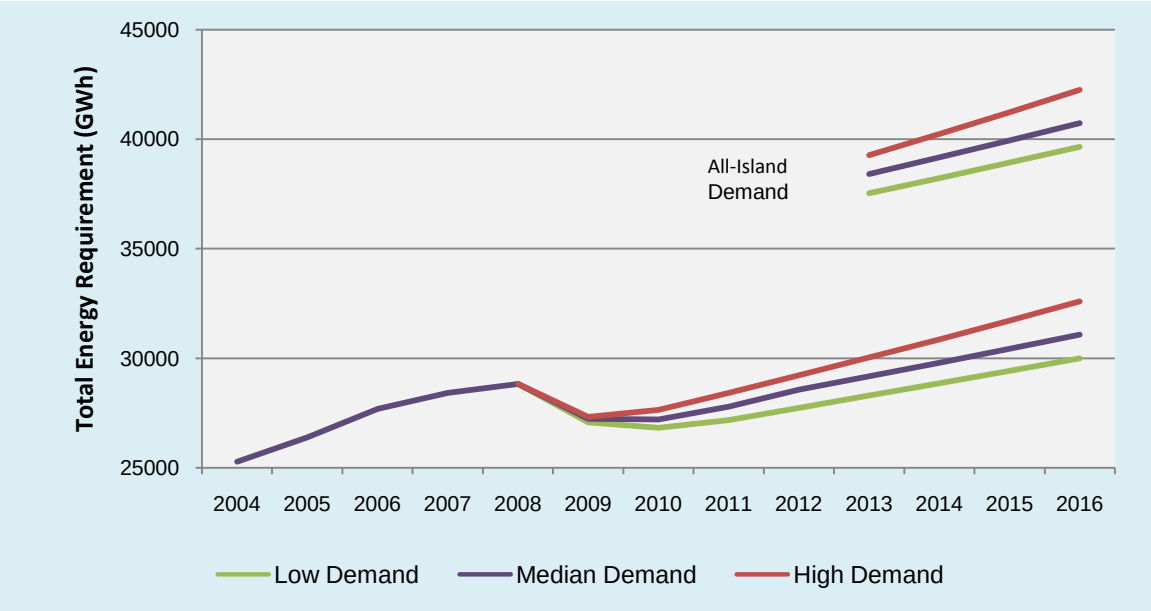


Figure 2-3: Historic and Forecast Annual Electricity Requirement (Source EirGrid)

EirGrid's analysis carried out in late 2009 suggests that while 2008 and 2009 has seen a decrease in electricity demand all three scenarios suggest a return to growth in mid 2010.

*Peak Demand Forecast*

The EirGrid peak demand model is based on the historical relationship between the annual electricity consumption and the winter peak.
The relationship between average and peak consumption is often referred to as a customer's load factor. In general large energy users with round the clock operations will have a high load factor as their demand is quite constant. A domestic customer on the other hand generally has a low load factor where they use large amounts of electricity for short periods of time, typically between 17:00 and 19:00 and have small loads during the night. In general electricity is most expensive to generate at peak times as more expensive less efficient plants need to be called upon. Historically, EirGrid has found that the winter peak is somewhat erratic and difficult to model as it is subject to many disparate influences. Figure 2-4 below shows the results of EirGrid's peak demand forecasting as per the latest Generation Adequacy Report.

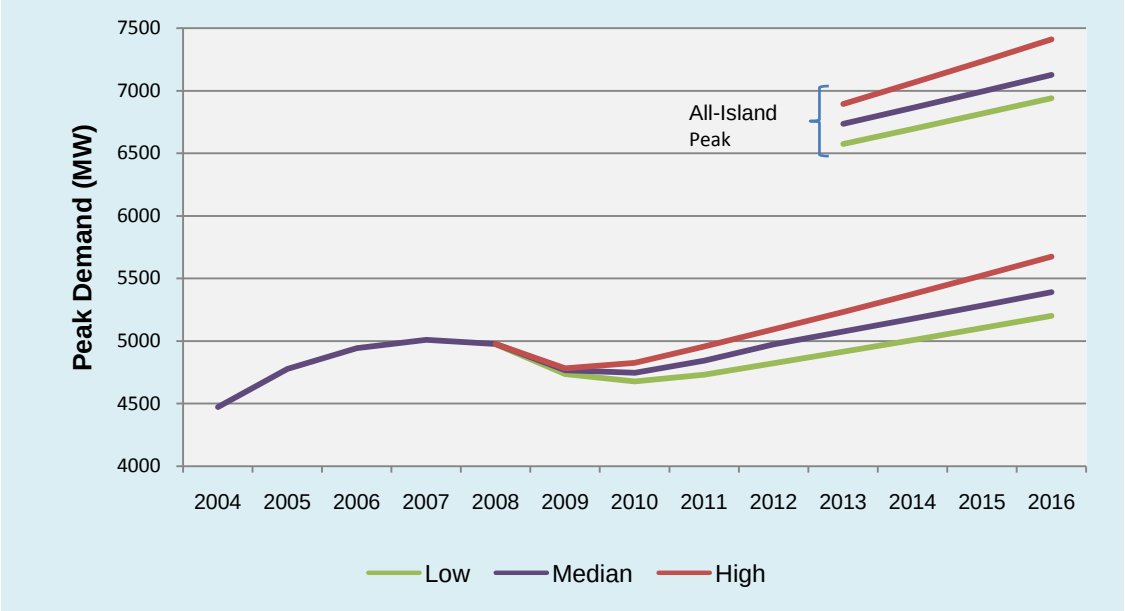


Fig 2-4: Historic and Forecast Peak Demand (Source: EirGrid)

EirGrid's analysis above from late 2009 shows that peak demand dropped off by circa 6% in 2008 and the trend continued into 2009. However, as with overall demand all three scenarios suggest a return to growth before mid 2010. It is useful to note that extreme weather conditions can have a significant impact on peak electricity demand. For example, in January 2010 Ireland experienced a record system demand of 4950MW on 7th January. This coincided with extremely cold weather conditions and a corresponding all time peak in gas system demand in Ireland.

## *2.4 Supply and Demand Balance*

This section compares the forecast levels of generation capacity with the forecast demand that needs to be satisfied out to 2016. EirGrid uses a software program for forecasting surplus available capacity. This software takes the outage rates for generators into account and also considers the system security of supply standard into account which is set using a loss of load expectation. A detailed description of the adequacy assessment methodology used by EirGrid is set out in their annual Generation Adequacy Report. Figure 2-5 below sets out the forecast generation adequacy levels under the different aforementioned EirGrid demand scenarios.

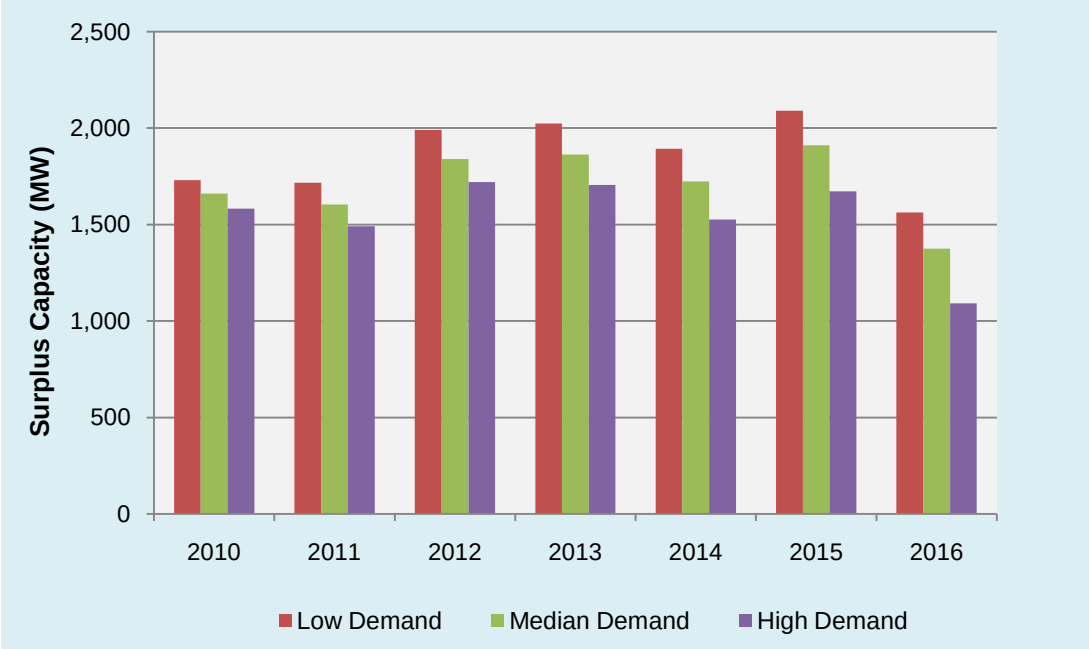


Figure 2-5. Generation Adequacy Levels (Source: EirGrid)

The EirGrid data above shows that there is an expected increase in surplus capacity in the coming years peaking in 2015. However, as stated previously, the availability of generators when they are needed is of critical importance. Also, it is expected that the flexibility of new plant will become more important as more intermittent generation connects to the system. This is area will be under continuous review by the CER and EirGrid.

### 2.4.1 Demand Side Initiatives

Article 5 of Directive 2005/89/EC allows members states to take measures to encourage real-time demand initiatives. Demand side initiatives are generally used to reduce peak electricity demand. Under certain conditions it may be more cost effective to pay for a reduction in demand at peak times rather than starting a potentially inefficient high cost plant.
There are demand side management initiatives in operation in Ireland at present. At industrial customer level, EirGrid offers a scheme called the Winter Peak Demand Reduction Scheme (WPDRS). The WPDRS offers financial incentives to business customers to reduce electricity consumption during the power system's peak hours (5pm - 7pm) during winter months (currently November to February). During the 2009/10 winter 360 customers participated in the scheme and an average total demand reduction of 120MW was achieved. The total cost of the scheme over the winter was €6.43m, with the majority of payments made in November and January.

Further to this, electricity suppliers generally offer a night saver tariff where electricity prices are cheaper during night hours which incentives customers to move their load from day time to lower demand times at night. At present circa 11% of domestic customers in Ireland are on a night saver tariff.

**Harmonised Demand Side Response**

As part of the Single Electricity Market (SEM) in Ireland and Northern Ireland the Regulatory Authorities recognise that demand response is intrinsic to active demand side management, as it refers to the ability of consumers to make decisions regarding the volume and timing of their energy consumption. To this end, a project is ongoing to define a high level and integrated demand response programme which takes into account the other changes that will occur over the coming decade and to make policy recommendations which can be presented to government, the market and key stakeholders for consideration. This project encompasses a number of key areas including:

- Energy efficiency
- Retail Aspects (Smart Metering & System Operator offered schemes)
- Demand Side Bidding
- Aggregation of generation
- Smart Grids

The overall framework being developed will be consulted upon in June with a view to a final strategy being published in September 2010.

## 2.4.2 Case Study 1 – Smart Metering Program

As stated earlier, Article 5 of Directive 2005/89/EC allows members states to take measures to encourage real-time demand technologies including advanced metering systems. The CER, in conjunction with ESB Networks and Bord Gáis Networks, commenced a Smart Metering Project in late 2007. Smart metering technology provides the potential to improve energy efficiency, change demand patterns and ultimately reduce costs for customers. Smart metering is also seen as a key method to support the development of micro generation & Smart Grids in Ireland.

National Smart Meter Plan

The first stage of this project involved setting up and running the Smart Metering Trials. The two main areas of the pilot are Customer Behaviour Trials and Technology Trials for both electricity and gas. Through the smart metering pilot the CER will ascertain the potential for smart metering technology to change customer behaviour, which could result in the reduction of peak demand and overall energy use.

A number of work streams were also established to address the various aspects of the project:

- Networks – Technical design, rollout & maintenance of Smart Metering infrastructure for the Customer Behaviour Trials and Technology Trials. Technology trials are underway in a number of geographic zones involving 4,000 meters being used to test the performance of different smart metering communication technologies.

- Customer Behaviour – Design and Implementation of the Customer Behaviour Trials for both electricity and gas. 6500 electricity and 2000 gas customers are participating in these trials which are testing Time-of-Use tariffs, detailed and more frequent billing, in-home displays and Wed-based information.

- Tariffs – Design of Tariffs (Time of Use) and development and implementation of an approach to test the use of smart meters as prepayment. A suite of electricity time of use tariffs have been rolled out as part of the electricity customer behaviour trials and prepayment trial is in progress with c.50 customers.

- Billing/Data – Design and Implement method of billing for the Customer Behaviour Trials and facilitate data flows to support statistical analysis of the trial findings. Suppliers and statisticians are receiving the profile data for billing and analysis purposes respectively.

Results from the trials will feed in to a Smart Metering Cost Benefit Analysis which is due to be completed by March 2011. The trial findings and CBA results will inform decisions regarding a full national roll-out of smart metering.

**Key Messages**

1. EirGrid, as TSO produces an annual Generation Adequacy Report (GAR). The GAR forecasts the demand for electricity in a forward seven year period, the likely production capacity that will be in place to meet this demand, and assesses the consequences in terms of the overall supply/demand balance
2. Generation adequacy will be assessed on an all-island basis with Northern Ireland from 2013
3. Ireland has a high dependency on imported fossil fuels for electricity generation. In 2008, 82% of electricity generation came from imported fuels.
4. EirGrid's assessment suggests that over the coming five years there will be sufficient capacity available to meet demand with an annual increase in dispatchable plant out to 2015
5. There are a number of new demand side initiatives under way including a smart metering trial and an all-island demand side response project. These will assist in the achievement of demand reduction.

# 3.0 Longer Term Security of Electricity Supplies

Article 7 the 2006 Directive requires member states to report on the prospects for security of electricity supply out to 10 years from the report date. While it is quite difficult to forecast new generation capacity out to ten years, this section of the report sets out the policy and market framework that is currently in place in Ireland and also the current generation investment intentions.

## *3.1 Government and EU Energy Policy*

The current framework for Government energy policy out to 2020 is set out in the White Paper on Energy published in 2007. The underlying strategic goals of the White Paper are as follows;

- Ensuring that electricity supply consistently meets demand
- Ensuring the physical security and reliability of gas supplies to Ireland
- Enhancing the diversity of fuels used for power generation
- Delivering electricity and gas to homes and businesses over efficient, reliable and secure networks
- Creating a stable attractive environment for hydrocarbon exploration and production
- Being prepared for energy supply disruptions

Some of the key targets relating to electricity generation are as follows;

- 15% of electricity consumption to come from renewable energy sources by 2010;
- 30% co-firing of peat stations to be achieved progressively by 2010
- 33% of Ireland's electricity consumption to come from renewable sources by 2020 (This target has since been increased by the Minister of Communications, Energy and Natural Resources to 40%).

**2009 Renewable Energy Sources Directive**

In addition to domestic targets there is new over-arching renewables legislation in the form of the Directive 2009/28/EC on the promotion of the use of energy from renewable sources. This Directive, which came into force on 25 June 2009, establishes a common framework for the promotion of energy from renewable sources in order to limit greenhouse gas emissions by promoting renewable energy, cleaner transport and energy efficiency. This Directive sets an EU wide target for 20% of final gross energy consumption to be made up of renewables. As part of this Ireland is required to produce 16% of final gross energy from renewable sources and to meet this there is a government target to generate 40% of electricity from renewable sources.

## *3.2 High Level Market Framework*

The Single Electricity Market (SEM) is a bi-jurisdictional market governed by Ireland and Northern Ireland and consists of a gross pool market into which all electricity generated (above 10MW) or imported onto the island of Ireland must be sold, and from which all wholesale electricity for consumption or export from the island of Ireland must be purchased. In addition to the pool there is also a capacity payment mechanism. The SEM which went live on 1st November 2007 is governed by the SEM Committee. The SEM Committee is a Committee of both CER and NIAUR (together the Regulatory Authorities) that, on behalf of the Regulatory Authorities, takes any decision as to the

exercise of a relevant function of CER or NIAUR in relation to an SEM matter. Figure 3-1 below sets out the high level workings of the SEM.

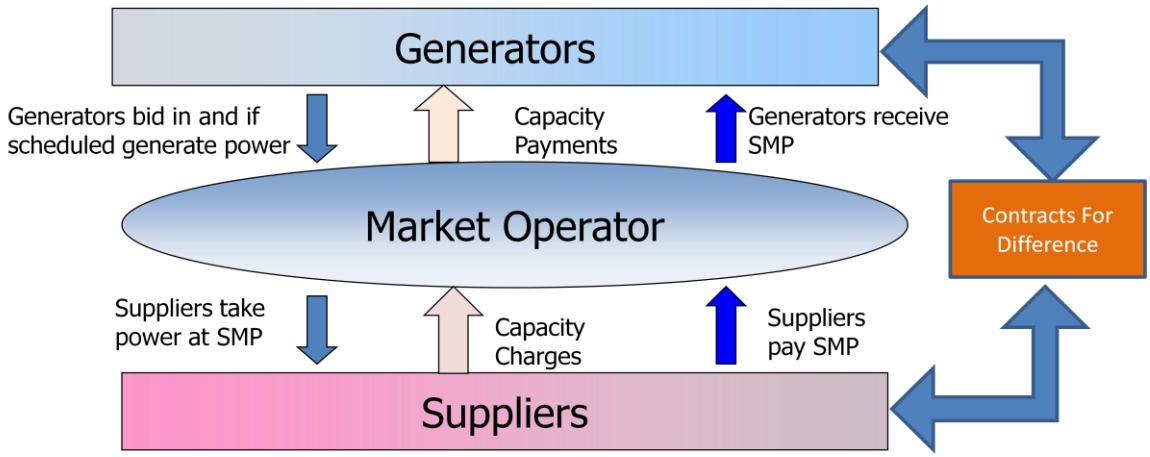


Figure 3-1 High Level SEM Framework

### 3.2.1 The SEM and the Capacity Payment Mechanism

The SEM, a bi-jurisdictional market of Ireland and Northern Ireland, has been in place since 1st November 2007. As stated previously, the SEM is a gross mandatory pool with an explicit capacity mechanism. The Capacity Payment Mechanism (CPM) provides a stream of revenue for generators based on their availability rather than just receiving revenue streams when they generate electricity. Without this explicit capacity mechanism generators would need to recover all their cost when they run. This would have the potential to cause price spikes in times of low margin when lesser used peaker plants are called on. Some of the advantages of an explicit capacity mechanism are below;

- Stability in pricing
- Reduced barriers to market entry
- Greater transparency
- Increased potential for competition

The CPM is designed to reimburse to fixed costs of a Best New Entrant (BNE) peaking plant in the SEM. The BNE peaker is seen as the marginal plant and may not run very often in the market. The CPM therefore ensures that the investment and ongoing costs of the BNE plant are reimbursed whether or not the plant actually runs thereby significantly reducing the risk on the investor. The capacity payment is paid to all generators based on their availability. The total pot of capacity revenue is currently calculated on a year ahead basis by looking at the cost of the BNE plant and also the capacity requirement for the coming year. To date, three full year pots have been approved by the Regulatory Authorities as follows;

- 2008 - €575,221,470
- 2009 - €640,854,720
- 2010 - €551,133,375

*CPM Medium Term Review*

As part of the ongoing operation of the SEM the Regulatory Authorities have committed to carry out a medium term review of the CPM which will take into account the evidence

to date of the operation of the SEM. Listed below are some key areas that the medium term review will consider;

- Historical Analysis of the CPM
- Review of the Capacity Requirement
- BNE Calculation Methodology
- Treatment of all generator types
- Timing and distribution of payments
- Impact of the CPM on customers

A body of scoping work has already been carried out on the medium term review. A full Consultation Paper is planned for late 2010.

### 3.2.2 The Gate Connection Process

The Government target to generate 40% of electricity from renewable sources by 2020 is expected to be met mainly by wind generation.
The process for offering new generation connection (including wind) to the electricity network in Ireland is now largely governed by a procedure known as "the gate" process. The CER developed this process in 2005 as a response to the significant increase in parties requesting connection of renewables. As the name suggests the gate process allows for the processing of applications in a group manner. To date there have been three gates with varying capacities catered for in each.

- Gate 1 – 2005 – 365MW
- Gate 2 – 2006 – 1300 MW
- Gate 3 – 2008 – 3900 MW

The Gate 3 decision allows for the connection of sufficient capacity meet the government's renewable electricity sources target.

*Gate 3 and Conventional Plant*
The CER issued a decision on gate 3 in late 2008. The Gate 3 decision allowed for the connection of 3900MW of new renewable electricity connections. This 3900MW will provide for Irelands Government target of 40% of electricity from renewable sources.

In conjunction with Gate 3 the CER also carefully considered the balancing of the increasing level of renewables on the system with the ongoing need for security of supply and improved generation efficiency. Accordingly, after extensive public consultation, the CER published in December 2009 a direction relating to Gate 3 which decided on the criteria for deciding which conventional (non-renewable) applicants will receive a connection offer to the electricity network. The total connection offer amount was based on criteria rather than an absolute number and currently provides for the issuance of connection offers to about 1,300 MW of conventional generation projects and, in addition, a merchant interconnector project.

*Connections outside the Gate Process*
In addition there is also a process in place to address the treatment of small, renewable and low carbon generators outside the group processing approach. This approach was consulted upon in 2009 and provides a route for fast tracking new generation capacity where it satisfies specific public interest criteria such as diversity of fuel mix, environmental benefits and research.

## *3.3 Planned Investment*

### 3.3.1 Conventional Generation

There is a significant capacity of new generation currently contracted to connect to the system in Ireland. EirGrid currently publishes listings of both contracted and connected plant. Table 3-1 below shows the larger stations with connection agreements in place.

Table 3-1. New Large Power Stations with Connection Agreements in Place

| Plant | Fuel Type | Capacity (MW) | Date |
|---|---|---|---|
| Aghada CCGT | Gas/Distillate | 432 | Connected 2010 |
| Whitegate CCGT | Gas/Distillate | 445 | 2010 |
| Edenderry OCGT | Distillate | 111 | 2010 |
| Nore OCGT | Gas/Distillate | 98 | 2011 |
| Ballykelly CCGT (Louth) | Gas/Distillate | 445 | 2012 |
| Cuileen OCGT | Gas/Distillate | 98 | 2012 |
| Caulstown OCGT | Gas/Distillate | 58 | 2012 |
| Suir OCGT | Gas/Distillate | 98 | 2013 |
| Knocknagreenan | Pumped Hydro Storage | 70 | 2014 |

Source: EirGrid

In addition there are a number of other developers interested in connecting to the network in the next number of years.

### 3.3.2 Renewable Generation

The Government target to generate 40% of electricity from renewable sources by 2020 is expected to be met mainly by wind generation but also with hydropower, wave, tidal, biomass, solar and landfill gas. To enable the realisation of ambitious renewable energy targets the Government launched the renewable energy feed in tariff (REFIT) scheme in 2006. The programme provides support to renewable energy projects over a fifteen year period. Further to this, renewable generation in Ireland receives priority dispatch whereby they are dispatched by the system operator in preference to most other conventional generation types.

#### 3.3.2.1 Wind Generation

The explicit government support for renewables and the gate connection regime has seen large numbers of wind farm developers seeking connection to the system. Wind has been by far the most popular renewable technology choice to date which may not be surprising given Irelands specific weather attributes and the advanced stage of wind technology compared to some technologies. Table 3-2 below sets out the wind generation contracted for future connection to the network.

Table 3-2 Wind Generation Contracted for system connection as of the data freeze for this report

| | Capacity (MW) |
|---|---|
| Transmission Connection | 511.8 |
| Distribution | 1257.5 |

Source: EirGrid

The connections dates for the contracted plant will depend on electricity network developments and how early the new capacity can be accommodated. This is discussed in further detail in the Networks section of this report.

### 3.3.2.2 Other Renewable Generation

In addition to wind, it is expected that there will be significant connection of other renewable energy sources. There are also explicit government targets for these non wind renewable sources. Table 3-3 below sets out the non wind renewables greater than 5MW currently contracted for connection to the system.

Table 3-3 Large Non Wind Renewables Contracted for future connection

| Plant | Fuel Type | Capacity (MW) |
|---|---|---|
| Meath Waste to Energy | Biomass | 21 |
| Dublin Waste to Energy | CHP | 72 |

Source: EirGrid

### 3.3.2.3 Accommodating High Levels of Renewables

The plant portfolio is expected to change somewhat in Ireland between now and 2025. Current policy caters for 6,500MW of renewables, 1,500MW of interconnection and 9,000MW of conventional plant. This is set against a backdrop of a forecast 8,000MW peak demand.

In view of the above the SEM Committee has begun examining the issues that could arise with such a portfolio. In July 2009 the Consultation Paper “Principles of Dispatch and the Design of the Market Schedule in the Trading & Settlement Code” was published by the SEM Committee. This paper examined a number of high level issues including the following;

- Underlying principles for the dispatch of all plant in the island;
- Treatment in dispatch of generation afforded priority dispatch, treatment of hybrid plant in the context of priority dispatch;
- Principles for dispatch in the context of tie breaking situations;
- Determination of market price when demand is met in by non price setting generation
- Curtailment and constraining of generation plant.

Work is ongoing in reviewing the responses received to this consultation and developing appropriate next steps.

## *3.4 Summary*

This section has looked at matters relevant to the security of electricity supplies over 10 years. In addition it is also useful to examine the prospects for longer term security of supply. Forecasting new levels of generation further than a few years is quite difficult given that a view is being taken on the investment intentions of commercial organisations. This will inevitably be subject to other factors such as electricity demand, the financial climate and the ability to raise finance.

However, much can be done to create an environment conducive to further investment. For example, the longer term rollout of network infrastructure is of paramount importance. This is discussed further in Section 4.

The CER will maintain a watching brief on the longer term security of electricity supplies. For example;

- The aim of the Capacity payments medium term review is to provide a stable investment platform for developers to build the optimum new generation.
- Gate 3 and associated decisions set out the framework for the connection of 3900MW of renewables in addition to more than 1300MW of conventional plant over and above what's already catered for.
- EirGrid commissioned a study in 2010 which looks at the potential electricity generation portfolios that would be able to meet Irelands low carbon electricity generation targets. This report looks at various portfolio scenarios including gas, nuclear, carbon capture and storage, high renewables with interconnection or electricity storage.

The monitoring of security of supply is and will remain a core duty of the CER. To this end we will continuously review our procedures and seek to make any appropriate improvements. With unprecedented intermittent capacity on the system in the future, the system operator and indeed the entire market may face many key challenges in maintaining the balance between supply and demand. This is now being addressed by EirGrid as part of their study into the facilitation of high levels of renewables.

**Key Messages**

1. The Single Electricity Market (SEM) is the wholesale market in Ireland and Northern Ireland. The market commenced operation on 1st November 2007. The SEM is a gross mandatory pool with an explicit capacity payment.
2. There is a Government target to generate 40% of electricity from renewable sources by 2020
3. There is a significant capacity of new generation currently contracted to connect to the system in Ireland.
4. Gate 3 and associated decisions set out the framework for the connection of 3900MW of renewables in addition to more than 1300MW of conventional plant over and above what's already catered for
5. With unprecedented intermittent capacity on the system in the future, the system operator and indeed the entire market may face many key challenges in maintaining the balance between supply and demand.

# 4.0 Networks Investment

Article 6 of the 2006 Directive requires member states to establish a regulatory framework that provides investment signals for both the transmission and distribution system network operators to develop their networks in order to meet foreseeable demand from the market and facilitates maintenance and, where necessary, renewal of their networks.

This section sets contains a description of the electricity network in Ireland. The section also sets out the regulation framework in place and a high level description of investment intentions.

## *4.1 Network Description*

The national grid plays a vital role in the supply of electricity, providing the means to transport power from the generators to the demand centres using a system comprising 400 kV, 220 kV and 110 kV networks. The 400 kV and 220 kV networks form the backbone of the grid *(Source: EirGrid Transmission Forecast Statement 2010-2016)*

The transmission system is made up of the following infrastructure;

Table 4-1 Transmission System Infrastructure

| Power Lines | Total Line Lengths (km) |
|---|---|
| 400kV | 439 |
| 275kV | 97 |
| 220kV | 1,835 |
| 110kV | 4,087 |
| Transformers | Number Of |
| 400/220kV | 5 |
| 275/220kV | 3 |
| 220/110kV | 39 |

Source: *EirGrid Transmission System Performance Report 2009*

## *4.2 Regulatory Framework*

EirGrid, a semi-state company, is the operator of the electricity transmission network and was granted a licence to operate the system by the CER. ESB, the semi-state vertically integrated electricity incumbent owns the entire transmission and distribution system and holds Transmission Asset Owner (TAO) and Distribution Asset Owner (DAO) licences. The Distribution System is operated by ESB Networks Ltd, a wholly owned subsidiary of ESB. ESB Networks Ltd was set up and licensed in 2009 to satisfy the legal unbundling requirements under Article 15 of EU Directive 2003/54/EC. The CER regulates EirGrid, ESB and ESB Networks.

### 4.2.1 Revenue Regulation

By their nature, the electricity networks are operated as monopoly businesses - it does not make sense, either economically or environmentally to construct or operate competing electricity networks. Regulation of the monopoly network owners and operators is therefore a fundamental role for the CER.
The bodies involved – ESB Networks as Distribution System Operator (DSO) and Transmission Asset Owner (TAO) and EirGrid as Transmission System Operator (TSO) are required to submit their proposals for required revenues, including capital expenditure over the five-year period of the review. The CER analyses and reviews their proposals, with the aim of achieving operational efficiencies while ensuring the correct level and type of investment in the electricity networks. The companies are benchmarked against similar organisations internationally and areas of their business where improvements need to be made are targeted. To date there have been two electricity networks revenue reviews.

The CER is currently carrying out the third revenue review for electricity networks. This control will run from 2011 to 2015. A full consultation is currently underway with a view to making a final decision in September 2010.

## *4.3 Networks Investment*

The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious targets for renewable generation and maintaining an integral system. To this end there will be significant investment in the transmission and distribution networks in the coming years. Given that much of the wind generation can be expected to be located in the west of the country where wind levels are significant, new wires are needed to transport the power back to the demand centres, many of which are located closer to the east of the country. The timely rollout of the network will require a joint up approach and co-operation between government bodies' market participants and electricity customers.

### 4.3.1 Case Study - Grid 25

In late 2008, EirGrid completed and launched a study into the future needs of the high voltage electricity grid. This in-depth study suggests that the biggest challenge facing EirGrid is the development of the high voltage transmission grid to meet the country's demand for more economical, reliable and environmentally friendly electric power. The EirGrid study was set against the backdrop of the following challenges;

- Climate change and energy security
- Increasing demand levels
- 40% contribution of renewables towards electricity needs by 2020
- Conventional generation and imports needed to compliment renewables
- Increased interconnection
- Physical location of renewable generation

*Reinforcement Needs*
The EirGrid study examined the reinforcement needs of the high voltage electricity system and the routes that electricity will flow in the future. Traditionally, electricity has

been generated close to built up areas and distributed out to surrounding areas and more remote regions. With increased penetration of renewables, most notable wind, there will be a requirement to carry the power from the wind rich west of Ireland back to the populations centres located to the east. EirGrid propose that new large scale transmission lines will be needed to ensure delivery of the ambitious renewables targets. In summary EirGrid proposed that the following will be required;

- Doubling of the capacity of the bulk transmission system
- Upgrade of 2300km of the existing network
- Construction of 1150km of new circuits.

EirGrid estimates that the cost of implementing Grid 2025 will be in the region of €4 billion. EirGrid has also carried out an assessment of how the estimated costs are distributed across the various regions within the country. This is shown in Figure 4-1 below.

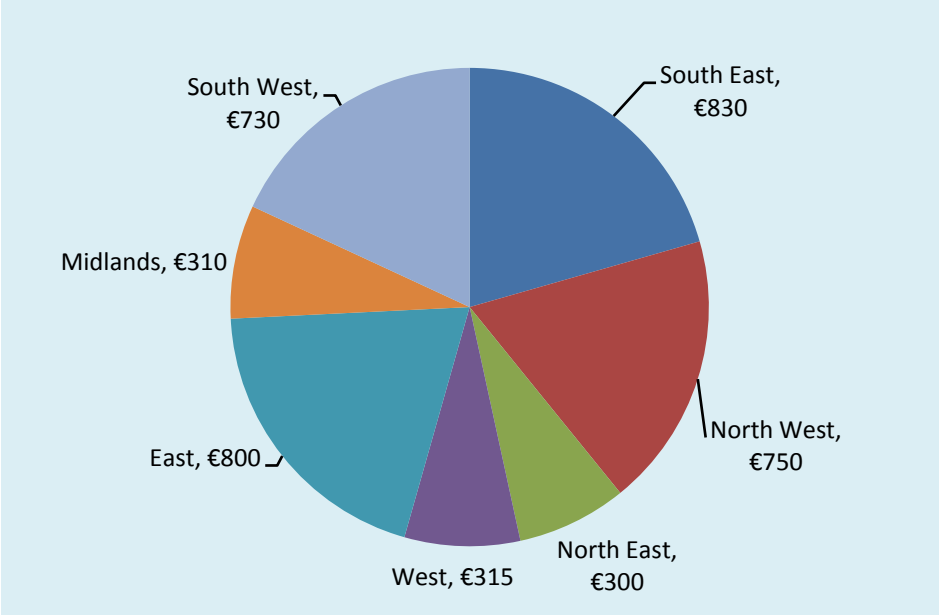


Figure 4-1. Distribution of Grid 2025 Costs (€m). Source: EirGrid.

**Key Messages**

1. The CER regulates the Transmission and Distribution system operators and owners in Ireland.
2. The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious targets for renewable generation and maintaining an integral system.
3. The timely rollout of the network will require a joint up approach and co-operation between government bodies' market participants and electricity customers.
4. The EirGrid Grid 25 Study suggests that the biggest challenge facing EirGrid is the development of the high voltage transmission grid to meet the country's demand for more economical, reliable and environmentally friendly electric power.

# 5.0 Operational Network Security

Article 4 of the 2006 Directive contains requirements in relation to operational network security. In particular the Directive requires Member States to ensure that transmission system operators (and where appropriate distribution system operators) set and comply with minimum operational rules and obligations on network security.

This section describes the operational framework in place for the operation of the system and also the measures in place for ensuring operational network security.

## *5.1 System Operation*

### 5.1.1 Operational Framework and Rules

The rules governing the operation, maintenance, and development of the transmission system, and procedures governing the actions of transmission system users, are set out in the Grid Code. This technical document establishes the rules governing the operation, maintenance and development of the transmission system and sets out the procedures for governing the actions of all transmission system users. Since 2004, the Wind Grid Code is also incorporated into the wider Grid Code.

EirGrid is responsible for the development and maintenance of the Grid Code through the Grid Code Review Panel (GCRP). The GCRP is a standing body mandated to review and discuss the Grid Code, its workings and offer suggestions for amendments to the Code. Any subsequent modifications, updates and derogation requests must be approved by the CER.

In addition, EirGrid uses its own Operating Security Standards, which set out the criteria to which the TSO aims to operate the system at all times.

### 5.1.2 Performance Incentives

The CER has implemented a scheme of performance incentives for the TSO. In 2009 the CER published a set of System Performance Incentives (SPI'S) to run through 2009 and 2010 (cer/09/004). The key areas that are incentivised are as follows;

- System Minutes Lost
- System Frequency
- Fault Clearance
- Lodgement of Planning Permission for new transmission infrastructure

### 5.1.3 Performance Reporting

As per their TSO licence, EirGrid is required to publish the Transmission System Performance Report annually to cover performance over the previous year. This report is based on performance criteria approved by the CER. The key areas that EirGrid report on are as follows;

- Basic System Data (i.e. throughput, number of connections etc),
- Grid Development and Maintenance
- Transmission System Availability and Outages
- Generation Availability and Outages

The 2009 Performance Report was published in April 2010 and is available on the EirGrid website. Some of the key information from the report is included in Table 5-1 and Table 5-2 below.

Tale 5-1 Generation and Transmission Data

| | 2008 | 2009 |
|---|---|---|
| Total Operational Generation Capacity | 7,495MW | 7,756 MW |
| Total Exported Energy | 28,241 GWh | 26,752 GWh |
| Peak Winter Demand | 4,878 MW | 4,890 MW |
| Min Summer Night Valley | 1,786 MW | 1,632 MW |

Table 5-2 System Availability Data

| | 2008 % | 2009 % |
|---|---|---|
| 400kV Circuit | 98.63 | 97.17 |
| 220kV Circuit | 95.78 | 95.47 |
| 110kV Circuit | 97.57 | 96.78 |
| Generation System (Average Weekly) | 78.86 | 84.35 |
| Generation System (Minimum) | 69.67 | 71.20 |
| Forced Outages (Average Weekly) | 11.18 | 7.73 |
| Forced Outages (Maximum) | 18.74 | 14.34 |

In addition, the following should be noted;

- The maximum recorded demand now stands at 4,950MW and was recorded at 17:45 on 7th January 2010.
- The maximum recorded wind generation now stands at 1120MW and was achieved at 17:15 on 5th April 2010.
- Total installed wind generation stands at 1379MW as of 24th May 2010

## *5.2 Ancillary Services*

As stated earlier, Article 5 of the 2006 Directive requires transmission system operators to ensure that an appropriate level of generation reserve capacity is available and/or to adopt equivalent market based measures. In Ireland this is currently achieved in the relationship between EirGrid and the individual generators and through ancillary services contracts.

Ancillary services are a key requirement in maintaining the supply/demand balance. Ancillary Services can be described as products, other than energy, that are required to ensure the secure operation of the transmission system. Some of the products offered as ancillary services include;

- Operating reserve
- Reactive power
- Black start

As part of the Single Electricity Market the rates for ancillary services are harmonised in Ireland and Northern Ireland. The rates offered for ancillary services are regulated and require regulatory approval. The project to harmonise the rates in the two jurisdictions

was carried out during 2009 with the harmonised rates coming into effect on 1st February 2010.

It is expected that the development of new ancillary services will be done against the backdrop to changes in the generation portfolio where more intermittent generation connects to the system. The CER would expect that the system operators will be best placed to understand the future ancillary service requirements and to put forward proposals for consideration.

## 5.3 Secondary Fuel Capability Obligations

The 2003 Directive as transposed in Ireland by S.I. 60 of 2005 enhanced the CER's role in relation to security of supply and enabled the CER to take any necessary actions to protect security of supply. Section 5 of S.I. 60 states that "*the Commission shall take such measures as it considers necessary, to protect security of supply.*"

A particular area deemed important by the CER for further consideration has been ensuring sufficient stocks of secondary fuels are held on site and the capability of plant to run such fuels in the event of a gas emergency.

Following consultation on this issue, the CER published its final decision on the requirements of generators, with regard to secondary fuel in early 2009. The decision essentially required generators with gas as a primary fuel to be able to run on a secondary fuel for a period of time and also for non gas fired generation stations to hold fuel in storage to run for a defined number of days. The key decisions from the paper are as follows;

| **Primary Fuel Type of the Generating Unit** | **Requirement to be capable of running on a secondary fuel** | **Requirement to hold stocks of that fuel** | **Number of Days Storage Required (Continuous running at primary fuel rated capacity)** | |
|---|---|---|---|---|
| Gas units and CHP units of more than 10MW | Yes (At 90% of units capacity) | Requirement to hold secondary fuel | Higher Merit | 5 |
| | | | Lower Merit | 3 |
| | | | CHP>10MW | 1 |
| Non-gas units such as oil and coal (excluding renewable and peat units) | No requirement | Requirement to hold primary fuel | Higher Merit | 5 |
| | | | Lower Merit | 3 |
| Renewable[6] units | No requirement | No requirement | N/A | |
| CHP units of 10MW and less | No requirement | No requirement | N/A | |
| Peat units | No requirement | No requirement | N/A | |

[6] Renewables is as defined in the Electricity Regulation Act 1999

Monitoring of stock levels by EirGrid has commenced. The schedule for the testing regime will begin once testing procedures are finalised and compensation arrangements for generators are in place. It is expected that secondary fuel capability testing will commence in late summer 2010.

**Key Messages**

1. The rules governing the physical operation of the electricity system are set out in the Grid Code. EirGrid is responsible for the development and maintenance of the Grid Code through the Grid Code Review Panel (GCRP).
2. The CER has implemented a scheme of performance incentives for the EirGrid
3. As per their TSO licence, EirGrid is required to publish the Transmission System Performance Report annual to cover performance over the previous year.
4. Ancillary services are a key requirement in maintaining the supply/demand balance.
5. As part of the Single Electricity Market in Ireland the rates for ancillary services are harmonised in Ireland and Northern Ireland.
6. It is expected that the development of new ancillary services will be done against the backdrop to changes in the generation portfolio where more intermittent generation connects to the system.
7. Gas generators in Ireland must be able to switch from their primary fuel to their secondary fuel while operating continuously and run on their secondary fuel for a defined period of time (1-5 days)
8. Most non gas fired generation stations must hold fuel in storage to run for a defined number of days (3-5 Days)

# 6.0 Interconnection and Regional Market Integration

Article 7 of Directive 2005/89/EC requires member states to report on the investment intentions, for the next five or more calendar years, of transmission system operators and those of any other party of which they are aware, as regards the provision of cross-border interconnection capacity. Article 7 also requires reporting on interconnection to take account of principles of congestion management, existing and planned transmission lines and the level of cross border exchanges.

## *6.1 North-South Tie-line*

There is one major electricity transmission line between the Ireland and Northern Ireland (NI) electricity grids consisting of a 275kV double circuit overhead line. This line is considered to be a tie-line rather than an interconnector because there is one wholesale market in Ireland and Northern Ireland. In addition, there are also two small 110kV standby North-South tie-lines which allow the TSOs in Northern Ireland (SONI) and Ireland (EirGrid) to provide mutual short-term technical assistance.

An agreement between the TSOs in Ireland and Northern Ireland allows the Ireland to rely on 200MW of capacity from NI and NI can rely on 100MW from Ireland. As a result of this agreement the total capacity requirement on the island of Ireland has decreased by 300MW. EirGrid has placed 200MW of formal capacity reliance from NI in previous Generation Adequacy Reports. The flows over the North-South tie-line are generally dominated by North to South flows.

EirGrid is currently in the process of putting another tie line in place between Ireland and Northern Ireland. This new line will be 138km in length and will be 400kV. The project is estimated to cost €280m and is currently in the planning stage. Subject to obtaining planning permission EirGrid plans to have the new tie line in place in 2012.

## *6.2 Moyle Interconnector*

The Moyle Interconnector connects the Northern Ireland and Scottish electricity systems and contributes to the generation adequacy position in Northern Ireland and consequently, benefits the Irish system in terms of capacity adequacy. Northern Ireland relies on the Moyle Interconnector for 450MW of capacity; however, EirGrid does not place any reliance on Moyle for capacity.

## *6.3 East West Interconnector (EWIC)*

EirGrid is currently building an electricity interconnector linking the Ireland and Great Britain power systems. The EWIC will have bi-directional capacity of 500MW and will be Direct Current (DC). The EWIC will consist of a 256km cable, 185km of which will be sub-sea with 71km of terrestrial underground cable. Figure 6-1 below sets out a schematic of the EWIC.

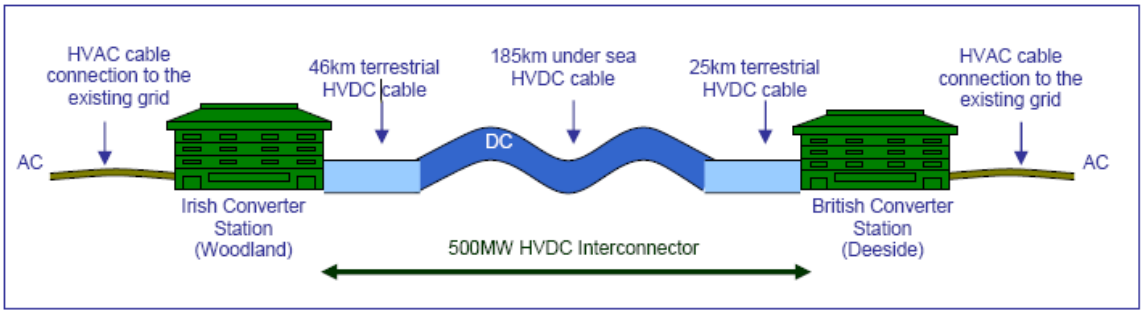


Figure 6-1: East West Interconnector Schematic (Source: EirGrid)

The decision to proceed with the project was a government mandated one and was included as part of the White Paper on Energy in 2007. As per that decision the CER was requested to arrange a competition for construction of the East West at the earliest possible date before 2012. The Government decision also stated that the new interconnector would be owned and operated by EirGrid.

EirGrid expects that the EWIC will bring the following benefits to Ireland;

- Energy security for a growing population
- Promotion of competition in the electricity sector
- Encourages the growth of renewable energy in Ireland
- Allows Irish companies to sell power to GB and vice versa.

The EWIC has now received the vast majority of required consents and construction has commenced. The EWIC is expected to be operational by Quarter 4 2012. EirGrid will require an interconnector operator licence from the CER for the EWIC. The EWIC will be subject to regulated Third Party Access (rTPA).

The total capital cost of the EWIC is expected to be close to €600m. EirGrid has already secured a loan of €300m from the European Investment Bank in addition to a €110m grant from the European Commission for interconnection. The remainder is expected to be funded by a combination of further capital investment from commercial banks and EirGrid equity.

## *6.4 Interconnection and Regional Market Integration*

Regional market integration is a priority work item for the SEM Committee in order to bring about the efficient use of current and future SEM interconnectors with neighbouring markets. This work is also required to ensure compliance with the requirements of the Congestion Management Guidelines set out in Regulation 714/2009. Furthermore, the emerging target models for cross border capacity allocation methods will eventually be codified as Framework Guidelines and binding Network Codes for European electricity markets under the Third Legislative Package.

An initial discussion paper on was published in early 2009. This paper recognised that flows in both directions across the Moyle Interconnector had not responded as fully as they might to price arbitrage opportunities between the SEM and the British markets. This exercise concluded by recommending the following steps.

- Supporting the development of shorter term capacity auctions for the Moyle Interconnector and permitting more flexible use of unused capacity on the Moyle Interconnector by the System Operators
- Investigating the costs and benefits of removing the 80 MW export restriction on the Moyle Interconnector
- Addressing in the medium term identified market misalignments between the SEM and the GB markets that frustrate interconnector usage; and
- Increasing liquidity in both the SEM and GB markets.

Following on from the discussion paper a Consultation Paper on SEM Regional Integration was published in September 2009. It considered the costs and benefits of increased interconnection and examined the question of how best to coordinate the allocation of available transfer capacity on interconnectors in the SEM across various time frames – from long to medium term through to day-ahead, intra-day and in balancing markets. The paper also examined in the detail the wider, more strategic implications for the integration of the SEM with its neighbouring markets in the context of recent initiatives at the European level. The paper recommended the following:

- The engagement by the RAs with stakeholders at European level to influence the development of policy on integration of electricity markets at a regional and European level
- The development of a co-ordinated approach to congestion management with Ofgem, and in particular the explicit auctioning of capacity on ICs
- The development of SEM rules on use-it-or-lose-it and IC trading to comply with the requirements of European legislation and to maximise the benefits of interconnection and intermittent generation to customers
- Depending on the response of interested parties and the likely costs and benefits, the further development of options for the market coupling of the SEM with its neighbouring markets.

Next Steps

A body of work is planned on developing SEM Regional Integration further during 2010/11 with a view to implementing market changes in time to be in place for the operation of the East West Interconnector. Figure 6-2 below sets out the high level work plan.

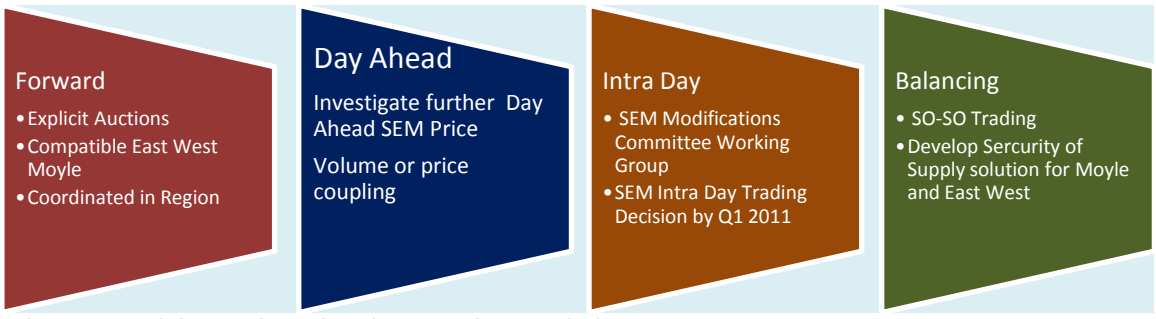

Figure 6-2 High Level Regional Integration Workplan

**Key Messages**

1. There is one major electricity transmission line between the Ireland and Northern Ireland (NI) electricity grids consisting of a 275kV double circuit overhead line.
2. The Moyle interconnector connects Northern Ireland and Scotland and has an import capacity of 450MW
3. EirGrid is currently building a 500MW bi directional electricity interconnector linking the Ireland and Great Britain power systems.
4. Regional market integration is a priority work item for the SEM Committee and is also required to ensure compliance with the requirements of the Congestion Management Guidelines set out in Regulation 714/2009
5. A body of work is planned on developing SEM Regional Integration further during 2010/11 with a view to implementing market changes in time to be in place for the operation of the East West Interconnector.