

2 Background to the Project

2.1 Introduction

This chapter of the EIS provides information on the background to the project and is divided into the following sub-sections;

2.1 Introduction

2.2 Need for the Facility

- *Government Policy - Supporting Renewables*
- *Future Flexible Generation Requirements*
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2.3 Main Alternative Technologies Considered

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- *Tier 3: Site Selection within the Derrygreenagh Area*

2.5 Connections to the National Grid and Gas Network

- *Connection to the National Grid*
- *Connection to the Gas Network*

2.2 Need for the Facility

2.2.1 Government Policy - Supporting Renewables

Security of electricity supply is identified as crucial for the economy in the Government White Paper entitled *Delivering a Sustainable Energy Future for Ireland (Energy Policy Framework 2007 – 2020)*. The paper highlights the need for robust electricity networks and electricity generating capacity to ensure consistent and competitive supply of energy.

The Government endorses the case for a process of structural change in the energy market. A key policy objective is the enabling of competition and delivery of consumer choice through structural change.

The above mentioned paper also highlights the need for additional electricity generating capacity and improved availability of existing generating stations with the following statement:

“Achieving an adequate safety margin between electricity supply and demand requires additional generating capacity including flexible plant and significantly higher standards of generating plant availability, as well as more interconnection. We will ensure that the strategic network development approach is underpinned by coordinated local, regional and national approaches to issues, which balance local interests with the national imperative to deliver strategic energy infrastructure. This approach will be supported by the new arrangements provided for in the Planning and Development (Strategic Infrastructure) Act 2006”.

Recognising Ireland’s external dependence on the supply of primary energy, 91% in 2007, its comparatively high level of greenhouse gas emissions and the need for fuel diversity in power generation, the Government’s White Paper indicates a target of 33% of electricity to be generated from Renewable Energy Sources (RES-E) by 2020. This renewable target has been recently increased to 40% of the electricity consumed in 2020 by the Minister for the Environment, Heritage and Local Government in his Second Carbon Budget delivered to the Oireachtas on 15th October 2008.

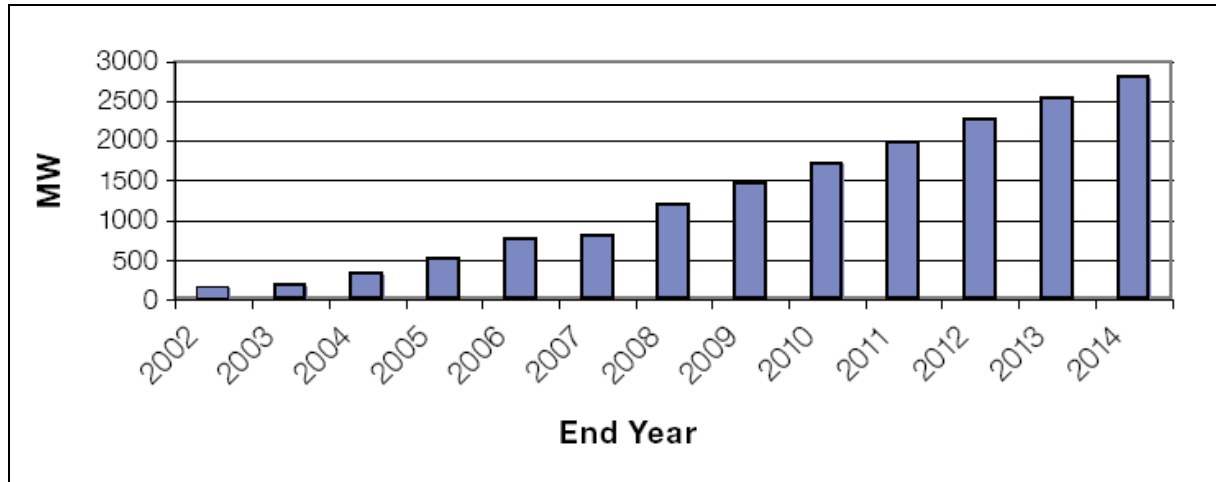
The bulk of this renewable generation capacity will be provided by wind, perhaps as much as 90%. The *All Island Grid Study* (2008), undertaken by the Department of Communications, Energy and Natural Resources, Dublin and the Department of Enterprise, Trade and Investment, Belfast, concluded that it was feasible to increase the share of electricity generated from renewable sources to 42% of total demand without incurring excess societal costs. The study concluded that the all-island portfolio of renewable plant required to deliver this contribution would likely include up to 6,000 MW of wind, 360 MW of base renewables such as biomass or biogas and 285 MW of other variable renewables such as wave or tidal energy.

It is clear that wind energy is at the heart of Government policy on the significant contributions of renewables to future energy requirements for Ireland. As of September 2008, in the Republic of Ireland a total of 920 MW of wind capacity has been installed. In addition, over 1,600 MW of wind generation is either contracted to connect or has received an offer as part of the Gate 2 grid application group processing scheme. The recent direction by the Commission for Energy Regulation (CER)¹ indicates that a further 3,900 MW will be issued connection offers under Gate 3.

¹ CRITERIA FOR GATE 3 RENEWABLE GENERATOR OFFERS & RELATED MATTERS
– Proposed Direction to the System Operators. Commission for Energy Regulation, CER/08/260 Dec 2008.

The amount of wind connected to the electricity grid has increased rapidly in recent years, and this trend is expected to continue, as illustrated in Figure 2.1 *Historical and Estimated Connected Wind Capacity (CER)*.

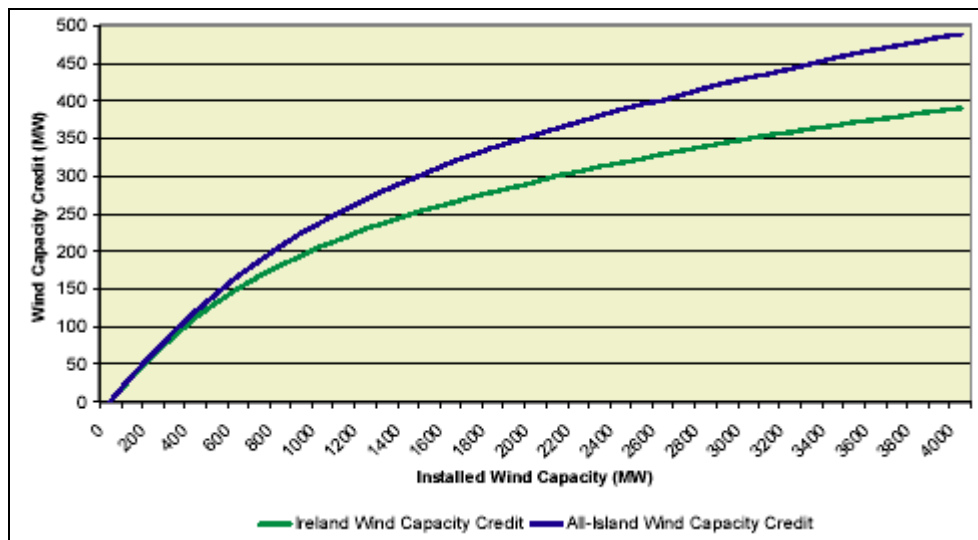
Figure 2.1: Historical and Estimated Connected Wind Capacity (CER)



While the increasing levels of wind penetration will make a valuable contribution to fuel diversity, sustainability and emissions reduction, there are issues surrounding the reliability of supply resulting from wind generated electricity. The intermittent nature of wind means that the contribution of wind power to generation adequacy is significantly less than its installed capacity.

Generation adequacy is defined as the ability of all the generation units connected to the electrical power system to meet the total demand imposed on them at all times. The demand includes transmission and distribution losses in addition to customer demand. When considering the generation adequacy of wind as an energy source, wind is given a lower 'capacity credit' than conventional thermal generation, primarily because of its intermittent nature. This capacity credit is used by the system operator, Eirgrid, when assessing the adequacy of overall generation capacity to meet the predicted demand. The capacity credit curve for wind used by Eirgrid in the Generation Adequacy Report 2009-15, is shown in Figure 2.2 *Capacity Curve for Wind*.

Figure 2.2: Capacity Curve for Wind



As can be seen from Figure 2.2 *Capacity Curve for Wind*, the capacity credit attributable to wind declines with increasing installed wind capacity. On an all-island basis, at the level of 4,000 MW of installed wind capacity, a capacity credit of approximately 500MW is attributed to wind when assessing generation adequacy. A key message from Eirgrid’s Generation Adequacy Report 2009-15 is:

“ Although the expected large growth of installed renewable capacity will increase portfolio diversity, it will only offer a limited contribution to generation adequacy.”

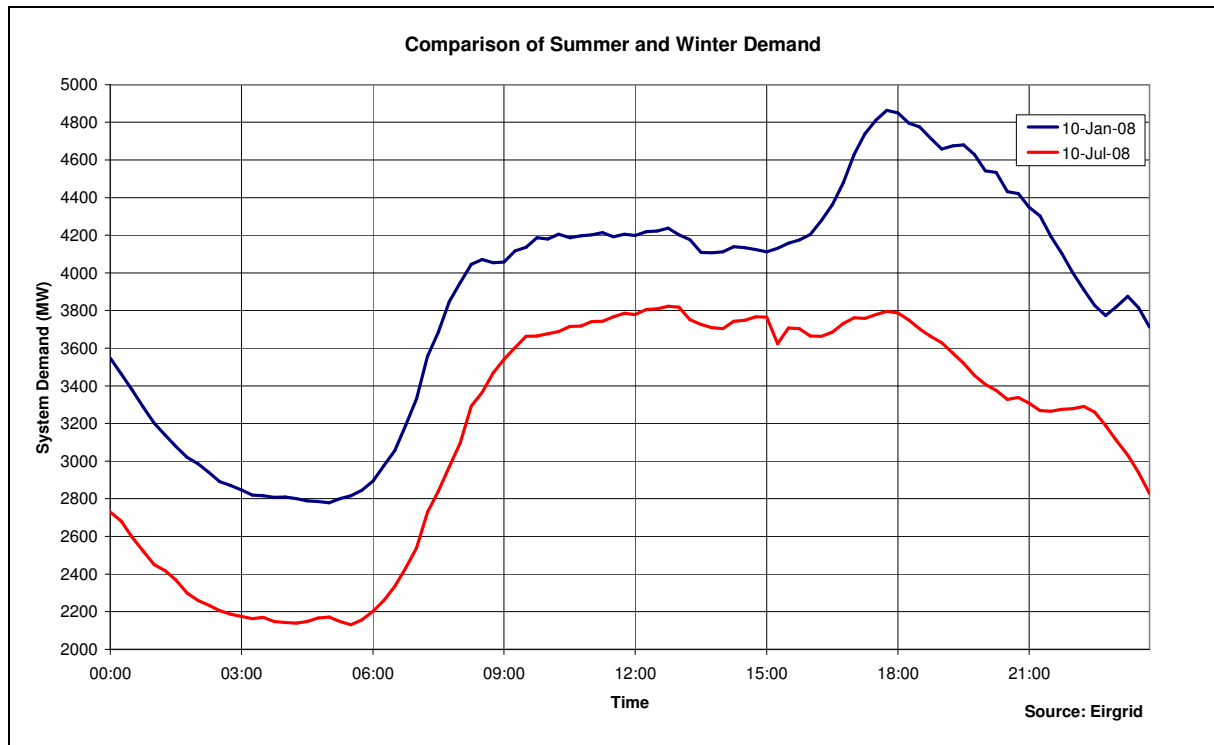
As a consequence, even though up to 6,000 MW of wind capacity may be installed on the grid by 2020, a considerable amount of conventional thermal generating plant will also be required. This is necessary to provide system reserve and backup capacity for periods of low output from wind generators, in order to maintain an adequate security of supply standard.

The thermal plant will be required to be flexible in nature, to complement the intermittent and variable nature of wind, thus allowing the Government’s RES-E target of 40% to be achieved by 2020. Gas fired generating plant provides the level of flexibility required to ensure system security standards are met where high levels of wind generation are connected to the system.

2.2.2 Future Flexible Generation Requirements

In this context, it is appropriate to consider the variability of the typical demand profile on the Irish transmission system. An example of the variation in daily electricity demand, at different times of the year, is illustrated in Figure 2.3 *A comparison of daily system demand in summer and winter*

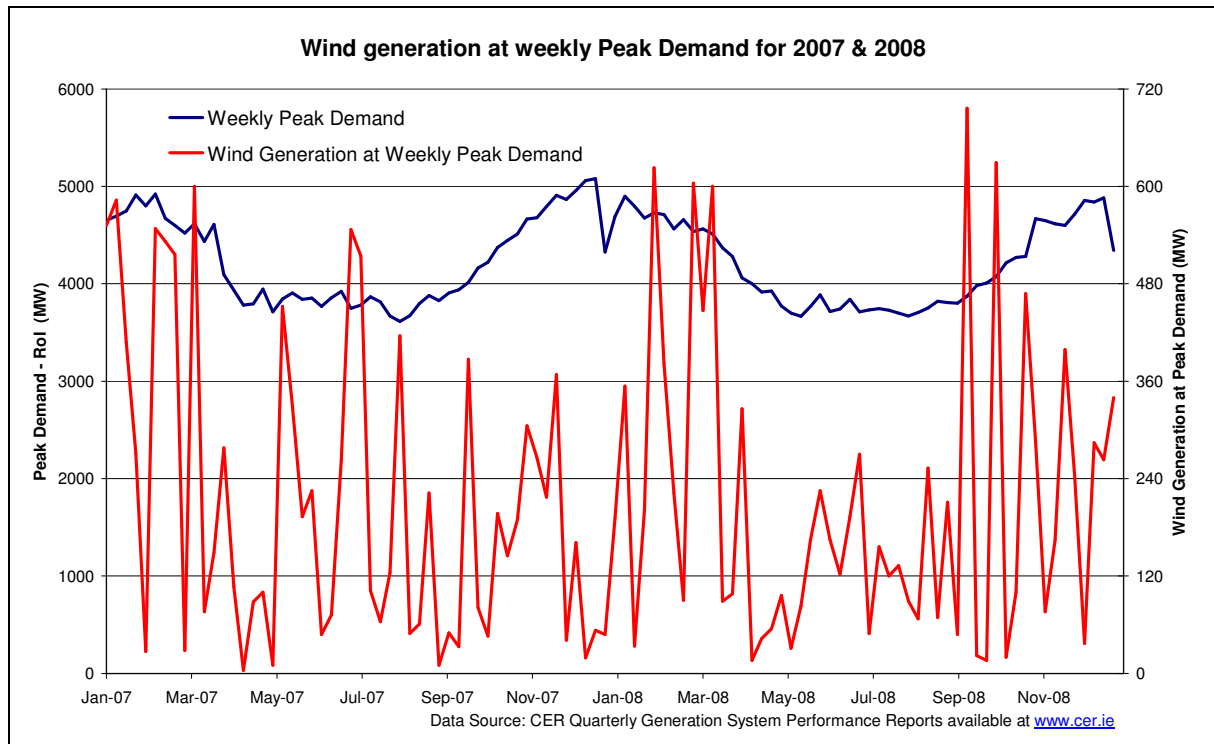
Figure 2.3 A comparison of daily system demand in summer and winter



It can be seen from Fig 2.3 that the level of demand can vary within a 24 hour period from a low of 2,800 MW to a peak of almost 5,000 MW. It follows that to meet this variation in daily demand, different generating units have different operating profiles. At present the base load requirement, of c. 2,800 MW in winter and c. 2,100 MW in summer, is typically provided by coal, peat and established combined cycle gas turbine (CCGT) units. Additional demand during daytime periods, (06:00 – 22:00) of 2,000 MW in winter and 1,600 MW in summer, is met by CCGT, oil, hydro and open cycle gas turbine (OCGT) units. This mode of operation is commonly referred to as ‘mid-merit’ or two-shift operation. Peak demand and replacement reserves are met mainly by distillate oil plants (OCGT), pumped storage, hydro-electrical and supply of electricity via the interconnector from Northern Ireland. As the level of installed wind capacity increases, wind power will significantly displace thermal generation from a base load running profile at times of high wind output.

The intermittent and variable nature of wind as a base load technology introduces a new supply side variability in the supply-demand balance. Fig 2.4 illustrates the significant variability in wind generation at times of peak weekly demand during 2007 and 2008. As can be seen, in certain weeks wind contributes significantly at the period of peak demand, while in other weeks its contribution is practically zero. Given the intermittent nature of wind, more flexible gas turbine plant will be required to manage this additional variability in the future.

Figure 2.4: Generation from wind at weekly peak demand during 2007 and 2008



Note: Peak Demand is read from the left hand axis, Wind at Peak Demand from the right hand axis

The existing CCGT units were designed mainly for continuous base load operation and have limited flexibility. While they can operate in a two-shift mode, they incur excessive maintenance costs and increased levels of unplanned outages if they have to shut down and start up on a daily basis. The existing oil-fired units that operate in this mode, are ageing rapidly and are expected to close by the middle of the next decade when new limits for emissions from large combustion plants take effect. Eirgrid's *Generation Adequacy Report 2009-15* has projected that the oil fired units at Poolbeg, Great Island and Tarbert will have closed by early 2012. As wind becomes the new base load technology with increasing penetration, gas turbine plant will increasingly fulfil the mid-merit role.

In order to perform this role in an optimum manner, this flexible plant needs to be capable of:

- Starting and stopping on a daily basis, with up to 250 starts per annum without any significant impact on plant availability;
- Starting up quickly;
- Ramping up and down quickly to follow variations in demand;
- Having a low minimum stable generating level.

Open cycle gas turbines (OCGT) alone could fulfil this need as they are capable of starting rapidly and have excellent load following capability. However, they generally have efficiencies ranging from 33 - 36%, for large heavy frame gas turbines, while smaller and more expensive aero-derivative gas turbines have efficiencies in the range 37 - 42%. This compares with a CCGT unit where overall

efficiencies range from 54 – 58%. This means that the use of OCGT units result in higher relative operating costs and higher greenhouse gas emissions if operated for long periods of time.

A comparison of alternative portfolios with different mixes of CCGT units and OCGT units was examined in the *All Island Grid Study*². Part of this study compared the generation dispatch patterns and associated costs and carbon emissions to meet “all island” demand in 2020 for these alternative portfolios. The study concluded that the portfolio with the larger proportion of OCGT units had higher operating costs and also higher CO₂ emissions owing to the lower efficiency of the OCGT units. This finding is backed up by the recently published report “*Impact of High Levels of Wind Penetration in 2020 on the Single Electricity Market (SEM)*”³ published by the Regulatory Authorities of the two jurisdictions in the market in January 2009.

Flexible combined cycle gas turbines (CCGT) are capable of a large number of starts per annum, without significantly reducing their availability, and have a low minimum stable generation. They are ideally suited to operate in a mid-merit mode to support increased wind penetration onto the grid, and they also confer significant benefits to the system in terms of lower costs and greenhouse gas emissions.

The Commission for Energy Regulation, in its document entitled *Criteria For Gate 3 Renewable Generator Connection Offers – Proposed Direction of the System Operators, July 2008* proposed the type of conventional power generation capacity and interconnection portfolio needed by 2025 to support a high level of wind penetration: See Table 2.1 *All Island 2025 Portfolio*.

Table 2.1: All Island 2025 Portfolio

Generation Type	Size (MW)	Number	Total (MW)
Base	500	8	4,000
Mid Merit	350	8	2,800
Peaking	100	16	1,600
CHP	100	4	400
Interconnectors	500	3	1,500

Bord na Móna’s proposed development at Derrygreenagh, comprising a c. 430 MW flexible CCGT unit and a c. 170 MW reserve/peaking OCGT unit fit comfortably within the ‘Mid Merit’ and the ‘Peaking’ categories respectively. In general, the flexible CCGT will be required to operate at high efficiency in the middle hours of the day when demand is elevated, and to reduce output to minimum stable generation or shut down at night depending on the output from wind. The OCGT will sit in reserve, but be capable of a fast start to meet demand at peak times and when generation supply is limited or constrained.

² <http://www.dcenr.gov.ie/Energy/North-South+Co-operation+in+the+Energy+Sector/All+Island+Grid+Study.htm>

³ <http://www.allislandproject.org/en/modelling-group-minutes-presentations.aspx?article=7e445962-3abe-4224-90a4-82adc6038b91>

2.2.3 Projected Load Growth to 2015

It is anticipated that total electricity demand by 2015 for the Republic Of Ireland will be in the region of 34.7 TWh (Terawatt hours), with peak demand approximately 6,050 MW, as indicated in Table 2.2 *Projected Rep. Of Ireland Demand Growth 2007 – 2015* below. These estimates are based on Eirgrid’s median demand forecast in the Generation Adequacy Report 2009 – 2015, and the projected energy usage is based on economic projections prepared by ESRI.

Table 2.2: Projected Rep. of Ireland Demand Growth 2007 - 2015

	Total Energy (TWh)	Peak Demand (MW)
2007	28.4	5,004
2008	29.0	5,086
2009	29.6	5,188
2010	30.3	5,291
2011	31.1	5,431
2012	32.0	5,580
2013	32.9	5,735
2014	33.8	5,895
2015	34.7	6,050

Note ₁ TWh: Terrawatt Hours (10^{12} Whr)

Note ₂ MW: Megawatt (10^6 W)

The Single Electricity Market (SEM) commenced operation on 1st November 2007, and generation adequacy assessments will soon be conducted on an all-island basis. It is therefore appropriate to consider projected demand growth on an all-island basis. The Generation Adequacy Report 2009-2015 has assumed that generation adequacy will be assessed on an all-island basis following completion of the North-South tie line in 2012.

The Generation Adequacy Report 2009 – 2015 outlines the predicted electricity demands for the island as a whole for the years 2013 2014 and 2015. It is estimated that the electricity demand for 2013 will be in the region of 43 TWh, with a peak demand of approximately 7,571 MW. A slight increase in demand is expected between 2013 and 2015 with the electricity demand for 2015 estimated at 45 TWh and peak demand of approximately 7,946 MW.

Based on a conservative estimate of demand growth beyond 2015 of 2% per annum it is estimated that peak demand by 2020 will be almost 9000 MW, with total demand close to 50 TWh. This level of total demand does not yet take into account, the increase that will be driven by the recently proposed plan to electrify up to 10% of the national car fleet by 2020.

Given the age profile of the existing plant on the system in Ireland, the current level of power plant availability and impending power plant retirements, a significant programme of new build is required in the medium term to maintain an adequate security standard. Eirgrid’s latest *Generation Adequacy Report 2009-2015* signals the requirement for new build from 2012, allowing for existing plants under development, and improvements in the average availability of the current portfolio. This new build must complement the level of wind penetration required to ensure the Government’s 40% RES-E target is achieved.

2.3 Main Alternative Technologies Considered

In the selection of the optimum plant type for the proposed development a number of factors were considered. The principal factors were:

- Unit size required to meet growing electricity demands;
- Efficiency of the unit in converting primary energy into electrical energy;
- Proven technology and reliability;
- Flexibility of the plant to operate efficiently at different loads;
- Site area constraints, such as planning, environmental or technical constraints;
- Proximity to a steady and secure primary energy source;
- Proximity to a significant electrical and/or heat load centre; and
- Local infrastructure.

Considering the above-mentioned factors, a number of alternative technologies were considered for two generic plant types

- A flexible mid-merit generating unit
- A peaking/reserve generating unit

The assessments of alternatives and other technical, environmental and financial studies determined that a c. 430 MW CCGT flexible mid merit unit and a c. 170MW OCGT peaking plant would be the optimum choice for this particular installation.

2.3.1 Alternative technologies considered for a Flexible Mid-Merit Generating Unit

The balance between flexibility and efficiency is the key to determining the optimum plant type to operate as a flexible mid-merit plant. The flexibility criteria required for a plant to operate in a mid-merit role in the future Irish electricity market where the baseload supply is dominated by wind power was discussed in section 2.2.1. These criteria along with the need for efficiency determine the assessment criteria used to compare the alternative options for a mid merit plant, as follows:

- The ability to start up and shut down on a daily basis with minimal impact on plant availability;
- Short minimum on and minimum off times;
- Quick start up times and associated low start up costs;
- Low minimum stable generation;
- High cycle efficiency;
- Low carbon intensity; and

- Fast ramp rates.

The potential plant configurations that were considered for this role include:

- Combined Cycle Gas Turbine (CCGT) plant;
- Combined Heat and Power (CHP) plant;
- Conventional steam cycle plant fuelled with coal, oil or gas; and
- Open Cycle Gas Turbine (OCGT) plant.

(i) Combined Cycle Gas Turbine Plant

CCGT technology has been the best new entrant technology for power generation for the past couple of decades. Whilst it is a relatively young technology compared to other types of generating plant, there are hundreds of plants around the world with millions of operating hours.

The key benefit of this technology is that it is the most efficient method of generating electricity from a primary fuel source. This means that it also has the lowest greenhouse gas intensity of any power plant type which uses a fossil fuel. This fact has meant that CCGT plants have traditionally fulfilled a base load running profile in electricity markets as they generated the cheapest electricity.

There is a perception that CCGT technology is not flexible enough to operate in a mid merit operating profile, and thus may act as a barrier to maximising the electricity generated from wind power. This perception is based on the capability of historical plants which were designed to run and be operated in a base load manner.

However, CCGT plants can be specifically designed to operate in a mid-merit running profile. There are reference plants where CCGT units perform the type of duty cycle envisaged for the unit in Derrygreenagh. There is also a significant drive amongst the suppliers of CCGT technology to improve its flexibility in anticipation of a much more significant penetration of variable renewables in electricity generation around the world.

In summary, CCGT technology can offer both the flexibility and the high efficiency required for a mid-merit power plant for the Irish system

(ii) Combined Heat and Power plant

Combined Heat and Power (CHP) is a variation of the combined cycle power generating concept. In this case, the waste heat from the gas turbine or boiler is not used to fire a secondary steam cycle for further power generation. It is used for another industrial purpose, such as drying or curing. In Europe, CHP technology is also frequently used to provide heat for municipal district heating schemes.

CHP plants may use either a gas turbine or conventional steam cycle for generating the electricity. In the latter case, carbon neutral fuels such as biomass or waste streams may be used to fire the boiler. The type of heating load will determine the efficiency of the cycle. If there is a requirement for a lot of low grade heat, rejected from the steam at relatively low temperatures, the efficiency of the process can exceed 80%.

There are two significant reasons why CHP technology is not suitable for development of a flexible mid-merit power plant at the Derrygreenagh site. In the first instance, there is no complementary industrial or district heating load in the vicinity of the site that could consume the heat output from the size of gas turbine generator envisaged for the site. Secondly, the demand for heat determines the electricity generation output from this type of plant. They are therefore limited in the type of flexibility they can offer to the system, and typically run in a base load running profile at maximum output.

(iii) Conventional steam cycle plant

There are a number of reasons why a conventional steam cycle plant is not suitable for the development of a flexible mid-merit generating unit at the Derrygreenagh site. The generation efficiencies of such plants are significantly lower than that available from CCGT or CHP technology. They also take longer to start up and shut down, and have longer minimum on and minimum off times which limit their ability to cycle on and off.

Finally such plants are usually sited close to their primary fuel source, and a significant water body to provide cooling. The only feasible option to supply a primary fuel source to the Derrygreenagh site for this size of unit is natural gas via a pipeline. It is much more economic to use this gas in a CCGT plant. The cooling load from a conventional steam cycle plant is over twice that for a CCGT unit with an equivalent electrical output. As discussed in chapter 3, the availability of water resources for a wet or hybrid cooling system is a significant constraint on the site.

(iv) Open Cycle Gas Turbine plant

The use of OCGT technology to perform a mid-merit role has previously been discussed in section 2.2.1. Whilst there is no doubt that such units can offer tremendous flexibility to the system, they do so at the cost of generating more expensive electricity and with a higher impact on the environment. This means that they are more suited to a peaking role, as discussed in the next section, where the energy provided by such plants is secondary to the level of flexibility they offer.

In summary, it is evident that a CCGT unit is the only choice of the alternatives considered that meets all of the criteria required for a flexible mid-merit plant for the Irish power system.

2.3.2 Alternative technologies considered for a Peaking/Reserve Generating Unit

A typical peaking plant does not generally make a large energy contribution to the electricity system. Rather it provides capacity at those times when generation supply is limited or constrained. This mode of operation is characterised by extended periods of inactivity, when it provides contingency reserve, and a few hours per year of actual running when, for example, several unit outages coincide or constraints on the transmission network need to be alleviated.

The potential technology options for a peaking plant were discussed in a consultation paper published jointly by the energy Regulatory Authorities during the development of the all-island electricity market⁴. The aim of the paper was to establish the Best New Entrant (BNE) peaking plant and its associated costs of development, which are a factor in determining the amount of money which is distributed annually to generators through the Capacity Payments Mechanism (CPM). The CPM is an integral feature of the Irish Single Electricity Market (SEM) which is designed to remunerate generators for those parts of their annual fixed costs, and annuitised capital costs, which are not remunerated through trading in the energy market.

The alternative options for a peaking plant as discussed in the paper referenced above were

- Open Cycle Gas Turbine
- Combined Cycle Gas Turbine Plant\Conventional Steam Cycle Plant
- Reciprocating Engine Technology
- Pumped Storage Generation

The assessment of the alternatives was summarised as follows:

- Combined-cycle gas turbine and conventional thermal plant tend to be more suited, technically and economically, to ‘base load’ and ‘mid-merit’ modes of operation. Start-up times from cold are long: up to 4 hours for combined-cycle gas turbines and up to 8-12 hours for conventional thermal plant. In combination with long shut-down periods, and not withstanding limitations on flexibility, this makes the cost of each start-up/ shut-down very expensive compared with other technologies;
- Reciprocating engines used in peaking applications are typically of the medium-speed diesel type. Medium-speed diesel engines are more expensive than gas turbines and have higher running costs. Slow speed diesels are more suited to base load operation while high speed diesels are rarely found in unit sizes of greater than 1MW; and
- Pumped storage hydroelectric plant can, in some instances, be more economically attractive than open-cycle gas turbine plant for peaking applications. However, the capital cost is very sensitive to the nuances of a particular scheme and, more importantly, there must be a suitable site to exploit in the first instance.

The paper concluded that the optimum technology for a new entrant peaking plant on the All-Island electricity system would be an open-cycle gas turbine owing to its relatively low capital cost and operating flexibility.

2.3.3 Co-location of the units on a single site

The co-location of the two units on a single site offers significant advantages in terms of the usage of common site elements to service both units. This leads to significant savings in the initial capital costs of the development.

⁴ “Fixed Costs of a New Entrant Peaking Plant for the Capacity Payments Mechanism”, AIP/SEM/124/06
<http://www.allislandproject.org/en/capacity-payments-consultation.aspx?page=1&article=3a72c290-e714-42ee-97b3-4c8ff691f42e>

The co-location also offers synergies which reduce the operation and maintenance costs for the power plant, in areas such as staffing, fuel procurement and general services.

In addition, the location of an OCGT and CCGT unit on a single site allows the proposed development to respond to energy demand in a more flexible manner. The OCGT unit will be capable of meeting peak demand requirements due to the capability of the unit to turn on and off at short notice. The flexible CCGT unit will be capable of responding on a daily basis to variations in electricity supply.

See Chapter 3 *Description of the Development* for a detailed discussion on the proposed development.

2.3.4 Air Cooling v Water Cooling

An assessment was undertaken to determine the most suitable cooling system option for the CCGT unit on the site. A number of cooling options were considered and these were:

- **Direct Wet Cooling:** Water is passed once through a steam turbine condenser and returned directly to the source. This cooling option is normally only suitable for coastal or lakeside sites due to the significant water requirements for this cooling option and also due to the difficulty in assimilating heated water in a river without having a significant impact on water quality;
- **Indirect Wet Cooling:** In an indirect cooling system the water is circulated around a separate closed loop circuit before being cooled in a cooling tower, from where it is recirculated. However a significant proportion of the cooling water is lost to the atmosphere and so there is a requirement for make-up water which, whilst significantly lower than that for a direct cooled plant, is still significant;
- **Direct Air Cooling:** An air cooled condenser is a water/steam to air heat exchanger made up of a large number of finned radiator tubes. The direct air cooling system does not use any significant quantities of water and so is more suitable for use where there is a limited quantity of water available as feed water to the plant.
- An assessment of both the groundwater resources (See Chapter 7 *Soils Geology and Hydrogeology*) and surface water resources (See Chapter 6 *Water Quality*) in the area identified the environmental constraints for both the supply of feedwater to the proposed development and the receiving water for receipt of process effluent. The results of this analysis determined that direct air cooling was the most suitable cooling option for this site.

2.4 Alternative Sites Considered

A three-tier approach was taken to the selection process when considering a suitable location for the proposed power plant development. The site selection process consisted of:

- Tier 1: Regional Site Selection;
- Tier 2: An Assessment of alternative sites within the Athlone-Tullamore-Mullingar Gateway, as defined by the National Spatial Strategy; and
- Tier 3: A more detailed appraisal of locations within the selected zone.

2.4.1 Tier 1: Regional Site Selection

The principal criteria utilised in assessing the primary areas were:

- Was there a history of power generation in the area?
- Was there a supply of natural gas at high pressure?
- Was there a high voltage transmission network in close proximity?
- Was there adequate surface or ground water to support water cooling?
- Was it a densely populated area?
- Did Bord na Móna own the land?

The three main areas considered as part of the regional site selection are outlined in Figure 2.5 *Regional Site Selection*.

The three areas considered in this assessment are Bellacorick, Derrygreenagh and Edenderry.

Bellacorick: Bord na Móna has a significant land holding in the area, including an office and workshop complex and over 2,000 ha of cutaway peatlands that previously supplied milled peat to a 40 MW peat-fired power plant. The Bellacorick plant closed in 2005;

Derrygreenagh: Bord na Móna has significant land holding in the area, including an office and workshop complex and over 1,000 ha of adjacent cutaway peatlands that formerly supplied the 80 MW peat-fired power station at Rhode;

Edenderry: Bord na Móna owns Edenderry power station and the associated 32 ha site, and has 500 ha of adjacent peatlands, some of which are still in active milled peat production.

Each of these three sites was assessed using the criteria listed above. The results of this analysis are presented in the Table 2.3 *Regional Site Selection Analysis*:

Figure 2.5: Regional Site Selection

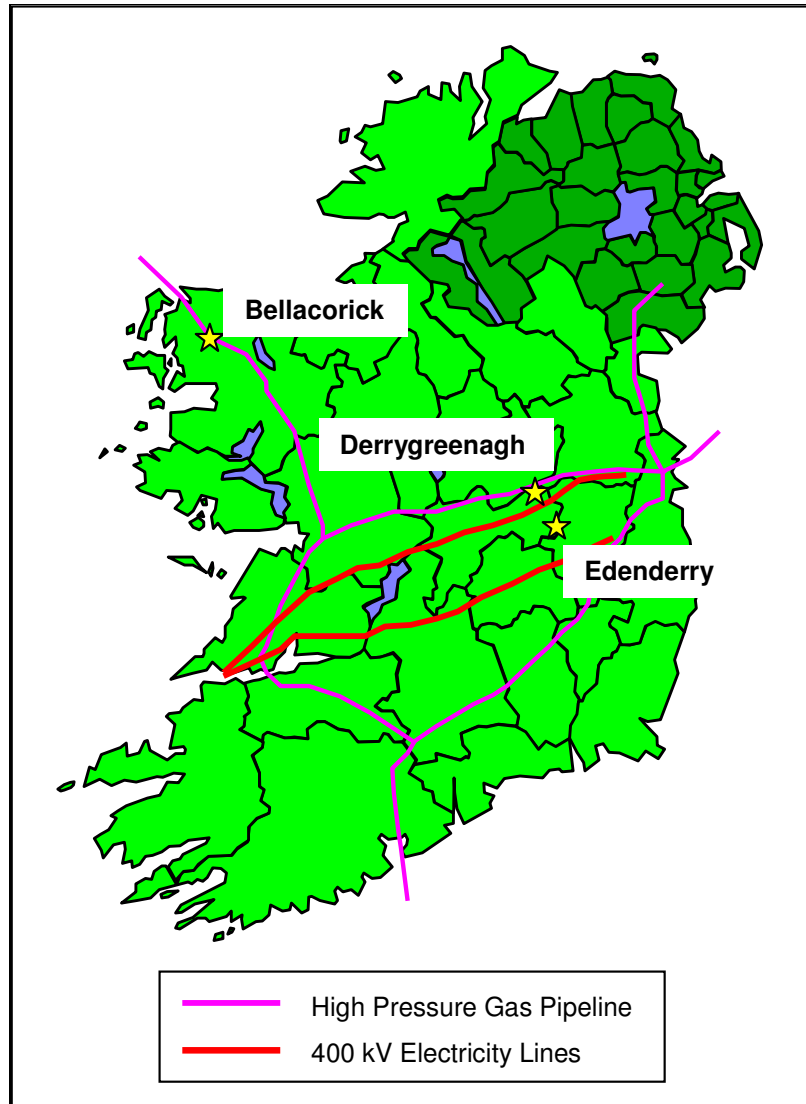


Table 2.3: Regional Site Selection Analysis

Selection Criterion	Bellacorick	Derrygreenagh	Edenderry
History of Power	✓	✓	✓
Gas Pipeline	✓	✓	X
High Voltage Grid	X	✓	✓
Water Cooling	X	X	X
Low Population	✓	✓	✓
Land Ownership	✓	✓	✓

The Bellacorick area is served by a high pressure gas pipeline that will connect the Corrib on-shore terminal to the main Dublin-Galway gas pipeline. However, the site has a significant limitation as it currently is only served by 110 kV power lines. These power lines are not sufficient to take the output from the proposed 600 MW power generation site. Bord na Móna has planning permission to develop a windfarm with a capacity of over 300 MW on the Bellacorick cutaway peatlands, but is still awaiting a grid connection offer from Eirgrid. While the former 40 MW peat-fired power station was water cooled, it is unlikely that there is sufficient water available from the Oweninny/Owenmore River to support water cooling for the scale of the proposed development. Considering the low summer flow, it is likely that sufficient water is available to support a hybrid cooling system at best.

The Edenderry area is also served at present by 110 kV lines, but is in reasonable proximity to the 400 kV grid. The site does not have adjacent gas supply, and a connecting pipeline of 16 km would be required to deliver high pressure gas to the area from the existing gas network. While the existing peat-fired power plant is water cooled, it is not clear whether there is sufficient additional water in the locality to support water cooling of the proposed power plant development.

The Derrygreenagh area is comparatively well served by both gas and electricity infrastructure. The Dublin-Galway gas line lies c. 8 km north of the site, just north of Rochfortbridge. The Maynooth-Shannonbridge 220 kV power line runs to the north of the site, the Derryiron 110kV substation is approximately 5 km south of the site and the 400 kV Oldstreet-Woodland power line lies further to the south. As both the Mongagh River and the Yellow River have fairly low levels of flow, it is not expected that they could supply sufficient water to support water cooling of the proposed development without causing significant ecological damage to these streams.

On balance, particularly considering the gas and power grid infrastructure, it was decided that the Derrygreenagh area offered the best potential for developing a 600 MW power plant development. In the absence of sufficient available water resources to allow water cooling at the facility, air cooling is considered the most appropriate method of cooling for the proposed power plant as discussed in Section 2.3.4 *Air Cooling v Water Cooling*.

2.4.2 Tier 2: An Assessment of alternative sites within the Athlone-Tullamore-Mullingar Gateway

The *National Spatial Strategy for Ireland 2002 – 2020* identified a number of “Gateways”, primarily existing large urban centres with enhanced development potential, and “Linked Gateways” in which two or more “strong towns” work in partnership to promote economic and social development in their region. One such Linked Gateway is Athlone-Tullamore-Mullingar in the Midlands region. The proposed development at Derrygreenagh lies just to the east of the geographic triangle formed by the three nodal towns in the Midlands Gateway.

It was considered appropriate to examine the possibility of locating the proposed power plant development at a location owned by Bord na Móna within the Athlone-Tullamore-Mullingar Gateway.

Most of Bord na Móna’s landholdings lie outside the geographic triangle of the Gateway: the Mountdillon Group of bogs, which supply Lough Ree power station, lie to the north west; the Derrygreenagh Group of bogs, which supply Edenderry power station, lie to the east; and the Boora/Blackwater Group of bogs, which supply West Offaly power station, just border the triangle on the south west.

Bord na Móna therefore has very limited landholdings lying within the Gateway triangle. Areas of peatland which just fall within the triangle include Bunahinly Bog, Co. Westmeath and Bellair Bog, Co. Offaly: (See Figure 2.6 *Locations Assessed within the Athlone – Tullamore – Mullingar Gateway*)

(i) Bunahinly Bog

Bunahinly Bog is located just south east of Athlone. This is an active milled peat production bog which is adjacent to a major housing development at the eastern edge of the town. In order to mitigate the impacts of dust from milled peat production operations on the new housing development, production on the northern section of the bog has been discontinued in recent years. The area is not a suitable site for a power plant development for the following reasons:

- It is covered by a considerable depth of peat;
- It is adjacent to a large scale housing development;
- It is not in close proximity to either a 400 kV or 220 kV electricity power line.

(ii) Bellair Bog

Bellair Bog is located to the northwest of Ballycumber village. This is an active milled peat production bog which supplies West Offaly power station. The bog has been brought into production in stages from the 1980s onwards, but none of it has reached the cutaway stage as yet. The area is not suitable for a power plant development for the following reasons:

- The bog is covered by a considerable depth of peat;
- It is in reasonable proximity to a 220 kV power line, but a considerable distance from the 400 kV grid.

Bord na Móna does not own suitable landholdings to accommodate the proposed power plant development within the geographic triangle formed by the Midlands Gateway.

(iii) Conclusion

The proposed development site at Derrygreenagh, which lies just 10 km to the east of the triangle, is the most suitable site for the proposed development owned by Bord na Móna in close proximity to the Midlands Gateway identified in the National Spatial Strategy.

2.4.3 Tier 3: Site selection within the Derrygreenagh area

Three potential sites for the proposed development were appraised within the overall Derrygreenagh area. See Figure 2.7 *Locations Assessed Within the Derrygreenagh Area*;

- Drumman Bog: A cutover peatland area, lying to the north east of the R400, with access from the roadway leading to a sand/gravel quarry;
- Derrygreenagh: The existing Bord na Móna office and workshop site located on the northern side of Derrygreenagh Hill, with direct access from the R400;

- Derryarkin Bog: A cutover peatland area, lying to the south west of the R400, with a new access roadway from the R400.

The principal criteria used in appraising these alternative location options were:

- Was it a brownfield or greenfield site?;
- The existing ground conditions;
- The ease of access;
- Proximity to the nearest neighbours; and
- Visual impact.

The results of the assessment using the appraisal criteria for each of the three alternative locations are presented in Table 2.4 *Derrygreenagh Area Site Selection Analysis*:

Table 2.4: Derrygreenagh Area Site Selection Analysis

Appraisal Criterion	Drumman Bog	Derrygreenagh Hill	Derryarkin Bog
Brownfield site	++	++	++
Ground conditions	--	+	--
Ease of access	-	++	--
Proximity to neighbours	++	+	-
Visual impact	--	-	--

All three alternative locations are brownfield sites, with both Drumman and Derryarkin sites on milled peat cutaway peatland, while the Derrygreenagh Hill site is located on a mineral island composed primarily of glacial till and is currently in use as a workshop and office complex. Ground conditions on the Derrygreenagh site are deemed to be superior, as both the Drumman and Derryarkin sites have a superficial layer of residual in situ peat overlying sands and gravels.

The Derrygreenagh Hill site has direct access to the R400, while the Drumman site is accessible from a new roadway created to facilitate the removal of sand and gravel from a quarry, and the Derryarkin site would require the construction of a new access road.

The Drumman site is located approx 1.6 km from its nearest neighbour, located close to the junction with the M6 motorway. The Derrygreenagh Hill site is 1.1 km from its nearest neighbour and the Derryarkin site is 0.7 km from the nearest habitation.

The Derrygreenagh Hill will offer a degree of screening to the proposed new development, particularly when viewed from the south east. In addition, the Derrygreenagh site has mature trees and hedges on the north western and southern sides, which offer additional screening cover. Both the Drumman site and the Derryarkin site are located on flat, open cutaway bog with little vegetation cover and would have the maximum visual impact.

In conclusion, it was decided that the Derrygreenagh Hill location offered the best site option, particularly in relation to ease of access, ground conditions and minimising visual impact.

2.5 Connections to the National Grid and Gas Network

The proposed development will require a connection to the National Grid, which is operated by Eirgrid, to allow for the supply of generated electricity to the market. In addition as the primary fuel to run the units is natural gas a connection to the gas network is also required.

This planning application does not cover a connection to either of these networks as the processes involved in connecting to these networks is significantly in the control of the network management companies. In the case of a connection to the national grid, a separate planning application by Eirgrid is required. The processes involved with obtaining a connection to the national grid (Eirgrid) and to the Gas Network (Gaslink) are detailed below.

2.5.1 Connection to the National Grid

The site for the proposed development is in close proximity to a number of power lines, including the Maynooth-Shannonbridge 220 kV power line, the Derryiron 110kV substation and the 400 kV Oldstreet-Woodland power line, as discussed in section 2.4.1. However, there is no substation in the immediate vicinity of the site. The development of the power plant will therefore, require an associated development of a new transmission substation at the site, and new overhead transmission lines to connect the plant to the existing transmission infrastructure in the area. The design and construction of these will be carried out by Eirgrid, the Transmission System Operator (TSO).

The process for designing and seeking planning approval for the associated transmission line, required to connect the proposed power plant to the national grid, is managed by Eirgrid. The role of the TSO encompasses the operation and maintenance of the high voltage transmission network and accommodation of new generation and demand connections to the system. They are also responsible for the management of the planning and construction of new infrastructure, as required to maintain a safe and secure transmission network.

A customer who requires a new generation connection at a site must apply to Eirgrid for a new grid connection. The application must provide details of the export capacity required, the type of generating plant, location of the required connection point, and key technical parameters of the main electrical components in the power station, such as the generator and transformer. Once the application has been assessed by Eirgrid for completeness and accuracy of the technical parameters, and has been deemed complete, it is processed according to a standard procedure. This procedure is termed the Connection Offer Process, and is approved by the Commission for Energy Regulation (CER).

Historically, the Connection Offer Process treated each application separately, and required the turnaround of an offer to the applicant within seventy business days. The process involved three main parts:

- Determination of the connection method, covering such issues as connection voltage and the detailed connection design,
- Connection routing and termination feasibility, and
- Connection offer pricing. This element includes the costs of the infrastructure for physical connection to the transmission system, referred to as the shallow connection costs. It excludes any other associated grid re-enforcement works, termed deep connection works.

The process had a timeline of seventy business days by which time a connection offer, detailing the proposed connection method, indicative route, and connection cost, must be made to the applicant. The process of planning and construction of the connection is managed by Eirgrid. It only commences once the connection offer has been accepted by the applicant, and the necessary bonds to commit the applicant to developing the station have been put in place.

The processing of applications individually became untenable a number of years ago, due to the volumes of applications for smaller sized renewable projects which were primarily for wind farms. Due to these difficulties a new system was put in place for applicants in the “renewables” sector. This entailed “deemed complete” applications being placed in a queue for processing. A group processing approach, known as the “Gate” process was then adopted for the processing of renewable applications. The selection of applications for processing under each Gate was conducted by the CER, based on date order of completion of application, and various system optimisation criteria. Since 2004, two Gates have been processed, incorporating approx 1700 MW of renewable generation applications. At present over 8000 MW of renewable generation applications still remain in the queue.

During the processing of the first two Gates, applications for conventional thermal plant were processed individually outside of the Gate system. Applications for connection of thermal plant could be fast tracked by the CER, for security of supply reasons, and a number of large conventional plant applications have been processed through this mechanism during this period.

Eirgrid and the CER have recently finalised the criteria for the determination of the renewable applications which will be included in the third Gate of group application processing. There are a number of significant changes to this Gate process compared to previous Gates, including:

- The size of the gate is significantly larger than previous gates, amounting to a proposed cumulative capacity of 3,900MW of renewable generation;
- The applications will be processed according to a new method, which incorporates the connection requirements of the both renewable and conventional applicants being processed within the wider requirements for grid development to 2025. These requirements are identified as part of Eirgrid’s *Grid Development Strategy*, a forward-looking transmission development strategy which plans the development of the transmission system now to cater for anticipated requirements for the long-term, i.e. for 2025, as requested in the Government’s White Paper on energy. The objectives of the grid development strategy are outlined in a report, *Grid25: A Strategy for the Development of Ireland’s Electricity Grid for a Sustainable and Competitive Future*⁵ published by Eirgrid in Oct 2008.
- Applicants processed under Gate 3 will be associated with an existing transmission system node, i.e. substation, or a new node in the transmission system. The rules for the determination of the location and voltage of new nodes are outlined in the direction paper on Gate 3 (Ref 1).
- All applications for conventional plant, including thermal plant and interconnectors, which have been received at the commencement of the Gate 3 process, will be included in the initial power flow studies.

⁵ See <http://www.eirgrid.com/EirgridPortal/uploads/Announcements/EirGrid%20GRID25.pdf>

- The applications for conventional plant are not guaranteed to get an offer in this gate, and the criteria used to select those applications for which an offer will be made will be a matter for a future consultation process from the CER.
- The indicative timeline for the making of connection offers from the Gate 3 process is from Nov 2009 to May 2011.

At the stage of completion of this EIS, grid connection applications for both units on the Derrygreenagh site have been made to Eirgrid, and both of these applications will be included in the ITC power flow study which is the first stage in the Gate 3 process. The first step in the processing of the ITC programme commenced in January 2009, with the publication of the node assignments for the applications being processed.⁶ The power plant at Derrygreenagh has been assigned to a new 400 kV node at Derrygreenagh, which is the only new 400 kV node that has been proposed in the list of node assignments. This new node has the potential to fulfill the need for a new 400 kV node in the midland region, as well as re-enforcing the supply to the Gateway towns of Athlone, Mullingar and Tullamore, which are a key objectives for the Grid Development Strategy highlighted in Eirgrid's *Grid25* report (Ref 5).

It is not possible to include the grid connection to the proposed development site as part of this planning application for the following reasons;

- The detailed design, including connection points, transmission line routes and transmission voltage, will be determined as part of the processing of the applications. This cannot take place any earlier than the timeframe envisaged in the Gate 3 grid connection processing scheme
- It is possible for a power plant developer to construct the shallow element of the physical grid connection, under what is known as the "Contestable Build" option. However, this option cannot be exercised until a grid connection has been received from Eirgrid.

2.5.2 Connection to the Gas Network

The process for developing a gas connection to the site is simpler than that outlined above for grid connection, and can be summarised as follows:

- An application is made to Gaslink, the Transmission System Operator (TSO) for the gas transmission network. Gaslink will then give an indicative quotation for works on the basis of a point to point route, an estimate of gas pipeline size and requirements for Above Ground Installations (AGI) where necessary.
- Following a decision to proceed to a more detailed engineering design of the connection, the developer and Gaslink sign a Letter of Agreement where the developer indicates that they will carry all of the costs of the basic engineering requirements for the development of the pipeline. The detailed design includes the determination of the point and method of connection to the gas network, the pipeline size, ground investigations and detailed route selection.

⁶ See "Gate 3 Node Assignments" available at
<http://www.eirgrid.com/EirgridPortal/DesktopDefault.aspx?tabid=Gate3&TreeLinkModID=1445&TreeLinkItemID=395>

- A number of studies are conducted to ensure that the development can be accommodated on the transmission network without unduly affecting other customers at off-take points. The connection to the transmission network may occur at the nearest AGI, or may be teed off directly from the transmission system.
- Once the detailed design has been completed, the developer will be given a final price for the development. Gaslink contracts Bord Gáis Networks (BGN) to develop the connection to the site. Theoretically, it is possible to get a third party contractor to undertake this work using BGN specification and design, however in practice this has never occurred.
- It is at this stage that BGN would apply for the necessary permits and way leaves, including planning permission where necessary before commencing the construction of the connection pipeline. There is no requirement to seek planning permission from a local authority if the route of the pipeline is less than 20 km and there are no associated above ground works. It is anticipated that the length of the pipeline to connect the proposed development to the gas network will be less than the 20 km threshold. It should be noted that the AGI on the development site is included in the scope of this planning application.
- BGN are required to apply for a license to construct from the CER, which requires a full appraisal of the environmental impacts of the proposed pipeline and the generation of either an Environmental Report (ER) or an Environmental Impact Statement (EIS) as deemed appropriate.

At this stage of the proposed development, prior to planning approval for the power plant being granted, it is not feasible to apply for planning permission for the gas connection to the site, as it is not clear at this stage if planning permission is required. Establishing whether planning permission is required for the gas connection would entail incurring the cost of the detailed design for the connection, and entering into a significant financial commitment with Gaslink. Such a financial commitment is deemed unreasonable in advance of obtaining planning consent for the power plant.

It is envisaged that the process of committing to the development of the gas connection, will coincide with the signing of an Engineer Procure and Construct (EPC) contract to develop the proposed power plant. The timelines for delivery of the EPC contract will allow sufficient time for the necessary planning and construction phases of the gas connection prior to commissioning of the power plant.