



Commission for Energy Regulation
An Coimisiún um Rialáil Fuinnimh

Electricity Security of Supply Report 2016

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Directive 2009/72/EC and Directive 2005/89/EC

Information Paper

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Regulating Water, Energy and Energy Safety in the Public Interest

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Executive Summary

Legislation

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. The legal requirement to complete this report is contained in Statutory Instrument 60 of 2005¹ (SI 60). SI 60 (2005) transposed Directive 2003/54/EC² and Directive 2005/89/EC³ into Irish law. In addition under Directive 2009/72/EC the CER is obliged to monitor security of supply as per Article 4 of that Directive⁴.

The monitoring of security of electricity supply is a key legal obligation and priority for the CER. In order to examine the security of supply position in the short, medium and long term, the CER has formal monitoring and reporting arrangements in place with the Irish Transmission System Operator (EirGrid). 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, Climate Action and Environment and of course market participants and customers.

Supply and Demand

The table below shows EirGrid's assessment of supply and demand of electricity in Ireland. As shown in the median demand scenario, there is a large surplus in Ireland in the short term (green cells up to 2020). However, by 2022 a significant number of plant have been decommissioned such that supply and demand are in balance (see the yellow squares indicating almost zero surplus). This is due both to emissions restrictions that will affect a number of plant and the assumption that not all plant will remain commercially viable in the I-SEM and may receive an exit signal from the new Capacity Market.

Ireland	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026		Scale
Low Demand	1560	1250	1050	350	300	210	250	230	230	230		>= 500
Median Demand	1520	1210	990	210	120	20	50	30	30	30		0
High Demand	1460	1160	920	50	-140	-300	-330	-410	-430	-450		<= -500
Median Demand, no EWIC	1140	870	670	-20	-210	-310	-280	-300	-310	-310		

¹ <http://www.irishstatutebook.ie/2005/en/si/0060.html>

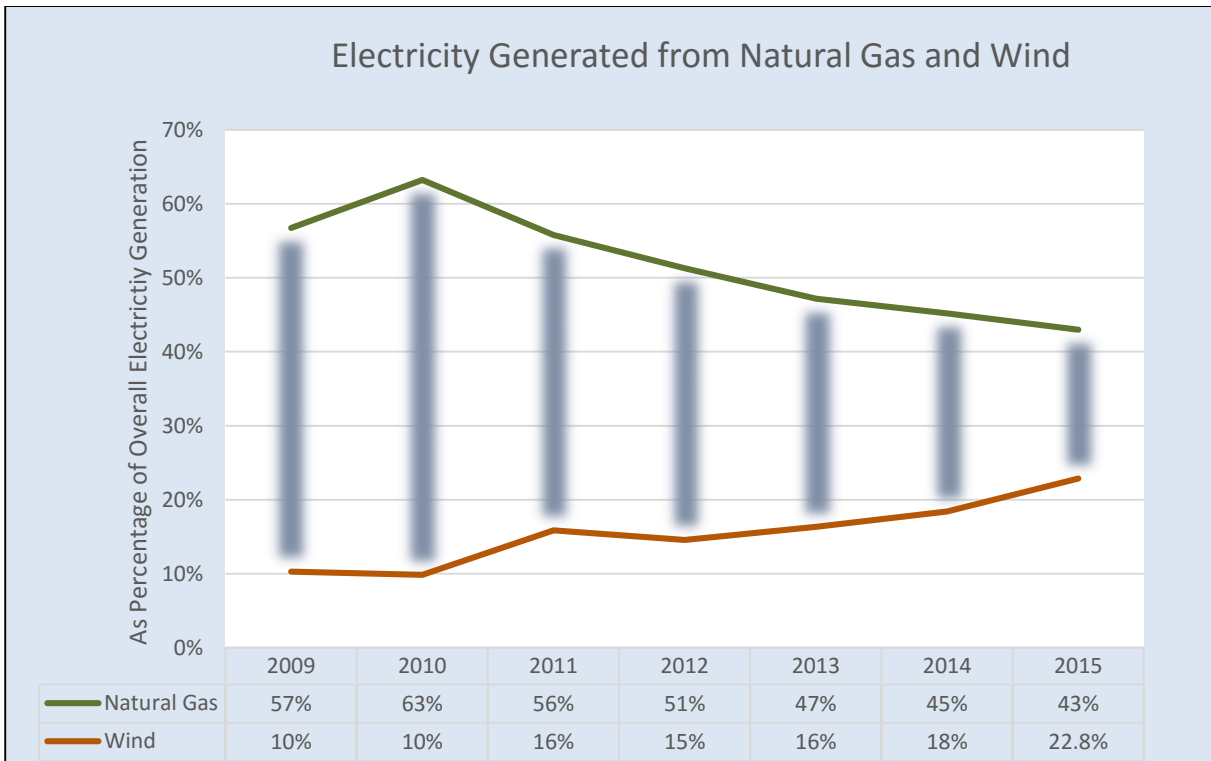
² This has since been repealed

³ Official Journal of the European Union, 18th January 2006

⁴ The CER notes the publication of the EU Commission's Clean Energy Package⁴ and its provisions relating to security of electricity supply and generation adequacy and is providing input and feedback as to its implications for security of supply through appropriate national and European channels.

Generation Adequacy MW Levels (Ireland) Source: EirGrid

A noticeable feature of the generation portfolio in Ireland is the significant reliance on imported fossil fuels. In 2015, approximately 61% of electricity generation came from imported fuels, of which approximately 43% was natural gas⁵, 17% was coal, and 1% was oil. However, in contrast to previous years the reliance on imported fossil fuels in Ireland has been steadily falling. This is due to indigenous gas production and an increase in electricity generated from wind power. The reduced contribution of gas to the generation mix has been primarily driven by a corresponding increase in wind generation since 2009. (See figure below).



Electricity Generated from Natural Gas and Wind as a Percentage of Total Electricity Generation. Data Source: SEAI Fuel Mix Provisional

System Operation and System Operators Initiatives & Incentives

To safeguard the security of electricity supply there is a governance framework in place under which the electricity system is operated by the TSO. For example, the rules governing the operation of the electricity system are set out in the Grid Code and

⁵ In 2014/15, 94% of Ireland’s gas demand was supplied through the Moffat entry point. This dynamic has started to change, in late 2015 indigenous gas started to flow from the Corrib gas field and is expected to reduce our reliance on the Moffat entry point.

EirGrid's Operating Security Standards. EirGrid as TSO, also manage system operator-based schemes in Ireland, schemes such as Short Term Active Response (STAR) and Powersave.⁶ The schemes are used to keep the system secure at times when the system is stressed. The transmission and distribution system operators are also required to report annually on their performance against agreed targets. A number of performance incentives regarding network delivery and revenue incentives also are also implemented to promote supply security. As part of the most recent electricity transmission price review (Price Review 4) the CER decided to put in place strategic incentives separately to incentives focused on operational and service level targets. The CER will consult on this framework during 2017. The objectives of the strategic incentives will focus on key deliverables which can deliver wider benefits to consumers and industry. 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.

Capital Expenditure

The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious targets for renewable generation and maintaining a secure system. In 2008 EirGrid published Grid25, their long-term strategy to develop Ireland's electricity grid looking out to 2025. At that time, demand for electricity had grown by an average of 4% a year over the previous decade. Forecasts suggested that this trend would continue.

Through Grid25, the aim was to deliver efficient and cost effective development that integrated with the existing grid. The approach also tried to avoid having too many projects in one area, if a single solution was viable. In 2011, following EirGrid's first major review of the capital expenditure programme, the forecasted costs were reduced from €4bn to €3.2bn. This was possible due to lower forecasts for electricity demand in the recessionary period, and through the use of new technologies.

In Electricity Price Review 3 (2011-2015), the CER approved €1.45 billion for transmission capital investment for that five year period. In Electricity Price Review 4 (2016-2020), the CER approved €984 million for transmission capital expenditure for this five year period.

In January 2017, EirGrid published their second major review the grid development strategy, entitled Your Grid, Your Tomorrow. In drafting this, EirGrid took account of public feedback which was accrued over an extensive consultation period beginning in March 2015 and also from consultations on proposed transmission projects. They also considered the Government's Energy White Paper. The forecasted costs are now in the

⁶ These schemes are aimed at large electricity users, for more info see EirGrid.com

range €2.6bn-€2.9bn, this is a further reduction of forecast cost compared to the initial €4bn. A range is used as the final cost will vary depending on the circumstances and technologies of each project.

A number of projects have already been completed under these programmes and project status updates are periodically communicated to the CER.

Maintenance

The maintenance of the transmission system is undertaken by EirGrid in accordance with EirGrid's maintenance policy. EirGrid's policy comprises continuous and cyclical condition monitoring, preventative maintenance on critical items of plant and the implementation of corrective maintenance tasks. EirGrid keep their maintenance policy under review to ensure that it continues to meet the requirements of the system and best international practice. Maintenance of the transmission system ensures that the transmission system can operate in a safe, secure and reliable manner.

I-SEM and Generation Adequacy

The wholesale electricity market on the island of Ireland, the SEM, is currently undergoing radical transformation arising from changes to European legislation designed to create a single wholesale electricity market across Europe and is due to come into operation in May 2018.

The Integrated Single Electricity Market (I-SEM) aims to increase the efficiency of the wholesale trading arrangements and increase the operational reliability of the system through more efficient cross border flows across the interconnectors with Great Britain and through closer to real time trading in electricity to allow more flexible and real time response to changing system dynamics. Balance responsibility with scarcity pricing at times of system stress and the introduction of within day cross border trading are key features of the new I-SEM energy market design.

The core changes to the I-SEM energy market are designed to bring the wholesale trading arrangements in line with the European model for trading as established in a series of EU regulations under the aegis of the Third Energy Package. In addition to these changes to the energy market, the I-SEM design brings a major overhaul of the capacity remuneration mechanism operating on the island of Ireland.

The I-SEM CRM has been designed to be in line with the EU state aid guidelines on generation adequacy and is closely aligned with policies regarding capacity payments set out in the EU's Clean Energy Package. In that context the new CRM in Ireland will place increased obligations on capacity providers to improve operational reliability at times of system stress and put downward pressure on capacity prices through a competitive auction designed to ensure supply security is delivered at least cost to consumers. The revised CRM will also provide for cross border participation thereby increasing long run

security of supply and will place greater emphasis on regional assessment of generation adequacy in line with EU best practice and the direction of travel set out in the EU's Clean Energy Package. The first forward transitional capacity auction is due to be held in Q4 2017 with the more significant long term auction (with a four year lead time period) that will signal efficient entry and exit scheduled for late 2018. The CRM has also been designed to ensure that local security of supply is protected through transitional arrangements that will ensure security of supply in import constrained regions of the network on the island such as Dublin and Northern Ireland.

DS3 System Services (Ancillary Services)

EirGrid has statutory responsibilities in Ireland in relation to the economic purchase of services necessary to support the secure operation of the system; these services are known as ancillary services. EirGrid had ancillary services contracts in place with a number of generators, in total seven services, such as operational reserve and reactive power, were purchased by EirGrid. The ancillary services framework has been revised through the DS3 Programme. The aim of the DS3 programme is to meet the challenges of operating the electricity system in a secure manner while achieving the 2020 renewable electricity targets. During 2016 a new procurement process was initiated to enable the procurement of seven new services in addition to the seven existing ancillary services. The new ancillary services arrangements are known as DS3 System Services. This procurement process signified a major change for the TSOs and Industry in the payment for and provision of System Services.

Secondary Fuel Obligations for Electricity Generators

There is 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 back up fuel in storage on site. In 2015, due to a number of significant changes in Ireland's electricity and gas sectors, the CER launched a consultation reviewing fuel stock obligations for electricity generators⁷. The CER received seven responses to the consultation paper and is yet to publish a decision.

Interconnection and Regional Transmission Development

Interconnection will continue to play an important role in future security of supply in Ireland. Along with the Moyle Interconnector that connects the transmission systems of Northern Ireland and Great Britain, the East-West Interconnector connects the transmission systems of Ireland and Great Britain, and can transmit 500 MW in either

⁷ [CER/15/213](#)

direction. The proposed North-South interconnector connecting Northern Ireland and Ireland will lead to a more secure, stable, and efficient all-island system.

In respect of other electricity interconnection, preliminary studies and assessments to date have indicated some potential benefits in developing the proposed the Celtic Interconnector (Ireland-France). The assessments have also provided the basis for initial cost benefit assessments (CBAs) for the project. In order to move to the initial design and pre-consultation stage, in February 2017 the CER approved revenues of €4 million for EirGrid, for more information see [CER/17/007](#). If this project was built it would improve Ireland's security of supply and enhance diversity of supply.

Other interconnector projects are also being studied, some such projects have been designated PCI status, one of which is entitled Greenlink. The Greenlink project proposes to connect the transmission system in Wexford, Ireland to the transmission system in Pembroke, Wales. Based on European requirements and the interest in developing electricity interconnectors in Ireland, the CER will develop a policy specifically for electricity interconnection in 2017/18. In 2016, the CER published an Information Paper requesting that interested parties provide submission as to the matters that should be considered in the development of a policy for electricity interconnectors, for further details see [CER/16/239](#). Further interconnection with neighbouring jurisdictions and to the rest of the EU Internal Energy Market will have a positive effect on Ireland's long term security of electricity supply.

Conclusion

The CER is confident that the current monitoring arrangements are sufficient to identify credible threats to the security of supply of electricity. The CER is also satisfied that the market framework in place and the new ancillary services and I-SEM arrangements, including a new capacity mechanism, are 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 both at national and EU level 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 sixth such report. The legal requirement to complete this report is contained in Statutory Instrument 60 of 2005⁸ (SI 60). SI 60 (2005) transposed Directive 2003/54/EC⁹ and Directive 2005/89/EC¹⁰ into Irish law. In addition under Directive 2009/72/EC the CER is obliged to monitor security of supply as per Article 4 of that Directive.

Directive 2009/72/EC

Article 4 of Directive 2009/72/EC states that Member States shall ensure the monitoring of security of supply issues¹¹. Such monitoring shall, in particular, cover the balance of supply and demand on the national market, the level of expected future demand and envisaged additional capacity being planned or under construction, and the quality and level of maintenance of the networks. This report is published every two years, by 31 July and forwarded to the European Commission.

Directive 2005/89/EC

Directive 2005/89/EC 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 7 (2) (reporting) refers to this report which is to be submitted to the European Commission. It details the reporting requirements regarding:
 - (a) Operational network security;
 - (b) The projected balance of supply and demand for the next five-year period;
 - (c) The prospects for security of electricity supply for the period between five and 15 years from the date of the report; and,
 - (d) The investment intentions, for the next five or more calendar years, of transmission system operators and those of any other party of which they

⁸ <http://www.irishstatutebook.ie/2005/en/si/0060.html>

⁹ This has since been repealed

¹⁰ Official Journal of the European Union, 18th January 2006

¹¹ In the case of Ireland the Member State has delegated this task to CER as the Regulatory Authority.

are aware, as regards the provision of cross-border interconnection capacity¹²

- In relation to part (d) of Article 7, the arrangements need to take account of:
 - a) Existing and planned transmission lines;
 - b) Expected patterns of generation, supply, cross-border exchanges and consumption, allowing for demand management measures, and, 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.

- Article 7(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

¹² It should be noted that the principles of congestion management for Article 7(d) were contained in Regulation 1228/2003/EC which has since been repealed

1 Structure of this Report

The purpose of this report is to present findings and messages arising from monitoring required under Regulation 11 of S.I. 60 and Article 4 of Directive 2009/72/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:

1.1 Section 2: 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.

1.2 Section 3: 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, and developments on the smart metering trials and roll out.

1.3 Section 4: 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 including the new I-SEM arrangements and the revised capacity mechanism to be implemented in 2017/2018.

1.4 Section 5: 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.

1.5 Section 6: 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. In particular reference will be made to the technical programmes put in place by EirGrid as TSO to facilitate non synchronous wind capacity (DS3 Programme).

1.6 Section 7: Interconnection and Regional Transmission Development

This section contains a description of current interconnector development plans in Ireland and further potential interconnection in addition to the existing East West and Moyle Interconnectors will positively impact on Ireland's supply security.

2 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 market players and to customers. As stated previously, the CER's security of supply monitoring obligations were established in Directive 2003/54/EC (which was replaced by Directive 2009/72/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.

2.1 Key Stakeholders

2.1.1 The European Commission

The European Commission has been working with the Member States 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*”¹³. Securing European energy supplies is therefore high on the EU's agenda. One of the key roles of the European Commission in security of supply is the pan-European legislation it develops to foster market integration across the European Union.

As part of the further integration of a single European electricity market the European Commission has published in November 2010 a communication titled “Energy 2020: A Strategy for competitive, sustainable and secure energy”¹⁴. This document outlines the approach to be taken EU-wide to reach renewable targets of 20% and a 20% improvement in energy efficiency. In particular it makes reference to the continuing development of secure and competitive sources of energy to come from low carbon sources.

Additionally, the European Commission has produced a further communication, in December 2011 titled “Energy Roadmap 2050”¹⁵ which outlines the longer term goals of

¹³ Introduction to Directive 2005/89/EC.

¹⁴ http://ec.europa.eu/energy/publications/doc/2011_energy2020_en.pdf

¹⁵ http://ec.europa.eu/energy/energy2020/roadmap/index_en.htm

reaching a “secure, competitive and decarbonised” energy system by 2050¹⁶. The EU is committed to reducing greenhouse gas emissions to 80-95% below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group. A key requirement for future energy is the focus on energy efficiency and switching to renewable energy sources.

In November 2012 the European Commission set up an electricity coordination group. The Electricity Coordination Group’s tasks are:

- to serve as a platform for the exchange of information and coordination of electricity policy measures having a cross-border impact and for the exchange of experiences, best practices and expertise and also to assist the Commission in designing its policy initiatives
- to facilitate the exchange of information and cooperation regarding security of supply in electricity, including generation adequacy and cross-border grid stability

The CER notes the publication of the EU Commission’s Clean Energy Package, and its provisions relating to security of electricity supply and generation adequacy and is providing input and feedback as to its implications for security of supply through appropriate national and European channels

2.1.2 Department of Communications, Climate Action and Environment

The Department of Communications, Climate Action and Environment (DCCA) 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.

In 2015, the Department published a White Paper on Ireland’s Transition to a Low Carbon Energy Future. The White Paper set out a framework to guide policy up to the year 2030. Its objective is to guide a transition to a low carbon energy system which provides secure supplies of competitive and affordable energy to citizens and businesses.¹⁷

¹⁷ [2015 White Paper - Ireland’s Transition to a Low Carbon Energy Future](#)

2.1.3 The Commission for Energy Regulation (CER)

The CER's primary economic responsibilities in energy are to regulate the Irish electricity and natural gas sectors. This covers electricity generation, electricity and gas networks, and electricity and gas supply activities. As part of its role, the CER jointly regulates the all-island wholesale Single Electricity Market (SEM) with its counterpart in Northern Ireland, the Utility Regulator. The SEM is governed by a decision-making body known as the SEM Committee, consisting of the CER, the Utility Regulator and an independent member. Under Section 27 of the Water Services Act 2013 (the "Act"), the remit of the CER was expanded to include a function to prepare to become the independent economic regulator for the public water services sector.

The CER's primary functions are granted 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 overall aim of the CER's economic role is to protect the interests of energy customers, maintain security of supply, and to promote competition in the generation and supply of electricity and supply of natural gas.

2.1.4 EirGrid - Transmission System Operator

EirGrid holds licences as independent electricity Transmission System Operator (TSO) and Market Operator (MO) in the wholesale trading system in Ireland, and is the owner of the System Operator Northern Ireland (SONI Ltd), the licensed TSO and market operator in Northern Ireland. The TSO, under section 28(4) of SI No 60 of 2005, 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.

2.1.5 Market Participants and Customers

Collectively market participants are key in ensuring security of electricity supplies in Ireland. Participants provide the required generation to meet demand. Also, many of the required demand side measures and ancillary services offered by customers are facilitated and incentivised by market participants. The Distribution System Operator (ESB Networks) also plays an active role in ensuring security and continuity of supplies to customers.

2.2 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 2-1 below sets out CER monitoring activities.

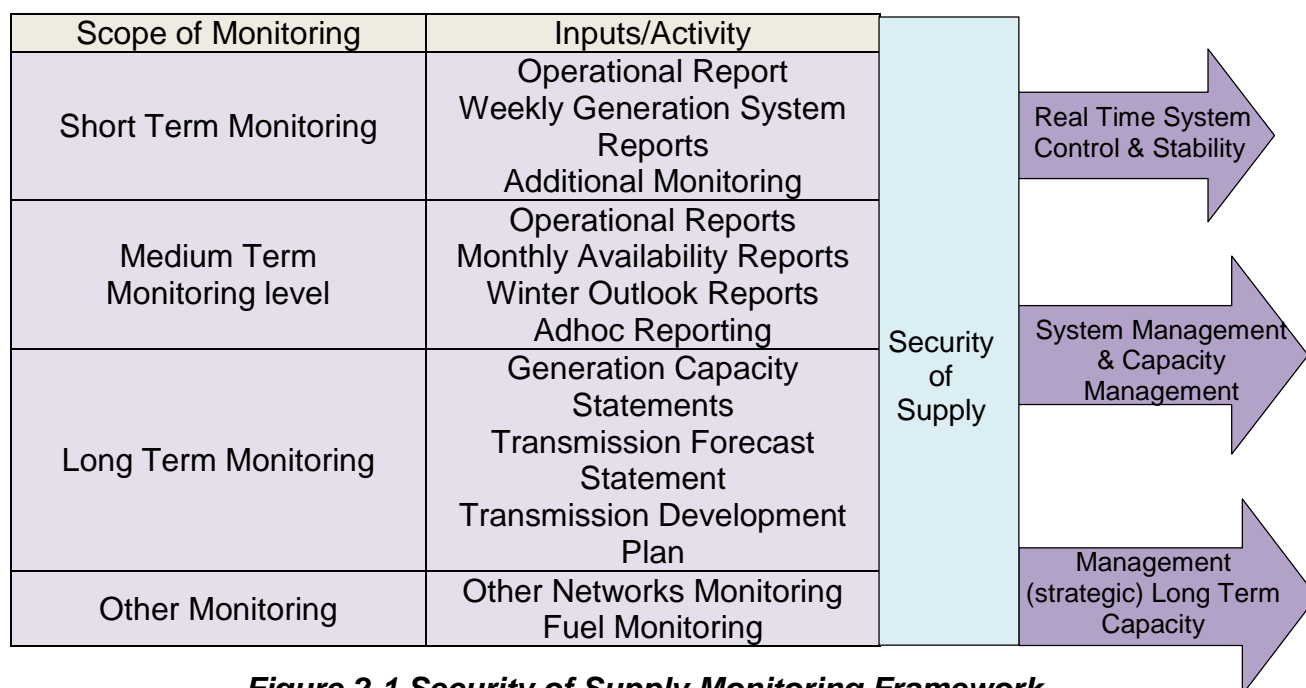


Figure 2-1 Security of Supply Monitoring Framework

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's published reports are referred to later in this report and include the Generation Capacity Statement, Winter Outlook Reports and the Transmission Forecast Statement. These reports feed into the security of supply monitoring activities of the CER (and other stakeholders) and are available on the EirGrid website¹⁸. In addition, the published reports are important for existing and potential market participants in assessing the viability of existing and new projects.

2.3 Security of Supply Initiatives

Ensuring security of electricity supply continues to form an important part of the CER's activities. In 2013, 47 %¹⁹ of electricity generated in Ireland was produced from natural gas. In 2015 due to a corresponding increase in wind generation this fell to 43%²⁰. This

¹⁸ [EirGrid – Library](#)

¹⁹ SEAI Electricity Generated % by Fuel Mix Provisional

²⁰ SEAI Electricity Generated % by Fuel Mix Provisional

highlights the impact that continuing wind connections can have on the system and the ability to reduce reliance on a single fuel source.

The East-West Interconnector has connected the transmission systems of Ireland and Great Britain, and can transmit 500 MW in either direction. Along with the existing Moyle Interconnector that connects the transmission systems of Northern Ireland and Great Britain, this has significantly enhanced the overall interconnection between the island of Ireland and Great Britain. The proposed second major North-South interconnector connecting Northern Ireland and Ireland will lead to a more secure, stable, and efficient all-island system. Other interconnector projects are also being studied both by EirGrid and by merchant developers, some such projects have been designated PCI status. Based on European Requirements and the interest in developing electricity interconnectors in Ireland, the CER plans to develop a Policy specifically for electricity Interconnection. In 2016, the CER published an Information Paper requesting that interested parties provide submission as to the matters that should be considered in the development of a policy for interconnectors, for further details see [CER/16/239](#).

Another area as outlined in DCCAE's White Paper is the impact of different types of storage on the electricity grid. DCCAE and the Northern Ireland Department of Trade and Investment commissioned work to model the impact on the electricity grid of different types of storage. These included very short-term storage in intelligent storage heaters in domestic premises, intermediate-level storage in battery and ice banks, and very large-scale compressed air storage in salt caverns. The work demonstrated that significant levels of storage, in particular multi-megawatt-scale grid-connected storage, would be needed to maximise the utilisation of RES-E. Small-scale storage would facilitate more efficient use of the networks, maintain high standards of security of supply, and keep network operating costs lower than they would be without storage.²¹

With reference to secondary fuel obligations, since 2009 conventional gas-fired electricity generators are required to be capable of operating on secondary fuel for five days in the event of a gas supply disruption. In 2015, the CER issued a consultation paper to examine whether the current five-day fuel stock regulatory obligations are sufficient in light of recent changes in the gas and electricity sectors. Thereafter the DCCAE plans to review the longer-term security of supply implications that may arise in the unlikely event of a long term gas supply disruption.

²¹ [2015 White Paper - Ireland's Transition to a Low Carbon Energy Future](#)

2.3.1 Gas Electricity Emergency Planning Group

The CER chairs a group called the Gas and Electricity Emergency Planning group (GEEP), which comprises representatives from Government (Department of Communications, Climate Action and Environment), the Regulator (CER) and industry (ESB/EirGrid and Gas Networks Ireland). The GEEP group is concerned with the interactions between the gas and electricity sectors, and focuses on short term issues relating to security of supply and emergencies in electricity and gas. The GEEP may also encompass some longer term and wider energy/emergency policy issues, which may emerge and be of relevance to the gas and electricity sectors.

2.3.2 Construction and Connection

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. Other than supported generation such as wind and biomass there are no large-scale generation units that are committed to connect.²²

Key Messages

- The CER has developed a security of supply monitoring framework to satisfy obligations in Directive 2009/72/EC and Directive 2005/89/EC.
- There are a number of key stakeholders involved in security of supply in Ireland including the European Commission, the DCCAE, the CER and the TSO.
- 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.
- Since the submission of the last Security of Supply Report in 2014 there has been a slight some diversification of fuel sources in Ireland. This contributes positively both to EU renewable targets and to supply security.

²² EirGrid GCS 2017

3 Balance between Supply and Demand

The requirements in Directive 2005/89/EC build upon Directive 2003/54/EC (which was replaced by Directive 2009/72/EC) 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 developed a Single Electricity Market (SEM) which went live on 1st November 2007. This is a gross mandatory pool market with an explicit Capacity Payment Mechanism (CPM). The pool market and CPM is being replaced by a revised market design and new capacity mechanism that will integrate the island of Ireland into the EU's Internal Energy Market and provide sharper and more efficient entry and exit signals so as to enhance long term supply security. The wholesale market arrangements are discussed further in Section 4.2.

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.

3.1 EirGrid Generation Capacity Statement

EirGrid, as TSO produces an annual Generation Capacity Statement (GCS). The GCS forecasts the demand for electricity in a forward ten 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 GCS are the main inputs to this section of the report. Several findings from the GCS are presented in this report.

It should be noted that since 2012 EirGrid and SONI (System Operator Northern Ireland) include an assessment of generation adequacy on an Ireland, Northern Ireland and All-Island basis in the Generation Capacity Statement.

3.2 Fuel Diversity

At the outset it is useful to set out the fuel mix of electricity generated. The most recent fuel mix refers to 2015 and are set out in Figure 3-1 below.

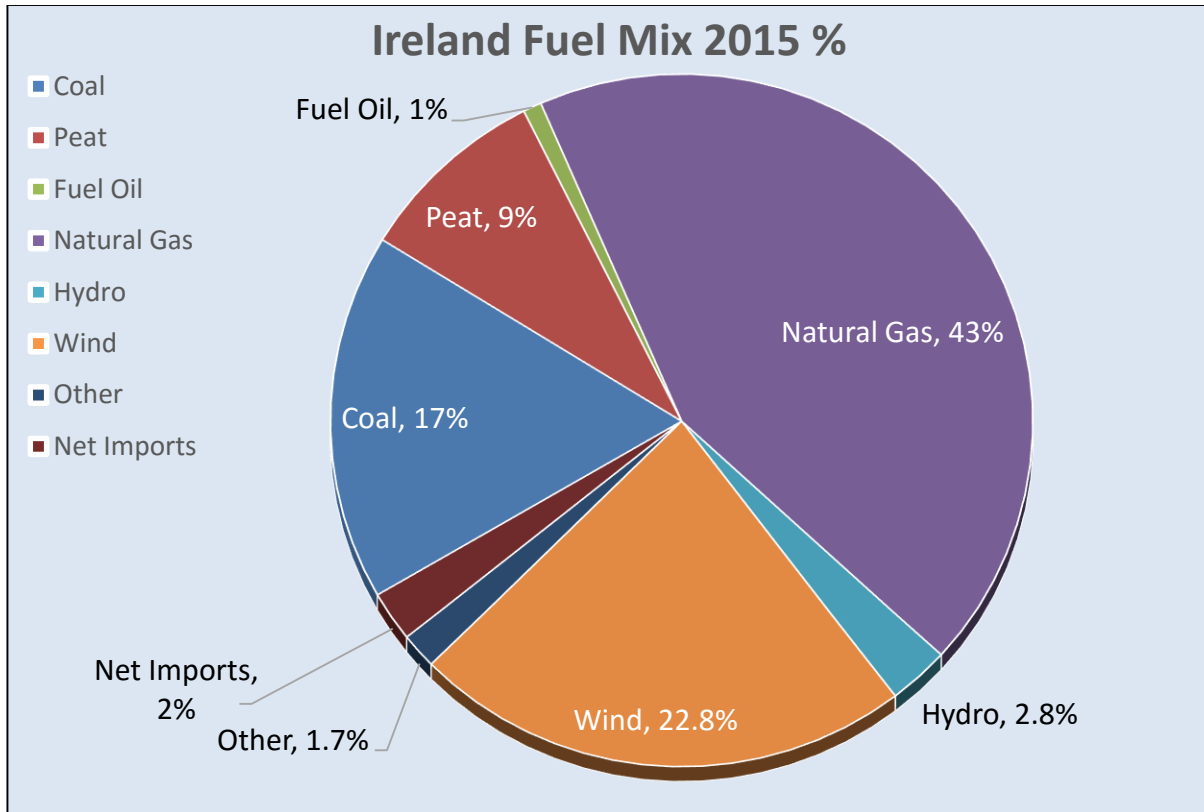


Figure 3-1 Ireland Fuel Mix 2015²³

A noticeable feature of the generation portfolio in Ireland is the significant reliance on fossil fuels. It should be noted however, that renewable sources of energy are playing an increasingly important part in the generation portfolio with a particular emphasis on wind generation. In 2013 renewables contributed 20.1% of electricity needs with 16.3% coming from wind powered generation. The remaining renewable generation came from hydro 2.1% and other 1.7%. In 2015 renewable generation rose to 27% with 22.8 % of this figure arising from wind, 2.8% from hydro and 1.7% from other. The significant increase in electricity produced by wind powered generators has resulted in a corresponding reduction in electricity generation from gas (see figure 3-2 below). This trend is accompanied by the corresponding reduction in reliance on imported fossil fuels. Although, it is important to note the significant intermittency that comes with electricity produced from wind.

²³ SEAI – Electricity Generation 2015 provisional

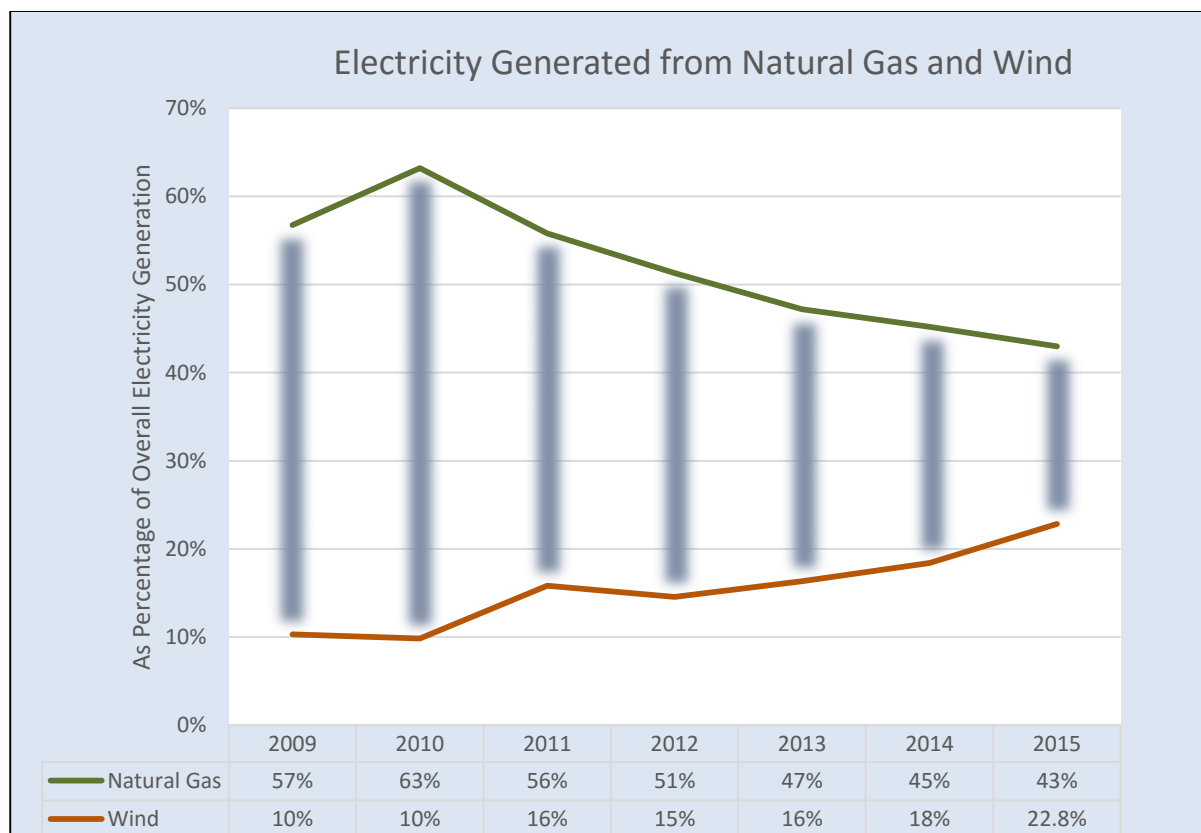


Figure 3-2 Electricity Generated from Natural Gas and Wind as a Percentage of Total Electricity Generation

In 2015, approximately 61% of electricity generation came from imported fuels, of which approximately 43% was natural gas²⁴, 17% was coal, 1% was oil. 9% of electricity was generated by an indigenous fuel. This compares with 63.9% of electricity generated in 2013 from imported fuels of which 48% was gas, 15.7% coal and 0.2% oil. This highlights a decrease in dependence on gas and oil with a slightly increased dependence on coal. Peat is an indigenous energy source which has been declining in importance although installed capacity has remained the same. There are three peat fired power plants still operational in Ireland – these are Edenderry, West Offaly and Lough Ree. The Edenderry Plant has been co-firing peat with biomass for more than five years²⁵.

²⁴ In 2014/15, 94% of Ireland’s gas demand was supplied through the Moffat entry point. This dynamic has started to change, in late 2015 indigenous gas started to flow from the Corrib gas field and is expected to reduce our reliance on the Moffat entry point.

²⁵ [DCCAIE – Energy – Solid Fuels – Peat](#)

3.2.1 Ireland's Gas System and Supply

The electricity generation sector is heavily reliant on gas fired generators, therefore it is prudent to consider the gas supply when considering electricity supply. In terms of obtaining gas supplies, the Irish gas system (see figure 3.3 below) conveys gas from three entry points, namely:

- Moffat (Western Scotland);
- Inch (Southern Ireland), and
- Bellanaboy (Western Ireland)



Figure 3-3 Overview of Gas System in Ireland²⁶

The Moffat entry point connects the Irish natural gas system to National Grid Gas's (NGG) gas system in GB, and allows for the importation of GB gas to Ireland, via two sub-sea Interconnectors and an onshore transmission network in Scotland (i.e. South

²⁶ [ENTSOG](#)

West Scotland Onshore System (SWSOS). There are two pipelines connecting Ireland to the GB gas network (i.e. Interconnector 1 (IC1) & Interconnector 2 (IC2)). The Inch entry point connects the Kinsale and Seven Heads gas fields and the Kinsale storage facility to the onshore network. The Bellanaboy entry point connects the Corrib gas field to the onshore network. The Bellanaboy entry point is connected to the onshore ring main via the Mayo-Galway pipeline, this facilitates the flow of gas from the Corrib Field into GNI's system.

In 2014/15, IC1 and IC2 supplied approximately 94% of total Irish annual demand. However, since the first gas flows from the Corrib gas field in late 2015, the supply dynamic has changed. In 2016/17 Corrib is expected to meet 71% of Ireland's demand. Production from Kinsale is in decline and is primarily operated as a seasonal gas storage facility. The Inch entry point is used to help refill the Kinsale storage facility during the summer months. Kinsale Energy Limited (KEL) advised the CER in 2015 that it plans to cease full storage operations in 2016/17 and commence blowdown of Southwest Kinsale²⁷. Over the horizon of GNI's 2016 ten-year network development plan there are no major concerns regarding security of gas supply in Ireland.

3.2.2 Categories of Plant

When the TSO examines the plant available for planning and operational purposes, there is a distinction between certain categories of plant. There are three categories of plant: dispatchable, partially dispatchable and non-dispatchable. 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 5 MW) can also be monitored and are considered partially- dispatchable i.e. their output can be reduced if required (e.g. due to transmission constraints). 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 includes small wind farms, small scale hydro and industrial backup generation etc.

3.2.3 Dispatchable Plant

In the Generation Capacity Statement EirGrid carries out a review of the expected new plant and retiring of old plant over the next 10 years. Further to this, the report examines the future generation market investment expected over the next number of years. Table 3-1 below sets out the dispatchable plant on the system in 2016 as per the EirGrid/SONI

²⁷ [Gas Networks Ireland Network Development Plan 2016](#)

Generation Capacity Statement 2017-2026. It also notes any plant that has provided notification for commissioning or retirement.

	Fuel Type	2016	Comment
All DSU	DSU	260	Modest growth assumed
Aghada	Gas	258	To be shut before end of 2023
	Gas/DO	90	To be shut before end of 2023
	Gas/DO	90	
	Gas/DO	90	
	Gas/DO	431	
Dublin Bay	Gas/DO	402	
Dublin Waste	Waste	-	Due to commission in 2017 (61 MW)
Edenderry	Milled peat/ biomass	118	Planning permission extended
Edenderry OCGT	DO	58	
	DO	58	
Great Island CCGT	Gas/DO	464	
Huntstown	Gas/DO	339	
	Gas/DO	397	
Indaver Waste	Waste	17	
Lough Ree	Peat	91	PSO levy runs out in 2019
Marina CC	Gas/DO	95	To be shut before end of 2023
Moneypoint	Coal/HFO	285	
	Coal/HFO	285	
	Coal/HFO	285	
North Wall CT	Gas/DO	104	To be shut by end of 2023
Poolbeg CC	Gas/DO	463	
Rhode	DO	52	
	DO	52	
Sealrock	Gas/DO	81	
	Gas/DO	81	
Tarbert	HFO	54	To be shut by end of 2022
	HFO	54	To be shut by end of 2022
	HFO	241	To be shut by end of 2022
	HFO	243	To be shut by end of 2022
Tawnaghmore	DO	52	
	DO	52	
Tynagh	Gas/DO	386	
West Offaly	Peat	137	PSO levy runs out in 2019
Whitegate	Gas/DO	444	
Ardnacrusha	Hydro	86	
Erne 1	Hydro	65	
Lee	Hydro	27	
Liffey	Hydro	38	
Turlough Hill	Pumped storage	292	

Table 3-1 Dispatchable Plant Source; EirGrid GCS

Table 3-1 also shows that there is 61 MW of new capacity expected on the system by 2017. EirGrid forecasting also predicts the retirement of over 1000 MW of plant by 2023. The majority of this capacity is heavy fuel oil fired plant. Figure 3-4 below pulls the previous information together and sets out EirGrid’s expected trend in the levels of dispatchable plant out to 2026. Decreasing levels of dispatchable generation to meet the adequacy standard relate to the commission of the North South Interconnector and the increasing penetration of renewable non-dispatchable generation. There is a difference between the amount of dispatchable plant based on notifications in Table 3-1 (Blue blocks in Figure 3-4), and the portfolio assumed to meet the adequacy standard from 2021 (red blocks). This difference is explained in the GCS - some plant may not remain commercially viable if they don’t secure capacity payments in the new Capacity Market.

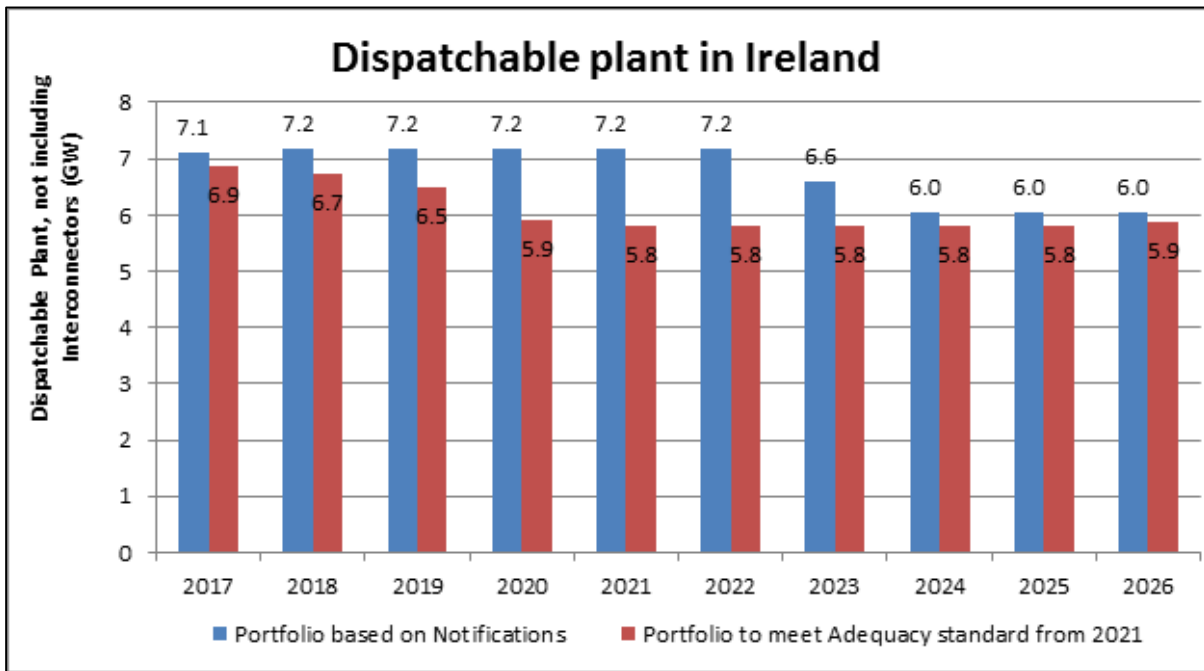


Figure 3-4 Expected Dispatchable Capacity out to 2026 Source: EirGrid

3.2.4 Partially Dispatchable and Non-Dispatchable Plant

As part of their annual Generation Capacity Statements, 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
- Wind generation

Wind farms represent the highest percentage of plant in this category and substantial analysis is being carried out on future levels of wind and also the input this generation can be given when planning for the future.

Set out below is EirGrid's assessment of partially and non-dispatchable plant. In assessing the potential benefits of renewables EirGrid's assessment takes into consideration the assumption that to achieve a 40% renewable target whilst maintaining system and supply security would require an installed capacity of between 3900 MW and 4300 MW. This range is derived from different assumptions concerning:

- The wind capacity factor
- Dispatch-down of wind due to transmission constraints or system-wide curtailment
- A range of demand forecast
- And different assumptions made about other renewable energy sources

The portion of wind energy in particular has increased dramatically in Ireland over the past decade from 1.6% in 2002 to 22.8% in 2015. However in the past fourteen years the annual wind capacity factor has varied from 23.8% to 35%. As a result, EirGrid as TSO in its predictions of how wind can contribute to the overall generation security perspective refers to the capacity credit, which is an estimated measure of how much wind generation contributes to generation adequacy. In addition to wind there is other small but significant changes in the generation portfolio. These are:

- Demand side generation
- Small Scale Combined Heat & Power (CHP)
- Biofuel
- Small Scale Hydro
- Solar PV

Demand side generation contributes a total of 9 MW. Conventional CHP in Ireland contributes 151 MW. Fossil fuel CHP has been withdrawn from supported generation activities but High Efficiency CHP is supported under the REFIT regime. Therefore it may in the future contribute more effectively to a secure fuel mix. In Ireland, there is currently an estimated 54 MW of landfill gas powered generation. REFIT 3 is designed to incentivise the addition of 310MW of renewable electricity capacity to the Irish grid composed of High efficiency Combined Heat and Power (using both Anaerobic Digestion

and the thermo-chemical conversion of solid biomass), biomass combustion and biomass co-firing²⁸.

Small scale Hydro provides 22 MW of capacity. While this is a mature technology, the lack of suitable new locations limits increased contribution from this source. It is assumed that there are no further increases in small hydro capacity over the remaining years of the study (please see table 3-2).

Year	Capacity 2017 (MW)	Capacity 2026 (MW)
Industrial	9	9
Conventional CHP	151	151
Biofuel	54	114
Small-scale Hydro	22	22
Solar PV	15	100
Wind	2740	5000
Total	2991	5396

Table 3-2 Assessment of Partially and Non-Dispatchable Plant Source: EirGrid

As outlined in Table 3-2 the total capacity from these renewable sources contributes 2991 MW to supply in 2016 with the vast majority (2740 MW) arising from wind capacity. By 2026 the total arising from renewable sources is expected to rise to 5396 MW. An installed wind capacity requirement of between 3900 MW and 4300 MW²⁹ is expected to be sufficient to meet the 40% renewable targets.

3.2.5 Importance of Plant Availability

Having sufficient 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

²⁸ [DCCAE – REFIT 3](#)

²⁹ Generation Capacity Statement 2017-2026

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. A series of Generator Performance Incentives (GPI's) are in place to optimise generator performance and ensure a balanced All-Island generation market. Late Synchronisation by generators for example will incur a penalty. GPI's such as this incentivise generators to perform to best capability at all times thus ensuring supply security. Figure 3.5 below shows the historic and forecast outage rates in Ireland.

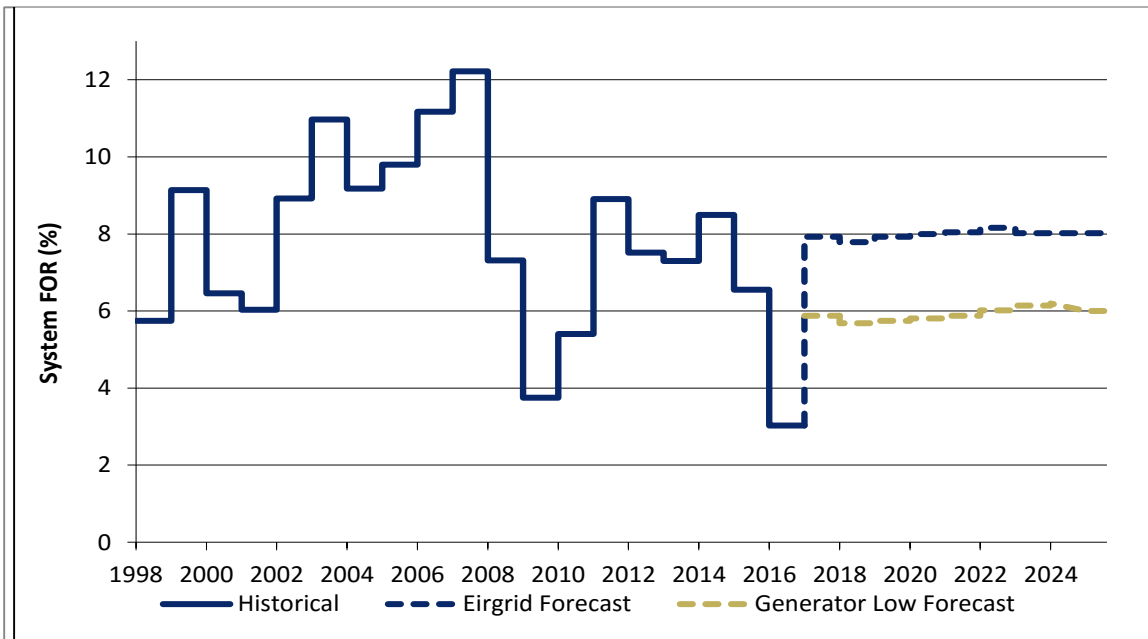


Figure 3.5 Historic and Forecast Forced Outage Rates

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.

Outlined in Table 3-3 below is the total of dispatchable, partially dispatchable and non dispatchable generation for 2017.

Generation Type	Total Capacity (MW)
Dispatchable	7617
Partially dispatchable (wind)	2740
Non-dispatchable	251
Total	10,608

Table 3-3 Total dispatchable, partially and non-dispatchable capacity

3.2.6 Generation Reporting

The Generator Financial Performance in the SEM report prepared for the CER and the Utility Regulatory in Northern Ireland, together the Regulatory Authorities (RAs) examines the financial performance of generation companies in the Single Electricity Market (SEM). The report provides aggregated information on the financial performance of generators in the SEM as a whole and broken down by generation fuel source and generation type. The report aims to enhance transparency around generator remuneration in the SEM while respecting individual generator commercial sensitivity by presenting aggregated information only. The most recent Generator Financial Performance in the SEM report (SEM/16/086) focuses on the period of the 2014 and 2015 financial years, and follows the previous 2013 (SEM/13/031) and 2014 (SEM/14/111) reports published by the SEM Committee. The most recent report provides an update to the 2014 report by analysing two additional years of data, namely the 2014 and 2015 financial years. The main objectives of the report are to:

- Provide greater insight into the financial performance of generators in the SEM, which will inform policy decisions; and
- Improve the level of market data available to all industry stakeholders, which will assist in providing market transparency.

In order to gather the information to develop this report generators with a combined installed generation capacity equal to or greater than 25 MW are required to complete the financial reporting template. This agreed template provides the RAs with sufficient data on all generation types and, with only a portion of wind generation companies required to report, excludes smaller generators from any reporting requirements. The information provided should align with the regulated accounts provided to the RAs, and a completed financial reporting template for each generation site must be delivered to the RAs within six months of the end of their financial year.

3.3 Demand

In developing the annual GCS, EirGrid carries out detailed analysis on future electricity demand forecasts using their electricity forecast model. The model is explained in detail in the GCS and predicts electricity demand based on changes in Gross National Product (GNP) and Personal Consumption of Goods and Services (PCGS). EirGrid also factor in the effects of energy efficiency measures and extreme weather events. This allows for numerous scenarios to be analysed.

A key driver for electricity demand in Ireland for the next number of years is the connection of large data centres. There are approximately 250MVA of installed data centres connected to the electricity network. In addition, there are connection offers in place or in the connection process for more than 600MVA. Furthermore, there are more than 1000MVA of additional data centre connection enquires (see Figure 3.8 below).

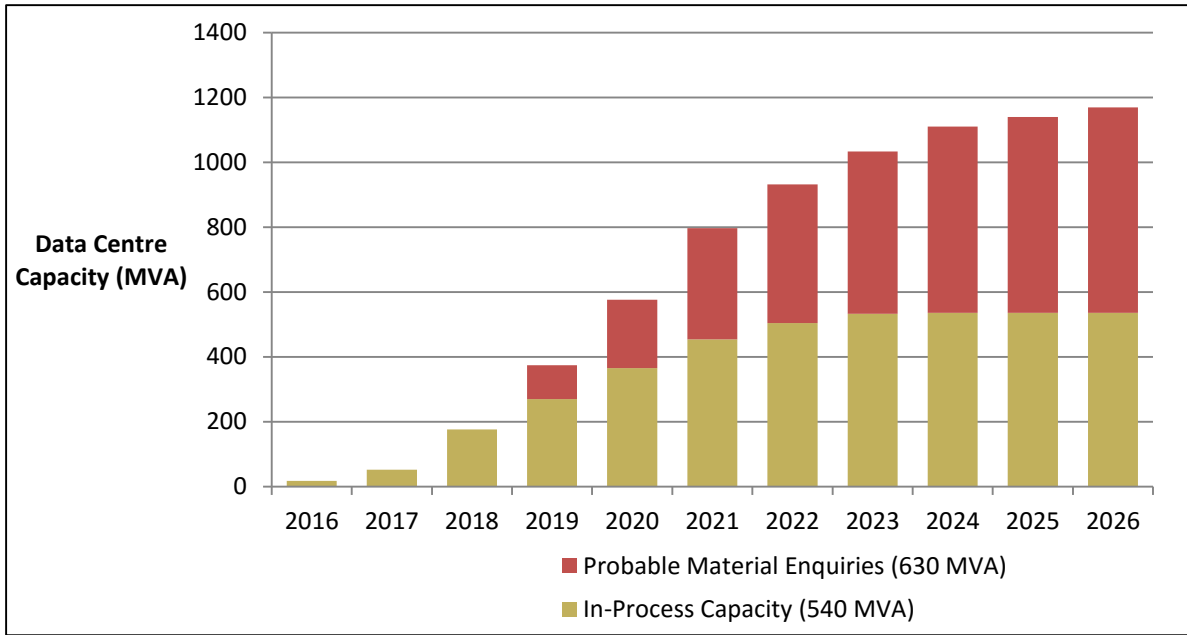


Fig 3-8: Demand expected from assumed build-out of new data centres. Source: EirGrid

In 2017 the GCS was prepared on the expectation that GNP would increase by 4% average per year in the period 2016 - 2020 and increase by 3.5% average in the period 2022 - 2026. The median scenario electricity demand is influenced by this economic growth forecast, and by the expected addition of data centre load³⁰.

³⁰ EirGrid, Generation Capacity Statement 2017-2026

As TSO, EirGrid qualify demand assessments by utilising a high, median and low demand scenario (see Figure 3-6), the median forecast is the most probable scenario to utilise for demand forecasting. A median forecast model assumes a return to growth over the next number of years.

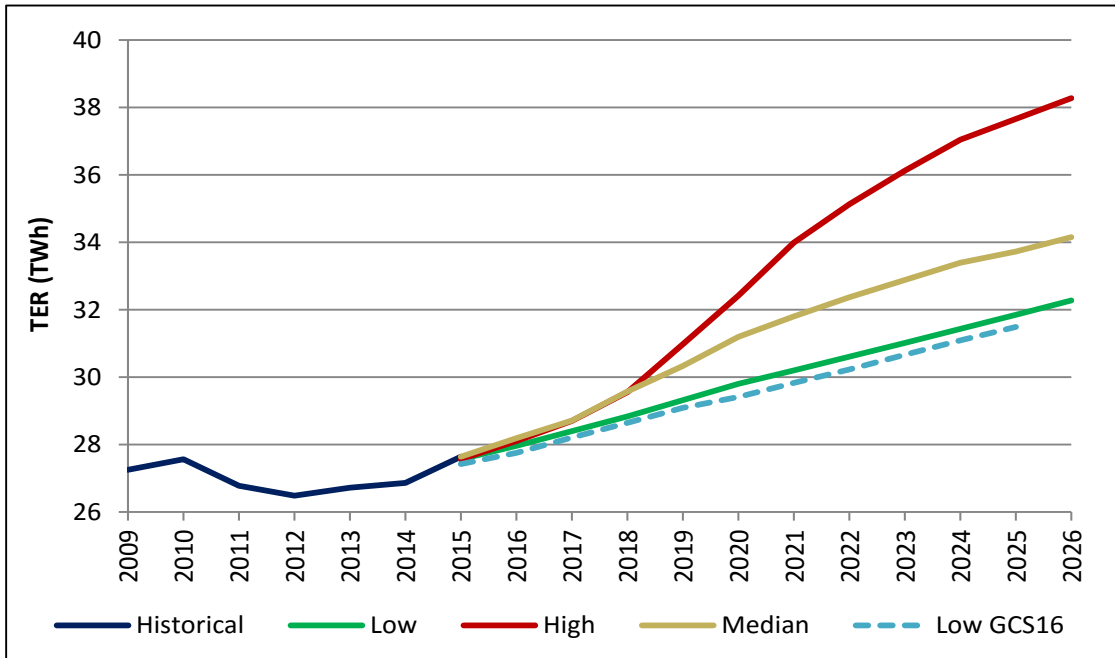


Figure 3-6 Historic Demand & Low, Median & High Demand forecasts

EirGrid carried out an analysis of electricity requirements in 2017 for the years up to and including 2026. In all scenarios total electricity requirements are expected to increase. In a low demand scenario, an increase of 1.7 % is expected in 2016, 1.3% in 2017 and 1.5% in 2018. In a median demand scenario a rate of 2% is expected in 2016 with 1.9% and 3% in the following years. Finally, a high demand scenario a rate of 2.2% would be expected for 2016 with this increasing to 1.9 % in 2017 and 3 % 2018.

3.3.1 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 3-8 below shows the results of EirGrid's peak demand forecasting as per the latest GCS.

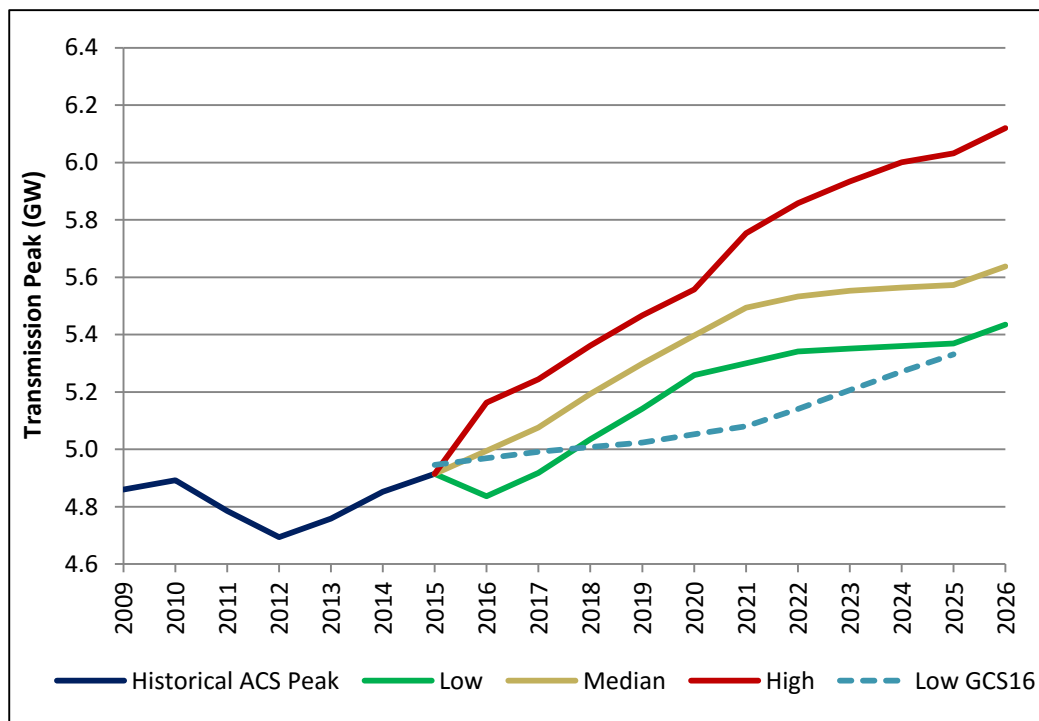


Fig 3-8: Historical³¹ and Forecast Peak Demand (Source: EirGrid) Historical peaks have been adjusted to normal temperatures.

Demand is highly influenced by temperature. By modelling historical energy and temperature data, it is possible to apply a temperature correction to past winter peaks (i.e. these are the peaks that would have occurred had the temperatures been average, defined as the Average Cold Spell (ACS) which is an average temperature assessed from a number of winters). The ACS is estimated from an average of 10 years. Peak demands are forecast for future years assuming the weather will be average. Also a one-in-10 year peak was forecast where the temperatures are the coldest experienced in a 10-year dataset. This is the high forecast. In addition low peak demands are forecast based on the low energy forecasts.

3.4 Supply and Demand Balance

This section compares the forecast levels of generation capacity with the forecast demand that needs to be satisfied out to 2026. EirGrid uses a software program for

³¹ A peak demand of 5090MW was reached on the 21st December 2010 due to inclement weather.

forecasting surplus available capacity or deficit. 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 GCS. Table 3-4 below sets out the forecast generation adequacy levels under the different aforementioned EirGrid demand scenarios.

Ireland	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Scale
Low Demand	1560	1250	1050	350	300	210	250	230	230	230	>= 500
Median Demand	1520	1210	990	210	120	20	50	30	30	30	0
High Demand	1460	1160	920	50	-140	-300	-330	-410	-430	-450	<= -500
Median Demand, no EWIC	1140	870	670	-20	-210	-310	-280	-300	-310	-310	

Table 3-4 Generation Adequacy Levels (Ireland) Source: EirGrid

The results for Ireland shows that in the median scenario, Ireland is in large surplus in the short term (green cells up to 2020). By 2021, enough plant has been decommissioned so that there is a balance between supply and demand, see the yellow squares indicating almost zero surplus.

If the high scenario were to transpire (or if EWIC was unavailable) with the same assumed portfolio, then the system would be in deficit to almost 500 MW. However, if some of the decommissioning plant were only mothballed, then they could be taken out of storage and help reduce this deficit if the high demand were to transpire.

In the short-term adequacy is in excess of the security standard. However, the surplus is expected to fall and be at the adequacy standard by 2021. The loss of Interconnection would result in an adequacy capacity reduction to -20MW in 2020.

3.4.1 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. As Ireland has moved successfully to a Single Electricity Market system, coupled with a reduction in demand and increase in generation capacity the need for centrally organised demand side initiatives has diminished.

The Power Off and Save is a new pilot programme that will reward domestic customers who agree to reduce their energy use when electricity demand is high. The programme is aimed at reducing consumption at key times, for example evening peaks, to reduce demand at such times. Approximately 1,500 domestic customers will take part and the programme will run for 18 months.

A Demand Side Unit (DSU) is a demand site that can be instructed by EirGrid to reduce electricity demand. Instructions to reduce electricity demand are called dispatch instructions. Where a DSU consists of more than one individual demand site it is called an aggregated DSU. A DSU uses a combination of on-site generation and/or plant shutdown to deliver a demand reduction in response to an instruction from EirGrid. Short Term Active Response (STAR) is a scheme operated by the TSO whereby electricity consumers are contracted to make their load available for short term interruptions. This service provides the TSO with 'reserves' that are utilised in the event of the loss (tripping) of a large generating unit.

3.4.2 Smart Meters

Smart meters are recognised at an EU wide level as an integral component in ensuring continuing security and allowing consumers to become more active in their consumption patterns. As stated earlier, Article 5 of Directive 2005/89/EC allows Member States to take measures to encourage real-time demand technologies including advanced metering systems. Smart metering promotes security of supply by transforming consumers from a passive state to being active, responsive consumers. This encourages efficiency in usage on the demand side. As set out in the Electricity Security of Supply Report 2012, the CER established the National Smart Metering Programme (NSMP) in late 2007 in conjunction with the ESB Networks and Bord Gáis Networks (now GNI) and working closely with the DCCA. In Phase 1 of the NSMP, an electricity Customer Behaviour Trial (CBT) was carried out. The CBT looked at the measurable reduction in electricity consumption overall and more specifically during peak demand periods. The trial concluded that there was:

- an increase in overall electricity consumption of 0.6%
- a reduction of 1.1% during peak demand periods

In July 2012, the CER made the decision to proceed with the national rollout of electricity and gas smart metering to all residential consumers and a significant proportion of small-

to-medium (SME) consumers. The decision was based on the positive results of the electricity and gas smart metering trials and associated cost-benefit analysis³²

The strategic objectives of the NSMP are to:

1. Encourage Energy Efficiency;
2. Facilitate Peak Load Management;
3. Support Renewable and Micro Generation;
4. Enhance Competition and Improve Consumer Experience; and
5. Improve Network Services.

With the successful conclusion of Phase 1 of the NSMP, a phased approach to the national implementation of electricity and gas smart metering has been agreed. Broadly this comprises the following phases:

- Phase 2: High Level Design
- Phase 3: Detailed Design & Procurement
- Phase 4: Build & Test
- Phase 5: Deployment

Phase 2 concluded in October 2014 with the publication of the High Level Design (HLD).³³ The HLD is based on a ‘thin’ solution with minimal functionality being performed on the actual meter. A wide area network (WAN) facilitates the transmission of an interval data file (recorded every 30 minutes) back to the electricity and gas DSOs every 24 hours. The DSOs then pass this interval data on to the relevant supplier who calculate the customer’s tariff. The HLD supports the facilitation of Time-of-Use tariffs (ToU) and a new model of smart prepayment providing consumers with more choice and flexibility. A key feature of the HLD is the establishment of a home area network (HAN) operated by the electricity DSO which transmits near-real time information into the consumer premises.

Phase 3 commenced in late 2014 following the publication of the High Level Design and focussed on developing detailed consumer policy in areas such as ToU³⁴, smart prepayment³⁵ and the provision of information to the consumer.

³² See CER/11/080a, CER/11/080b, CER/11/080c for further detail on the CBT, technology trials and cost benefit analysis.

³³ <http://www.cer.ie/docs/000699/CER14046%20High%20Level%20Design.pdf>

³⁴ <http://www.cer.ie/docs/001021/CER15270%20Time%20of%20Use%20Tariffs.pdf>

³⁵ <http://www.cer.ie/docs/001021/CER15271%20Smart%20Pay%20As%20You%20Go.pdf>

The NSMP also established an Information / Cyber Security workstream as part of Phase 3 which carried out an end-to-end Risk Assessment on the High Level Design. This was followed by the development of a Risk Treatment Plan to develop and mitigate the risks identified in the Risk Assessment.

To date, the CER has conducted three Privacy Impact Assessments (PIA) on the NSMP. The NSMP has experienced some delays primarily related to the sequencing of changes to the market and internal, DSO IT upgrades combined with delays to the procurement processes. Due to these delays, the CER undertook a significant re-plan exercise in mid-2016 to bring more certainty to the Programme timelines and is keeping the Directorate-General for Energy abreast of developments in this regard.

The CER will conduct a final cost-benefit analysis (CBA) on the NSMP in 2017 and following the completion of this exercise, progress to Phase 4 *Build & Test* in 2018.

Key Messages

- The NSMP High Level Design was completed in October 2014 which established the parameters of the smart metering solution for Ireland, subject to cost benefit analysis on the ultimate design to be implemented.
- Detailed design of the solution was completed after a period of significant engagement with industry and public consultation. This process concluded in April 2016.
- The overall aim of the National Smart Metering Programme was to achieve the target set in Directive 2009/72/EC of 80% roll out of electricity smart meters by 2020. However, due to the emergence of issues related to market changes, systems updates and procurement, the timelines for the NSMP will be delayed.
- The ultimate decision on the scale, scope and timing of the roll out of the smart metering programme will be determined by a costs benefit analysis carried out by the CER and in the context of the provisions set out in the Clean Energy Package.

4 Longer Term Security of Electricity Supplies

Article 7 of Directive 2005/89/EC 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.

4.1 Government and EU Energy Policy

As the EU looks towards 2030 and 2050, it is timely to reflect on what has been achieved and to reorient Irish energy policy priorities towards the 2030 horizon. The following section highlights key developments in the Irish, EU and international energy markets.

4.1.1 Government White Paper on Energy

In 2015 The Department of Communications, Climate Action and Environment published a White Paper on Energy. The White Paper set out a framework to guide policy up to the year 2030. Its objective is to guide a transition to a low carbon energy system which provides secure supplies of competitive and affordable energy to citizens and businesses. More specifically, with regard to energy security in the transition, the White paper states:

“Ireland will further develop a coordinated energy security policy, which encourages diversification of energy supplies and facilitates more integrated energy markets, through our membership of the EU and the International Energy Agency (IEA).”

Furthermore, reaching our sustainable energy targets, and having fully integrated and well-functioning markets, will enhance Ireland’s energy security. The White Paper outlines Ireland’s energy security policy and explains how risks to security of energy supply will be managed.³⁶

The National Renewable Energy Action Plan (NREAP) sets out the Government’s strategic approach and concrete measures to deliver on Ireland’s 16% renewable energy target, as per Article 4 of Directive 2009/28/EC³⁷. This action plan was submitted to the European Commission in July 2010. Article 22 of Directive 2009/28/EC obliges ongoing reporting on Member States. To this effect Ireland submitted its first progress report to the Commission in January 2012, its second in February 2014, and its third in April 2016.

³⁶ [White Paper - Ireland’s Transition to a Low Carbon Energy Future](#)

³⁷ On the Promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/E see http://europa.eu/legislation_summaries/energy/renewable_energy/en0009_en.htm

The Government has set a target of 40% electricity consumption from renewable sources by 2020. Since setting this target Ireland has made major strides in accelerating renewable generation. In the 2001 EU RES-E Directive 2001/77/EC, Ireland was set a target of moving from 3.6% RES-E to 13.2% RES-E by 2010. Ireland achieved 14.8% RES-E in 2010³⁸. In Ireland's third NREAP progress report, RES-E accounted for 22.7% electricity consumption in 2014³⁹. According to the most recent SEAI estimates, in 2015, electricity consumption from renewable sources was approximately 27%⁴⁰.

The significant growth in electricity from renewable sources in recent years is largely attributable to onshore wind. As Ireland moves towards achieving circa 40% RES-E by 2020, the Irish grid is increasingly having to cope with the challenges posed by large amounts of intermittent power. As outlined in the plan, EirGrid, is involved in detailed examination of the issues and is pioneering several renewables facilitation studies with a view to ensuring the appropriate management of the grid and stability of the electricity system during this transition.

The Action Plan details the financial, regulatory and technical measures being implemented alongside infrastructure projects to ensure Ireland's renewable targets are met whilst ensuring security of supply. The wide range of measures practically aimed at ensuring Ireland meets renewable targets are succinctly laid out in the Action Plan. The broad range of examples reflects the aim of ensuring a sustainable and secure supply system. The range of measures in place ensures that reliance and dependence is not overly weighed on any one specific aspect.

To help achieve 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 ensure the economic viability of renewable energy.

An issue raised in the NREAP is the possibility of conflict between wind potential harnessing capacity and the desire to ensure the preservation of areas of nature conservation and biodiversity importance. Conflict may arise in the future arising from the placement of turbines in areas where other considerations such as Natura2000 are in direct conflict with the preservation of peat lands.

Existing policy for connection of exporting generators to the electricity network in Ireland is primarily driven by the Government's 2020 renewable targets, and aims to connect sufficient volumes of renewable generation to meet the 40% share of renewable

³⁸ [DCCAE - NREAP First Progress Report 2012](#)

³⁹ [DCCAE - NREAP Third Progress Report 2016](#)

⁴⁰ SEAI – Electricity Generation 2015 provisional

electricity. This policy is captured under two broad processing approaches: the group processing approach (GPA) and the non-group processing approach (non-GPA).

Under the GPA, system operators have issued connection offers to these generators in batches, called “gates”. The last iteration was gate 3 and provided for approx. 6,000MW of connection offers; 4,000MW to renewable generators (mostly wind) and 2,000MW to conventional generators. This, together with renewable generators connected under the previous two gates, is considered sufficient to meet the 40% renewable electricity target, particularly given the fall in forecasted 2020 demand since the start of gate 3. For more details on the connection process, see sections 4.2.2 – 4.2.4 below.

4.1.2 2009 Renewable Energy Sources Directive - a European Perspective

In addition to domestic targets there is new over-arching renewables legislation in the form of 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 for 40% of electricity consumption to come from renewable sources. Additionally there has been a number of communications and Directives at European level which Ireland is obliged to follow. This includes the Energy End Use Efficiency and Energy Services Directive 2006/32/EC. This Directive specifically references the aim of creating stronger demand side incentives⁴¹. Article 13 of the Directive also references the need for competitively priced smart meters availability to accurately reflect demand side consumption. There is ongoing discussion on a revised and updated Directive to accurately reflect energy targets beyond 2020.

4.1.3 REFIT- Financial Support for long term security

To support the renewables target REFIT has been extended to include a number of renewable energy sources. REFIT currently covers onshore wind, small scale hydro, biomass landfill gas and other biomass.

REFIT1 was open for applications until 31 December 2009. Under the terms and conditions of the REFIT 1 scheme, plants were to be operational by end 2010. The technologies covered in REFIT 1 are small wind (less than 5MW), large wind (greater

⁴¹Article 7, Directive 2006/32/EC

than 5MW), Hydroelectricity and Biomass/Landfill gas. The support is provided for a period of 15 years.⁴²

REFIT2 which succeeded REFIT 1, came into operation in March 2012. It provides for up to 4,000MW of renewable generation. The technologies covered are small wind (less than 5MW), large wind (greater than 5MW), Hydroelectricity and Biomass/Landfill gas.⁴³

REFIT3 is designed to incentivise the addition of 310MW of renewable electricity capacity to the Irish grid. Specially targeting High Efficiency Combined Heat and Power (using both Anaerobic Digestion and the thermo-chemical conversion of solid biomass), biomass combustion and biomass co-firing. Demand for the biomass CHP category has exceeded the original allocation and for the other two categories is significantly below the original allocations. In August 2014 the DCCAE approved the reallocation of 70MW, comprising a combination of capacity from the anaerobic digestion (35MW) and biomass combustion categories (35MW), to biomass CHP. This was to reflect demand and increase the number of projects that could deliver renewable electricity and renewable heat and without significantly increasing the modelled costs of the scheme or the possibility of supporting co-firing at the three peat plant.⁴⁴

4.2 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 (from generators above 10 MW in size) 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 a SEM matter. Figure 4-1 below sets out the high level workings of the SEM.

⁴² [DCCAE – REFIT1](#)

⁴³ [DCCAE – REFIT2](#)

⁴⁴ [DCCAE – REFIT3](#)

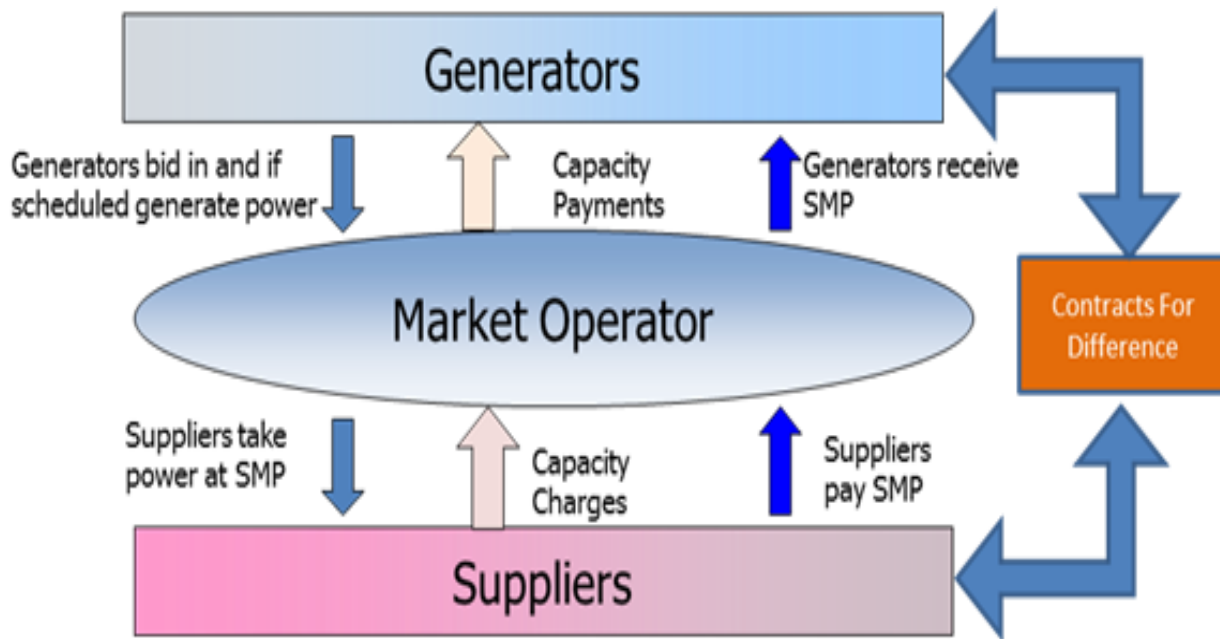


Figure 4-1 High Level SEM Framework

4.2.1 The SEM and the Capacity Payment Mechanism

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
- Stable investment signal

The CPM is designed to reimburse the 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.

In March 2012 the SEM Committee published a Medium Term Review of the Capacity Payment Mechanism. The review has led to some minor changes to the operation of the mechanism but has otherwise confirmed that the mechanism remains fit for purpose.

4.2.2 The I-SEM and the New Capacity Remuneration Mechanism

In the context of meeting the requirements of the European 3rd package of energy legislation, the SEM Committee committed to implementing the Integrated Single Electricity Market (I-SEM), replacing the current Single Electricity Market (SEM) arrangements. The Regulatory Authorities (Regulatory Authorities) for Ireland and Northern Ireland agreed the High Level Design of the market required for the third package - and called that market the I-SEM (Integrated Single Electricity Market). The Integrated Single Electricity Market (I-SEM) aims to increase the efficiency of the wholesale trading arrangements and increase the operational reliability of the system through more efficient cross border flows across the interconnectors with Great Britain and through closer to real time trading in electricity to allow more flexible and real time response to changing system dynamics. Balance responsibility and the introduction of within day cross border trading are key features of the new I-SEM energy market design.

The core changes to the I-SEM energy market are designed to bring the wholesale trading arrangements in line with the European model for trading as established in a series of EU regulations under the aegis of the Third Energy Package. In addition to these changes to the energy market, the I-SEM design changes include a significantly changed system of capacity payments.

The I-SEM CRM has been designed to be in line with the EU state aid guidelines on generation adequacy and in line with policies regarding capacity payments set out in the EU's Clean Energy Package. In that context the new CRM in Ireland will place increased obligations on capacity providers to improve operational reliability at times of system stress and provide for cross border participation thereby increasing long run security of supply. In addition greater emphasis will be placed on regional assessment of generation adequacy. The first forward capacity auction is due to be held in Q4 2017.

The I-SEM CRM is based around Reliability Options (ROs) with market participants receiving a capacity payment in return for providing capacity when demand is high, prices are rising and the system becomes tight. The CRM pays for the capacity to produce electrical energy through the option fee on a "per MW" basis. Capacity Providers can

receive two payments – one for providing capacity and the other for the energy they actually produce.

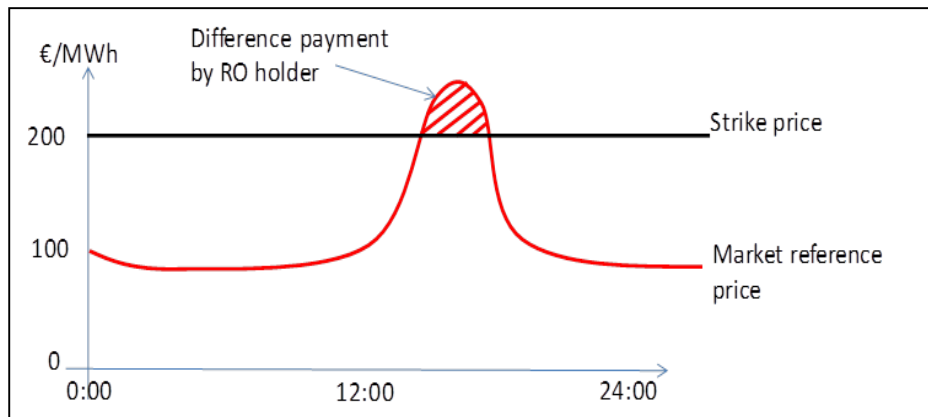


Figure 4-2 Reliability Option difference payments

The I-SEM CRM has 5 key stages including:

Determine key requirements: This step involves fundamental analysis of the I-SEM requirements for capacity to determine:

- The level of capacity that will be needed to maintain security of supply in future years; and
The extent to which each plant contributes to that need for capacity. This leads to factors that scale down the “name plate” capacity of each plant to give its “de-rated” capacity.

Qualification: Qualification is the start of the procurement of capacity from providers. This process aims to identify those potential providers of capacity that are genuinely credible – and are likely to be able to deliver the capacity they offer. Those “credible” providers “qualify” to participate in the subsequent auction.

Auction: The auction is a competition between qualified capacity providers to be awarded Reliability Options for the provision of capacity. This auction will allocate sufficient Reliability Options to at least meet the capacity requirement identified in the “Key Requirements” step. This allocation will aim to minimize the per-MW cost of those Reliability Options, based on prices submitted by each provider.

Build: Where the auction awards a Reliability Option to a new (as opposed to existing) capacity provider for new capacity to be built. The arrangements for this “build” phase will

include incentives on the relevant party to build their capacity within the required timescales.

Operate: The “Operate” phase is when capacity is available to, and being paid by, the I-SEM. This leads to the following payments:

- “per MW” option-fee payments to capacity providers for their capacity
- “per MWh” difference payments from capacity providers at time when energy prices are high (above the Reliability Option Strike Price);
- Payments from Suppliers to cover the “per MW” option fee payments to capacity providers; and
- Payments to Suppliers at times when energy prices are high (above the Reliability Option Strike Price).

The end to end process for the I-SEM CRM is illustrated in the Figure below:

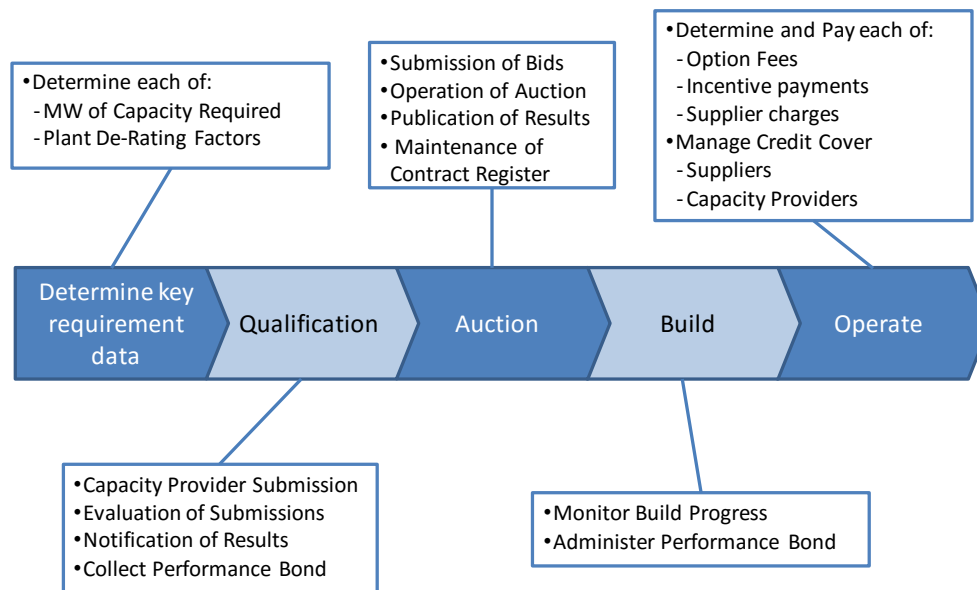


Figure 4-3 I-SEM CRM Process Overview

In particular, there are three key elements of the overall CRM design which combine to deliver the key CRM objectives of ensuring all customers pay the same price for capacity. These three elements are the Administrative Scarcity Price (ASP) which is set as a

function of the value of lost load, the Market Reference Price (which is set as a blend of the day ahead intra-day and balance markets) and the socialisation of any shortfall in difference payments.

The ASP provides sharp and cost reflective price signals at times of system stress. The ASP, combined with the chosen MRP option combine to give capacity providers a strong incentive to be available at times of system stress, and prevents unreliable generation from gaming the CRM, by being exposed to the ASP when not available. The ASP also provides Suppliers with a strong incentive to provide demand side response, reducing consumption at times of system stress, whilst at the same time, the choice of a blended MRP, ensures that Suppliers who are unable to respond to these price signals have their price exposure capped at the RO Strike Price. The CRM has also been designed to ensure that local security of supply is protected through transitional arrangements that will ensure security of supply in import constrained regions of the network on the island such as Dublin and Northern Ireland.

4.3 Connection policy

The Government target to generate 40% of electricity from renewable sources by 2020 is expected to be met mainly by wind generation. Existing policy for connection of exporting generators to the electricity network in Ireland is captured under two broad processing approaches: the group processing approach (GPA) and the non-group processing approach (non-GPA).

4.3.1 Gate Processing Approach (GPA)

The GPA has been designed for larger, renewable and conventional generators. Initially, the CER, along with the TSO and DSO, developed this process in 2004 as a response to the significant increase in parties requesting connection of renewables. As the name suggests the process allows for the processing of applications in groups or “gates”. Eligibility for inclusion in a gate has been based on criteria set out by the CER in its decisions on each of the three gates to date; gate 1 in 2004, gate 2 in 2006 and gate 3 in 2008 and 2009. These gates have been sequentially larger, see table 4-2 below:

<ul style="list-style-type: none"> • Gate1 in 2004 provided for 365MW
<ul style="list-style-type: none"> • Gate2 in 2006 provided for 1300 MW
<ul style="list-style-type: none"> • Gate3 in 2008 provided for 3900 MW

Table 4-2 Gate Connection Offers

Gate 3 allows for the connection of sufficient capacity to meet the Government's 2020 renewable electricity sources target of 40%. Under gate 3, system operators issued approx. 4,000MW to renewable generators (mostly wind). As of Q2 2014 just over 3400 MW of gate 3 connection offers have been accepted.

In conjunction with gate 3 for renewables, the CER is also carefully considering 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 decided to include conventional (non-renewable) applicants in gate processing. The total connection offer amount was based on criteria rather than an absolute number and provided for the issuance of connection offers to approximately 1300MW of conventional generation projects and, in addition, a merchant interconnector project. The 628 MW of conventional generation has been accepted in 2014. From these projects a CCGT and an OCGT generation have been commissioned and three other OCGTs have accepted their connection offer.

Under the GPA, system operators have issued connection offers to these generators in batches, called "gates". Eligibility for inclusion in a gate has been based on criteria set out by the CER in its decisions on each of the three gates to date; gate 1 in 2004, gate 2 in 2006 and gate 3 in 2008 and 2009. In the last iteration, gate 3, system operators issued approx. 6,000MW of connection offers – 4,000MW to renewable generators (mostly wind) and 2,000MW to conventional generators. Gate 3 has been largely driven by Ireland's objective to move to a low-carbon economy. The 2009 Renewable Energy Directive (Directive 2009/28/EC) set Ireland a binding target of meeting 16% of the country's energy requirements from renewable energy sources (RES) by 2020. To reach this target, Ireland is committed to meeting 40% of electricity demand by renewable sources (RES-E), 12% renewables in the heating sector (RES-H), and 10% in transport (RES-T). The non-GPA is the process to connect small, renewable and low carbon generators that fulfil public interest criteria. While under the GPA, generators included in a given gate have always been processed together as a group, non-GPA applicants are processed individually and sequentially.

4.3.2 Non-Group Processing Approach (non-GPA)

In addition to GPA, there is also a process in place to connect small, renewable and low carbon generators outside the gate. 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. While under the GPA, generators included in a given gate have always been processed together as a group, non-GPA applicants are processed individually and sequentially. As

Ireland diversifies its fuel mix with various renewables it is expected that connections outside the gate process may increase.

4.3.3 Generator Connections Liaison Group

The CER continues to chair the Generator Connections Liaison Group (former “Gate 3 Liaison Group”), a group comprising the TSO, the DSO and industry participants, which has turned to examining post issuance matters. As gate 3 offers have now been accepted, the CER is now considering the appropriate post-gate 3 connection process. The gate process has proved reliable in ensuring that multiple source generation are being facilitated into the transmission system by EirGrid.

The CER is currently reviewing its policy around managing connections to the electricity and transmission grids. In this context the CER made a decision in October 2016 on set of transitional arrangements and plans to consult on an enduring connection regime in 2017⁴⁵.

4.4 Planned Investment and Maintenance

4.4.1 Connections Overview

In order to connect to the transmission system, all demand and generation customers must execute a Connection Agreement with EirGrid. A connection offer which is accepted in one year is unlikely to impact on connected generation capacity in the same year given the lead times associated with construction.

When a Connection Agreement is executed for a new connection, depending on technology, it typically takes a number of years before the demand or generation is connected to the transmission system. This period includes project development, time taken to obtain consents and to construct the connection. When the transmission connection is energised, it then takes a number of months for the generator to reach commercial operation. This period is generally much shorter for demand customers.

⁴⁵ For background on CER’s electricity connection policy see:

<https://www.cer.ie/docs/001060/CER%2015284%20Review%20of%20Connection%20and%20Grid%20Access%20Policy.pdf>

<http://www.cer.ie/docs/001060/CER16284%20Transitional%20Arrangements%20Decision.pdf>

4.4.2 Conventional Generation

At present, there is no significant capacity of new conventional generation contracted to connect to the system in Ireland. EirGrid publishes listings of both contracted and connected plant on its website. Apart from supported generation such as wind and biomass there are no large-scale generation units that are committed to connect. In Ireland, the only new conventional generator documented committed to connect is the Dublin Waste to Energy Plant.

Plant	Capacity (MW)
Dublin Waste to Energy	61

Table 4.3 Plant planned to be commissioned in Ireland⁴⁶

4.4.3 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, 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. REFIT2 opened in March 2012 and increases the quantity of onshore wind supported under the original REFIT scheme. Further regulatory support is being given to small scale hydro and landfill gas. A further REFIT3 scheme specifically targets biomass. Further to this, renewable generation in Ireland receives priority dispatch whereby they are dispatched by the system operator in preference to conventional generation.

4.4.4 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 Ireland's specific weather attributes and the advanced stage of wind technology compared to other renewable energy technologies. As already outlined onshore wind is supported through the REFIT1 & 2 programmes. REFIT2 has been expanded to include other renewable areas that are to be supported. However it is expected that onshore wind, due to its proven technology is likely to continue to be a major component of the supported energy sources.

Table 4-5 below sets out the wind generation already connected as of the data freeze for this element of the report.

⁴⁶ EirGrid GCS 2017

System	2016 (MW)
Transmission and Distribution	2740

Table 4-5 Transmission & Distribution Capacity of connected wind farms 2016
Source EirGrid GCS

4.4.5 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. The table below 4-6 below sets out the non-wind renewables greater than 5MW recently connected and contracted for connection to the system. The CER envisages that connection Feed in Tariffs will continue to expand the support available for other sources of energy as outlined above.

Fuel Type	Capacity (MW)
Hydro	22
Biomass /Landfill gas	54 ⁴⁷
CHP	151 ⁴⁸
Industrial	9
Solar PV	15 ⁴⁹
Total	251

Table 4-6 New Other Renewable Connections

4.4.6 Maintenance Works completed

Transmission maintenance is undertaken by EirGrid in accordance with EirGrid's maintenance policy to ensure that the transmission system can operate in a safe, secure and reliable manner. The policy comprises continuous and cyclical condition monitoring (on-line and off-line), preventative maintenance on critical items of plant and the implementation of corrective maintenance tasks. The maintenance policy is kept under review to ensure that it continues to meet the requirements of the system and best

⁴⁷ Includes Meath Waste to Power (17MW)

⁴⁸ Includes Dublin Waste to Energy (62MW). Not including the 161 MW centrally dispatched CHP plant operated by Aughinish Alumina.

⁴⁹ Generation Capacity Statement 2017-2026

international practice. On an annual basis, transmission maintenance activities dictated by the asset maintenance policy and protection maintenance policy, along with work identified from analysis of plant condition and work carried over from the previous year combine to form the planned maintenance requirements for the year. This is then included in the Transmission Outage Plan.

During the relevant year, due to a variety of reasons (including resource limitations, outage restrictions, material availability, system conditions, CAPEX projects etc.), it may be necessary to defer programmed maintenance activities. The TSO will consider the appropriateness or otherwise of deferring preventive and/or corrective maintenance activities. This is subject to prioritisation and deferral assessments in accordance with established EirGrid procedures. These assessments will consider system/safety/environmental impact, duration of outage, controls and mitigation measures. Deferrals are kept under review, as any increase in backlog could have a negative impact on the reliability and performance of the transmission system.

Table 4.7 provides, in volume terms, a summary of transmission maintenance requirements, maintenance programmed and maintenance completed in 2015 for overhead lines, underground cables and transmission stations. In order to facilitate more maintenance work and CAPEX projects, EirGrid took the decision in 2015 to extend the transmission outage season by two months; work now takes place from the beginning of March and continues until the end of November.

Volume of Transmission Maintenance by Activity	Maintenance Requirements	Maintenance Programme Year End	Maintenance Completed
Overhead Line Maintenance			
Patrols (incl. Helicopter, climbing, infrared & Bolt)	9,221	9,221	7,791
Timber Cutting [km]	44	44	23
Structure & Hardware Replacement [Number]	74	80	57
Insulator & Hardware Replacement [Number]	234	233	29
Underground Cable Maintenance			
Alarm Checks / Inspection [Number]	620	750	597
Station Maintenance			
Ordinary Service [Number]	509	332	240
Operational Tests [Number]	1037	1028	807
Condition Assessment of Switchgear [Number]	275	147	106
Tap Changer Inspection [Number]	13	12	8
Corrective Maintenance Tasks [No. of Tasks]	530	596	349

Table 4.7: Maintenance Summary for 2015⁵⁰

4.5 Summary

This section has looked at matters relevant to the security of electricity supplies over ten 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. The CER maintains a watching brief on the longer-term security of electricity supplies and implements measures that are designed to provide for longer term security of supply.

⁵⁰ [All-Island Transmission System Performance Report 2015](#)

Key Messages

- The Single Electricity Market (SEM) resulted in a successful wholesale market for the Island of Ireland. The nature of the market ensured that there was sufficient capacity to meet demand.
- The SEM Committee committed to implementing the Integrated Single Electricity Market (I-SEM), replacing the current Single Electricity Market (SEM) arrangements. In addition to reform of energy market, the High Level Design includes a Capacity Remuneration Mechanism (CRM) based around Reliability Options in order to ensure long term supply security on the island of Ireland
- The I-SEM CRM is in line with EU rules on state aid and has been designed to incentivise long and short terms security of supply by incentivised generation, demand reduction and storage provision that meets the need of the operational reliability of the electricity system. Cross border participation in the CRM will enhance further security of supply on the island.
- There is a Government target to generate 40% of electricity from renewable sources by 2020. To this effect a National Renewable Energy Action Plan has been published which outlines how this target is to be achieved. An update to this action Plan was submitted to the European Commission in January 2012.
- Under Gate 3 system operators issued approx. 6,000MW of connection offers – 4,000MW to renewable generators (mostly wind) and 2,000MW to conventional generators. Approx. 900MW of capacity have been connected, and a further 3,010MW of capacity have been contracted for connection.
- Support is now being given to new types of renewable generation via REFIT2 & 3. Those supported generation types include biomass, hydro, further onshore wind, and biomass gas.

5 Networks Investment

Article 6 of the 2005 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 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.

5.1 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, 275 kV 220 kV and 110 kV networks. The 400 kV and 220 kV networks form the backbone of Ireland's grid. The key components of the transmission system are set out in Table 5-1 below.

Power Lines	2014 Total Line Lengths (km)	2015 Total Line Lengths (km)
400kV	439	439
275kV	97	97
220kV	1917	1927
110kV	4268	4342
Circuit Total	6721	6799
Transformers	Number Of Items	Number Of Items
400/220kV	77	7
275/220kV	3	3
220/110kV	46	46
Transformer Total	56	56

Table 5-1 Source: EirGrid Transmission System Performance Report 2015⁵¹

In addition to the current transmission system in place there are a number of projects underway to provide stability and security to the system. This investment is focused on both increasing the capacity of the transmission system and refurbishing the existing system. This is of particular importance to maintain security of supply and facilitate the increasing amounts of renewable energy, much of which is located along the West coast of Ireland.

⁵¹ [EirGrid Transmission System Performance Report 2015](#)

5.2 Regulatory Framework

The Irish transmission arrangements were certified by the CER in accordance with Article 1 of the European Commission Decision of 12th April 2013, pursuant to Article 3(1) of Regulation (EC) No 714/2009 and Article 10(6) of Directive 2009/72/EC. EirGrid, a publicly owned company, is the transmission system operator. ESB, a publicly owned vertically integrated utility, is the transmission and distribution system owner through its ring fenced business unit ESB Networks. The distribution system is operated by ESB Networks Ltd, a wholly owned, legally separate, subsidiary of ESB.

5.2.1 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 three electricity networks revenue reviews.

5.2.2 Capital Expenditure

The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious targets for renewable generation and maintaining a secure system. In 2008 EirGrid published Grid25, their long-term strategy to develop Ireland's electricity grid looking out to 2025. At that time, demand for electricity had grown by an average of 4% a year over the previous decade. Forecasts suggested that this trend would continue.

Through Grid25, the aim was to deliver efficient and cost effective development that integrated with the existing grid. This approach also tried to avoid too many projects in one area, if a single solution was viable. . In 2011, following EirGrid's first major review of the capital expenditure programme, the forecasted costs were reduced from €4bn to €3.2bn. This was possible due to lower forecasts for electricity demand in the recessionary period, and through the use of new technologies.

In Electricity Price Review 3 (2011-2015), the CER approved €1.45 billion for transmission capital investment for that five year period. In Electricity Price Review 4

(2016-2020), the CER approved €984 million for transmission capital expenditure for this five year period. These figures are part of the €3.2bn Grid25 capital expenditure programme.

In January 2017, EirGrid published their second major review the grid development strategy, entitled Your Grid, Your Tomorrow. In drafting this, EirGrid took account of public feedback which was accrued over an extensive consultation period beginning in March 2015 and also from consultations on proposed transmission projects. They also considered the Government's Energy White Paper. The forecasted costs are now in the range €2.6bn-€2.9bn. A range is used as the final cost will vary depending on the circumstances and technologies of each project.

A number of projects have already been completed under these programmes and project status updates are periodically communicated to the CER. Please see table 5-2 for capital projects complete in 2015.

CP No.	Project Title	Date Project Completed
CP0911	Cullenagh - Knockraha Polymeric Insulator Replacement	Q3 2015
CP0736	Cunghill - Sligo 110 kV Line Uprate	Q4 2015
CP0777	Mullingar 110 kV Station - Transmission Works Associated with Installation of New 38 kV GIS	Q4 2015
CP0828	Boggeragh 110 kV Station - New 110 kV Bay	Q4 2015
CP0657	Ikerrin T - Thurles 110 kV Line Uprate and Thurles 110 kV Station - Busbar Uprate and New Coupler	Q2 2015
CP0716	Carrigadrohid - Macroom 110 kV Line Uprate	Q4 2015
CP0627	Bandon 110 kV Station - Uprate 110 kV Bay	Q4 2015
CP0790	Cloghboola 110 kV Station - New Windfarm and New DSO Transformers	Q4 2015
CP0851	Kilbarry 110 kV Station - Uprate Three 110 kV Circuit Breakers	Q4 2015
CP0508	Shelton Abbey 110 kV Station – Protection Upgrade	Q4 2015
CP0705	Woodhouse 110 kV New Station – New Wind Farm Connection	Q2 2015
CP0769	Dunstown - Kellis 220 kV Line Refurbishment	Q4 2015
CP0860	Finglas 220 kV Station - Transformer Replacement Project	Q3 2015
CP0797	Dunfirth - Kinnegad - Rinawade 110 kV Line Refurbishment	Q4 2015
CP0744	Cahir - Tipperary 110 kV Line Uprate and Tipperary 110 kV Station Busbar Uprate	Q4 2015
CP0481	Strategic Spare - 220 kV Mobile Bay	Q3 2015
CP0821	HV Line Tower Painting - North	Q4 2015
CP0727	Balteau CT Replacement at 110 kV and 220 kV	Q1 2016
CP0608	Cloghboola 110 kV New Station and Connection to Trien 110 kV Station – New Wind Farm Connections	Q2 2015
CP0787	Surge Arrestor Replacement – South	Q1 2016

Table 5-2 Significant Transmission Capital Projects Completed in 2015/16⁵²

The significant investment in strengthening capacity connections between regions allows regional demand to be met in the best way possible. This is of particular importance due to the geographical distribution of demand in Ireland. Whereas maximum wind potential is located along the west coast where wind levels are high, Ireland's population is concentrated along the east coast. As a result it is of vital importance that the grid is capable of facilitating this regional increase in future generation on the network and successfully facilitates its transmission.

⁵² EirGrid Transmission Development Plan

The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious renewable generation targets and for maintaining a secure and reliable system. To this end there will be significant investment in the transmission and distribution networks in the coming years.

5.2.3 Monitoring of Capital Expenditure Grid25 (Grid Development Strategy)

EirGrid as TSO regularly updated the CER regarding Grid 25 progress⁵³. Since 2011, a number of Grid25 projects have been completed. The completed projects are set out in table 5-3 below. Regular reports submitted to CER assist in monitoring the capital expenditure. These reports are jointly submitted by EirGrid as TSO and ESB Networks as TAO.

⁵³ With specific reference to capital projects over €10 million in value.

Electricity Security of Supply Report 2016

	Project	Project Energised
CP0608	Trien 110kV Station	Q2 2015
CP	Ikerrin – Thurles 110kV line uprate	Q2 2015
CP0745	Cathaleen’s Fall – Srannagh	Q4 2014
CP0228	Marina	Q4 2014
CP0717	Clashvoon – Knockraha	Q4 2013
CP0696	Marina - Trabeg	Q4 2013
CP0292	Gorman - Meath Hill	Q4 2012
CP0374	Arva Shankill	Q4 2012
CP0664	Cullenagh Knockraha	Q4 2012
CP0211	Srananagh	Q3 2012
CP0656	Arklow - Crane	Q2 2012
CP0254	Dalton Galway	Q2 2012
CP0264	Tarbert Tralee	Q4 2011
CP0660	Cashla – Ennis	Q3 2011
Cp0659	Arva - Navan	Q3 2011
CP0587	Glanaglow Raffeen	Q3 2011
CP0588	Kilbarry – Mallow	Q3 2011
CP0241	Lodgewood	Q1 2011
CP0201	Athy	Q2 2011
CP0175	Charleville - Killonan	Q2 2011

Table 5-3 Updated Grid25 Projects Complete Since 2011

In May 2016, the CER published its final reports on the Grid 25 Capex Monitoring for the years 2014 to 2015. This closed the historic capex monitoring for the PR3 period. As set

out in the PR4 Decision the CER will review the reporting and monitoring framework for the PR4 period (2016-2020). The CER will consult on this framework during 2017.

5.2.4 Conclusion

The electricity system in Ireland is regulated by the CER with specific roles held by EirGrid as TSO and ESB Networks as TAO. As a result of changes occurring on the transmission and distribution systems a coordinated approach is required from all players to ensure continuing investment in the electricity network.

Key Messages

- The CER regulates the transmission and distribution system operators and owners in Ireland.
- 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 especially with the ongoing renewable connections onto the system.
- EirGrid is committed to a grid development strategy that will be continually reviewed to ensure it is up to date and continues to meet Ireland's changing needs

6 Operational Network Security

Article 4 of the 2005 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.

6.1 System Operation

6.1.1 Operational Framework and Rules

The technical 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. In 2004 a section specifically addressing the technical requirements of wind generators, was incorporated into the Grid Code⁵⁴.

EirGrid is responsible for the administration of the Grid Code through the Grid Code Review Panel (GCRP). The GCRP is a standing body with representation from across the electricity industry. The GCRP reviews and discusses modifications to the Grid Code. While the GCRP may recommend modifications to the Grid Code any modifications must be approved by the CER. Individual generators may apply for derogations from the Grid Code, which must be assessed by EirGrid and approved by the CER. In addition, EirGrid uses its own Operating Security Standards, which set out the criteria to which the TSO operates the system at all times.

The Grid Code will be impacted by the entry into force of a number of European Regulations in the form of Electricity Network Codes. In particular the RFG (Requirements for Generators) and the DCC (Demand Connection Code) will require substantial revisions to the current Grid Code document as well as the HVDC Code. A working group of the GCRP and several sub-working groups were set up to prepare impact assessments on the transposition of the new requirements into the Grid Code. The impact assessments for all of the Network Codes was completed in 2015, and presented to the GCRP. As the Codes are entering into force EirGrid have commenced the implementation of the Network Codes.

⁵⁴ This section of the Grid Code has now been updated to refer to PPMs (power park modules – any generation connected behind power electronics) rather than solely wind generation.

Currently a number of the Codes have entered into force or have been voted in. The following table gives an update on those Codes that will likely require changes to existing Grid Code standards:

Name of Code/Framework Guideline	Status	Entry into Force date	Main Focus
Requirements for Generators (RfG) (Regulation (EU) 2016/631)	Adopted by EU and published.	17 th May 2016	Connections
High Voltage Direct Current systems	Adopted by EU and published.	28 th September 2016	Connections/ Operations
Demand Connection Code	Adopted by EU and published.	7 th September 2016	Connections
Systems Operations	Voted in by Member States, awaiting validation by EU Council and Parliament	Anticipated Q3 2017	Operations
Electricity Balancing	Pre-comitology-anticipated Member State voting to take place in Q1 2017	Anticipated Q4 2017	Operations and Markets
Emergency Restoration	Voted in by Member States, awaiting validation by EU Council and Parliament	Anticipated Q3 2017	Operations

The implementation of these Network Codes and Guidelines will be a significant undertaking.

6.1.2 Performance Incentives

As part of PR3, the CER implemented a scheme of performance incentives for the TSO. In July 2011 the CER published a decision on Transmission Incentives to run until 2015⁵⁵.

As part of PR4 the CER decided to put in place strategic incentives separately to incentives focused on operational and service level targets. It is proposed that provision for these strategic incentives would be included in the TSO's baseline model and where the TSO achieved the relevant objective the TSO would be permitted to retain the revenue. The CER will consult on this framework during 2017. The objectives of the

⁵⁵ CER/11/128

strategic incentives will focus on key deliverables which can deliver wider benefits to consumers and industry. The CER will carry out a review of the incentive mechanism that currently applies to the TSO and TAO.⁵⁶

6.1.3 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

Some of the key information from the report is included in Table 6-1 and Table 6-2 below.

Generation & Transmission Data	2015
Total Operational Generation Capacity (ROI only)	7,166 MW
Total Energy Produced (ROI only)	27600 GWh
Peak Winter Demand (All-Island)	6392 MW
Minimum Summer Night Valley (All-Island)	2295 MW

Table 6-1 Generation and Transmission Data Source: EirGrid⁵⁷

System Availability	2014 %	2015 %
400kV Circuit	97.17	93.58
220kV Circuit	95.8	95.01
110kV Circuit	92.63	95.17

Table 6-2 System Availability Data⁵⁸

⁵⁶ [Decision on TSO and TAO Transmission Revenue for 2016 to 2020 PR4](#)

⁵⁷ [All-Island Transmission System Performance Report 2015](#)

⁵⁸ [All-Island Transmission System Performance Report 2015](#)

6.1.4 Generator Availability

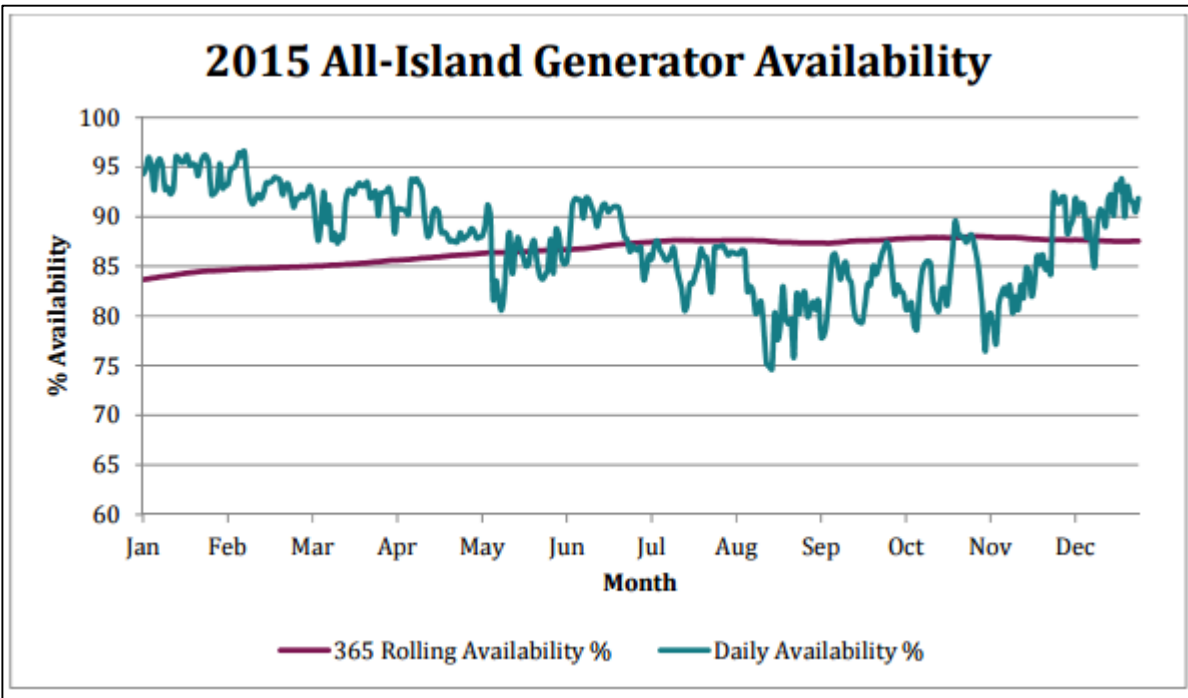


Figure 6-1 Generator Availability Data⁵⁹

- The average daily generation system availability in 2015 was 87.58%
- The maximum daily generation system availability in 2015 was 96.56%, occurring on the 7th of February.
- The minimum daily generation system availability in 2015 was 74.63%, occurring on the 19th of August.

⁵⁹ [All-Island Transmission System Performance Report 2015](#)

6.1.5 Generator Forced Outage Rates

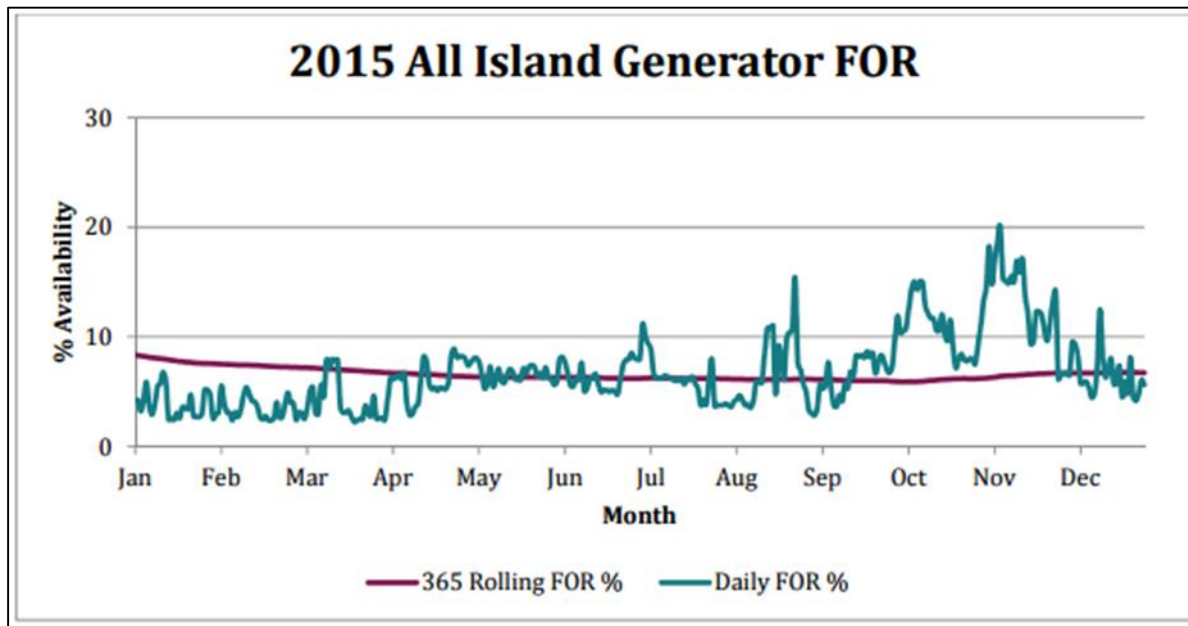


Figure 6-2 Generator Forced Outage Rate Data⁶⁰

- The average daily generation system forced outage rate in 2015 was 10.07%.
- The highest forced outage rate in 2015 was 20.06%, occurring on the 9th of November. On this date the following units were on a forced outage: Great Island GI4, Moneypoint MP3, Ballylumford B31 and Coolkeeragh GT8.
- The minimum daily generation system forced outage rate in 2015 was 2.23%.⁶¹

⁶⁰ [All-Island Transmission System Performance Report 2015](#)

⁶¹ [All-Island Transmission System Performance Report 2015](#)

6.1.6 Generator Scheduled Outage Rate

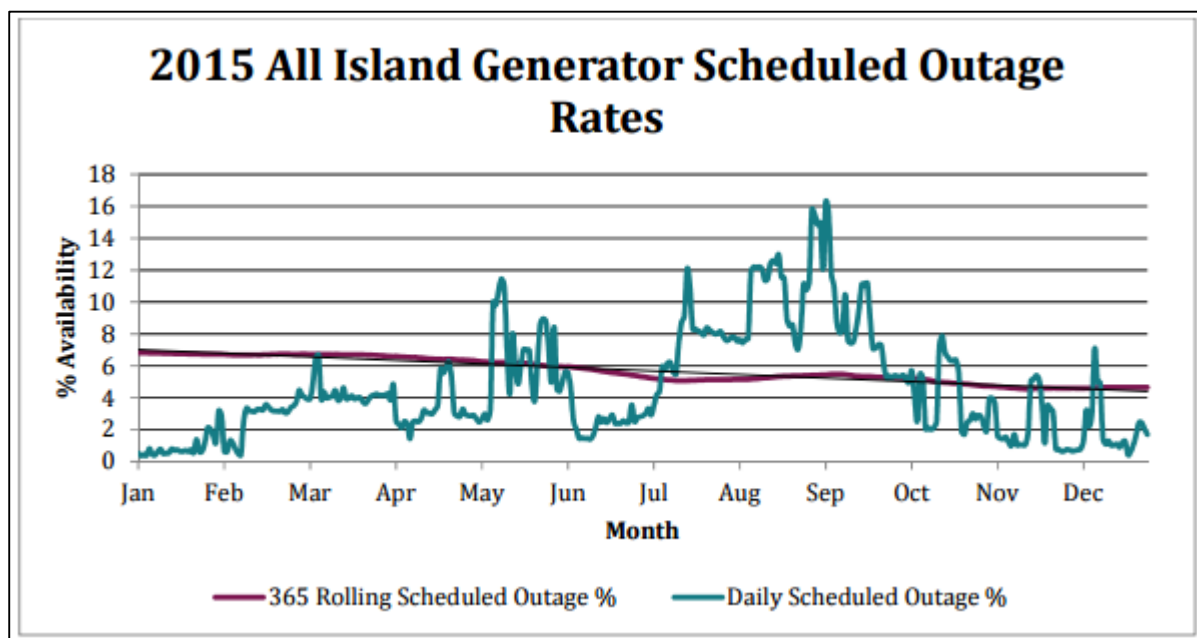


Figure 6-3 Generator Scheduled Outage Rate Data⁶²

- The average daily generation system scheduled outage rate in 2015 was 4.64%.
- The maximum daily generation system scheduled outage rate in 2015 was 16.27%, occurring on the 6th of September.
- The minimum daily generation system scheduled outage rate in 2015 was 0.37%.

6.2 Ancillary Services (DS3 System Services)

As stated earlier, Article 5 of the 2005 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 through mandatory Grid Code obligations to provide ancillary services and ancillary services contracts between EirGrid and the individual generators.

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. The ancillary services framework has been revised through the DS3 Programme. Currently Ireland has very high levels of non-synchronous variable generation (predominantly wind). The aim of the DS3 programme is to meet the challenges of operating the electricity system in a secure manner while achieving the 2020 renewable electricity targets. In this context, a key

⁶² [All-Island Transmission System Performance Report 2015](#)

focus of the DS3 Programme is to enable high instantaneous penetration of non-synchronous generation while maintaining system stability.

The Renewable Energy Directive 2009/28/EC states that system operators are obliged to “take appropriate grid and market related operational measures in order to minimise the curtailment of electricity from renewable sources on the electricity system”. In accordance with this Directive EirGrid as TSO is implementing the “DS3 Programme” to ensure a secure, reliable and efficient electricity system in a changing energy environment. To successfully fulfil the 40% renewable electricity target a total of approximately 5200MW of wind generation will need to be connected to the system by 2020 on an All-Island basis. This portfolio change poses significant challenges to the network in Ireland above and beyond non-synchronous facilitation challenges posed to other jurisdictions.

The TSOs formally commenced the DS3 Programme in September 2011, following a review by the Regulatory Authorities of the TSOs’ Report on Ensuring a Secure, Reliable and Efficient Power System in July 2011. This followed a request by the SEM Committee for the TSOs to put in place a programme of work to solve the challenges which would occur with operating the electricity system in a secure manner as levels of wind penetration increase. These issues had been identified by the TSOs in the Facilitation of Renewables Study, a large body of work which concluded in 2010.

The DS3 programme consists of eleven separate work streams: System Services, RoCoF, Grid Code, Demand Side Management, Voltage Control, Frequency Control, Control Centre Tools, Model Development and Studies, WSAT, Renewable Data, and Performance Monitoring and Testing. One of the objectives of the DS3 programme is to enhance the capability of the system to allow the TSO to safely operate the system at 75% SNSP (“System Non-Synchronous Penetration”) up from the limit of 50% applied in 2014. A 75% SNSP limit means that at any given time wind generation can contribute 75% of total electricity generation. This will allow the system to make the best use of wind generation when it is available, lowering curtailment levels and increasing the average share of renewable generation to meet the 40% target.

Following a four month trial period, EirGrid Group changed the operational policy to allow SNSP to reach up to 60%. The increase in allowable SNSP levels from 50% to 60% since 2014 has been enabled as a direct result of the progress being made under several

DS3 workstreams including Control Centre tools. The current status of all the DS3 workstreams can be found on EirGrid's website⁶³.

One of the key work streams in the DS3 programme is the System Services (or Ancillary Services) workstream. The aim of the system services workstream is to put in place the correct structure, level and type of service in order to ensure that the system can operate securely with higher levels of wind penetration (up to 75% instantaneous penetration).

The TSOs have statutory responsibilities in Ireland and Northern Ireland in relation to the economic purchase of services necessary to support the secure operation of the system. During 2016 a new procurement process was initiated to enable the procurement of 7 new services in addition to the 7 existing services. This procurement process signified a major change for the TSOs and Industry in the payment for and provision of System Services. An OJEU tender was initiated for technical qualification of plant and payment for services is currently based on distinct tariffs for each of the 14 services, which are paid to providers on the basis of demonstrated technical availability of the service provision. These new System Services provide increased operational security for the System Operator when operating the system (which has no A/C interconnection) with high levels of non-synchronous generation. Some of the products procured under DS3 include:

- Synchronous Inertial Response (SIR)
- Fast Frequency Response (FFR)
- Primary Operating Reserve (POR)
- Secondary Operating Reserve (SOR)
- Tertiary Operating Reserve (TOR1)
- Tertiary Operating Reserve (TOR2)
- Replacement Reserve - Synchronised (RRS)
- Replacement Reserve – Desynchronised (RRD)
- Ramping Margin 1 (RM1)
- Ramping Margin 3 (RM3)
- Ramping Margin 8 (RM8)
- Fast Post Fault Active Power Recovery (FPFAPR)
- Steady State Reactive Power (SSRP)
- Dynamic Reactive Response (DRR)

⁶³ <http://www.eirgrid.com/operations/ds3/>

It is intended that competitive procurement of DS3 System Services will be enabled following further development of possible options by the Regulatory Authorities during 2017.

6.3 Secondary Fuel Capability Obligations

Directive 2003/54/EC (which was replaced by Directive 2009/72/EC) 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. Regulation 5 of S.I. 60 of 2005 states that "*the Commission shall take such measures as it considers necessary, to protect security of supply.*"

Secondary fuel obligations are of particular importance in the island of Ireland's electricity market. This is due to the fact that the majority of electricity requirements on an all Island basis are being met from gas.

In the medium to long term the majority of gas is expected to be supplied through a single entry point onto the island of Ireland, from an electricity security of supply perspective it is essential that emergency provisions are put in place. To this end generators are required to hold reserves of either their primary or secondary fuel and they must be capable of running at 90% plus of capacity on a secondary fuel. The specific requirements on generators to hold reserves are set out in table 6-3 below. As TSO, EirGrid has an obligation⁶⁴ to examine fuel stocks and may test fuel stocks twice per annum.

In May 2012 EirGrid carried out a Capacity Report to assess the possibility of increasing secondary fuel obligations above the current requirements. The report concluded that various scenarios were possible including an option for key generation plants in particular to increase their secondary obligations if necessary.

In its decision paper on Secondary Fuel Obligations in 2009 the CER committed to keep secondary fuel obligations under continuous review to address potential issues arising from gas supply sources and the increase in intermittent renewable generation on the electricity network. In 2014 the CER commenced analysis to estimate the impact of the current policy under various potential future scenarios.

⁶⁴ [CER/09/001](#)

In 2015, due to a number of significant changes in Ireland's electricity and gas sectors, the CER launched a consultation reviewing fuel stock obligations for electricity generators⁶⁵. The changes considered during the consultation are as follows:

- a declining proportion of gas use in electricity power generation;
- opening and closure of a number of electricity generation plants;
- increased wind generation;
- commissioning of the East-West Interconnector;
- increased investment in gas infrastructure (e.g. twinning of gas pipeline in South West Scotland Onshore System); and
- new sources of indigenous gas (i.e. Corrib) coming on stream

The CER received seven response to the consultation paper reviewing the fuel stock obligations in Ireland and is yet to publish a decision.

Due to the importance of gas as a fuel for electricity generation the CER require that in the event of a gas supply disruption base load gas powered plants are required to stock five days of secondary fuel while peaking plants are required to stock three days of secondary fuel. Electricity generating plants with operating hours above 2630 hours per annum are categorised as higher merit while plants operating below 2630 hours per annum are categorised as lower merit generating units⁶⁶

⁶⁵ [CER/15/213](#)

⁶⁶ [CER/09/001](#)

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 ⁶⁷ 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	

Table 6-3 Secondary Fuel Requirements⁶⁸

As previously outlined Ireland cooperates regionally with the UK through the UK & Ireland Gas Emergency Group. The UK & Ireland Gas Emergency Group provides a physical communication median that ensures proportional market sector supplies will be distributed to Ireland if a gas emergency is declared in the UK⁶⁹. This agreement is currently under review to take account of Ireland's new indigenous natural gas sourced from the Corrib gas field off the West coast of Ireland.

⁶⁷ Renewables is as defined in the Electricity Regulation Act 1999

⁶⁸ [CER/09/001](#)

⁶⁹ This is not a function of the UK/Ireland group but based on a protocol between TSOs, who are members of the group.

Key Messages

1. The rules governing the 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. In 2017, The CER has will consult on a new incentives, strategic incentives and reporting and monitoring regime for the TSO.
3. Ancillary services are a key requirement in maintaining the supply/demand balance. The implementation of the DS3 Programme has introduced 7 new additional ancillary services, with 11 services currently contracted and a further 3 due to be contracted during 2017/18.
4. The progress made under the DS3 programme has enabled the operational instantaneous limit of level of non-synchronous generation on the system to increase from 50% to the current trial of 60%.
5. 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)
6. Non-gas fired generation stations must hold primary fuel in storage to run for a defined number of days (3-5 Days)
7. Compliance with the primary and secondary fuel requirements is monitored by EirGrid. The majority of generators are in compliance with these obligations.

7 Interconnection and Regional Transmission Development

Article 22 of Directive 2009/72/EC requires TSOs to submit to the regulatory authority a ten-year network development plan based on existing and forecast supply and demand after having consulted all the relevant stakeholders. That network development plan shall contain efficient measures in order to guarantee the adequacy of the system and the security of supply.

The ten-year network development plan shall in particular:

- a) Indicate to market participants the main transmission infrastructure that needs to be built or upgraded over the next ten years
- b) Contain all the investments already decided and identify new investments which have to be executed in the next three years
- c) Provide for time frame for all investment projects

Regulation 347/2013 sets up guidelines for the timely development and interoperability of priority corridors and areas of trans-European energy infrastructure. In particular, this Regulation:

- a) Addresses the identification of projects of common interest necessary to implement priority corridors and areas falling under the energy infrastructure categories in electricity, gas, oil and carbon dioxide
- b) Facilitates the timely implementation of projects of common interest by streamlining, coordinating more closely, and accelerating permit granting processes and by enhancing public participation
- c) Provides rules and guidance for the cross-border allocation of costs and risk-related incentives for projects of common interest
- d) Determines the conditions for eligibility of projects of common interest for Union financial assistance

The PCI projects in Ireland are outlined in Table 7-1:

PCI No.	Type (e.g. electricity)	PCI Definition
1.6	Electricity	France — Ireland interconnection between La Martyre (FR) and Great Island or Knockraha (IE) [currently known as “Celtic Interconnector”]
1.9 - Cluster connecting Ireland to United Kingdom.	Electricity	1.9.1 Ireland — United Kingdom interconnection between Wexford (IE) and Pembroke, Wales (UK) [currently known as “Greenlink”] 1.9.2 Ireland — United Kingdom interconnection between Coolkeeragh — Coleraine hubs (IE) and Hunterston station, Islay, Argyll and Location C Offshore Wind Farms (UK) [currently known as “ISLES”]
2.13 - Cluster Ireland — United Kingdom interconnections.	Electricity	2.13.1 Ireland — United Kingdom interconnection between Woodland (IE) and Turleenan (UK) 2.13.2 Ireland — United Kingdom Interconnection between Srananagh (IE) and Turleenan (UK)
5.1 - Cluster to allow bidirectional flows from Northern Ireland to Great Britain and Ireland and also from Ireland to United Kingdom.	Gas	5.1.1 Physical reverse flow at Moffat interconnection point (IE/UK) 5.1.2 Upgrade of the SNIP (Scotland to Northern Ireland) pipeline to accommodate physical reverse flow between Ballylumford and Twynholm 5.1.3 Development of the Islandmagee Underground Gas Storage (UGS) facility at Larne (Northern Ireland)
5.3	Gas	Shannon LNG Terminal and connecting pipeline (IE)
10.1	Smart Grid	North Atlantic Green Zone Project (Ireland, United Kingdom/Northern Ireland) aims at lowering wind curtailment by implementing communication infrastructure, enhanced grid control and interconnection and establishing (cross-border) protocols for Demand Side Management.

Table 7-1 the PCI projects in Ireland⁷⁰

⁷⁰ [The Second list of PCI](#)

7.1.1 North South Interconnector

A new North South Interconnector is currently proposed by EirGrid and SONI (System Operator for Northern Ireland), which will comprise a 400kV overhead line to connect the electricity Grid of Ireland and Northern Ireland. The proposed project will run through counties Monaghan, Cavan, Meath, Armagh and Tyrone. The EU officially granted the North South Interconnector PCI status in 2013. The project was granted planning approval by An Bord Pleanála in December 2016. A decision on planning permission for the northern element of the project is not expected until the latter half of 2017.

7.1.2 Celtic Interconnector

The two national Transmission System Operators (TSO), EirGrid in Ireland and its French counterpart, RTE (Reseau de Transport D'Electricite), signed a Memorandum of Understanding to commission preliminary studies on the feasibility of building a submarine electricity interconnector between Ireland and France⁷¹. The preliminary studies and assessments to date have indicated the following benefits of the Celtic Interconnector:

- **Competition** – facilitation of increased electricity trading in an economically efficient manner within Europe by directly linking the electricity market of mainland Europe with the Single Electricity Market on the island of Ireland;
- **Renewables** – further development of renewable sources, particularly variable sources such as wind, by reducing curtailment volumes;
- **Security of Supply** – providing an additional supply of power to Ireland, and also leading to increased diversification of fuel sources, making Ireland less reliant on its electricity interconnection to Great Britain.

The assessments to date have also provided the basis for initial cost benefit assessments (CBAs). These CBAs have shown a range of consumer welfare outcomes for the project. In some scenarios these consumer welfare outcomes are relatively low or poor; in others they are favourable. In order to move to the next phase of assessment which pertains to initial design and pre consultation, the CER approved revenues of €4 million for EirGrid's share of the initial design and pre-consultation stage, for more information see [CER/17/007](#). Furthermore, the Celtic Project has recently received funding of some €4m for the next Phase from the Connecting Europe Facility.

⁷¹ The potential interconnector has been named the Celtic Interconnector

7.1.3 Greenlink Interconnector

Greenlink is a 500MW electricity interconnector that could link the power markets in Ireland and GB. The project is being led by element power, an international developer of renewable energy and interconnection projects. The project consists of a twin high voltage subsea and underground cable, connecting into two new converter stations, which then allows power to flow between transmission systems. The project, if developed, will provide additional capacity between Ireland and GB.

7.2 Existing Interconnectors/Tie-lines

7.2.1 North-South Tie-line

There is one major electricity transmission line between the Ireland and Northern Ireland (NI) electricity grids consisting of a 275 kV 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 110 kV standby North-South tie-lines which allow the TSOs in Northern Ireland (SONI) and Ireland (EirGrid) to provide mutual short-term technical assistance.

7.2.2 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 450 MW of capacity.

In previous years the export capacity of Moyle from Ireland was contractually limited to 80 MW. However due to EU obligations pertaining to Article 15(2) of Regulation 714/2009 EC⁷² this limitation has been extended to 295 MW⁷³. The trading conditions for Moyle have also been altered and have been moved towards a computerised auction system. This allows the Interconnector to provide a greater variety of products of differing durations. Revised access rules also allow participants to acquire capacity close to the start of the tariff year to align with customer contracts. An auction platform of both Moyle and East-West Interconnector has been procured together. This will provide flexible and competitive trading rules that help to bolster supply security on an All-Island basis.

⁷² “A general scheme for the calculation of total transfer capacity and the transmission reliability margin based on the electrical and physical features of the network” shall be published.

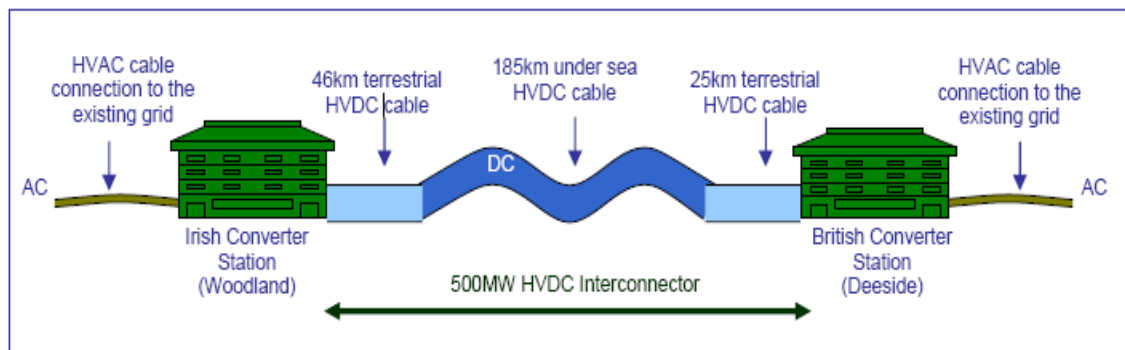
⁷³ Between September and April, 287MW May to August

The Moyle Interconnector is part of a wide scale programme of infrastructure which allows Ireland to connect to a European wide programme of Interconnection. EirGrid published an Interconnection Economic Feasibility Report which outlines that Moyle and the East West Interconnector (outlined below), from an economic and supply security perspective are integral to the island of Ireland. The Report also concludes that a third Interconnector is economically viable in particular where ongoing renewables are connected onto the system.

7.2.3 East West Interconnector (EWIC)

The electricity transmission systems of Ireland and Great Britain are connected via the East West Interconnector (EWIC) which is a high-voltage direct current submarine and underground power cable. It has a power rating of 500 MW and is one of the largest High Voltage Direct Current schemes in the world to use Voltage Source Converter technology. The EWIC is a fully regulated interconnector which was developed and is owned by EirGrid Interconnector Designated Activity Company (EIDAC), part of the EirGrid Group. It has a total length of 261 kilometres, of which 186 kilometres is submarine cable and 75 kilometres is subsoil cable. The link connects Portan converter station in County Meath, Ireland, and Shotton converter station in North Wales.

Figure 7-1 below sets out a schematic of the EWIC.



Figure

7-1 East West Interconnector Schematic (Source: EirGrid)

This Interconnector is of particular importance to overall energy policy and security in Ireland and within the EU. Specifically:

- energy security for a growing population both within Ireland and in the UK
- promotion of competition in the electricity sector, EWIC makes an additional 500 MW of bi-directional capacity available between Ireland and Britain
- encourages the growth of renewable energy in Ireland by encouraging excess energy to be exported to Great Britain

- allows a wider energy market that allows companies in both Ireland and Great Britain to sell to a larger market, this would help foster wider competition and increase security through diversification of generation sources

A study was carried out by the SEM examining the effect of EWIC on prices. The study examined the first six months of its operation, effectively rerunning the market schedule for those months and graphing the differential with and without EWIC in full operation. On average EWIC reduced the System Marginal Price (SMP) by €4 / MWh, or 8%, for those months⁷⁴.

7.2.4 Regional Interconnection Projects

Great Britain has 4 GW interconnection through four interconnectors – 2 GW France (through the interconnector known as IFA), 1 GW to the Netherlands (BritNed) and two links of around 500 MW each to the Island of Ireland (Moyle and EWIC). IFA, which connects England with France, was developed in the mid-1980s by the state owned Central Electricity Generating Board on the Great Britain side and its French counterpart. Moyle, which goes between Scotland and Northern Ireland, began operation in 2002 and is a mutualised company wholly owned by Northern Irish consumers. BritNed was developed as a merchant project jointly between National Grid Interconnector Limited⁷⁵ and TenneT, the Dutch Transmission System Operator (TSO). It came online in 2011. The most recent interconnector to be developed was the East West Interconnector between Wales and Ireland which became active in 2012 – a project undertaken by EirGrid and wholly underwritten by Irish consumers.

These projects allow for the interconnection of energy jurisdictions across Northern Europe. This greatly enhances supply security by suitably absorbing the large volumes of wind capacity that are continuously being connected to European Grids as Europe progresses towards a more sustainable and efficient energy future. This ensures that Ireland as an EU Member State contributes to the dual goals of renewable targets and to the development of a secure supply system. Interconnection within a wider European context allows for the promotion of secure supplies across jurisdictions.

⁷⁴ <http://www.eirgrid.com/media/Generation%20Capacity%20Statement%202014.pdf>

⁷⁵ A commercial arm of National Grid plc.

Key Messages

- There is one major electricity transmission line between the Ireland and Northern Ireland (NI) electricity grids consisting of a 275kV double circuit overhead line.
- The Moyle interconnector connects Northern Ireland and Scotland and has an import capacity of 450MW.
- The EWIC connects the transmission systems in Ireland and Wales. It became fully operational in May 2013 and provides 500 MW of power in each direction.
- A number of Projects of Common Interest have been identified in the North West Region that, if progressed, would increase cross border linkages between Ireland and neighbouring jurisdictions thus increasing security of supply.