TRANSMISSION DEVELOPMENT PLAN 2010

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Abbreviations

ACSR	Aluminium Conductor Steel Reinforced
AIS	Air Insulated Switchgear
CER	Commission for Energy Regulation
CCGT	Combined Cycle Gas Turbine
CP No.	Capital Project Identification Number
DC	Direct Current
DSO	Distribution System Operator
ECD	Estimated Completion Date
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPAD	Estimated Project Agreement Date
ESB	Electricity Supply Board
ESRI	Economic & Social Research Institute
GIS	Gas Insulated Switchgear
HTLS	High Temperature Low Sag
HV	High Voltage
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IPP	Independent Power Producer
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
MV	Medium Voltage
NI	Northern Ireland
NIE	Northern Ireland Electricity
NSS	National Spatial Strategy
OCGT	Open Cycle Gas Turbine
RES	Renewable Energy Sources
SCADA	Supervisory Control And Data Acquisition
SEA	Strategic Environmental Assessment
SEM	Single Energy Market

SI445	Statutory Instrument 445 (2000)
SONI	System Operator Northern Ireland
SVC	Static Var Compensator
TAO	Transmission Asset Owner
TDP	Transmission Development Plan
TPC	Transmission Planning Criteria
Trafo.	Transformer
TSO	Transmission System Operator
TUoS	Transmission Use of System

Summary

A reliable electricity infrastructure providing quality performance is vital for Ireland's socio-economic development. The high voltage transmission system, similar to the motorways and broadband telecommunications networks, forms the backbone infrastructure which supports the economy.

The Transmission Development Plan 2010 is the plan for the development of the transmission system over the five years from 2010 and supersedes the Transmission Development Plan 2008-2012. This five year plan presents those components of the overall long term development of the transmission system where there is some level of certainty. Only projects which have received capital approval within EirGrid are detailed in this report[1]. All information in this development plan: project details; project expected completion dates; and generators with executed connection agreements is correct as of the end of December 2010. However, other likely areas where development projects may soon be required are also discussed. This report has been prepared in accordance with Regulation 8.6 of Statutory Instrument 445 (2000), entitled European Communities (Internal Market in Electricity) Regulations, 2000 and Condition 8 of the TSO Licence.

In October 2008, EirGrid published Grid25, its strategy for the long-term development of the Transmission system. In summary, the strategy aims to achieve a balance between costs and the impact of new infrastructure through maximising the capability of the existing grid and where new high capacity infrastructure is required, building it mainly at the 400 kV voltage. Following a recent review of Grid25, EirGrid estimates that between now and 2025 over 2,500 km of the existing network will have to be upgraded and in the order of 1,200 km of new infrastructure will have to be built to meet the needs of consumers and generators, both renewable and conventional. EirGrid is undertaking detailed studies to identify network solutions to be brought forward into the planning process and ultimately to construction. Some Grid25 reinforcement projects have been identified and are included in this Development Plan. As other solution proposals emerge they will be included in future development plans. Even in the context of slower growth than was estimated at the time of writing Grid25, this level of development will still be required over the short, medium and long terms.

The Transmission System

The transmission network forms the backbone of the electricity supply system in Ireland. It is a meshed network of high voltage lines and cables for the transmission of bulk electricity

[1] Refer to Figure 2-1 in Section 2.5.1 for further detail.

supplies around Ireland. The transmission system comprises 400 kV, 220 kV and 110 kV networks linked through transmission stations.

The network is designed to comply with the Transmission Planning Criteria. These set out objective reliability standards, which are comparable with planning standards internationally, and which have been found to deliver an acceptable compromise between cost of development and the level of transmission service provided.

The Role of the Transmission System Operator

Statutory Instrument 445 (2000), (SI445), which gives effect to the current electricity industry arrangements, among other things, assigns responsibilities for transmission network development to the Transmission System Operator (TSO) . EirGrid, as the TSO, also has the responsibility for operating and ensuring the maintenance of the transmission system. Generation, Distribution and Supply (sales) functions are carried out by other parties.

ESB, as the Transmission Asset Owner (TAO), is charged with constructing the assets for the transmission system infrastructure. This Transmission Development Plan provides the TAO with an overview of the transmission projects that are in progress and an indication of the level of development that is likely to emerge in the period to 2015. ESB also has the role of Distribution System Operator (DSO) with which EirGrid in its role as the TSO coordinates planning and development requirements.

The funding for the transmission system ultimately comes from all electricity customers and therefore developing high quality infrastructure, while investing efficiently and economically, are key considerations. The Commission for Energy Regulation (CER) has the role of approving the overall level of investment in the transmission infrastructure.

Developments for 2010 to 2015

While economic activity has declined sharply over the last couple of years, it is expected that over the period of this plan and beyond there will be a return to demand growth, albeit at more modest levels than those experienced over the previous decade. Electricity peak demand decreased by about 5.5% in 2009 from 2008 levels, but is forecast to return to 1.8% growth from 2011 to 2012, rising to 2.3% between 2012 and 2013, as illustrated in Figure S-1 overleaf. 70 MW of pumped storage generation and 1,171 MW of new wind farm generation capacity have executed agreements for connection to the transmission system. 647MW of thermal generation have live connection offers.

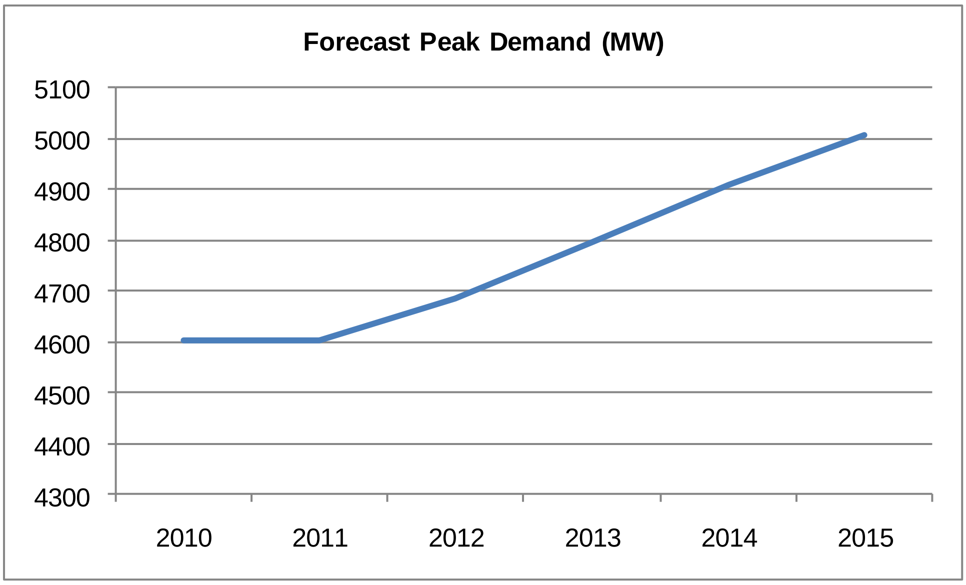


Figure S-1 Forecast Transmission Peak Demand

This Development Plan sets out the development projects that have been initiated to meet these future needs, and discusses the potential for further development in the next five years. The main features of the plan, which involves developments in all parts of the country, include:

- Completion of the 220 kV expansion project to Srananagh in the Sligo area to meet demand in the North West and provide an essential route for power flows from future wind generation;
- Expansion of the 400 kV system to provide necessary bulk transfer capacity out of Dublin and Moneypoint, and between this system and the Northern Ireland system;
- Strengthening of the networks in and around Athlone, Cavan, Cork City, Dunmanway, Galway, Letterkenny, Meath Hill, Newbridge, Tullamore, and Wexford to meet demand;
- Establishment of four new 220/110 kV stations in Kerry, three of which are required to connect renewable generation;
- Connection of nine new DSO stations;
- Connection of one new pumped storage generator to the transmission system;
- Connection of 1,424 MW Gate 2 Wind;
- Connection of 3,995 MW Gate 3 Wind Applications; and
- Reduction of high short circuit levels in Dublin.

The development plan as at the end of December 2010 includes a total of 111 projects that are in progress, 70 of which are in the detailed design and construction phase.

The totals of new equipment currently planned are presented in Table S-1. These are estimates only because project scopes can change during the course of a project, particularly in the preliminary stages of design.

Table S-1 Estimates of Planned New Transmission Assets

	400 kV	220 kV	110 kV
Number of New Stations	1	9	7
Number of New Station Bays	8	49	181
Overhead Line, (km)	140	56	313
Underground/Undersea Cable, (km)	0.5	33.5	0

	400/220 kV	400/110 kV	220/110 kV
Number of New Transformers	2	2	16
New Transformers, Total MVA	1,000	500	3,250

	110 kV
Number of New Capacitor Banks	7
Capacitor Banks Total Mvar	135

In addition, 7.7 km of 220 kV and 575 km of 110 kV transmission circuits will have their thermal ratings increased. Two 220 kV transmission lines and two 110 kV transmission lines will also be refurbished without affecting their ratings.

East-West Interconnector

In 2006 the Government tasked the CER and EirGrid with arranging the design of a competition to secure the construction of a 500 MW interconnector between Ireland and Great Britain. In October 2008, the CER granted EirGrid authorisation to construct an interconnector.

The CER has approved the choice of Woodland as the connection point on the Irish system and Deeside in North Wales as the connection point on the British system. Permission was granted by An Bord Pleanála on 15 September 2009 for the location and construction of a converter station in Woodland, Co. Meath and the installation of underground cables, mainly on public roads to the coast at Rush, Co. Dublin, approximately 45 km in length and in the seabed out to the 12 nautical mile foreshore limit.[2] Converter station sites have been

[2] The DC Link does not form part of the transmission system and is therefore not detailed in the Capital Approval CP0652 in Table 4.5, Section 4.4

acquired in Ireland and Wales. Construction, undertaken by Swedish engineering firm ABB commenced in 2010 and is expected to be completed by September 2012.

Other Potential Developments

Grid25 and other studies carried out by EirGrid have identified further development requirements throughout the country. EirGrid is considering options for solving these needs. Development projects will be initiated at the optimum time to meet the network requirements.

Other development requirements not yet anticipated may emerge, such as the connection of new demand, generation and interconnections, and on new refurbishment requirements that will be identified as condition assessments are carried out. EirGrid is constantly monitoring and reviewing the above drivers and factors to determine when and how they will require attention.

Renewable Energy

EirGrid is committed to supporting government policy on renewable energy and to integrating further renewable generation as an increasingly important part of the overall generation mix.

The Government's renewable generation target for 2020 is to meet 40% of electricity consumption from renewable energy resources. EirGrid's Grid Development Strategy, as outlined in Grid25, involves planning and developing the transmission system now to meet the anticipated generation/demand needs over the long-run, providing for a more cost effective, optimal and efficient system than would be the case with a more short-term and piecemeal approach. In particular, Grid25 allows for the efficient/optimal connection of a very significant capacity of renewable generation in Ireland over the coming years, facilitating the achievement of the 40% Government renewable target through a long-term and strategic programme of transmission development, to the benefit of renewable generators and end-customers generally.

The CER direction on "Gate 3", CER/08/260, deals with connections for 3,995 MW of renewable generation which, if connected, will meet the Government target for 2020. The Gate 3 process is based on achievement of the forward-looking Grid Development Strategy.

Regional Development

Because of the importance of the electricity system to customers all over Ireland, EirGrid is very conscious of the need to support regional development.

The investment in this Development Plan is distributed across all regions and will significantly improve the electricity infrastructure and provide the backbone for further economic development in the regions. Further developments emerging from Grid25 will maintain priority in supply standards across all parts of the network, thus enabling economic development in all regions.

Capital Expenditure

EirGrid estimates that transmission development requirements will involve major expenditure between 2010 and 2015. However many projects are at a preliminary design stage, while others have not yet been initiated. Better expenditure estimates will evolve as project scopes become more certain.

EirGrid welcomes the CER’s continued support for investment in the transmission network. In its 2006-2010 Transmission Price Control Review Decision Paper the CER has set a cap on capital expenditure on transmission at €520 million for the period. In 2010 the CER will issue its determination of the transmission capital expenditure for the 2011-2015 Price Control period, taking into account the transmission development required to meet the needs of consumers and generators.

Conclusion

EirGrid is committed to delivering quality connection, transmission and market services to its customers and to developing the transmission grid infrastructure required to support the development of Ireland’s economy.

With the projects outlined in this Transmission Development Plan forming part of the overall long-term transmission system development, coupled with the constant review of the transmission infrastructure and the changing environment requirements, EirGrid is confident that the needs of a growing Irish economy will be met well into the future.

1 Introduction

Electricity supply is an essential service in Ireland's economy. The transmission system is a meshed network of 400 kV, 220 kV and 110 kV high voltage lines and cables and plays a vital role in the supply of electricity. It is the backbone of the power system and provides the means to deliver a high capacity of bulk power from generation sources to demand centres within acceptable technical security and reliability standards. It is analogous to the motorway and national road networks enabling producers (generators) to deliver their product to large customers and to major depots for onward distribution to smaller customers via regional and local distributor roads.

1.1 The Role of the Transmission System Operator

SI445[3], which gives effect to the electricity market arrangements, among other things assigns responsibilities for transmission network development to a Transmission System Operator (TSO). EirGrid, as the TSO in Ireland, has the legal responsibility for developing the transmission system. Developing means planning, routing, obtaining consents etc., but not constructing.

EirGrid's role is entirely separate to the companies which generate, distribute and sell electricity in Ireland. The funding for the transmission system comes from all electricity customers and therefore developing high quality infrastructure, while investing efficiently and economically, are key considerations.

ESB, as the Transmission Asset Owner (TAO), is charged with constructing the transmission assets as specified by EirGrid. This Development Plan provides the TAO with an overview of the transmission projects that are in progress and an indication of the level of development that is likely to emerge in the period to 2015. ESB also has the role of Distribution System Operator (DSO) with which EirGrid coordinates planning and development requirements.

1.2 The Transmission Development Plan

The Transmission Development Plan (TDP) presents EirGrid's view of how the future transmission needs are likely to change and its plan to develop the network to meet those needs. The long term development of the transmission grid is constantly under review. This plan comprises a list of development projects that are in progress and for which there is some

[3] Statutory Instrument 445 (2000), entitled European Communities (Internal Market in Electricity) Regulations, 2000

level of certainty and a description of other areas where further development is likely to be required.

Expected completion dates for developments may change for a number of reasons, including:

- Consents;
- Access and Way-leaves;
- Material availability;
- Availability of Resources;
- Site conditions;
- Construction progress;
- Inclement weather;
- Force majeure; and
- System conditions, especially outage availability.

As such, some of the project dates included in this plan differ from the expected dates quoted in the TDP 2008-2012.

1.3 Context of the Plan

The development of the network is a complex process involving forecasting future needs and planning solutions that strike a balance between network reliability, costs and environmental impacts. The process must be dynamic to meet the ever-evolving needs but also to enable the strategic development of the system in the long term.

This plan is a snap-shot of the developments for the period 2010 to 2015 in the process at this point in time. All information in this Transmission Development Plan; project details, project expected completion dates, generators with executed connection agreements is correct as of the end of December 2010. It is possible that changes will occur in some project delivery dates, in the scope of some projects or in the need for some developments. Similarly, it is likely, given the continuously changing nature of electricity transport requirements and studies such as the Grid Development Strategy described in section 1.3.1 below, that new developments will emerge that will change the plan as presented. These changes will be captured in the annual review and updated in future development plans.

1.3.1 Grid Development Strategy

EirGrid published Grid25 in October 2008, outlining its strategy for the long-term development of the transmission system. The strategy adopted aims to achieve a balance between costs and the impact of new infrastructure through maximising the capability of the existing grid. To that end, new high capacity infrastructure is required; in general it will be built at a voltage of 400 kV. Following a recent review of Grid25, EirGrid estimates that between now and 2025 over 2,500 km of the existing network will have to be upgraded and in the order of 1,200 km of new infrastructure will have to be built to meet the needs of consumers and, both renewable and conventional generators. EirGrid is progressing detailed studies to identify network solutions to be brought forward in the planning process and ultimately to construction. Some Grid25 reinforcement projects have been identified and are included in this Development Plan. As other solution proposals emerge they will be included in future Development Plans.

1.3.2 All Island Joint Planning

Following the introduction of the All Island Single Energy Market (SEM), licence obligations were changed requiring EirGrid and System Operator Northern Ireland (SONI) to set up joint structures and arrangements to carry out All Island transmission planning. The key principles and arrangements are outlined in Schedule 4 of the System Operations Agreement. Joint planning studies also involve Northern Ireland Electricity (NIE), the company responsible for transmission planning in Northern Ireland. The objective of joint planning is to ensure as far as possible that solutions developed to resolve network problems will be optimised for the island as a whole. As joint solutions are developed they will be incorporated in future TDPs.

1.4 Document Structure

This document contains a summary, followed by six main sections and six appendices.

The Summary section gives an overview of the main highlights of the document and presents the plan in summary terms.

Section 1, Introduction, gives the purpose and context of the plan.

Section 2, Transmission Development Approach, provides information on the TSO's legal requirements in relation to development and describes the TSO's planning process and strategies employed.

Section 3, Context for Network Development, describes the factors that drive network development and presents the TSO's forecasts and assumptions relating to the drivers for this plan.

Section 4, Planned Network Developments, lists the development projects that are currently in progress. It provides a brief description of the scope of works and a reason for the development.

Section 5, Other Potential Developments, lists areas where development needs are expected to emerge in the future.

Section 6, Environmental Assessments, summarises the standard approach taken by EirGrid to carry out Environmental Assessments in the planning stages of any project.

Appendix A includes a map of the existing network and further maps illustrating the locations of major development projects and future development requirements.

Appendix B provides details of major development projects in the detailed design or construction phase.

Appendix C provides details of major development projects currently in the public planning process.

Appendix D includes the text of Regulation 8(6) of SI445, which obliges EirGrid to produce this TDP.

Appendix E provides a glossary of terms used in the document.

Appendix F provides a list of references used in the document.

2 Transmission Development Approach

A reliable electricity infrastructure providing quality performance is vital for Ireland's socio-economic development. The development of that infrastructure is of national strategic importance. The high voltage transmission network forms the backbone of the electricity supply system in Ireland which supports the economy.

This section provides a high level overview of EirGrid's approach to determining the network requirements, finding the appropriate solution and implementing the necessary works by presenting the context of transmission planning, the objectives, strategies and decision-making criteria as well as an explanation of EirGrid's planning process. It is important to note that while the transmission network is studied and planned in the context of the long-term strategic development of the power system, this report concentrates on the committed transmission projects that are in progress and other potential developments identified at this point in time.

2.1 Statutory and Legal Requirements

SI445[4], modified by Statutory Instrument 60 (2005)[5], outlines the roles and responsibilities of EirGrid as the TSO. Under Regulation 8(1)(a) of SI445, the TSO is assigned the following exclusive function:

> *to operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical, and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases with a view to ensuring that all reasonable demands for electricity are met having due regard for the environment.*

[4] Statutory Instrument 445 (2000), entitled European Communities (Internal Market in Electricity) Regulations, 2000

[5] Statutory Instrument 60 (2005), entitled European Communities (Internal Market in Electricity) Regulations 2005

This gives EirGrid exclusive responsibility for the operation and development of the transmission system within the Ireland. It also requires EirGrid to strive for a balance between development to improve security and reliability and the economic cost and environmental impact of such required developments.

EirGrid has a statutory obligation to produce a Transmission Development Plan. As part of the preparation EirGrid is required to consult on the Development Plan prior to submitting it to the CER for approval. The text of SI445 Regulation 8(6) which deals with the Development Plan is included in its entirety in Appendix D.

In preparing this Transmission Development Plan, EirGrid has taken account of other Regulations as listed below:

SI445 8(1) (c) *to take into account the need to operate a co-ordinated distribution system and transmission system*;

SI445 8(1) (i) *to offer terms and enter into agreements, where appropriate, for connection to and use of the transmission system with all those using and seeking to use the transmission system*.

SI445 8(3) *In discharging its functions under these Regulations, the transmission system operator shall take into account the objective of minimising the overall costs of the generation, transmission, distribution and supply of electricity to final customers.*

SI60 8(1) (c) *to plan the long term ability of the transmission system to meet reasonable demands for the transmission of electricity*; and

(ca) *to contribute to security of supply through adequate planning and operation of transmission capacity and system reliability*.

Regulation 8(8) of SI445 (2000) precludes EirGrid from developing generation directly as a solution to network needs. However, EirGrid does facilitate connection of third-party generation and when future connections are confirmed it takes their impact into consideration when evaluating network development requirements.

SI445 8(8) *The transmission system operator shall not engage in the generation, distribution or supply of electricity in the State*.

Section 19 of SI445 (2000) gives the ESB the responsibility as Asset Owner to carry out construction work in accordance with EirGrid's development plan.

SI445 19. *The transmission system owner shall (a) as asset owner, maintain the transmission system and carry out construction work in accordance with the transmission system operator's development plan, subject to the provisions of Regulation 18(3).*

EirGrid's TSO Licence requires it to consult with System Operator Northern Ireland (SONI) in revising its plan to ensure that the information set out in the Development Plan continues to be accurate in all material respects. SONI has been consulted in preparation of this TDP.

2.2 Development Objectives and Strategies

An objective of EirGrid as the TSO is to develop a safe, secure, reliable, economical, and efficient electricity transmission system to meet reasonable demands for the transmission of electricity in accordance with its legal obligations.

The demands for the transmission of electricity are driven by a number of factors including but not limited to growth in electricity demand, and developments of generation and interconnection. These drivers are discussed in Section 3.

EirGrid plans the development of the grid taking account of the long-term needs and the economics of various development options. EirGrid's Grid Development Strategy, Grid25, provides an indication of the transmission development requirements out to 2025. EirGrid is working on bringing forward more defined projects to meet the needs identified. Some Grid25 reinforcement projects have been identified and are included in Section 4 of this Development Plan. As other solution proposals emerge they will be included in future Transmission Development Plans when they are sufficiently defined and have become firm proposals.

The need for development is determined by assessing long-term future network performance against technical standards embodied in the Transmission Planning Criteria (TPC), as described in the next section. When it is established that these demands cannot be met without violating the deterministic criteria, a wide range of issues is taken into account in selecting a transmission enhancement strategy. These include long-term economic assessments of a range of transmission alternatives. These assessments attempt to take account of the full range of costs and benefits associated with each option. However, it is not possible to calculate with absolute precision the full range of benefits.

The factors considered in selecting the optimum development project are described in Section 2.5.1 under "*Select Optimum Development Project*". In considering these factors, EirGrid adopts a number of high level strategies, to optimise development, as described below.

EirGrid seeks to find single development projects to meet multiple network requirements where possible. When assessing development options to address future potential network needs, EirGrid considers the impacts of each possible option on other potential development needs. In some cases a proposed project will meet one or more other development requirements and may prove more economic and have less impact on the environment than multiple projects.

When examining alternative developments EirGrid considers the effectiveness of the options in meeting the longer-term needs. In some cases it may be more cost effective to choose a higher cost project that will perform better in the long-term and may obviate the need for further development. Where a more costly development is needed in the long term, EirGrid will seek ways to phase the project. For example, a 400 kV project could be selected for its long-term benefits even though the immediate requirement is for a 220 kV solution only. In some cases, where economic to do so, a line could be constructed as a 400 kV line but initially operated at 220 kV thus deferring the more expensive 400 kV station equipment costs until the line is energised at 400 kV at a later date.

The future operation of the network is considered when evaluating options for meeting future transmission requirements to ensure that the flexibility required for an efficient market is not unduly compromised.

By making more effective use of the existing system, EirGrid can delay large investment or avoid the need for additional circuits. Examples of this strategy include;

- Using higher capacity conductors to uprate existing lines and allow greater power flows;
- Installing a phase shifting transformer in Dublin to manage power flows on cables and delay the need for additional cables;
- Using relatively low cost capacitors to support voltages, thus delaying until necessary larger investment in lines and stations; and
- Installing 400/220 kV and 220/110 kV stations rather than new lines where economically viable to relieve the stress on the underlying 220 kV and 110 kV networks and make better use of the capacity of the high voltage networks.

Consideration is also given to applications for temporary derogations in scenarios where the cost of development is unduly onerous.

Overhead lines are the preferred means to provide new transmission circuits as they are easier to maintain and repair and so provide a more reliable means of supply than underground cables. They are also substantially less expensive. Underground cables are considered where appropriate such as in city centres or urban areas. However consideration is given to these and other technological alternatives in specific respect of every project.

2.3 The Transmission Planning Criteria

The requirement for grid development is identified when simulation of future conditions indicates that the transmission planning standards would be breached. These standards, which are in line with international standards, are set out in the TPC and can be accessed on EirGrid's website, **www.eirgrid.com** (under "Publications").

These criteria are deterministic as are those generally used throughout the world in transmission planning. They set out an objective standard which has been found to deliver an acceptable compromise between the cost of development and the service delivered. Transmission investment planning consists of many different decisions to address different problems. Rather than attempting to carry out subjective benefit analysis in each case it is preferable to plan to meet an objective standard and carry out analysis of the range of options available to comply with the standard.

Once a violation of the criteria has been identified, a wide range of issues are taken into account in selecting a transmission enhancement strategy as described in Section 2.2. The objective is to come up with investment plans that meet the transmission requirements in an efficient and cost effective manner in compliance with the principles of the TPC.

The criteria include standards for voltage range and deviations, maximum thermal loading of grid equipment, system security, dynamic stability and short circuit levels. The grid must operate within these specified standards for intact network conditions, and following an unexpected outage of any circuit or generator. This also applies during maintenance outages of any other lines, cables, transformers or generators.

Table 2-1 Contingency types tested for different demand scenarios

Contingency	**Winter Peak**	**Summer Peak**	**Summer Valley**
Loss of any single item of generation or transmission plant	✓	✓	✓
Overlapping single contingency and generator outage	✓	✓	✓
Trip-Maintenance i.e. loss of any single item of generation or transmission plant when another circuit is out on maintenance	✗	✓	✓

Table 2-1 indicates the contingencies normally tested for three separate demand scenarios. The *Winter Peak* represents the forecast maximum annual demand. The *Summer Peak,* which refers to the average week-day peak value between March and September inclusive, is typically 20% lower than the winter peak. This demand level is of interest because although the overall grid power flow may be lower in summer than in winter, this may not be the case for flows on all circuits. In addition, the capacity of overhead lines is lower because of higher ambient temperatures. Finally, network maintenance outages, normally taken in the March to September period, can deplete the network, further reducing its capability to transport power.

The *Summer Valley* is the annual minimum which generally occurs in August. Annual minimum demand is typically 36% of the annual maximum demand. Analysis of summer valley cases is concerned with the impact of low demand and corresponding low levels of generation. This minimum condition is of particular interest when assessing the capability to connect new generation. With local demand at a minimum, the connecting generator must export more of its power across the grid than at peak times.

2.4 Planning and Environmental Considerations

2.4.1 A Dynamic Process

EirGrid published Grid25 in October 2008 and the resultant TDP 2008-2012 marked the beginning of a series of updates that describe current plans to implement that strategy. The TDP is a continuously evolving document that mediates between strategic medium to long-term objectives and the annually emerging practicalities of those projects that are required to sustain or improve the availability and reliability of power.

2.4.2 Planning Considerations

Permission for transmission projects is sought on a project-by-project basis as the need arises. Transmission projects are primarily determined by An Bord Pleanála as Strategic Infrastructure projects in accordance with normal development management considerations, These considerations include, among other things:

- Conformity with the applicable provisions of the relevant development plans;
- Input from Prescribed Bodies such as the relevant Planning Authority, Dept. of Communications, Energy & Natural Resources, and Department of the Environment, Health & Local Government;
- Requirements to protect areas on account of their ecological, cultural, archaeological and visual sensitivity or significance; and
- Having regard to the strategic directives and development policies.

2.4.3 Environmental Considerations

Applications for planning permission are accompanied – where required or relevant – by Environmental Impact Statements and/or Appropriate Assessments to comply with statutory requirements under the Environmental Impact Assessment and Habitats Directives and associated legislation.

2.4.4 Environmental Constraint Mapping

EirGrid is moving to deepen this incorporation of planning and environmental considerations into the next iteration of the TDP by ensuring that environmental considerations are incorporated into the conception, development and design of projects. This is being implemented by the development of new planning instruments, including a comprehensive national mapping of planning and environmental sensitivities (i.e. Environmental Constraint Mapping) to guide high-level strategies and plans.

2.4.5 Strategic Environmental Assessment

Another measure to anticipate and avoid adverse effects on the environment is the preparation of a Strategic Environmental Assessment (SEA) of the Implementation Programme of Grid25. This includes the attendant statutory scoping, consultation and publication requirements that are required by the relevant Regulations. The SEA is currently in the final stages of preparation.

2.4.6 Emerging Practice

The most immediate effect of these developments has been a broadening of the range of the main alternatives that are considered at the earliest stage of project planning. Where relevant, projects commence with high level technical, planning and environmental considerations of alternative strategies for dealing with the particular identified challenge. Such alternative strategies include grid configuration, re-use of existing routes, underground or underwater solutions.

These considerations result in the development of general routing studies which set out spatially-specific alternatives based on this analysis. These are then progressed by systematic analysis and comparison, in consultation with relevant stakeholders, until an emerging preferred route is identified. This route is then refined and the design is developed to become the subject of an application for planning permission.

2.5 The Network Development Planning Process

2.5.1 Network Development

The network development planning process is of necessity a dynamic process as requirements for transmission services are continuously evolving. The Development Plan is a snap shot in time of the development needs in the process. Figure 2-1 illustrates the various stages in the process which are described below.

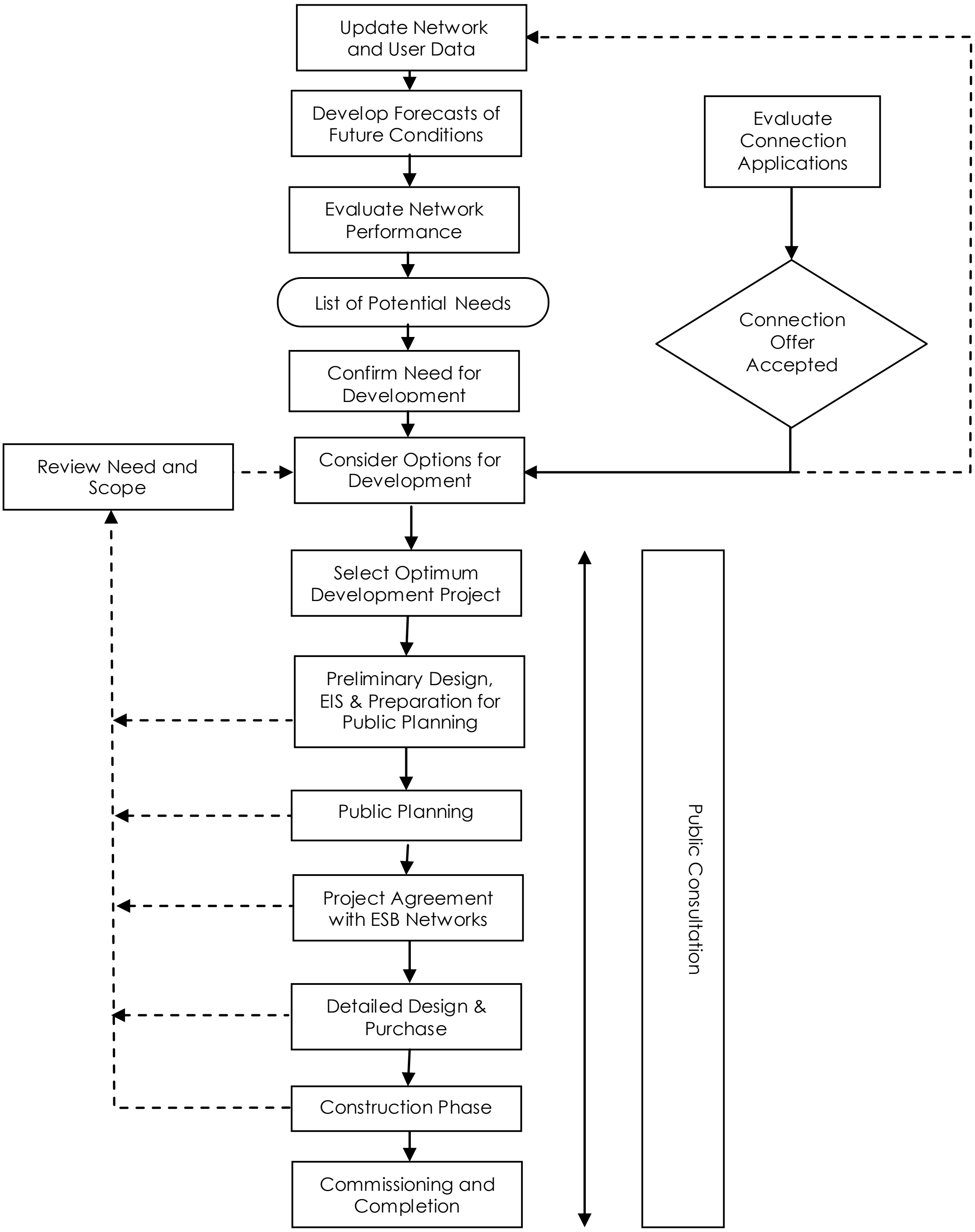


Figure 2-1 Flow Chart of Network Development Process

Update the Network & User Data: The beginning of the process involves reviewing and updating the network and user information that defines the network model.

Develop Forecasts of Future Conditions: This involves reviewing and making projections of the main drivers as outlined in Section 3. The projections are incorporated into models of the future network.

Evaluate Network Performance: The network models are used to assess the future long term performance of the network against the TPC. Grid25 and other system studies identify areas of weakness which may require development. The studies include an assessment of various factors such as; diverse generation dispatches, different interconnection power transfers, generation closure, network stability. Analysis of potential long-term needs provides useful information when considering solution options, as it enables the selection of a more optimum solution and avoids sub-optimal incremental development.

Evaluate Connection Applications: An analysis of shallow connection and associated deep reinforcements are carried out for each valid application received for connection of new generation or demand, or for a DSO connection. EirGrid is obliged to make a connection offer to every applicant.

Connection Offer Accepted: If the applicant signs the connection agreement the shallow connections are progressed, while optimum deep reinforcement options are considered for selection.

Confirm Need for Development: The previous stages provide a list of potential problem areas that may arise in the future. In some cases there may not be an immediate need to progress a solution. Therefore, at the appropriate time, a detailed review is carried out on each problem to determine if there is a definite requirement for development.

Consider Options for Development: Once the need is confirmed, a list of potential options will be developed. Each option will be evaluated to ensure it meets the statutory requirements, as detailed in Section 2.1.

Public Consultation: A regulatory process by which the public's input on matters affecting them is sought. Its main goals are in improving the efficiency, transparency and public involvement in large-scale projects or laws and policies. It usually involves *notification* - to publicise the matter to be consulted on; *consultation* - a two-way flow of information and opinion exchange; as well as *participation* - involving interest groups in the drafting of policy or legislation.

Select Optimum Development Project: Where more than one technically feasible option is available, selection of the optimum project involves the consideration of many factors including:

- Compliance with the TPC;
- Meeting the government's objectives;
- Environmental and societal impacts;
- Economics of alternative development options;
- Project lead-times and feasibility of options;
- The impact of constraints in the transmission system on generation costs;
- Flexibility in scheduling generation to support the operation of an effective market;
- Match with Grid Development Strategy;
- Robustness to alternative future needs and long-term benefit of options;
- The impact on transmission operations, protection and maintenance;
- Co-ordination with the DSO requirements;
- The impact of alternative development plans on distribution costs;
- Synergy with refurbishment projects.

The challenge for EirGrid is to find robust solutions that deliver the best long term value to the customer taking account of these factors and of the uncertainties in demand and generation projections. Uncertainty in generation not only relates to location and size of new connections but also to the operation level of all connected generators.

After careful analysis and internal review a preferred option is put forward as a solution. Internal approval is sought to progress the project to the next stage.

Preliminary Design, Environmental Impact Statement and Preparation of Planning Applications: This phase includes a number of tasks; preparation of preliminary designs, site selection, route surveys and meetings with stakeholders (landowners, local representative bodies and the general public). For developments that require Planning Permission this stage includes a number of additional tasks; preparation of Planning Applications to the relevant statutory authorities and preparation of an environmental impact statement, which is required to comply with environmental legislation.

Public Planning: The Strategic Infrastructure Act 2006 introduces a new strategic consent process for major infrastructure of national and public importance. Persons seeking permission for electricity transmission infrastructure (110 kV and greater) will apply directly to An Bord Pleanála for approval of the scheme. The public, the Local Authority (including the elected members) and interested stakeholders will be consulted or otherwise will be given an opportunity to provide input to the application process and their views taken into account.

Some projects do not comprise strategic infrastructure, and an application will be lodged with the relevant planning authority. The planning authority decides whether or not to grant planning permission for the project. If planning permission is granted it may be subsequently appealed to An Bord Pleanála. Once planning permission is secured by either of the above processes, the requirement for the project is reviewed and the project cost is re-evaluated before progressing to the next phase.

Project Agreement with ESB Networks: Under the Infrastructure Agreement, EirGrid and ESB Networks conclude a Project Agreement for detailed design and construction of each committed project. The Project Agreement contains a project description, the outline design and functional specification, and a description of the methods by which the project will be realised within the agreed timescale and budget.

The next three stages are undertaken by ESB Networks. EirGrid has a client engineering role throughout these phases.

Detailed Design and Purchase: When statutory consents are secured where necessary and internal approval obtained to proceed to construction, the materials are procured, station sites are finalised where necessary, and construction arrangements put in place.

Construction Phase: Once the detailed design and purchase are completed, construction is carried out.

Commissioning and Completion: When the development is constructed it must undergo commission testing and approval before going into operation. This is to ensure that equipment is safe, will operate as per design and that signals and controls are correctly installed.

Review Need and Scope: The process is presented above in a sequential format for explanatory purposes. It is in fact a dynamic and non-linear process i.e., there are opportunities at various stages for a review and possible change of the project scope. For example, the process includes a review following the planning process when more accurate project costs based on an actual route are obtained. If these turn out to be significantly higher than estimated, the project justification and selection would be reviewed. If planning permission is not granted, or if there are particular difficulties during construction, then it would be necessary to reassess the project. If the original assumptions underlying the project justification change dramatically at any time, the project would be reviewed. This avoids unnecessary investment and ensures that the network development plan matches requirements as far as possible.

Figure 2-2 shows the typical lead-times for various types of development projects from the decision to proceed with a selected project to final completion. Stage 1 includes preliminary design and public planning and the periods are based on estimates made by EirGrid. Stage 2 includes detailed design, procurement, construction and commissioning. Periods are based on information provided by ESB Networks. The periods quoted for underground cables assume that they do not require planning permission.

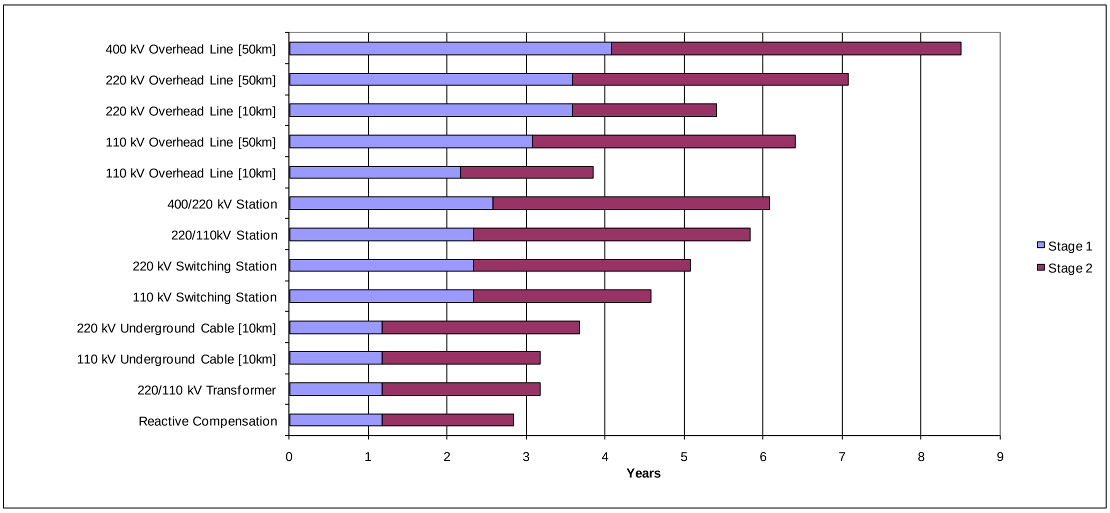


Figure 2-2 Typical Lead times for Development Projects

Timelines for two different lengths of 110 kV and 220 kV overhead lines are given to illustrate the possible range. It should be noted that the timelines for all circuits include the provision of bay equipment at both ends of the circuits, and that switching stations do not include transformers or equipment at other voltages.

The values in the chart are based on all consents being un-contentious and uninterrupted access to sites. Because of the uncertainty in the public planning process and land access these lead times should be considered indicative only, and may be considered optimistic.

2.5.2 Refurbishment

Refurbishment consists of major overhaul of equipment to extend the life of transmission assets. For some equipment, replacement rather than refurbishment may be the most appropriate action when all factors are considered. Examples of such factors include safety and environmental considerations, age, increasing fault frequency, increasing cost and complexity of maintenance, lack of spares, and plant obsolescence. Where action is required on the basis of condition it is referred to as a refurbishment project for simplicity, regardless of whether replacement or refurbishment is chosen.

The process of network refurbishment is illustrated in Figure 2-3. The main inputs into the process are represented by the two blocks titled "Initial Condition Assessment" and "Performance and Technology Review".

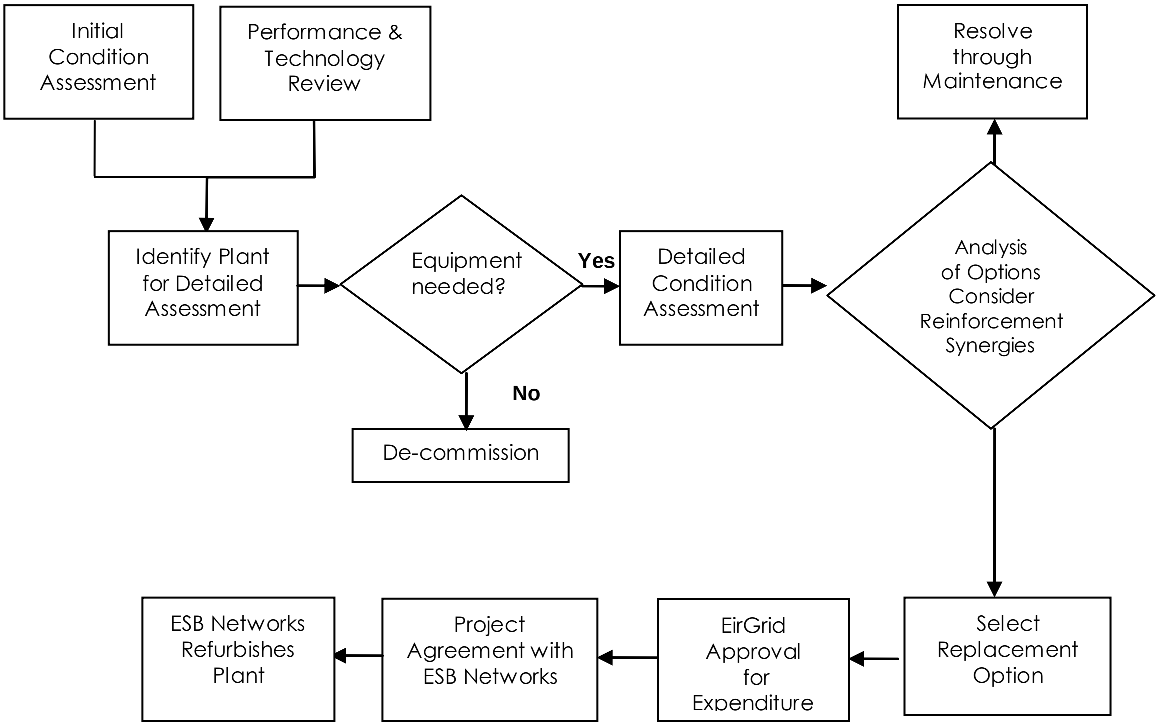


Figure 2-3 Flow Chart of Network Refurbishment Process

Initial Condition Assessment: Most transmission maintenance is condition based. Consideration may be given to a refurbishment programme when regular condition assessments identify that the condition of a significant amount of plant is showing signs of deterioration which would otherwise require costly, special or excessive amounts of maintenance to rectify.

Performance and Technology Review: The performance reviews are undertaken on an ongoing basis and the results are used to identify if a particular asset or a family of equipment type is not performing as well as expected. Technology reviews determine if any of the installed equipment is obsolete or if it is still adequate to provide the necessary performance and able to interact with the rest of the system.

Identify Plant for Detailed Assessment: Input from the first two activities result in the creation of a list of plant requiring a detailed assessment of their condition.

Equipment Needed: Before embarking on a detailed assessment program the continued need for the equipment is established.

De-commission: If the equipment is no longer required, it may be permanently isolated from the system and removed completely.

Detailed Condition Assessment: The detailed assessment of the condition of the relevant asset or plant will identify which individual items of plant, if any, need to be replaced. This could include for example, in the case of overhead lines, the replacement of individual pole-sets, insulators and hardware at selected locations and the replacement or strengthening of selected angle tower foundations. In the case of stations, such a detailed condition assessment would identify the requirement for the replacement of selected items of high voltage plant, protection and control equipment, vintage civil works etc.

Analysis of Options & Consider Reinforcement Synergies: Based on the detailed condition assessment report the economics and cost-benefit of a full refurbishment project versus a special maintenance project (or enhanced maintenance) will then be considered. Analysis of refurbishment options could include for example, the like-for-like replacement of old switchgear, use of more modern switchgear or the construction of a new station to replace the old one. Following the analysis, a decision is made to resolve the problem either through maintenance or through a refurbishment project. Having identified the refurbishment options, an analysis is then carried out to determine if synergies exist between the refurbishment and potential reinforcement projects. In the case of overhead line projects for example, the refurbishment project may provide the opportunity to uprate the line to meet future load requirements. The decision would be based on an assessment of the economics of uprating the line early during the refurbishment works as against uprating later as a stand-alone project. Likewise in station refurbishment projects, the opportunity may be taken to uprate busbars and switchgear or upgrade protection equipment, if economic to do so.

Resolve Through Maintenance: It may be that maintenance of the existing asset is all that is required to extend its life. If this is the case and it is the most cost effective option, maintenance can normally be carried out and the asset returned to service relatively quickly.

Select Replacement Option: The chosen option is determined by factors such as cost, economic trade-off, environmental considerations, system safety, security and reliability. A final scope of work for the selected option is developed and an estimated cost prepared.

EirGrid Approval of Expenditure: The final scope with estimated costs for the refurbishment project is submitted for internal approval.

Project Agreement with ESB Networks: Under the Infrastructure Agreement, EirGrid and ESB Networks conclude a Project Agreement for detailed design and construction of each committed project. The Project Agreement contains a project description, the outline design and functional specification, and a description of the methods by which the project will be realised within the agreed timescale and budget.

ESB Networks Refurbishes Plant: Following project agreement ESB Networks carries out the refurbishment works. EirGrid has a client engineering role during this phase of the project.

3 Context for Network Development

Section 8.1(c) of Statutory Instrument 60 (2005) requires EirGrid in its role as the TSO “to plan the long term ability of the transmission system to meet reasonable demands for the transmission of electricity”. This section describes the factors that are expected to drive the need for network development over the period of this plan and presents EirGrid’s assumptions of those drivers:

- Government Objectives;
- Electricity Demand Forecasts;
- Generation;
- Interconnection with Other Systems; and
- Condition of the Network.

These assumptions provide the context for the current TDP and for the discussion on potential further development requirements.

3.1 Government Objectives

EirGrid seeks to take into account national and regional government policy objectives in putting together its Development Plan. There are a number which have a bearing on development needs including policy to support the development of renewables, the furtherance of interconnection and therefore trading opportunities with other jurisdictions and the development of the full potential of each region through the National Spatial Strategy. The impact of these objectives on other drivers is described in the relevant sub-sections below.

As has already been outlined, EirGrid has a statutory duty to support the development of the Irish economy and society by ensuring the network is able to support all reasonable demands for electricity. In addition, it is a requirement for the system operator to enter into agreement for connection with parties seeking to connect to the system under such terms approved by the Commission for Energy Regulation. EirGrid seeks to develop the network to ensure it is able to meet both of these commitments, while continuing to have regard to its primary responsibility to operate a safe secure, economic and reliable system.

EirGrid must also ensure that it protects the interests of the final customer who ultimately pays for any additional investment in the network. If the network is developed in anticipation of future developments which fail to materialise in a timely manner, there would be a degree of what is known as ‘stranding’ in the assets which would be underutilised but which would still have to be paid for by the existing customer base. However, given the significant number of renewable generators seeking to connect to the system, and the desire to see that government targets for the penetration of energy from renewable sources are met, EirGrid has in some instances as part of the group processing approach accelerated or upgraded current network connections in anticipation of the likely connection of future renewable parties. These works have been carried out where construction at a higher specification is likely to lead to both lower cost and more timely connection in the future. In such instances the regulator has looked favourably on the cost of the advancement of these works being underwritten by Transmission Use of System (TUoS) Charges until such times as contributions are received from parties seeking to connect.

Further details on how EirGrid has helped contribute towards the delivery of the government's renewables policy are given in section 3.3.2.

3.2 Electricity Demand Forecasts

Increasing or changing load demand alters the flow of power on the network, and as such will have an impact on system performance. Demand changes are dealt with in the following categories:

- Generic Demand Growth;
- New Demand Connections;
- Demand Reductions; and
- National Spatial Strategy.

3.2.1 Generic Demand Growth

Generic demand growth is the underlying increase occurring typically at all transmission stations resulting from economic growth. Forecasts of demand growth at a system wide and local 110 kV station level are prepared each year taking account of new and updated information available. The system wide demand forecasts are generated based on predictions of key economic variables and using a proven relationship between electricity demand and these economic variables.

Table 3-1 presents the forecasts of transmission demand for the six years 2010 to 2015. These correspond to the median demand forecasts published in the *All Island Generation Capacity Statement 2011-2020* available on **www.eirgrid.com**, which are calculated based on Economic & Social Research Institute forecasts of economic activity.[6]

Three demand values are presented for each year:

- The annual maximum, also referred to as the Winter Peak;
- The average Summer Peak, calculated as 80 % of Winter Peak; and
- The annual minimum, also referred to as the Summer Valley, calculated as 36% of Winter Peak.

Table 3-1 Transmission Peak Demand Forecasts, MW

Year	Summer Peak	Summer Valley	Winter Peak
2010[7]	3,682	1,657	4,602
2011	3,683	1,657	4,604
2012	3,750	1,687	4,687
2013	3,837	1,727	4,796
2014	3,926	1,767	4,908
2015	4,006	1,803	5,008

Appendix C of EirGrid's *Transmission Forecast Statement 2010-2016* document lists the forecast demand at each transmission interface station at time of winter peak, summer peak and summer valley for each year of the plan. Transmission interface stations are the points of connection between the transmission system and the distribution system, or directly connected customers. The demand figures listed in the table above are those published for Ireland in the *All Island Generation Capacity Statement 2011-2020*, and give a reasonable indication of expected local demand levels.

Demand projections at individual transmission stations are developed from the system demand forecasts on a top-down basis. The forecasting process includes regular monitoring and review of trends in consumption in all parts of the country. The allocation of the system demand forecast to each station is based pro-rata on an up-to-date measurement of actual peak demand at each station. In this way, changes in geographical electricity consumption are captured. This process provides a station demand forecast and by extension a regional demand forecast for the short to medium term. The system wide demand forecasts, presented in Table 3-1, include an estimate of transmission losses whereas the individual station demand forecasts do not.

[6] Section 2 of All Island Generation Capacity Statement 2011-2020 explains the correlation between economic performance and electricity demand.
[7] The Actual Transmission Peak Demand Figure for 2010 is not yet available

3.2.2 New Demand Connections

Demand connections describe the connections of new large demands at existing or new stations. The demand could be a large industrial plant or a new DSO station. The DSO develops its plans to reinforce the distribution system to accommodate increasing demands and embedded generation connections. Where the DSO requires new stations or changes in connection methods it submits a connection application to EirGrid. EirGrid will make a connection offer having considered the implications for the transmission system. Once the connection offer is accepted, EirGrid and the DSO cooperate to progress these connection projects through to approval and completion. Table 3-2 lists the new 110 kV distribution stations for which the transmission element of the project is in the preliminary design phase, in the public planning process or under construction. Details of the developments required to connect these stations are included in Section 4. In some cases, where the transmission element of the project is minor, the DSO may have progressed its element of a project to a different stage ahead of EirGrid. Section 5.2.2 lists such cases. EirGrid is confident however that it will deliver its element at a suitable time.

Table 3-2 DSO 110 kV Station Connection Projects

110 kV Station	Location	Transformer Capacity (MVA)
Adamstown	Lucan, Co. Kildare	40
Ardnagappary	Bunbeg, Co. Donegal	31.5
Balgriffin	Balgriffin, Co. Dublin	250
Ballycummin [8]	Raheen, Co. Limerick	40
Banoge[9]	Gorey, Co. Wexford	40
Bracklone	Portarlington, Co. Laois	40
Carrowbeg	Westport, Co. Mayo	31.5
Finnstown	Adamstown, Co. Dublin	250
Salthill	Salthill, Co. Galway	126
Screeb	Screeb, Co.Galway	31.5

Major customers may apply to connect directly to the grid. Applications for new demand connections made to EirGrid are studied and once the best connection option is identified a connection agreement is issued which is signed by both the customer and EirGrid. Due to client confidentiality the technical details of these connection agreements can only be made public when the customer signs the agreement.

[8] Ballycummin is currently On Hold

[9] Banoge 110 kV Station has already been built, but is awaiting a 110 kV connection.

Closure or reduction in size of demand facilities can reduce the power flows on lines feeding the load. However, in certain cases where the demand is absorbing local generation and reducing the amount of generation exported from the area, the closure can lead to increased power flows. Large customers are required to give 18 months notification of reduction in their maximum load requirements. As of December 2010, EirGrid has not received notification of any significant demand reduction from its directly connected customers.

3.2.3 National Spatial Strategy

The National Spatial Strategy (NSS) was published in November 2002. The NSS is a 20 year spatial planning framework covering the entire country. In implementation terms it has been given effect through a series of Regional Planning Guidelines prepared by each Regional Authority, as well as through county and town development plans. The NSS seeks to ensure that each region grows in a sustainable manner according to its potential. To ensure this the NSS requires that areas of sufficient scale and critical mass are built up through a network of gateways and hubs, which are supported by development of transport, energy and communications infrastructure. It is not within EirGrid's scope to deliver the NSS - that is a matter for government. EirGrid seeks to facilitate its delivery through the provision of high quality electrical transmission infrastructure where it is required while continuing to promote national competitiveness for customers currently connected to the system through only developing the system and therefore levying charges at an efficient level. The TDP is based on updated demand forecasts which are derived using the latest information on regional demand shifts. EirGrid, takes account of best estimates of likely growth patterns in determining which of a number of possible transmission solutions ought to be advanced to meet a particular requirement.

3.3 Generation

The network must be capable of transporting the output from generators to demand stations. Because of the relative size of generation it can have a more significant impact on changes to power flows than demand. The largest generator in Ireland is currently Whitegate CCGT with a maximum export capacity of 440.6 MW, which is approximately 9.57 % of 2010 Winter Peak demand.

The addition of new generation capacity requires network development to connect the new generator to the grid, thus providing a path for the power from the new generator. The new generation capacity will inevitably alter the power flows across the network, potentially creating overload problems deep into the network, leading to the need for reinforcements (known as deep reinforcements) to allow full grid access. Recent experience shows that connection of large generators, or large groups of smaller generators, leads to large-scale deep reinforcements. However, even relatively small generators may require some deep reinforcements. The results of the transfer capability analysis presented in EirGrid's *Transmission Forecast Statement 2010-2016* indicate that spare capacity in the network has effectively been used up by generation connections and that at many locations the addition of even small amounts of new generation would require deep reinforcements.

Embedded generation, which is connected to the distribution system, is generally smaller than transmission connected plant. However, its impact on the network is practically the same as if the same generation was connected to the transmission system. As such it also changes flows on the network and in certain cases it can cause the network to go outside standards specified by the TPC and hence require deep network reinforcement.

At the end of December 2010 some 8,819 MW (net of house load) of generation capacity was installed in Ireland. Of this 7,296 MW is connected to the transmission system and 893 MW is connected directly to the distribution system. Since the publication of the TDP 2008-2012, approximately 1,300 MW of new generation was installed in Ireland, as summarised in the Table 3.2.

Table 3-2 Generation Installed since July 2009

Type	TSO (MW)	DSO (MW)	Total
Conventional	992	0.44	992.44
Wind	244.95	63.2	308.15

The assumptions regarding the changes in generation from the publication of the TDP 2008-2012 underlying the new TDP are dealt with in the following categories:

- New thermal generation connections;
- New renewable generation; and
- Planned generation closures.

3.3.1 New Thermal Generation Connections

New generators are expected to pay the shallow connection costs, i.e. the costs of the plant required to directly connect the generator to the grid. Any further strengthening of the network that is required to integrate the generation, referred to as deep reinforcement, is implemented by EirGrid and the TAO and the costs are reflected in the transmission tariff to the customers.

Table 3-3 lists the generators, as yet not connected, that have executed agreements for connection to the grid as of the end of December 2010. Capacity values listed are the maximum continuous rating (exported) which may differ from contracted Maximum Export Capacity (MEC) values.

Table 3-3 Future Planned Generation Connections

Generator	Type	Capacity (MW)	Connection Date	Status
Ballakelly	CCGT	445	Apr 12	On Hold
Caulstown	OCGT	58	Nov 12	On Hold
Cuilleen	OCGT	98.4	June 11	On Hold
Knocknagreenan	Pumped Storage	70	June 11	In Progress
Nore Power	OCGT	98	Dec 11	On Hold
Suir	OCGT	98	June 11	On Hold

Table 3.4 lists generators which have live connection offers.

Table 3.4 Live Connection Offers

Generator	Type	Capacity (MW)
Ballymakailly	OCGT	115.2
Cahernagh	OCGT	101
Great Island	CCGT	431

At the end of December 2010, 39 thermal generators, with a total capacity of 4,254 MW have submitted complete application forms to EirGrid for grid connections. 10 pumped storage generator applications with a total capacity of 2,443 MW are also in the queue.

3.3.2 New Renewable Generation

A significant proportion of new renewable generation is expected to be provided by wind powered generation. Tables 3-5 and 3-6 list the new wind farms and MEC changes to existing wind farms with executed agreements for connection to the transmission system as of the end of December 2010.

Table 3-5 TSO Contracted Wind Farm Connections.

Generator	Transmission Station Connection Point	Capacity (MW)
Athea Phase 1 & 2	Athea	73
Dromada (a)	Athea	17.5
Cloghboola	Cloghboola	46
Glanlee	Glanlee	6
Knockacummer	Knockacummer	87
Mulreavy	Cathaleen's Fall	82
Moneypoint WF	Moneypoint	21.9

Table 3-6 MEC Changes to Existing TSO Connected Wind Farms.

Generator	Transmission Station Connection Point	Capacity Increase (MW)
Booltiagh Phase 2 & 3	Booltiagh	12
Keelderry	Derrybrien	29.75
Ratrussan	Ratrussan	22

The Government's Renewable Energy policy, reflecting the RES-E[10] Directive of the European Parliament and Council (Directive 2001/77/EC), sets a target for Ireland of 15% of total electricity consumption from renewable sources by 2010, and 40% by 2020. Wind power generation is expected to be the major contributor to the 2010 target. Analysis showed that the target of 15% electricity from renewable sources in 2010 was contingent on at least 120 MW of wind generation connecting during 2010. However, only 107 MW was connected, so the target was not achieved. It should also be noted that the level of wind itself was below what was forecast, so the target would not have been achieved even if the 120 MW had been connected.

[10] Renwable Energy Sources

The figures for wind generation, both transmission and distribution connected, as at the end of December 2010 are:

- Connected wind generation: 1,420 MW;
- Signed connection offers: 1,171 MW;
- Live connection offers in Gate 2: None;
- Gate 3 Applications : 3995 MW; and
- Other applications outside Gate 3: 12,060 MW.

The total MEC for wind farms connected or with executed connection agreements is 2,591MW.

3.3.3 Planned Generation Closures

Poolbeg Units 1 & 2 (2 x 109.5 MW) ceased operating in March 2010 when all three units were officially decommissioned. The 27 MW steam turbine at Marina was decommissioned in March 2010. The larger gas turbine however remains operational.

The old Endesa steam turbines at Tarbert are due to close by the end of 2015. Tarbert currently has an MEC of 589.4 MW; an application for a new 285 MW OCGT is currently being processed, which is the subject of ongoing discussions

A live connection offer is in place following an application to increase the MEC at Great Island by 216 MW to accommodate a new 431 MW CCGT.

3.3.4 Constraints on Existing Generation

Network constraints may dictate that more expensive generator units are required to run in place of units using a cheaper fuel. EirGrid takes these constraint costs into consideration when identifying new network reinforcements to remove the network technical constraints. Future fuel cost differences may lead to new reinforcement projects in the TDP.

3.3.5 High Short Circuit Levels on the Network

The connection of large generators combined with the meshed nature of the transmission network results in increasing short circuit levels. The more tightly connected a network becomes the lower the impedance of the system. While this may reduce system losses, it also enables more current from all power stations to reach connected stations during a fault. This is particularly noticeable when there are parallel paths between sections at different voltage levels, such as 220 kV and 110 kV. High short circuit levels are a safety issue and measures must be taken to prevent the catastrophic failure of high voltage equipment in stations.

Investigations for the connection of new power stations and transmission reinforcement take into account the impact of the development on short circuit levels. The two most common methods of resolving short circuit level problems are upgrading the station equipment with higher rated switchgear and equipment or reconfiguring the stations and network to reduce the number of parallel paths and thus decrease the short circuit level. In some cases the installation of fault current reducing reactors or use of higher impedance transformers are considered. Options are considered that will provide the most practical and economic solution.

The *Transmission Forecast Statement 2010-2016* indicates that short circuit currents in a number of areas including Dublin and Cork are sufficiently high to warrant close monitoring. Interim plans are in place to maintain short circuit levels within safety standards which they would otherwise exceed.

Dublin

The fifth Finglas 220/110 kV transformer (CP0264), which was commissioned in February 2010 has reduced the short circuit current levels in North and East Dublin. This transformer is on open standby to cater for a fault on one of the on-load transformers as it is not possible to operate three transformers in parallel. (The station configuration allows it to directly replace any one of the existing transformers.) The new Finglas 110 kV Gas Insulated Switchgear (GIS) substation (CP0646), which is to replace the existing Air Insulated Switchgear (AIS) installation, will resolve the short circuit issues and allow three transformers to be run in parallel. It is due for completion by December 2014. Other operational measures are also in place to limit short circuit currents in the Dublin area; most notably station running arrangements.

Cork

As a result of the recent connection of two new large CCGTs in Cork, the short circuit current levels in Cork have had to be addressed. Operational measures such as specific station running arrangements are presently in place to resolve these issues. EirGrid is actively progressing long term solutions to deal with high short circuit current levels in these areas, including a new Aghada 220 kV AIS Station (CP0593) and Glanagow 220 kV GIS Station (CP0595), both due for completion by the end of Summer 2011.

Other Areas

Short circuit current levels are high at Louth, where the existing 275 kV interconnector to Northern Ireland is connected, and in the area around Tarbert, where a new submarine cable connecting Tarbert and Moneypoint generation is expected to be completed by Summer 2013. This is one of a number of issues which will be resolved by the Tarbert Redevelopment Project (CP0647), also due for completion by Summer 2013. Present and projected short circuit current levels at these locations are still within safety standards. EirGrid will continue to monitor these stations to ensure that they remain so.

3.4 Interconnection With Other Systems

3.4.1 Tie-lines with Northern Ireland

The transmission system is electrically interconnected with Northern Ireland at 275 kV (Louth-Tandragee) and at 110 kV (Letterkenny-Strabane & Corraclassy-Enniskillen). The 110 kV connections utilise Phase Shifting Transformers (PSTs) to control the flows.

Under the trading arrangements of the All Island Single Electricity Market, the tie-lines are effectively internal circuits. Transfers on these existing tie-lines are normally constrained.

EirGrid and NIE are working on the provision of a new major interconnection development project. This will form a significant part of the robust infrastructure that is required to meet the needs of the All Island Single Energy Market and enhance security of supply for consumers. Along with other network developments it is expected to alleviate constraints and provide increased capacity for transfers between the two jurisdictions. This project is at an advanced stage following comprehensive joint EirGrid/NIE studies and stakeholder consultation. The preferred interconnection option is at 400 kV located to the west of the existing 275 kV interconnector. The development is listed in Section 4.1, Table 4-2 of this document.

3.4.2 Interconnection with Great Britain

In 2006 the Government tasked the CER and EirGrid with arranging the design of a competition to secure the construction of a 500 MW interconnector between Ireland and Great Britain. On March 12th 2008 the Electricity Regulation (Amended) Bill 2008 was published to reflect this. This Bill provides for EirGrid ownership, construction and operation of the interconnector subject to authorisations required from the CER. In October 2008, CER granted EirGrid authorisation to construct an interconnector.

Woodland is to be the connection point on the Irish system and Deeside in North Wales as the connection point on the British system. EirGrid submitted an application to the Strategic Infrastructure Division of An Bord Pleanála in November 2008. Permission was granted on September 2009 for the location and construction of a converter station at Portan, near Woodland in Co. Meath and the installation of underground cables, mainly on public roads to the coast at Rush, Co. Dublin, approximately 45km in length and in the seabed out to the 12 nautical mile foreshore limit. Construction, which is being undertaken by Swedish engineering firm ABB commenced in 2010 and is expected to be completed by September 2012.

3.5 Condition of the Network

The decision whether to refurbish particular transmission assets is based on detailed condition assessments, as discussed in Section 2.5.2. The age of the assets determines if a condition assessment is required. The need to be refurbish will depend on the outcome of this assessment. Other factors include the local environment and the quality, reliability and serviceability of the asset. The age profile of the main transmission assets on the system are shown in Table 3-6. This is the most recent information available from ESB Networks.

Table 3-6 Transmission Asset Age Profile (Source ESB Networks)

	Date Asset Was Built					
	Up to 1969	**1970 1979**	**1980 1989**	**1990 1999**	**2000 2006**	**Total**
Overhead lines (km)						
400 kV lines	-	-	432.7	-	-	432.7
275 kV lines	-	21.0	-	-	-	21.0
220 kV lines	479.8	772.4	300.5	122.1	84.3	1,759.1
110 kV lines	2,086.40	979.6	422.2	208.6	397.3	4,094.1
Total	**2,566.20**	**1,773.0**	**1,155.4**	**330.7**	**481.6**	**6,306.9**
Underground cables (km)						
400 kV cables	-	-	1.8	-	-	1.8
220 kV cables	-	45.3	16.2	14.7	28.6	104.8
220 kV cables (sub-marine)	-	2.6	-	-	-	2.6
110 kV cables	4.3	5.5	1.8	2.8	13.3	27.8
Total	**4.3**	**53.4**	**19.8**	**17.5**	**41.9**	**137**
Switchgear (units)						
400 kV substation bays	-	-	17	-	3	20
275 kV substation bays	1	1	-	-	1	3
220 kV substation bays	25	38	57	15	65	200
110 kV CB (GIS)	-	-	4	6	8	18
110 kV CB-(other)	124	93	74	136	211	638
110 kV isolators	289	319	198	294	528	1,628
110 kV mobile switching bays	-	-	-	3	6	9
Total	**439**	**451**	**350**	**454**	**822**	**2,516**
Transformers (per unit)						
400/220 kV transformers	-	-	3	-	1	4
275/220 kV transformers	1	1	-	-	1	3
220/110 kV transformers	6	12	2	5	21	46
Total	**7**	**13**	**5**	**5**	**23**	**53**
Capacitors						
110 kV Capacitors	-	-	-	3	23	**26**
110 kV Mobile Capacitors	-	-	-	-	4	**4**
Total	**-**	**-**	**-**	**3**	**27**	**30**

3.5.1 Line Refurbishments

A condition assessment on a line is usually carried out when it is 35 years old. The majority of the existing transmission lines were constructed after 1960 and the majority of those which were constructed prior to 1960 have already been refurbished. There is an ongoing programme of line refurbishment concentrating on the older lines. These refurbishment projects are condition based and as described in Section 2.5.2, the initial step is to determine the existing line condition. Once a line has been identified for refurbishment, consideration is given to take the opportunity to uprate the capacity or thermal rating of the line.

The transmission lines that have been approved for refurbishment are listed in Section 4.5. As the condition monitoring of the transmission lines is an ongoing process it is possible that other lines may be identified for refurbishment before the end of the Plan Period. Due to the relatively short lead times for projects involving existing structures, refurbishment and upgrading projects will only be initiated relatively close to the time of their implementation.

The transmission lines that are under consideration for refurbishment are listed below.

- Lisdrum-Louth 110 kV (40.4 km);
- Corduff-Ryebrook 220 kV (18.3 km);
- Cashla-Tynagh 220 kV (33.8 km);
- Dunfirth-Kinnegad-Rinawade 110kV (59.2 km);
- Kellis-Kilkenny 110kV (34.3 km);
- Charleville-Mallow 110kV (22.5 km); and
- Dunstown-Kellis 220kV (60 km).

3.6 Station Refurbishments

The process by which substation refurbishment projects are developed has been described in Section 2.5.2. The condition of the equipment in transmission stations is constantly being reviewed and assessed as part of the regular maintenance, performance monitoring and condition assessment programmes.

The majority of the station plant and equipment was installed between 1970 and 2000. Accordingly, the older stations are now approaching 40 years in service. Station-wide condition assessments are being carried out and, where necessary, options for refurbishment/replacement are being developed.

Age is not the only potential trigger for carrying out extensive substation plant replacement/ refurbishment. Other factors which, either on their own or in combination, may lead to refurbishment proposals being developed include the need to upgrade the control, instrumentation, protection and telecommunications equipment within the station to leverage increased opportunity provided by modern Supervisory Control And Data Acquisition (SCADA) systems. These upgrades can necessitate the replacement of large amounts of high voltage equipment and the work necessitates major outages of elements. In such cases it may be more efficient to carry out a full station refurbishment. Also taken into account is the need to uprate existing older equipment to meet the higher demands being placed on it by increasing demand. For example, increasing short circuit levels may necessitate extensive switchgear replacement. In such instances the opportunity may be availed of to carry out further refurbishment works.

The following stations currently under consideration for refurbishment/ replacement include:

- Cathaleen's Fall 110 kV;
- Carrick-on-Shannon 110 kV;
- Navan 110 kV; and
- Great Island 220 kV;

The following stations require sectionalising circuit breakers so as to comply with DSO security standards:

- Athlone 110 kV;
- Ballybeg 110 kV;
- Baltrasna 110 kV;
- Banoge 110 kV*;
- Carlow 110 kV;
- Kilkenny 110 kV;
- Letterkenny 110 kV*;
- Limerick 110 kV;
- Macetown 110 kV;
- Moy 110 kV*;
- Mullingar 110 kV;
- Navan 110 kV;
- Sligo 110 kV;
- Tralee 110 kV; and
- Wexford 110 kV*.

* Formal Application received from DSO

3.7 Implications of Drivers for Network Development

The drivers described in the previous sections indicate that the demands made on the transmission network are set to increase over the period of this TDP. While economic activity has declined sharply over the last year, it is expected that over the period of this TDP and beyond there will be a return to demand growth, albeit at more modest levels than those experienced over the previous decade. In certain areas where the network is close to or already at capacity, this additional demand will bring forward the need for new network developments to ensure security of supply.

All Gate 2 offers have been issued and as of the end of December 2010 all but one offer have been accepted. (This offer has now lapsed, and so there are no outstanding live Gate 2 Offers). Under Gate 3, EirGrid and the DSO will issue offers to 3,995 MW of Wind Generation and 3,400 MW of conventional generation. Grid25 has indicated that a significant investment in transmission infrastructure is required to accommodate these levels of generation. This is discussed further in Section 5.

EirGrid and the CER are progressing the delivery of the new 500 MW High Voltage Direct Current (HVDC) interconnector between Ireland and Great Britain. As recommended by

EirGrid, the CER has approved the choice of Woodland 400 kV station as the connection point on the Irish system for the interconnector. Deeside 400 kV Station in North Wales has been chosen as the connection point on the National Grid UK system.

Figure 3.1 illustrates the areas where changes in demand and generation will drive the need for network reinforcements. The legend explains the meaning of the different colour shapes on the map.

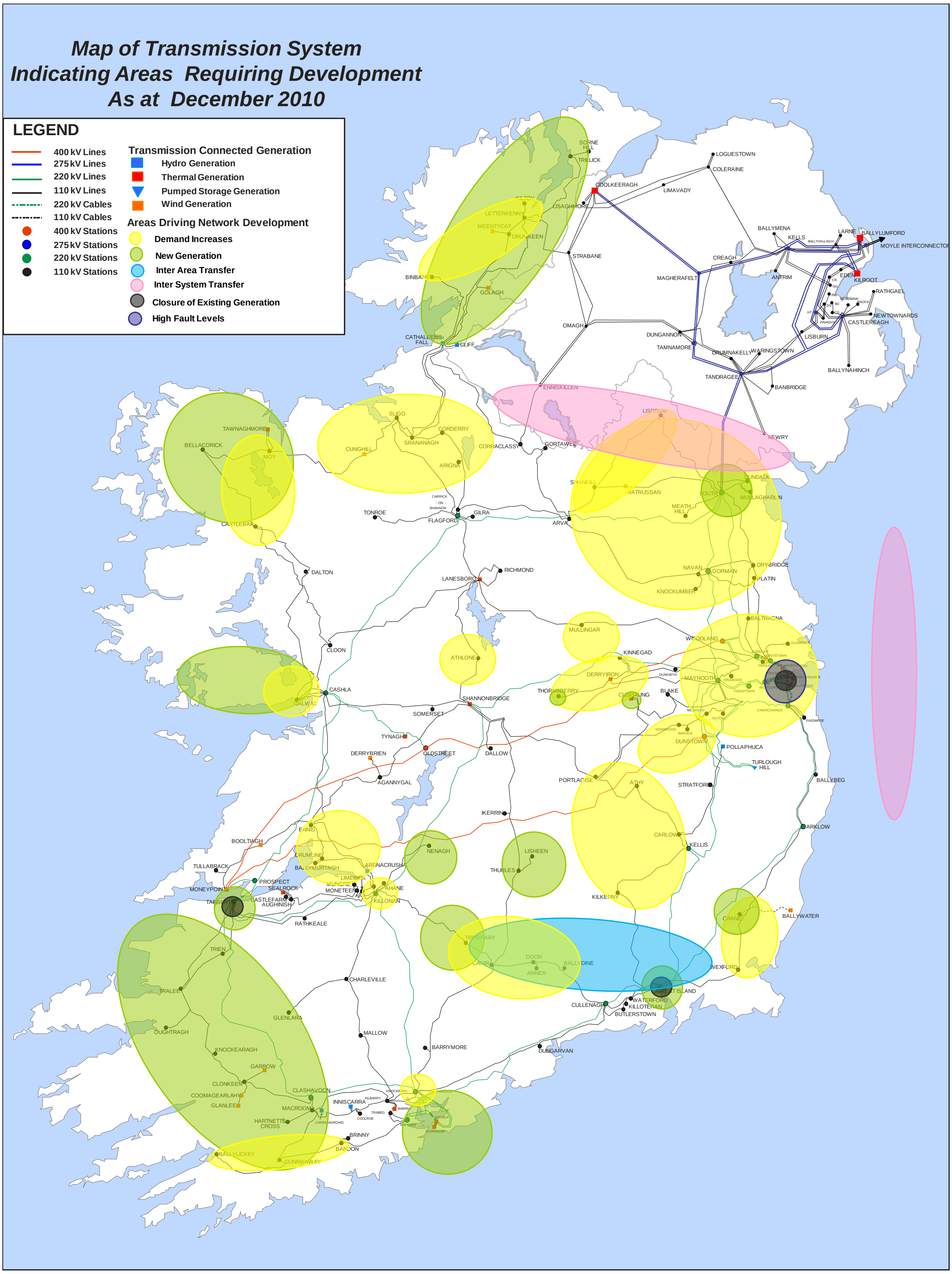


Figure 3-1 Network Map Showing Areas of Change Driving Network Development

4 Planned Network Developments

The transmission network development planning process for the transmission network followed by EirGrid is outlined in Section 2.4. This section presents and discusses the network development projects that EirGrid has progressed to the point where they are the preferred option to meet the changing system requirements in the context of the long term development of the network.

The development plan includes a total of 111 projects that are in progress, 70 of which are in the detailed design and construction phase. The totals of new equipment currently planned are presented in Table 4-1. These are estimates only because project scopes can change during the course of a project, particularly in the preliminary stages of design,.

Table 4-1 Estimates of Planned New Transmission Assets

	400 kV	220 kV	110 kV
Number of New Stations	1	9	7
Number of New Station Bays	8	49	181
Overhead Line, (km)	140	56	313
Underground/Undersea Cable, (km)	0.5	33.5	0

	400/220 kV	400/110 kV	220/110 kV
Number of New Transformers	2	2	16
New Transformers, Total MVA	1000	500	3250

	110 kV
Number of New Capacitor Banks	7
Capacitor Banks Total Mvar	135

In addition, 7.7 km of 220 kV and 575 km of 110 kV transmission circuits will have their thermal ratings increased. Two 220 kV transmission lines and two 110 kV transmission lines will also be refurbished without affecting their ratings.

The development projects presented in this section are categorised under five subsections relating to the main development drivers:

- Network Reinforcements;
- DSO Connections;
- Generator Connections;
- Interconnectors; and
- Refurbishments.

Within each sub-section and where relevant, development projects are categorised by the stage in the development programme as follows:

- Developments in the Detailed Design and Construction Phase - projects that have received public planning permission, where appropriate, or are
  - at the project agreement stage;
  - at the initial stage of procurement and engineering design;
  - presently under construction.
- Developments in the Public Planning Process - projects or developments that have been approved at the appropriate level internally and have entered the public planning process; and
- Developments in the Outline Design and EIA Phase - projects or developments that have been approved at the appropriate level internally and are at the Outline Design or Environmental Impact Assessment (EIA) stage.

All new network infrastructure project proposals are subject to an ongoing process of environmental impact assessment at all stages including consideration of alternatives, detailed design and public planning.

Because of the uncertainties inherent in the public planning process, the dates and the scope of projects not yet in the Construction Phase are subject to change.

Tables 4-2 to 4-6 present the following project information:

- Capital Project number (CP No.) - each project is referenced with a Capital Project number for coordination between EirGrid and TAO;
- Project Description provides a project title and a brief description of the works involved. For projects in the Outline Design or EIA stage, the project descriptions provided are EirGrid's best estimates and may be subject to change;

- Major New Equipment - a high level equipment list where appropriate describing the new transmission assets (e.g. bays, line length[11], etc.) added to the network on completion of the project. This is not provided for refurbishment projects where no new assets are added;
- Project Justification - a brief description of the reason for the network development projects. This is not provided for DSO and Generator connections, where the reason for the development is in all cases the connection);
- Expected Completion Date (ECD) - the estimates provided are subject to the planning process where applicable, the construction progress, availability of transmission outages and commissioning and may be liable to change; and
- Phase – the stage the project has progressed to at the time of publication.

The Freeze Date for data compiled for the TDP 2010 which was released for Public Consultation was the end on January 2010. The data was updated prior to Final Publication for the end of December 2010. Projects which were ongoing when this Transmission Development Plan was first released, but were completed by December 2010 have been included in Tables 4-2 to 4-6. These projects have not been included in the figures of total equipment quoted on Pages 7 and 45, nor have projects which are now 'On Hold'

The maps in Appendix A illustrate the location of the larger network development projects. EirGrid and the TAO are co-ordinating other capital projects in addition to the projects listed below. These come under the general description of minor capital works and line diversions and alterations. These projects are numerous and have little significance to the development of the network and so are not itemised below. For those projects not yet in the planning process, the lines are indicative only and do not represent a preferred route.

4.1 Network Reinforcement Developments

This section deals with the development projects that are driven by generic demand growth and the deep reinforcements resulting from generator, demand and interconnector connections.

Table 4-2 overleaf lists the network reinforcement projects. Appendix B presents more detailed information for the larger network reinforcement projects in the Detailed Design & Construction Phase. Appendix C presents more detailed information for the larger reinforcement projects currently in the Public Planning Process.

[11] Line lengths are approximate for Network Reinforcement projects that are in the outline design phase or in Public Planning Process.

Table 4-2 Network Reinforcement Projects

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0217a	Blake-Cushaling-Maynooth 110 kV Line - Loop into Newbridge 110 kV station Existing Cushaling-Maynooth 110 kV circuit to be looped into Newbridge 110 kV station between Blake T and Cushaling.	110 kV bays: 2 110 kV line: 14 km	To improve the quality of supply to the 110 kV stations in this area by preventing low voltages and line overloads under certain contingencies.	Jun-10	Complete
CP0241a	Lodgewood 220kV Project - New 220kV Station A new Lodgewood 220/110 kV station in Co.Wexford, connected into the Arklow-Great Island 220 kV line and linked with a new Crane-Lodgewood 110 kV line, through a 250MVA 220/110 kV transformer	220 kV Station 220/110 kV 250 MVA Trafo: 1 220 kV bays: 5 110 kV bays: 5 In other stations 110 kV bays: 1 New Line 220 kV line: 1 km 110 kV: 7 km	To provide support to the 110 kV network in this area and by preventing low voltages and line overloads under certain contingencies.	Dec-10	Complete
CP0264a	Finglas 220kV Station: 5th 250MVA 220/110 kV Transformer (T2105) Installation of a fifth 250 MVA 220/110 kV transformer and coupler	220 kV bays: 2 110 kV bays: 2 220/110 kV 250 MVA Trafo: 1	To maintain short circuit levels within standards and to alleviate potential overloading of the Maynooth-Ryebrook 110 kV line under certain maintenance-trip conditions.	Feb-10	Complete
CP0379	Carrigadrohid-Kilbarry 110 kV Line Uprate Uprate line and busbars to equivalent of 430mm^2 ACSR @80^{o}C	Uprate 110 kV line 33.6 km	Refurbishment required due to condition of line, uprate indicated necessary by studies for Gate 2 wind.	Dec-10	Complete
CP0451	Dungarvan-Knockraha 110kV Line Uprate Uprate line to 430mm^2 ACSR @80^{o}C	Uprate 110 kV line: 54 km	This uprate is necessary to avoid unacceptable overloading of the 110 kV during certain contingencies as a result of new generation in the south west The uprating of the line has been completed, work is currently being carried out to uprate the remote ends to enable full operating capacity of the circuit.	Dec-10	Complete

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0512	New Capacitors at Kilkenny One new 30 Mvar capacitor at Kilkenny 110 kV station	110 kV station. 110 kV bays: 1 Caps: 1 x 30Mvar	To ensure that voltages in the Kilkenny area continue to comply with standards and to minimise the risk of voltage collapse following the tripping of the Kilkenny-Kellis 110 kV line.	Mar-10	Complete
CP0515	New capacitor at Drumline: One new 15 Mvar capacitor at Drumline 110 kV station.	110 kV bays: 1 Caps.: 1 x 15 MVar	To ensure that voltages in the Drumline area continue to comply with standards.	Oct-10	Complete
CP0528	New capacitor at Kilteel One new 30 Mvar capacitor at Kilteel 110 kV station	110 kV bays: 1 Caps.: 1 x 30Mvar	To ensure that voltages in the Kildare area continue to comply with voltage standards following the looping of Kilteel station and to minimise the risk of voltage collapse.	Nov-10	Complete
CP0549a	Shannonbridge-Dallow T-Portlaoise 110 kV Line Partial Uprate Partial line uprate so that all of the line is equivalent to 430mm^2 ACSR @80^{o}C	Uprate 110 kV line: 18.3km of 66.7 km	The need of uprating has been identified to avoid potential overloads of the line.	Sep-10	Complete
CP0562	Great Island-Waterford 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^{o}C	Uprate 110 kV line 11.8 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-10	Complete
CP0576	Cathaleen's Fall-Corraclassy 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110 kV line 61.3 km	The need of uprating has been identified to avoid potential overloads of the line in times of high wind output from Donegal	Nov-10	Complete
CP0584	Shannonbridge-Ikerrin T 110 kV Line Uprate: Uprate line to the equivalent rating of 430 mm^2 ACSR @ 80°C and uprate all station equipment to this rating.	Uprate 110 kV line: 54 km	The need of uprating has been identified to avoid potential overloads of the line.	Sep-10	Complete
CP0590	Raffeen-Trabeg No.2 110 kV Line Uprate: Uprate line to the equivalent of 430mm^2 ACSR @ 80°C.	Uprate 110 kV line: 9.23 km	The need of uprating has been identified to avoid potential overloads of the line.	Dec-10	Complete

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0592	Aghada-Raffeen 220 kV Cable The new 220 kV circuit consisting of a section of cable and a section of overhead line. The overhead line portion of the circuit has been completed in 2006	220 kV bays: 2 220 kV cable: 7 km 220 kV line: 8 km	The increased growth in both demand and generation in the Cork area has placed a large strain on the networks in this area.	Jun-10	Complete
CP0626	Killonan-Knockraha 220 kV Line Uprate: Replace the existing conductor with a High Temperature Low Sag (GAP) conductor to achieve a higher rating.	Uprate 220 kV line: 82 km	Condition assessment identified the need for refurbishment. The line was replaced with one of a higher rating which adheres to current standards.	Dec-10	Complete
CP0175	Charleville-Killonan 110 kV Line Uprate Uprate Line to 430mm^2 ACSR @80^{o}C	Uprate 110 kV Line: 36.9km	The need for uprating has been identified to avoid potential overloads of the line. The uprating of the line has been completed and work is currently being carried out to uprate the remote ends to enable full operating capacity of the circuit.	Jun-11	Detailed Design & Construction
CP0197a	Cushaling-Thornsberry 110kV New Line Construction of a new Cushaling-Thornsberry 110 kV line as a 2nd connection to Thornsberry 110 kV station	110 kV bays: 2 110 kV line: 30 km	To improve the quality of supply to the 110 kV stations in this area by preventing low voltages and line overloads under certain contingencies. The DSO has requested a second 110 kV line to the DSO station at Thornsberry to improve the security of supply.	Sep-11	Detailed Design & Construction
CP0211	Srananagh 220 kV Station and Line: A new Srananagh 220/110 kV station connected by a new 220 kV line to Flagford 220 kV station; 110 kV work now complete	220 kV Station: 220/110 kV 250 MVA Trafo: 1 220 kV bays: 3 New Lines: 220 kV: 56 km	This development is needed to reinforce the network in the North-West area by supporting the voltage and reducing the risk of loss of supply during the winter peaks and the summer maintenance outages. It is also required to facilitate the export of renewable generation from the north west.	Dec-11	Detailed Design & Construction
CP0218	Gorman-Navan No. 3 110 kV line: A third line from Gorman 110 kV station to Navan 110 kV station will be constructed.	110 kV bays: 2 110 kV line: 4 km	To alleviate unacceptable overloads of either of the existing Gorman-Navan 110 kV lines from 2012 under certain contingencies.	Sep-11	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0246a	Tarbert-Tralee No.2 110 kV New Line A second line from Tarbert to Tralee constructed at 110 kV	110 kV bays: 2 110 kV line: 47km	This is needed to overcome 110 kV line overloads and voltage collapse in the Tralee area.	Nov-11	Detailed Design & Construction
CP0254	Cashla loop-in of the Dalton-Galway 110 kV line: Looping of the Dalton–Galway 110 kV line into the Cashla station, creating the Cashla–Dalton line and the Cashla–Galway No. 4 110 kV line. This line will then be extended out to the new Salthill 100 kV station, creating a Cashla-Salthill 110 kV line. Ref CP0543 in DSO section.	110 kV bays: 2 110 kV line: 22 km	To avoid overloading the existing Cashla-Galway 110 kV lines during certain contingencies by removing the Dalton load connection and providing an additional circuit into Galway.	Sep-11	Detailed Design & Construction
CP0265	Cullenagh - Great Island 220 kV Line Uprate Uprate line to equivalent of 600mm^2 HTLS ACSR @ 80^o C	Uprate 220kV Line 23 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Oct-12	Detailed Design & Construction
CP0292a	Gorman-Meath Hill 110 kV New Line A new110 kV line will be constructed between Gorman and Meath Hill 110 kV stations	110 kV bays: 2 110 kV line: 30 km	The DSO has requested a second connection to Meath Hill 110 kV station.	Dec-11	Detailed Design & Construction
CP0374a	Arva-Shankill No.2 110 kV New Line A new 110 kV line constructed between Arva and Shankill 110 kV stations.	110 kV bays: 2 110 kV line: 20 km	To alleviate unacceptable overloads of a number of 110 kV lines in the area for certain contingency conditions. This reinforcement is associated with generation connection.	Dec-11	Detailed Design & Construction
CP0371	Ballydine - Doon 110 kV Line Uprate (inc of Ballydine busbar) (11.4km) Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV line: 11.4 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Oct-12	Detailed Design & Construction
CP0406a	Cashla-Cloon 110kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @80^{o}C	Uprate 110 kV line: 23 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Jun-11	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0421	Binbane-Letterkenny 110 kV New Line (Donegal Reinforcement) A new 110 kV line between the existing Binbane and Letterkenny 110 kV stations in County Donegal; this new line is looped into a new 110 kV switching station, Tievebrack, east of Glenties to facilitate DSO connection to Ardnagappary.	110 kV bays: 4 110 kV line: 65 km	The DSO has requested a second 110 kV connection to Binbane. The Binbane-Letterkenny line meets the DSO's needs while facilitating generation exports from Donegal during low demand periods and meeting the increasing electricity demand in the area.	Oct-13	Detailed Design & Construction
CP0467a	Louth 220kV Station - Reactive Compensation Installation of a 30 Mvar re-deployable capacitor unit at the 110 kV busbar in Louth station.	Louth 110 kV Bays: 1 Caps: 1x30 Mvar	To resolve temporary and long term voltage problems in the north east.	Jun-10	Detailed Design & Construction
CP0511	Killonan 220kV Station Installation of a 4th 220/110 kV Transformer. The unit will have a rating of 250 MVA.	220/110 kV 250 MVA Trafo: 1	Required to avoid overloading the existing 63 MVA transformers when the 125MVA transformer is out of service and one of the remaining 63 MVA transformers trips.	Jun-11	Detailed Design & Construction
CP0513	Carrickmines 220kV Station Installation of a 3rd 250MVA 220/110kV Transformer	220/110 250 MVA Trafo: 1 110 kV bays: 1 220 kV bays: 1	Necessary to avoid unacceptable voltage levels in the area when one transformers is out of service and the subsequent loss of the second transformer.	Oct-11	Detailed Design & Construction
CP0514	Ardnacrusha 110 kV Station Reactive Compensation Installation of a new 30 Mvar capacitor at Ardnacrusha110 kV Station.	110 kV bays: 1 Caps.: 1 x 30 Mvar	To ensure that voltages in the Ardnacrusha area continue to comply with standards.	Jun-11	Detailed Design & Construction
CP0523	Inchicore 220kV Station - 4th 250MVA 220/110kV Transformer Connection of a new 250 MVA, 220/110 kV double wound transformer (T2103) in Inchicore 220 kV station; extension of the existing GIS 220 kV busbar and building; installation of a new 220 kV transformer bay, line bay and coupler.	220 kV bays: 3 220/110 250 MVA Trafo: 1	This will maintain security of supply and alleviate existing 220 kV short circuit problems.	Jun-11	Detailed Design & Construction
CP0529	New Capacitor at Thurles One new 15 Mvar Capacitor at Thurles 110 kV station	110 kV bays: 1 Caps.: 1 x 15 Mvar	To ensure that voltages in the Thurles area continue to comply with the TPC and to minimise voltage drop violations.	Oct-12	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0537	Limerick-Moneteen 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110 kV line 6.4 km	The need of uprating has been identified to avoid potential overloads of the line.	Aug-11	Detailed Design & Construction
CP0551	Cahir-Doon 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110 kV line 16 km	The need of uprating has been identified to avoid potential overloads of the line.	Jun-11	Detailed Design & Construction
CP0552	Athlone-Shannonbridge 110 kV Line Uprate Uprate line to equivalent rating of 430mm^2 ACSR @80^{o}C	Uprate 110 kV line: 21 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-11	Detailed Design & Construction
CP0575	Corraclassy-Gortawee 110 kV Line Uprate Refurbishment and full uprating of the Corraclassy - Gortawee 110 kV line to an equivalent of 430 mm^2 ACSR @ 80 ºC.	Uprate 110 kV line 10.9 km	A condition assessment of the Corraclassy – Gortawee 110 kV line was carried out and showed the requirement to replace the conductor. The need for uprating has been identified to avoid potential overloads on this line in times of high wind output from Donegal Line Work now complete, Awaiting bay conductor uprate.	Mar-11	Detailed Design & Construction
CP0586	Knockraha 220 kV Station Installation of a 3rd 250MVA 220/110kV transformer	220/110 kV trafo: 1 220 kV bay: 1 110 kV bays: 1 110 kV cable:1	Two new CCGTs in Cork drive the need for additional transformer capacity in Knockraha 220 kV station.	Jun-11	Detailed Design & Construction
CP0593	Aghada 220 kV AIS Station Replacement and upgrading of existing station	220 kV Station	The increased growth in both demand and generation is placing a large strain on the networks in this area. The condition of the plant and apparatus due to age is also a factor.	Aug-11	Detailed Design & Construction
CP0594	New Capacitors at Mullingar Two new 15 Mvar capacitors at Mullingar 110 kV station	110 kV bays: 2 Caps: 2 x 15 Mvar	To ensure that voltages in the Mullingar area continue to comply with the TPC and to cater for increasing demand.	Oct-12	Detailed Design & Construction
CP0618	New Capacitors at Lisdrum Installation of two 15 Mvar fixed capacitor units at Lisdrum 110 kV station.	110 kV bays:2 Caps: 2x15 Mvar	To resolve the temporary and long term voltage problems in the north east.	**Apr-11**	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0587	Glanagow-Raffeen 220 kV Underground Cable Circuit A new 220 kV circuit consisting of a section of cable and a section of overhead line.	220 kV Cables Underground: 4 km Undersea: 4.5 km 220 kV bays: 2	This is necessary to facilitate the export of generation from the Cork harbour area.	Jul-11	Detailed Design & Construction
CP0620	Arva-Gortawee 110 kV Line Uprate Refurbishment and full uprating of the Arva - Gortawee 110 kV line to an equivalent of 430 mm^2 ACSR @ 80 ºC.	Uprate 110 kV line: 30.6 km	A condition assessment of the Arva-Gortawee 110kV line was carried out in 2008. The need for refurbishment was identified by this assessment while system studies indicated the need to uprate to avoid unacceptable overloading.	Jun-11	Detailed Design & Construction
CP0517	Coolroe - Kilbarry 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80 ^{o} C	Uprate 110kV Line 14.5km	The need of uprating has been identified to avoid potential overloads of the line.	Dec-12	Detailed Design & Construction
CP0518	Coolroe - Inniscarra line uprate (inc Innicscarra busbar) Uprate line to equivalent of 430mm^2 ACSR @ 80 ^{o} C	Uprate 110kV Line 2.74 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-11	Detailed Design & Construction
CP0559	Butlerstown - Killoteran line uprate (inc of busbars) Uprate line to equivalent of 430mm^2 ACSR @ 80 ^{o} C	Uprate 110kV Line 2.7 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-12	Detailed Design & Construction
CP0560	Cullenagh - Waterford 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80 ^{o} C	Uprate 110kV Line 12.5 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-12	Detailed Design & Construction
CP0637D	Portlaoise busbar uprate-Athy Carlow Line Works Busbars, sectionalisers and disconnectors to be uprated.	110kV Station: BB uprate: 1	The need of uprating has been identified to enable development of the network.	Oct-11	Detailed Design & Construction
CP0656	Arklow - Crane 110 kV Line Uprate incl busbars in Arklow & Crane Uprate line to equivalent of 430mm^2 ACSR @ 80 ^{o} C	Uprate 110kV Line 41.8km	The need of uprating has been identified to avoid potential overloads of the line.	Aug-11	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0659	Arva - Navan 110 kV Line Uprate & Line Works Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV Line 65.5km	The need of uprating has been identified to avoid potential overloads of the line.	Jul-11	Detailed Design & Construction
CP0667	Inchicore - Maynooth 1 & 2 220kV Line (double cct)- Uprate with HTLS	Uprate 220kV Line 2x19 km	The need of uprating has been identified to avoid potential overloads of the line.	Dec-12	Detailed Design & Construction
CP0687	Dunmanway - Macroom 110kV Refurbishment New line equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV Line 26.2 km	Condition Assessment indicates requirement for line refurbishment. Existing line to be upgraded according to current policy	Oct-11	Detailed Design & Construction
CP0689	Ennis 110kV station - Busbar Uprate	110kV Station: Busbar uprate: 1	The need of uprating has been identified to enable development of the network	Oct-12	Detailed Design & Construction
CP0694	Athlone 110kV Busbar Uprate	110kV Station: Busbar uprate: 1	The need of uprating has been identified to enable development of the network	Dec-11	Detailed Design & Construction
CP0696	Marina - Trabeg 1 110kV Cable Uprate	110kV Cable uprate 3.3km	The need of uprating has been identified to avoid potential overloads of the line.	Dec-12	Detailed Design & Construction
CP0698	Prospect - Tarbert 220kV Line Uprate (7.7km)	Uprate 220kV line 7.7 km	The need of uprating has been identified to avoid potential overloads of the line.	Dec-12	Detailed Design & Construction
CP0701	Cullenagh - Dungarvan 110 kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV line 34.32 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-13	Detailed Design & Construction
CP0702	Butlerstown - Cullenagh 110kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV line 11.55 km	The need of uprating has been identified to avoid potential overloads of the line.	Oct-13	Detailed Design & Construction
CP0660	Cashla-Ennis 110 kV Line Uprate Uprate Line to equivalent of 430mm^2@80^o C	Uprate 110 kV Line 54.3 km	The need of uprating has been identified to avoid potential overloads of the line.	Jul-11	Detailed Design & Construction
CP0466a & CP0469	North-South 400 kV Interconnection Development A new 400 kV line constructed between the existing Woodland 400 kV station, in south east Co. Meath and Turleenan in Co. Tyrone,	Woodland 400 kV Bay: 1 400 kV line: 140 km	To increase transfer capacity between the two systems in both directions and avoid situations where a single event could lead to system separation. Also to provide network reinforcement in the north east.	Dec-14	Public Planning Process (see page 107)

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0399	Moneypoint-Tarbert 220 kV New Cable A new submarine cable constructed across the Shannon Estuary from Moneypoint in Co. Clare to a new 220 kV station west of Tarbert in north Co. Kerry; installation of a new 400/220 kV transformer in Moneypoint.	400 kV bays: 1 220 kV bays: 1 500 MVA Trafo: 1 220 kV cable: 10 km	To provide an alternative route for power into and out of the south west as well as an additional link between the 400 kV and 220 kV networks.	Jul-13	Public Planning Process
CP0682	Woodland 400 kV Station - 2nd 400/220 500MVA Trafo	400kV Station:1 500MVA Trafo:1	Required deep reinforcement for East-West Interconnector.	Jul-12	Public Planning process
CP0683	Dunstown 400kV Station - 2nd 400/220 500MVA Trafo	400kV Station:1 500MVA Trafo:1	Required deep reinforcement for East-West Interconnector.	Dec-12	Public Planning process
CP0647	Tarbert Redevelopment Project New 220/110 kV station to the west of the existing Tarbert Station. All existing 110 kV circuits connected into Tarbert 220 kV station will be diverted to this new station.	220/110 kV Station:1 220/110 kV Trafos: 3 220 kV Bays: 12 110 kV Bays:12	Required to accommodate planned generation in the south west and the refurbishment of the existing Tarbert 220 kV station. The new 110 kV part of the station will allow for the existing Tarbert 110 kV equipment to be removed for a cleanup of lines in the area. Also the route access into Tarbert is restricted, the new station will improve this.	Jul-13	Public Planning Process
CP0501	Clashavoon-Dunmanway 110 kV New Line Construction of a new 110 kV line from Clashavoon to Dunmanway station and associated stations works.	110kV line: 35 km 110 kV bays: 2	The construction of a Clashavoon - Dunmanway 110 kV line will improve security of supply for west Cork and facilitate renewable generation.	Mar-14	Outline Design or EIA
CP0580	Carrickmines 220 kV GIS Development Replacement of existing air-insulated switchgear with gas-insulated switchgear (GIS); Installation of a new 4th 220/110 kV transformer.	220 kV substation:1 220 kV bays: 1 220/110 kV 250MVA Trafo: 1	The requirement to change the switchgear is due to the assets' condition and expansion needs. The 4th 220/110 kV 250 MVA transformer is necessary to avoid unacceptable low voltage levels in the area when one transformer is out for maintenance and a fault occurs on a second transformer.	Dec-12	Outline Design or EIA

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0585	Laois /Kilkenny Reinforcement New Station & Associated Lines & Station Works New 400/110 kV transmission station in Co. Laois. The station will be looped into the existing Dunstown-Moneypoint 400 kV line and Carlow-Portlaoise 110 kV line. A new 110 kV circuit from the new station to Kilkenny using the existing Ballyragget-Kilkenny 38 kV line which is built to 110 kV standards. A new 110/38 kV station at Ballyragget to cater for loss of the Kilkenny-Ballyragget 38 kV line. [Details to be finalised with DSO].	400 kV Station 400 kV bays: 5 400 kV busbar 110 kV Station: 110 kV bays: 7 110 kV busbar In other 110 kV stations 110 kV bays: 5 110 kV OHL: 30km	This will provide a strong injection from the 400 kV network into the 110 kV network near Portlaoise, and will significantly improve the quality and security of supply in counties Laois, Carlow and Kilkenny and provide for long term growth throughout the region.	Dec-14	Outline Design or EIA
CP0596	New 110kV Circuit To Mullingar Construction of a new 110 kV circuit to Mullingar 110 kV station from either Kinnegad or Derryiron 110 kV stations.	110 kV bays: 2 110 kV Line: 30km	Required to ensure voltage levels at Mullingar remain within standards during certain contingencies and allow for economic growth in the area.	Oct-14	Outline Design or EIA
CP0597	Reinforcement of the Ardnacrusha & Ennis Area Uprating of the Moneypoint-Tullabrack-Booltiagh-Ennis 110 kV circuit to equivalent of 430mm^2 ACSR @80^o C. Dependent on Moneypoint 400/220/110 kV GIS Development, see CP0688	Uprate 110 kV line: 53.1 km	To alleviate low voltage levels in the Ardnacrusha and Ennis areas during the summer maintenance of certain existing overhead lines in the area.	Dec-14	Outline Design or EIA
CP0674	Tralee 110 kV Station New Coupler	110 kV Coupler: 1	Required to improve security of supply in Kerry.	Aug-12	Outline Design or EIA
CP0688	Moneypoint - New 400/220/110kV GIS development	400, 220, 110kV station	Required to comply with busbar policy and security of supply standards. Also facilitate development of transmission network.	Oct-15	Outline Design or EIA
CP0699	Cathaleen's Fall - Srananagh 1 110kV Line Uprate Uprate line to equivalent of 430mm^2 ACSR @ 80^o C	Uprate 110kV Line 52.7 km 110 kV Bay : 1	The need of uprating has been identified to avoid potential overloads of the line.	Oct-12	Outline Design or EIA

CP No.	Project Title & Description	Major New Equipment	Project Justification	ECD	Phase
CP0709	Dunmanway 110kV Station Upgrade	100kV Station: Trafo Bay: 1 BB/coupler: 1	Required to comply with busbar policy and security of supply standards. Also facilitate development of transmission network.	Dec-14	Outline Design or EIA
CP0707	Barrymore 110kV station extension - Loop into Cahir - Knockraha 110kV line	New Lines: 110kV: 0.3 km	DSO has requested connection of of 2nd 110/38 kV transformer. This drives need for full 4 bay looped in station to comply with transmission standards.	Jun-13	Outline Design or EIA
CP0619	New Capacitors at Shankill Installation of 15 Mvar and 30 Mvar re-deployable capacitor units at Shankill 110 kV station	110 kV bays:2 Caps: 1x15 Mvar 1x 30 Mvar	To resolve the temporary and long term voltage problems in the north east.	On Hold	Outline Design or EIA

4.2 Demand Customer and DSO Connections

Most demand connections to the transmission system are sought by the Distribution System Operator which applies for new station connections. Table 4-3 lists the development projects that relate directly to the connection of new TSO/DSO interface stations to the grid, or to changes in existing connection arrangements.

The DSO has further development plans which are at various stages of preparation, several at an advanced stage; more details are given in Section 5. EirGrid is co-operating with the DSO on these expansion plans in order to bring them forward to project initiation when required. EirGrid will initiate the necessary transmission connections when formal notifications from the DSO to proceed are received.

Table 4-3 DSO Connection Projects

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0489	Castlebar 110 kV Station - New 110 kV Line bay for Carrowbeg Carrowbeg is the name for a new 110 kV station near Westport, Co. Mayo, tail fed from Castlebar. Installation of 110 kV equipment in an existing line bay in Castlebar 110 kV station. It is proposed that the new station will supply 1 MVA of new load and accommodate the transfer of 22 MW from Castlebar.	110 kV bay: 1	Jun-10	Complete
CP0535	College Park 110 kV Station - 3rd Transformer bay Connect 1 X 20 MVA, 110/10 kV transformer (T103) in College Park 110 kV station. It is proposed that the new transformer will enable College Park 110 kV station to accommodate an increase in MIC of 24 MVA.	110 kV bay: 1	Mar-10	Complete
CP0628	Doon 110 kV Station New Transformer Bay.	110 kV Trafo bay: 1	Dec-10	Complete
CP0631	Waterford 110 kV Station - Uprate 2 bays to 63 MVA Replace the existing 2x31.5 MVA Transformers at Waterford 110 kV station with 2 x 63 MVA units.	110 kV Trafo bay: 2	Sep-10	Complete
CP0173b	Banoge 110 kV New Connection The existing Arklow-Crane 110 kV line looped into Banoge 110 kV station, creating new Arklow-Banoge and Banoge-Crane 110 kV lines. This station has already been built and is awaiting connection.	110 kV station 110 kV bays: 4 110 kV line: 6 km	Jun-11	Detailed Design & Construction
CP0201a	Athy 110 kV Station The existing Carlow-Portlaoise 110 kV line looped into a new Athy 110 kV station, creating new Athy-Portlaoise and Athy-Carlow 110 kV lines. Station is complete and energised, but is tee'd on to Carlow-Portlaoise 110 kV line. A further outage is required in 2010 to loop this new station into the existing circuit.	110 kV station 110 kV bays: 5 110 kV line: 18 km	Dec-11	Detailed Design & Construction
CP0507	Arklow 220/110 kV Station – New 2x20 MVA DSO Transformers (T2101/T2102) to be installed to accommodate growing load in the area.	110 kV bays: 2	Mar-11	Detailed Design & Construction
CP0543	Salthill 110kV Station - New Station New looped 110 kV station will be built on site of existing Salthill 38 kV station. Salthill will be connected to Galway 110 kV station and to Cashla by re-directing the proposed Cashla-Galway 110 kV No.4 line to Salthill, which will become Cashla-Salthill 110 kV. This project also incorporates a bay in Salthill for the DSO connection to Screeb.	110 kV line bays: 5 110 kV trafo bays: 3 110 kV cable: 12 km	Oct-11	Detailed Design & Construction

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0630	Carlow 110 kV Station - Uprate 2 bays to 63 MVA Replace the existing 2x31.5 MVA Transformers at Carlow 110 kV station with 2 x 63 MVA units	110 kV Trafo Bay: 2	Jul-11	Detailed Design & Construction
CP0646	Finglas 110 kV Station New 35 bay 110 kV GIS Station to replace existing 110 kV AIS.	110 kV Station Bays: 35	Dec-14	Public Planning Process
CP0437a	North Dublin 220kV Project - New 220kV Station A new 220 kV station in the Balgriffin area and associated networks. The development is part of a wider TSO/DSO agreed reinforcement strategy to enhance the network in the northern fringe of Dublin city. The station will be tail fed from Finglas 220 kV using cable and constructed with GIS. The process of acquisition of a new site for this project is currently underway.	220 kV Station (GIS):1 220/110 kV 250 MVA Trafo: 1 220 kV bays : 1 In other stations 220 kV bays: 1 220 kV cable; 15 km	Dec-14	Outline Design or EIA
CP0506	Finnstown 220kV Project (Adamstown) - New 220kV Station Finnstown 220 kV station, south of Lucan, a new 220 kV station looped into the Inchicore-Maynooth No. 1 and No.2 220 kV lines. The station will be initially a single transformer 220 kV station, but allow final development for a four transformer station. Due to space restrictions on potential sites an entirely GIS station is proposed.	220 kV GIS station Trafo bay: 4 Line/cable bays : 4 Coupler bay: 3 220/110 kV 250 MVA Trafo: 1 110 kV GIS Station Double busbar: 1 Trafo bay: 4 Line/cable/MV trafo bays: 8 GIS coupler bay: 3	Mar-14	Outline Design or EIA
CP0644	Bracklone 110 kV Station and Loop In New 110 kV station to be looped into Portlaoise-Newbridge 110 kV line. Replaces existing Portarlington 38 kV Station.	110 kV station line bays: 2 Trafo Bays: 2	Dec-12	Outline Design or EIA
CP0649	Drumline 110 kV Station Works Two 20 MVA Transformers supplying 12.2 MW New load and 11.4 MW transfered load from existing Drumline transformers.	110 KV Bays: 2	Jun-13	Outline Design or EIA
CP0627	Bandon 110 kV Station New Transformer Bay.	110 kV Trafo bay: 1	On Hold	Outline Design or EIA
CP0075	Ballycummin 110 kV New Station New station looped into the Limerick-Moneteen 110 kV line.	110 kV line bays: 5 110 kV line: 0.2 km	On Hold	Outline Design or EIA
CP0629	Monread 110 kV Station	110 kV Trafo Bay: 1	Dec-10	Cancelled

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
	New Transformer Bay Cancelled – included in Minor Capital Works instead Jan 10)			

4.3 Generator Connections

This section outlines the projects underway that relate directly to connection of generation to the transmission system or to changes in existing generation connection arrangements. Some of these connections are “contestable”, i.e. the generator has decided to build the connection assets to TSO specified standards.

The Estimated Completion Date (ECD) is EirGrid’s current best estimate of when the generation connection will be completed. It should be noted that this is dependent on progress by the applicant. The date of completion for these projects is coordinated with the IPP programme of connection.

Table 4-4 lists the generator connection projects.

Table 4-4 Generator Connection Projects

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0563	IPP62 Garvagh Connection Installation of Garvagh 110 kV bay in Corderry 110 kV station (IPP build)	Bays: 1 (located at Corderry 110 kV) Line: 7 km	Apr-10	Complete
CP0599	IPP048E Coomagearlahy Wind Farm Extension A new bay in the existing Coomagearlahy 110 kV station to facilitate an extension of the wind farm (IPP Build)	110 kV Bay: 1	Feb-10	Complete
CP0614	IPP142 Edenderry Peaker Project A new 110 kV bay at the existing Cushaling 110 kV station to connect a new 116 MW distillate generator	Bays: 1 (at Cushaling 110 kV)	Apr-10	Complete
CP0555	IPP111 Castledockrill Connection A new 110 kV station connected to Lodgewood station, see CP241 in Table 4-2. This will facilitate connection of DSO windfarm. (IPP Build).	110 kV station 110 kV bays: 2 110 kV Cable: 6.6km	Dec-10	Complete
CP0479a	IPP055 Athea Phase 1 Connection A new Athea 110 kV station connected to the existing Trien 110 kV station for the connection of Athea Windfarm (IPP Build).	110 kV GIS Station Bays: 7 (inc. 1 bay at Trien 110 kV) Line : 13km (to Dromada)	Jun-12	Detailed Design & Construction
CP0595	Glanagow 220 kV Station A new 220 kV GIS station for the connection of a new CCGT plant. (Already generating, with temporary connection via AIS station)	New 220 kV Station:1	Jul-11	Detailed Design & Construction
CP0500	North Kerry Project A new 220 kV station looped into the existing Clashavoon-Tarbert 220 kV line. The work includes connection works for Athea, Dromada and Cloghboola windfarms	220 kV Station:1 250MVA Trafo: 1 Bays: 2 110 kV Station:1 Bays: 5 Line: 15.2 km	Apr-14	Outline Design or EIA
CP0603	IPP088 Mulreavy Connection Connection of a new 110 kV station for connection of new windfarm.	110 kV Station:1 110 kV Bays: 5 110 kV Line: 7.7 km	Jan-12	Outline Design or EIA

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0608	IPP119 Cloghboola Wind Farm Connection of a new windfarm into the existing Trien 110 kV station.	110 kV Station Bays : 3 Line: 13 km Trien 110 kV Bays: 1	Apr-14	Outline Design or EIA
CP0615	Glenree 110kV Station Connection of a new 110 kV station, looped into the existing Cunghill-Moy 110 kV line. This station will facilitate the connection of new DSO windfarms.	110 kV Station Bays: 3 Sectionaliser: 1 Line: 1.4km (2 x 0.7km)	Sep-11	Outline Design or EIA
CP0648	Garrow 110 kV Station Extension Works for a new 110 kV transformer bay for the provision of renewable energy.	110 kV station 110 kV Line Bays: 3 110 kV Trafo Bay: 1 110 kV Coupler 1 110 kV busbar extension	Aug-11	Outline Design or EIA
CP0650	Millstreet 220/110 kV station New 220/110 kV station looped into the existing Clashavoon-Tarbert 220 kV line for the connection of wind farms.	220/110 kV Station 220/110 kV Trafo: 1 220 kV Bays: 2 110 kV Bays: 1	Aug-14	Outline Design or EIA
CP0651	East Kerry & North West Cork 220 kV Station A new 220 kV station looped into the existing Clashavoon-Tarbert 220 kV line for the connection of wind farms. Two new 110 kV lines will be constructed, one to Glenlaraand the other to the planned Cordal station in Co. Kerry. Knockacummer connection into Glenlara is also part of this project.	220/110 kV Station 220/110 kV Trafo: 1 220 kV Bays: 2 110 kV Bays: 2	Jan-14	Outline Design or EIA
CP0602	IPP044 Keelderry Wind Farm Connection of a new windfarm to a new station, looped into the existing Agannygal-Derrybrien 110 kV line.	110 kV Station: 1 Bays: 3	On Hold	Outline Design or EIA
CP0641	IPP118 Nore Power Station Extension works in the existing Kilkenny station for the connection of a new OCGT.	110 kV station 110 kV busbar extension 110 kV Cable Bay (at Kilkenny)	On Hold	Outline Design or EIA

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0669	IPP159 Cuilleen Power Shallow Connection Connection of a new OCGT into the existing Athlone 110 kV station	Athlone 110 kV station Line Bay: 1 110 kV Coupler	On Hold	Outline Design or EIA
CP0670	IPP112 Suir Power Shallow Connection Connection of a new OCGT into the existing Cahir 110 kV station	110 kV Station 110 kV busbar extension 110 kV Cable Bay: 1 (at Cahir)	On Hold	Outline Design or EIA

4.4 Connection of Interconnectors

This section outlines the projects that relate directly to the connection of interconnectors to the transmission system. These are listed in Table 4-5.

Table 4-5 Interconnector Connection Projects

CP No.	Project Title & Description	Major New Equipment	ECD	Phase
CP0652	East-West Interconnector Shallow connection of East-West Interconnector into Woodland 400 kV station from new HVDC/HVAC Converter Station at Portan, near Woodland in Co. Meath	400kV bays:1 400 kV tailed converter station: 1 400 kV cable: 500 m	Sep-12	Detailed Design & Construction

4.5 Refurbishments

This section details the development projects relating to upgrading of existing transmission equipment. Table 4-6 lists the refurbishment projects that are currently in the Detailed Design and Construction Phase.

Table 4-6 Refurbishment Projects in the Detailed Design & Construction Phase.

CP No.	Project Description	ECD	Phase
CP0225d	Shannonbridge 220kV Station - Replacement of switchgear (Part 3) & Synchronisation Scheme Minor capital works to complete commissioning	Oct-10	Complete
CP0503	Tarbert T201 & T202 Protection Upgrade Protection Testing on Tarbert T2101 & T2102 found that the protection on both transformers was operating incorrectly	Jun-10	Complete
CP0570	KIlbarry-Knockraha 110 kV No.1 Line - Refurbishment - 11.9 km	Dec-10	Complete
CP0573	Gorman-Maynooth 220kV Line - Refurbishment - 42.19 km	Sep-10	Complete
CP0653	Charleville-Mallow 110 kV Line – Refurbishment 22.5 km	Oct-10	Complete
CP0671	Booltiagh-Ennis 110 kV Line – Refurbishment - 24 km	Oct-10	Complete
CP0672	Booltiagh-Moneypoint-Tullabrack 110 kV Line - Refurbishment - 29.1 km	Oct-10	Complete
CP0122g	Aughinish-Tarbert 220 kV Station Works – Busbar Protection	Oct-11	Detailed Design & Construction
CP0157	Bellacorick 110kV Station – Refurbishment Refurbishment work complete, some fencing work remains.	Dec-11	Detailed Design & Construction
CP0192c	Kilbarry 110kV Station - Refurbishment (Part 3)	Apr-11	Detailed Design & Construction
CP0228a	Marina 110kV Station - Station Replacement Replacement of the existing Marina 110 kV station with a new gas insulated (GIS) indoor station on an adjacent site within the Marina generation station grounds.	Oct-12	Detailed Design & Construction
CP0322	Protection Upgrades at major stations; Macroom 110 kV, Trabeg 110 kV, Arklow 110 kV, Cashla 220 kV, North Wall 220 kV, Poolbeg 220 kV, Knockearagh 110 kV.	Oct-12	Detailed Design & Construction

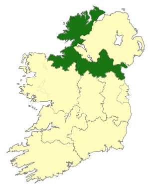
CP No.	Project Description	ECD	Phase
CP0383	Lisdrum-Shankill 110 kV Line - Refurbishment – 39.3 km	Oct-12	Detailed Design & Construction
CP0497a-za	Power Line Carrier & Coupling Capacitor Replacement at the following stations Dunstown 400kV, Moneypoint 400kV, Woodland 400kV, Aghada 220kV, Turlough Hill 220kV, Cathaleen's Fall 110kV, Letterkenny 110kV, Lisheen 110kV, Moy 110kV, Tawnaghmore 110kV, Trien 110kV, Thurles 110kV.	Jul-11	Detailed Design & Construction
CP0536a-zj	Installation of Surge Arrestors at following stations: Knockraha 220kV, Cathaleen's Fall 110kV , Portlaoise 110kV, Cashla 220kV, Raffeen 220kV, Arva 110kV, Drybridge 110kV, Waterford 110kV, Cloon 110kV, Corraclassy 110kV, Ballydine 110kV, Binbane 110kV, Butlerstown 110kV, Charleville 110kV, Athlone 110kV, Dalton 110kV, Drumline 110kV, Flagford 220kV, Galway 110kV, Golagh 110kV, Gortawee 110kV, Kilkenny 110kV, Knockearagh 110kV, Macetown 110kV, Macroom 110kV, Midleton 110kV, Tawnaghmore 110kV, Thurles 110kV, Maynooth 220kV.	Dec-12	Detailed Design & Construction
CP0571	Limerick-Rathkeale 110 kV Line - Refurbishment – 29.11 km	Oct-12	Detailed Design & Construction
CP0591	Protection upgrade to 400 kV transformers in Woodland	May-11	Detailed Design & Construction
CP0664	Cullenagh-Knockraha 220 kV Line - Refurbishment – 86 km	Aug-11	Detailed Design & Construction
CP0665	Dunstown-Maynooth 220 kV – Part Line Refurbishment 17.56 km of 36.291 km to be refurbished	Oct-12	Detailed Design & Construction

4.6 Regional Benefits

The network is generally performing within the required standards at present. Some areas have been identified as likely to go outside such standards in the absence of network reinforcement as demand increases and/or new generation is connected. The network reinforcement projects identified in the Sections 4.1-4.5 have been designed to deal with these emerging challenges.

Because of the meshed nature of the network, developments benefit a wider area than those supplied directly by the stations reinforced. For example the proposed Arva-Shankill 110 kV No.2 line will benefit all Monaghan and Cavan, not just the towns of Cavan (Arva) and Cootehill (Shankill).

Border Region



The North-South 400 kV Interconnection Development project will increase transfer capacity between the Ireland and Northern Ireland systems in both directions and avoid situations where a single event could lead to system separation and also to provide network reinforcement in the north east of Ireland. This new circuit will

- Improve competition and economic operation by removing constraints;
- Improve security of supply by allowing sharing of generation across the island;
- Provide required flexibility for renewable generation; and
- Ensure security of supply for the north east.

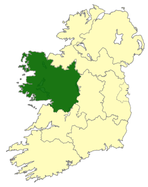
The connection of the Srananagh 220 kV station to Flagford will reinforce the grid across the north west and provide an essential route for power flows from future wind generation. The 110 kV works associated with this project are now complete.

Binbane-Letterkenny 110 kV and the connection to Ardnagappary near Bunbeg 110 kV meets the DSO's needs for a second 110 kV line into Binbane, facilitates increasing demand in north-west Donegal, and assists in exporting wind generation out of north Donegal.

The new Arva-Shankill 110 kV No.2 line deals with specific local supply issues in counties Cavan and Monaghan. Reactive compensation at Lisdrum and Louth stations are being installed to improve the voltage profile across the north east and bring the area within standards until the more permanent solution of the North-South 400 kV Interconnection Development is delivered.

Uprating Cathaleen's Fall-Corraclassy, Corraclassy-Gortawee, Arva-Gortawee and Cathaleen's Fall-Srananagh No.1 110 kV lines is part of an overall strategy to increase capacity for the large potential power flows out of Donegal.

West Region



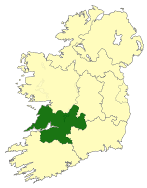
Looping the Dalton-Galway 110 kV line into Cashla and the extension of the resulting Cashla-Galway No.4 line into Shankill will provide an extra circuit into the Galway area and help avoid post fault overloads on the Cashla-Galway circuits that supply the high demand in the Galway area.

Uprating the Cashla-Cloon 110 kV line will avoid unacceptable overloading of the line during certain contingencies.

Uprating the existing Athlone-Shannonbridge 110 kV line will improve the ability of the network to move power from generation sources in the south to the north west.

EirGrid is assessing network options to evacuate large quantities of renewable generation from north Mayo.

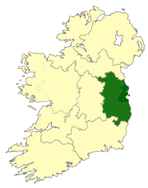
Mid-West Region



The Moneypoint-Tarbert 220 kV undersea cable will provide an additional high capacity path from the 400 kV system terminating at Moneypoint into the south west region. This will greatly enhance the reliability of service to demands in the south west. In addition it will provide much needed flexibility for the dispatch of the system generation which will improve reliability and economics for the benefit of all electricity customers.

New capacitors at Ardnacrusha and Drumline, a transformer at Moneypoint and uprating the Moneypoint-Booltiagh-Ennis 110 kV circuit will ensure that voltages in the region continue to comply with standards and permit the connection of new local loads.

Dublin & Mid-East Region



Uprating the existing Drybridge-Louth 110 kV line will reduce line loading and strengthen the reliability of supply in the area.

Gorman-Navan 110 kV n^{o} 3 will increase the reliability of supply to Navan, which will alleviate unacceptable overloads on the two existing Gorman-Navan 110 kV lines.

The uprating of Arva-Navan 110 kV line will alleviate unacceptable overloads due to certain contingencies.

Gorman-Meath Hill 110 kV will provide a second circuit to Meath Hill, giving more reliability of supply to the east Cavan area supplied by the Meath Hill station and also providing additional capacity on the corridor between Dublin and Louth.

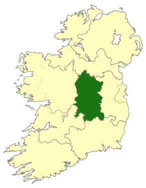
The planned 30 Mvar capacitor at Kilteel will ensure that voltages in Kildare continue to comply with voltage standards following the looping in of Kilteel station.

A number of new 220/110 kV transformers are required in the Dublin region to accommodate existing and future demand levels:

- The fifth Finglas transformer will provide essential additional capacity at this key Bulk Supply Point and will alleviate potential overloading of the existing transformers and of the Maynooth-Ryebrook 110 kV line.
- Two new transformers, the third and fourth units, are required at Carrickmines to avoid the risk of low voltages and voltage collapse in the area. Due to the assets condition and expansion needs, there is a plan to replace existing switchgear at Carrickmines with equipment using the lower foot-print GIS technology.
- A fourth transformer at Inchicore will maintain security of supply and alleviate existing 220 kV short circuit problems in south Dublin.

New 220 kV stations are required at Finnstown and North Dublin to cope with predicted demand in west and north east of Dublin, respectively.

Midland Region

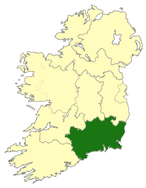


The Laois-Kilkenny Reinforcement project will provide a strong injection from the 400 kV network into the 110 kV network near Portlaoise, and will significantly improve the quality and security of supply in counties Laois, Carlow and Kilkenny.

Reactive compensation at Mullingar 110 kV station and a new circuit from Mullingar to either Kinnegad or Derryiron will ensure that voltage standards are maintained in the area supplied by the Mullingar 110 kV station.

The new Cushaling-Thornsberry 110 kV line will improve the quality of supply to the 110 kV stations in the area.

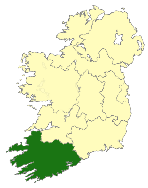
South East Region



A new 30 Mvar capacitor at Kilkenny 110 kV and a 15 Mvar capacitor at Thurles will ensure that voltages in the area continue to comply with standards.

Uprating of Cahir-Doon 110 kV will resolve overloading on the line during certain contingencies.

South West Region



Two new large generators have recently connected at Aghada and Glanagow 220 kV stations in east Cork. The recently connected Aghada-Raffeen 220 kV and a new Glanagow-Raffeen 220 kV circuit are required to provide capacity for the output from these stations. These new circuits will also ensure a reliable supply of electricity to the Cork city and harbour area.

The second Tarbert-Tralee 110 kV line will reduce line loading on the existing Tarbert-Tralee 110 kV line and strengthen reliability of supply in the area.

The Tarbert Redevelopment project is planned to replace many of the functions of the existing Tarbert station. The new station is necessary to allow for the essential expansion of transmission connections in north Kerry.

The new North Kerry, East Kerry/North West Cork and Millstreet 220/110 kV stations, looped into the existing Tarbert-Clashavoon 220 kV circuit, are necessary for facilitating the connection of large amounts of wind generation in the area..

Clashavoon-Dunmanway 110 kV line will accommodate new generation in west Cork and will improve security of supply in the area during maintenance outages of transmission equipment.

A third 220/110 kV transformer is required at Knockraha, following the connection of the two large generators in east Cork. A fourth 220/110 kV transformer is required at Killonan to avoid potential post fault overloads on the existing transformers.

Reinforcement in the Ardnacrusha & Ennis area will alleviate voltage levels in the area during the summer maintenance of certain existing lines in the area. This is to be achieved by a new 220/110 kV transformer at Moneypoint and uprating of the Moneypoint-Booltiagh-Ennis 110 kV circuit.

5 Other Potential Developments

This section covers the areas on the network that may require some form of development to start within the next five year planning period, for which a specific development project has not yet been approved or identified. These are regarded as potential developments and they are separated into the different categories as follows:

- **Expected reinforcement requirements** through analysis of the system performance based on forecasted demands and generation;
- **DSO plans for further connections** which are currently under investigation or being prepared for approval.

The two categories of potential development are discussed separately below.

5.1 Expected Reinforcement Requirements

In October 2008, EirGrid published Grid25, its strategy for the long-term development of the Transmission system. In summary, the strategy adopted is to achieve a balance between costs and the impact of new infrastructure through maximising the capability of the existing grid and where new high capacity infrastructure is required, building it mainly at the 400 kV voltage. Following a recent review of Grid25, EirGrid estimates that between now and 2025 over 2,500 km of the existing network will have to be upgraded and in the order of 1,200 km of new infrastructure will have to be built to meet the needs of consumers and, both renewable and conventional generators.

Detailed studies are being carried out to identify network solutions which will be brought forward in the planning process and ultimately to construction. Some Grid25 reinforcement projects have been identified and are included in Section 4 of this Development Plan. The map in Figure A4 in Appendix A illustrates those areas of the grid that need development in addition to the development projects described in Section 4.

The following is a summary list of development requirements for each region, including both those identified and being studied. These are based on meeting the network needs outlined in Section 3 and illustrated in the map in Figure 3.1.

5.1.1 Reinforcement of the Grid in the Border Region

There are a number of issues that need to be addressed in the long-term strategic development of the electricity transmission infrastructure in the Border Region of the Republic of Ireland. These issues arise due to:

- The advent of significant amounts of new generation, in particular generation from renewable sources, that is expected to materialise throughout both the Border Region itself and the West Region; and
- Security of supply in the region.

Generation

A substantial number of new electricity generators are proposing to locate in the Border Region, particularly in the counties of Donegal and Sligo. Each of these generators is seeking to connect to the electricity grid. These generators comprise mainly renewable generation sources such as wind farms. The electricity transmission infrastructure will be required to be strengthened in order to transport the power produced from these new sources to areas of higher electricity demand. This will result in the requirement to both upgrade some of the existing infrastructure and build new extra-high voltage electricity transmission infrastructure in the region, as the existing infrastructure is nearly at full capacity.

EirGrid is currently working with the electricity utilities in Northern Ireland in a joint project called Renewables Integration Development Project (RIDP) to identify the most optimal solution for the network to cater for renewable generation in the north west of the island (i.e. Donegal and the west of Northern Ireland).

The substantial number of new generator connections being sought in the West Region may also have an impact on the Border Region. The excess generation will need to be transported to areas of higher demand principally on the east coast, and may have to cross through some of the counties of the Border Region.

Security of Supply

Growth in demand for electricity in the Border Region (following recovery from the present economic downturn and consequent temporary reduction in demand) may place pressure on the transmission infrastructure requiring upgrading of the transmission grid to ensure quality and security of supply to local homes and businesses.

5.1.2 Reinforcement of the Grid in the West Region

The issues that need to be addressed in the long-term strategic development of the electricity transmission infrastructure of the West Region include the following:

- The advent of significant amounts of generation, in particular generation from renewable sources, that is expected to materialise throughout the West Region; and
- General demand growth in the area.

A substantial number of new electricity generators are proposing to locate in the West Region, and each of these generators is seeking to connect to the electricity grid. These generators comprise mainly renewable generation sources such as wind farms, biomass plants and ocean-based generation technologies, along with conventional gas and distillate fired power stations. The electricity transmission infrastructure will be required to transport the power produced from these new sources to areas of higher electricity demand. This will result in the requirement to build new extra-high voltage electricity transmission infrastructure in the region, the main new corridors being as follows:

- New electricity transmission infrastructure will be required from the north Mayo area towards either the east or south of the West Region. It is likely that this infrastructure will then continue on into different regions.
- New electricity transmission infrastructure will also be required from west Co. Galway eastwards towards Galway city.

The connection of these new generators will also result in the requirement to upgrade many parts of the existing transmission network in order for it to be able to carry more electricity.

General demand growth in the area will also result in the requirement to both upgrade the existing network and build new 110 kV transmission lines. For example there is a recognised need to reinforce the network in the Mayo area to secure demand.

EirGrid will analyse the requirement to provide infrastructure for transporting the excess generation out of the area, while at the same time looking at the requirement to secure local demand, and propose optimised solutions for both.

5.1.3 Reinforcement of the Grid in the Mid West Region

There are three areas which have been identified as requiring reinforcement in the Mid West regional authority area over the next few years. Further reinforcements may be identified as part of changing generation and demand patterns and these will be progressed as appropriate.

Moneypoint-Tarbert Reinforcement

Reinforcement of the planned circuit between Moneypoint and Tarbert is required to facilitate power flows in the mid west and south west of the country. This reinforcement is part of the evolving developments required to enable renewable and conventional generation to be transmitted to the load centres. This provides increased security and availability for consumers and will reinforce the existing transmission networks particularly the 220kV system (Moneypoint - Prospect - Cashla 220kV circuit). The additional reinforcement gives flexibility for meeting the power requirements of the region.

Clare & Limerick Reinforcement

The existing networks which extend from an area between Ennis and Limerick require further reinforcement to ensure the system will continue to comply with EirGrid's TPC. A number of solutions are presently being examined which resolve the identified future problems. These solutions will be brought to the relevant planning authorities at the appropriate time.

Tipperary Area Reinforcement

Further reinforcement of the existing networks in the Tipperary area will be required to facilitate the connection of renewable energy projects which have applied for connection to the electricity networks as part of the connection offer process known as Gate 3. The actual reinforcements and connection methods will be identified within the next two years as part of the Gate 3 connection process and projects will be progressed to the planning authorities at that stage.

5.1.4 Reinforcement of the Grid in the Dublin and Mid East Region

The Greater Dublin area is the most significant electricity demand centre in the national context and as such, a large concentration of transmission lines are located in the area which includes existing and proposed 110 kV, 220 kV and 400 kV lines and stations.

The Dublin 220 kV system consists of four primary bulk supply points, comprising the Carrickmines, Finglas, Inchicore and Poolbeg 220/110 kV stations. The plans outlined in Section 4 include increased transformer capacity at Carrickmines, Finglas and Inchicore stations. EirGrid and ESB Networks are working together to provide additional transformer capacity at Carrickmines and Inchicore 220 kV stations.

In relation to the Dublin networks, EirGrid, in conjunction with the DSO, has identified the need for two new 220/110 kV in-feed stations in the north and west of Dublin. New stations are planned in the areas of Finnstown in the west and Balgriffin to the north, to accommodate demand growth and to better manage existing demand levels.

It is likely that some reconfiguration of the 220 kV and the 110 kV networks and/or some reinforcement will be required in the future to meet the DSO demands and avoid network constraints in the Dublin area.

ESB has completed its HV Network Investment Plan for the Greater Dublin Area. EirGrid is reviewing this plan to evaluate the impact if any on the transmission network.

The 400 kV network provides a high capacity link between Moneypoint generation station and Galway on the west coast and Dublin on the east. EirGrid also has conceptual plans to expand its 400 kV network into Greater Dublin. This could be by the alteration of existing routes and equipment or with new overhead line or cable routes entirely. Additional transformer capacity is planned at two existing 400 kV stations: at Woodland near Dunshaughlin, Co. Meath and at Dunstown, Co. Kildare. Timescales for these works are under review and could be expected to begin in the period of this TDP.

5.1.5 Reinforcement of the Grid in the Midlands Region

In the short term, the transmission reinforcement projects in the Midlands region are driven by the need to increase the security and quality of supply to key parts of the network. This is the case with the construction of new 110kV circuits between Thornsberry and Cushaling, and the reinforcement of Mullingar. The establishment of a 400/110kV substation in the Laois area is required to support the 110kV networks and provide the requisite level of security of supply in Laois, Carlow and Kilkenny.

Longer term reinforcements are associated with the integration of new wind generation that is associated with meeting the commitment of providing 40% of the Republic of Ireland’s demand from renewable sources. Wind generation connecting locally needs to be integrated while the capacity to sustain power transfers between wind generation in the west and the main load centre of Dublin in the east needs to be created.

5.1.6 Reinforcement of the Grid in the South East Region

There are a number of issues that need to be addressed in the long term strategic development of the transmission infrastructure in the South East Region. These issues arise due to:

- General demand growth in the region, and in neighbouring regions particularly in the greater Dublin area;
- New generation connections within the south east;
- The potential for new transmission interconnections with Great Britain and mainland Europe; and
- The advent of significant amounts of wind generation that is expected to connect to the electricity system throughout the country, particularly in the south of the country.

The transmission infrastructure is expected to come under strain both at a local and at a regional level:

- At a local level, demand growth (despite the current reduction in load) places pressure in the transmission infrastructure requiring local reinforcement. Also at a local level, there is a need to integrate new generation that is scheduled to connect to the network.

- At a regional level, a large amount of wind generation is planned to connect in the south of the country and would result in an increase in the amount of energy that would traverse the South East Region. In order to facilitate these power flows, transmission reinforcement will be required.

There is a potential for further interconnections to be constructed between the Ireland, Great Britain and Europe. Given its geographical location, the south east would be a likely area for termination of a future interconnector, which would further enforce the need for transmission development in the South East Region.

5.1.7 Reinforcement of the Grid in the South West Region

In the South West Region there are a number of issues which need to be taken into account when planning for the long-term strategic development of the electricity transmission infrastructure of the South West Region.

The demand growth in the South West region needs to be accounted for and this may lead to new electricity transmission infrastructure in local areas in the region. Local demand growth may include new industries that would like to establish or expand in the region or annual growth of the existing demand. As the demand growth varies with the economy the need for such projects will be progressed as appropriate and cannot be specifically described at one point in time.

The South West Region has seen a high level of renewable generation and conventional generation looking to connect to the electricity network. EirGrid will analyse the requirement to provide infrastructure for transporting the excess generation out of the area, while at the same time looking at the requirement to secure local demand, and propose optimised solutions for both.

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5.2 DSO Plans for Further Connections

Most demand connections to the transmission system are sought by the Distribution System Operator (DSO) which applies for new station connections. The DSO has further development plans which are at various stages of preparation, several at an advanced stage.

EirGrid is co-operating with the DSO on these expansion plans in order to bring them forward to project initiation when required. EirGrid will initiate the necessary transmission connections when the formal notifications from the DSO to proceed are received. These plans include new additional transformers for the DSO at existing transmission stations as well as new DSO 110 kV stations to be connected to the transmission grid. The DSO connection plans that are presently being prepared in conjunction with EirGrid are listed below, following receipt of formal notifications from the DSO. In some cases, where the EirGrid element of the project is minor, the DSO may have progressed its element of a project to a different stage ahead of the TSO. EirGrid is confident that it will deliver its element at a suitable time.

5.2.1 New 110 kV Stations

The DSO plans include the construction and connection of new 110 kV stations in the vicinity of:

- Athenry, Athenry, Co. Galway - 110kV/MV Substation;
- Cherrywood, Loughinstown, Co. Dublin - 110 kV/MV Substation;
- Derryolam, Carrickmacross, Co. Monaghan - 110 kV/MV Substation;
- Fosterstown, Trim, Co. Meath - 110 kV/MV Substation;
- Knockmullen, New Ross, Co. Wexford - 110 kV/MV Substation;
- Nenagh, Nenagh, Co. Tipperary - 110 kV/MV Substation[12]; and
- Reamore, Reamore, Co. Kerry - 110 kV/MV Substation.

[12] CP0138, New bay at Killonan 110 kV Station is complete, DSO work is still ongoing

5.2.2 Additional DSO Transformers

The DSO plans include connection of the following additional transformers:

- Two 110/38 kV 63 MVA transformer at Athlone 110 kV station;
- Two 110/10 kV 20 MVA transformers at Arklow 110 kV station;
- Two 110/MV 20 MVA transformers at Baroda 110 kV station;
- One 110 kV/MV 20 MVA transformer at Barrymore 110 kV station;
- Two 110/38 kV 63 MVA transformers at Binbane 110 kV station;
- One 220/110 kV 250 MVA transformer at Carrickmines 220 kV station;
- One 110/38 kV 63 MVA transformer at Castlebar 110 kV station;
- One 110/38 kV 31.5 MVA transformer at Cloon 110 kV station;
- Two 110/10 kV 20 MVA transformers at Corduff 110 kV station;
- Two 110/10 kV 20 MVA transformers at Cow Cross 110 kV station;
- One 220/110 kV 250 MVA transformer at Inchicore 220 kV station;
- One 110 kV/MV 20 MVA transformer at Midleton 110 kV station;
- One 110/38 kV 31.5 MVA transformer at Midleton 110 kV station;
- One 110/38 kV 63 MVA transformer at Mullagharlin 110 kV station;
- Two 110/20 kV 20 MVA transformers at Portlaoise 110 kV station;
- Two 110/38 kV 63 MVA transformers at Trabeg 110 kV station; and
- One 110/MV 20 MVA transformer at Wexford 110 kV station.

6 Environmental Assessments

These are prepared where it is determined that an Environmental Assessment is required by the relevant planning authority [usually a County Council or An Bord Pleanála in the case of Strategic Infrastructure projects]. In some instances, the concern may solely arise on account of concerns about the potential to affect, directly or indirectly, the integrity of a habitat or species that is protected under legislation governing the Natura 2000 network of sites of European ecological significance. Part 10 of the Planning and Development Regulations 2001 set out the specific criteria for determining when an Environmental Impact Statement (EIS) is required.

The essential content and coverage, or scope of the EIS is determined by the EIA Regulations, however the detail varies from project to project - depending on local environmental sensitivities and community concerns.

Once the scope of the EIS has been established then specialists, the majority being independent, are commissioned to prepare reports on the sensitivities and significance of the area in question. The work proceeds in two stages.

The first is a series of high-level studies which are carried out to determine the relative ranking of routes, from most to least environmentally sensitive. Ecological and visual sensitivity in combination with proximity to communities tend to be accorded the most weight at this stage of analysis. This stage often results in the identification of further routes, which are sometimes combinations of earlier routes, which are subject to further analysis. The concerns of all specialists are taken into account and the route with the least sensitivity is selected for detailed design.

The second level of assessment by specialists is based on this more detailed design - showing the exact location of the route, with the likely locations of angle masts and poles/masts shown. At this stage detailed fieldwork is carried out where sites are accessible and computer generated visualisations are prepared so that the final appearance can be evaluated. This stage often results in considerable further design review as a result of dialogue between designers, environmental specialists and stakeholders.

The final EIS is the result of many revisions of the routing and design, all carried out to anticipate and avoid as many environmental impacts as possible. Those that cannot be removed are referred to as the residual effects, which are the final sum of all unavoidable environmental effects, ie, the environmental cost of the project.

Experience has shown that consultation on environmental issues prior to the finalisation of either the specialist reports or the EIS itself provides a practical way to ensure that concerns have been met and that solutions are being proposed that are acceptable to both the technical design team and those with concern for planning or environmental matters.

Appendix A Network Maps

Figure A1 Map of the Irish Transmission System as at December 2010

Figure A2 *Map Indicating Planned Network Developments in the Detailed Design & Construction Phase*

Figure A3 *Map Indicating Planned Network Developments in the Outline Design Phase and Public Planning Process*
Note: All new developments on this map are subject to existing/on-going EIA

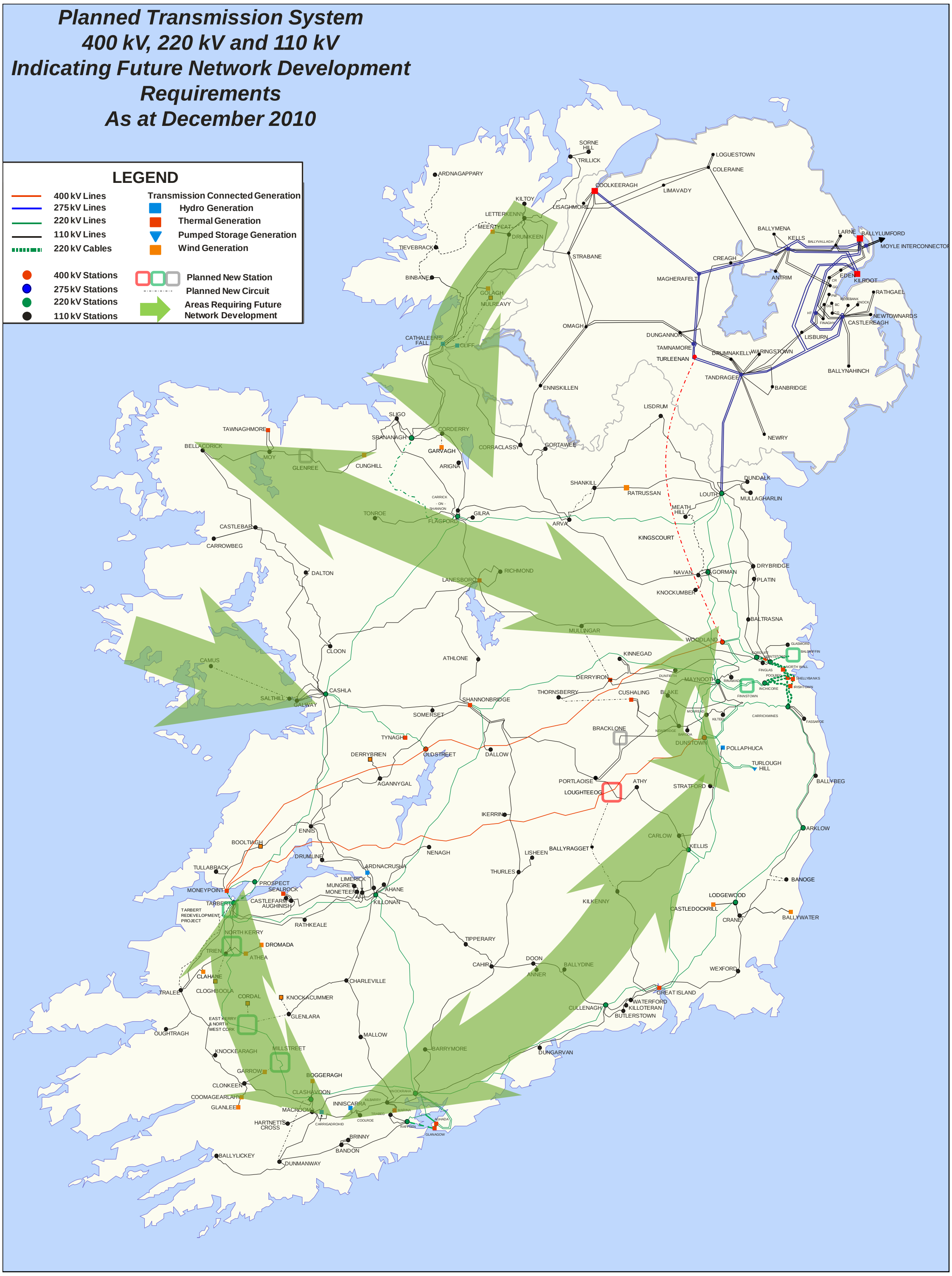

Figure A4 Map Indicating Future Network Development Requirements

Appendix B Details of Major Development Projects in the Detailed Design and Construction Phase

Details are provided in this appendix for the following major development projects:

B.1 Cushaling-Thornsberry 110 kV Line

B.2 Dalton-Galway 110 kV Line Looped Into Cashla Station

B.3 Gorman-Meath Hill 110 kV Line

B.4 Srananagh 220 kV Project

B.5 Tarbert-Tralee No. 2 110 kV Line

B.6 Arva-Shankill No. 2 110 kV Line

B.7 Gorman-Navan No.3 110 kV Line

B.8 Binbane-Letterkenny 110 kV Line

B.9 Glanagow-Raffeen 220 kV Circuit

B1 Cushaling-Thornsberry 110 kV Line (CP0197)

B.1.1 Description

This project involves construction of a 110 kV line from Thornsberry station (near Tullamore) to Cushaling station (near Edenderry), approximately 30 km in length. The project is due for completion in September 2011.

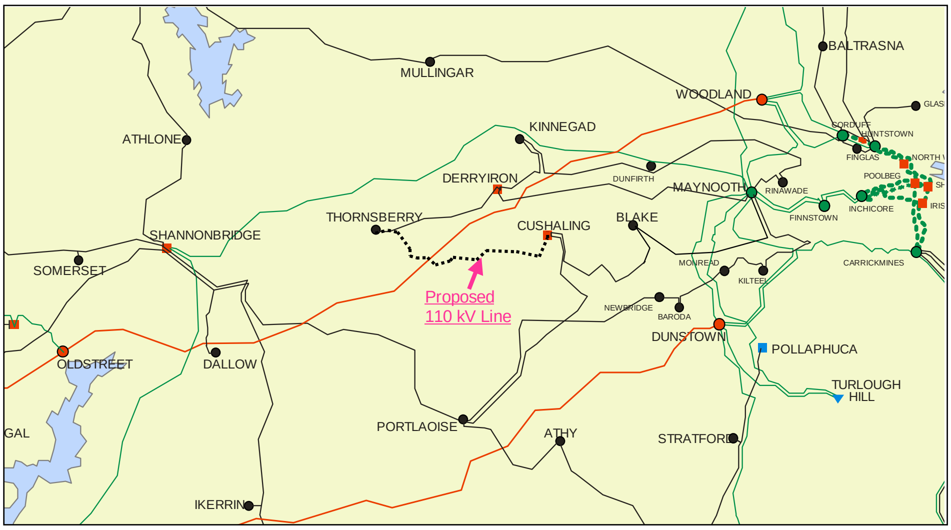

Figure B-2 Proposed Cushaling-Thornsberry 110 kV Line

B.1.2 Reason for Development

The DSO requested and accepted an offer from EirGrid to provide a second connection to the existing Thornsberry 110kV station. This will be achieved by constructing a new Cushaling-Thornsberry 110kV line. The need for this expenditure is driven by the DSO.

B2 Dalton-Galway 110 kV Line Looped Into Cashla Station (CP0254)

B.2.1 Description

There are three 110 kV circuits between Cashla 220/110 kV and Galway 110 kV stations. It is planned to loop the Dalton-Galway 110 kV line into Cashla station, thus providing a fourth 110 kV connection between Cashla and Galway. Dalton station will then be fed from Cashla instead of Galway. This project is due for completion in September 2011.

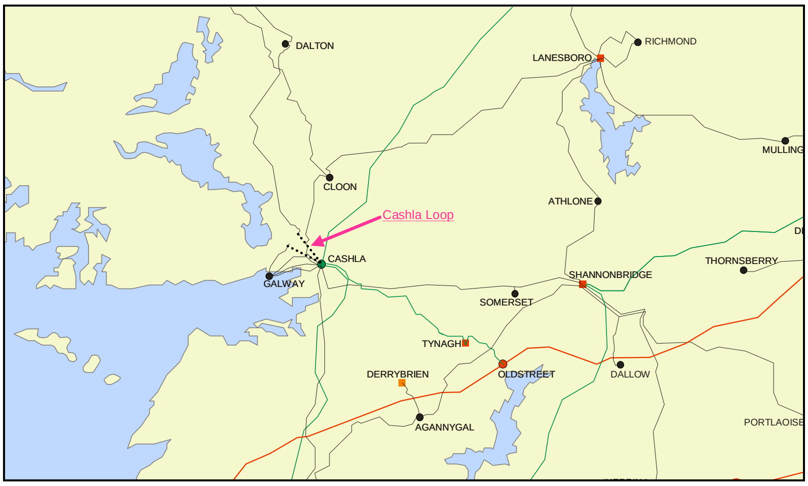

Figure B-3 – Illustration of Dalton-Galway Loop into Cashla Station

B.2.2 Reason for Dalton-Galway loop into Cashla

There are three 110 kV lines between Cashla 220 kV station and Galway 110 kV station. These 110 kV lines transfer power not only to Galway city and its surrounding area, but they also supply a significant proportion of power into Co. Mayo.

The TPC is violated under maintenance-trip conditions of the transmission network in the north west. Loss of one of the existing three Cashla–Galway 110 kV lines, during an outage at summer peak for maintenance of another, leads to overloading of the remaining Cashla-Galway 110 kV line.

This decreases the standard of supply to all customers in the Galway area. Reinforcement is therefore required to reduce the risk of potential overloads.

The looping of Dalton-Galway 110 kV into Cashla station provides for the long term needs of the transmission network in the area. It will separate the existing power transferred into Co. Mayo (via Dalton 110kV station) from Galway onto a direct feed from Cashla 220kV station. As a consequence, the load carried on Cashla-Galway 110kV lines will be reduced extending the life expectancy of this reinforcement.

B3 Gorman-Meath Hill 110 kV Line (CP0292)

B.3.1 Description

This project involves construction of a 110 kV line from Meath Hill station to Gorman 220/110 kV station, approximately 30 km in length. The project is due for completion in December 2011.

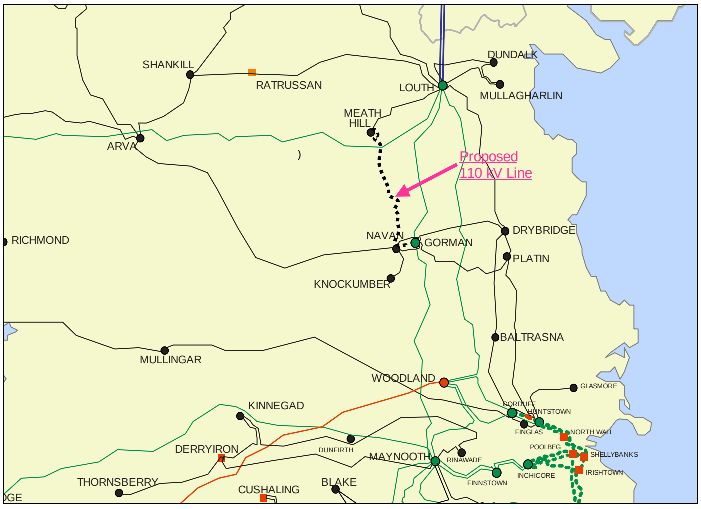

Figure B-4 Proposed Gorman–Meath Hill 110kV

B.3.2 Reason for Development

The DSO requested and accepted an offer from EirGrid to provide a 2nd connection to the existing Meath Hill 110kV station. This will be achieved by constructing a new Gorman-Meath Hill 110kV line. The need for this expenditure is driven by the DSO.

B.4 Sranangh 220 kV Project (CP0211)

B.4.1 Description

This project involves construction of a new Sranangh 220 kV station, east of Sligo town, connected to the 220 kV network by 55 km of overhead line from Flagford, near Carrick-on-Shannon, thus extending the 220 kV network into the north-west. Five 110 kV lines are connected into the new station, making Sranangh a new hub for power flows into and out of the north west. The expansion of wind generation in the north west has increased the need for network reinforcements in the area. The 110 kV sections of this project are now complete while the 220kV work is due for completion in December 2011.

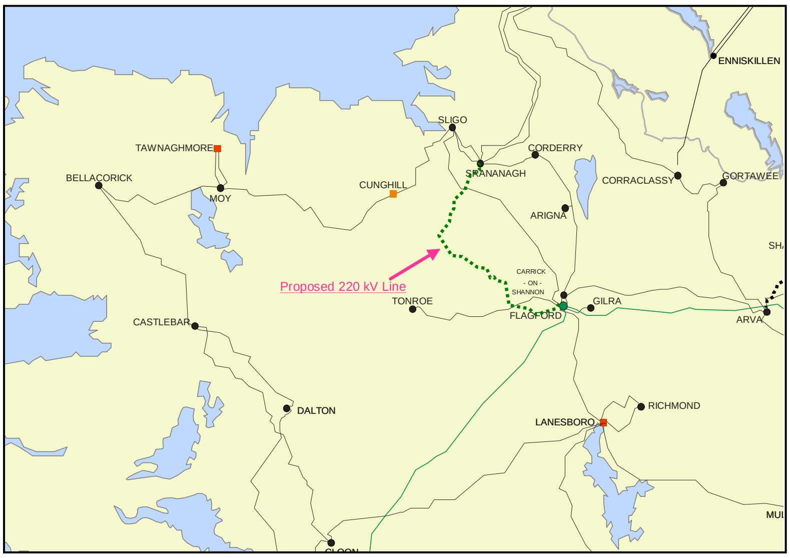

Figure B-5 New Sranangh 220 kV Station and 220 kV Lines

B.4.2 Reason for Development

From Summer 2016 onwards, studies have indicated potential violations of the TPC under maintenance-trip conditions. Loss of any one of a number of 110 kV lines during an outage for maintenance of another may lead to voltage collapse in the north west.

The Flagford-Sranangh 220 kV project is a major development which provides for the long term transmission needs in the area and provides a platform for future network development within the north west area. It also provides the network flexibility to accommodate developments envisaged by the National Development Plan and National Spatial Strategy.

B.5 Tarbert–Tralee No. 2 110 kV Development (CP0246)

B.5.1 Description

At present there are three existing 110kV lines supplying Tralee 110 kV station. This project involves a second 110 kV line from Tarbert to Tralee in Co. Kerry, approximately 47 km in length. The expected completion date is currently November 2011.

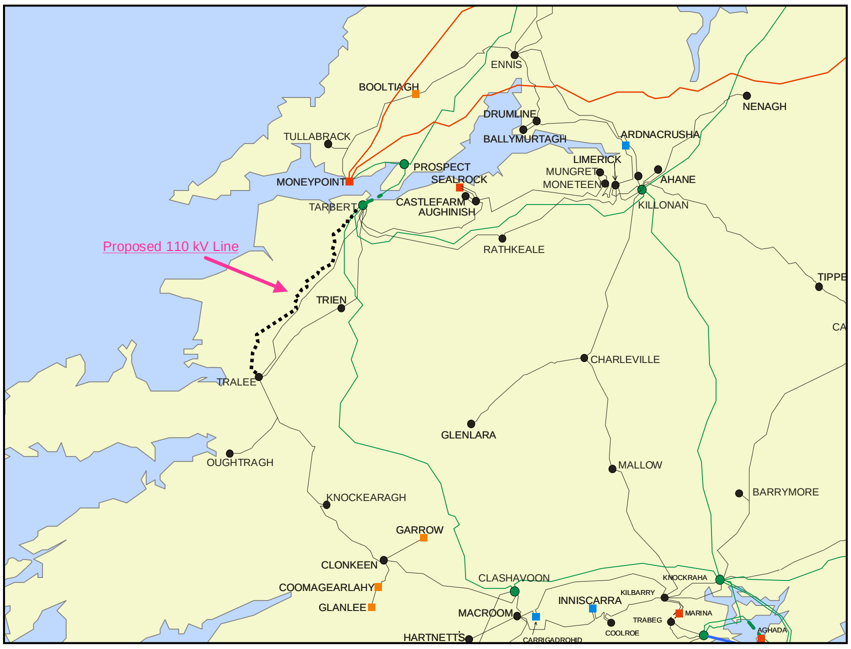

Figure B-6 Proposed new Tarbert-Tralee No.2 110 kV line

B.5.2 Reason for Development

A large amount of existing as well as planned Gate 2 and Gate 3 wind generation will be located in the south west and high overloads are particularly prevalent on the circuits between Tarbert, Tralee, Trien and Clahane 110 kV stations with faults on Tarbert-Trien 110 kV or Clahane-Tralee 110 kV being the most onerous. This issue is already pressing. This new line will help to overcome line overloads and voltage collapse in the Tralee area.

The Tarbert-Tralee No.2 110 kV line goes some way towards meeting the needs identified and is consistent with the long-term strategy for development of the transmission system in the south west. In addition this development is one of a number identified that will increase transmission capacity for generation export capability in Co. Kerry.

B6 Arva-Shankill No. 2 110 kV Line (CP0374)

B.6.1 Description

This project involves construction of a second Arva-Shankill 110kV line, approximately 20 km in length. This project is due for completion in December 2011.

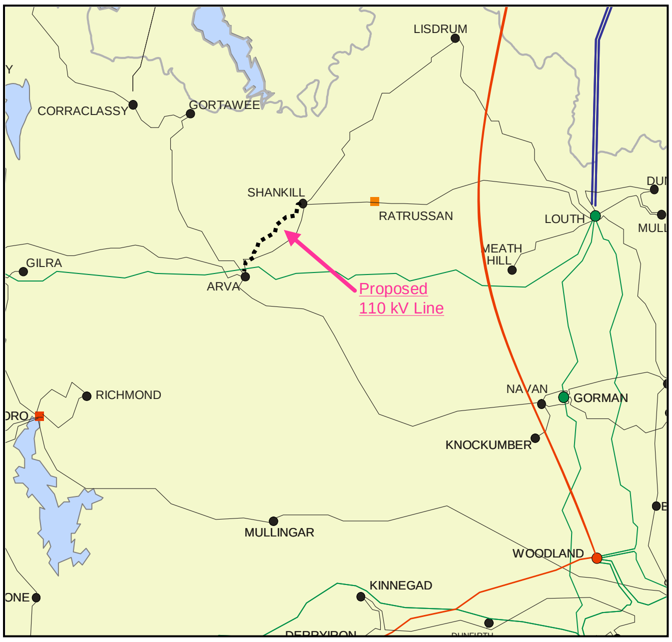

Figure B-8 Proposed Arva-Shankill No.2 110kV line

B.6.2 Reason for Development

At present, there are three 110 kV lines feeding the combined load of Lisdrum (Monaghan) and Shankill (Cavan) 110 kV stations. Studies indicate that the loss of one of the existing three 110 kV lines, during an outage at summer peak for maintenance of another, leads to overloading of the remaining 110 kV line feeding the combined Lisdrum (Monaghan) and Shankill (Cavan) stations loads. The new line will provide a fourth 110 kV line into the Shankill/Lisdrum area thus securing supplies to the area.

B7 Gorman-Navan No.3 110 kV Line (CP0218)

B.7.1 Description

This project involves construction of a third Gorman-Navan 110kV line, approximately 4 km in length. This project is due for completion in September 2011.

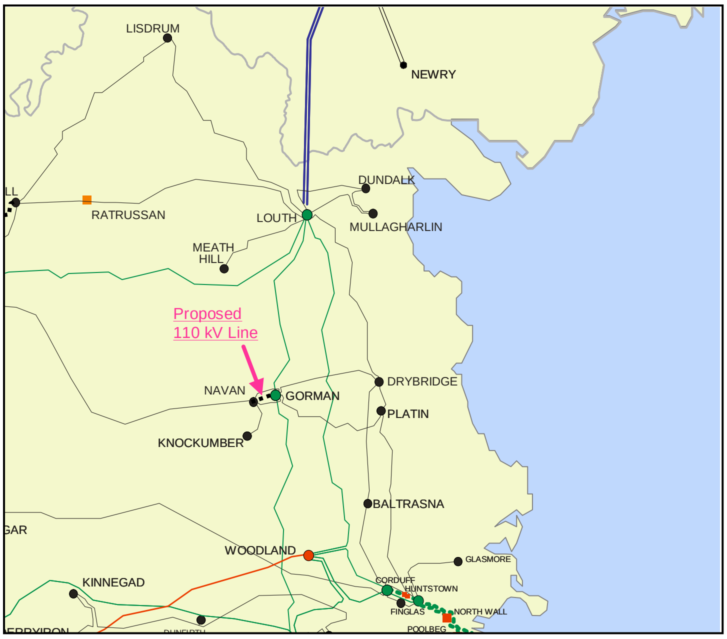

Figure B-9 Proposed Gorman-Navan No.3 110kV line

B.7.2 Reason for Development

In the National Spatial Strategy, Navan has been designated as a primary development centre on a public transport corridor where development in Dublin's hinterland should be concentrated, and as a result will be a source of inward investment and demand development within the area.

At present there are three 110 kV lines feeding into Navan 110 kV station, two of which are connected to Gorman 110 kV. Previous studies have indicated that from March 2010, during the maintenance of either Gorman-Navan No.1 or 2 110 kV lines, the subsequent loss of the other will result in an overload on the Arva-Navan 110 kV line by greater than 110%, violating the Transmission Planning Criteria.

In addition, from October 2012, the loss of either Gorman-Navan No.1 or 2 110 kV lines will result in an overload of the adjacent line by greater than 110 %, violating the Transmission Planning Criteria.

B8 Binbane-Letterkenny 110 kV Line (CP0421)

B.8.1 Description

At present, there are three 110 kV lines feeding the load at Letterkenny 110 kV station, two from Cathaleen's Fall in the south and one from Strabane to the east. This project involves construction of a new 110kV line between Binbane and Letterkenny in Co. Donegal, approximately 69 km in length. A 110 kV switching station will be constructed along the route. The purpose of this switching station is to facilitate the DSO 110 kV connections to the Ardnagappary area of Donegal. The project is expected to be completed in October 2013.

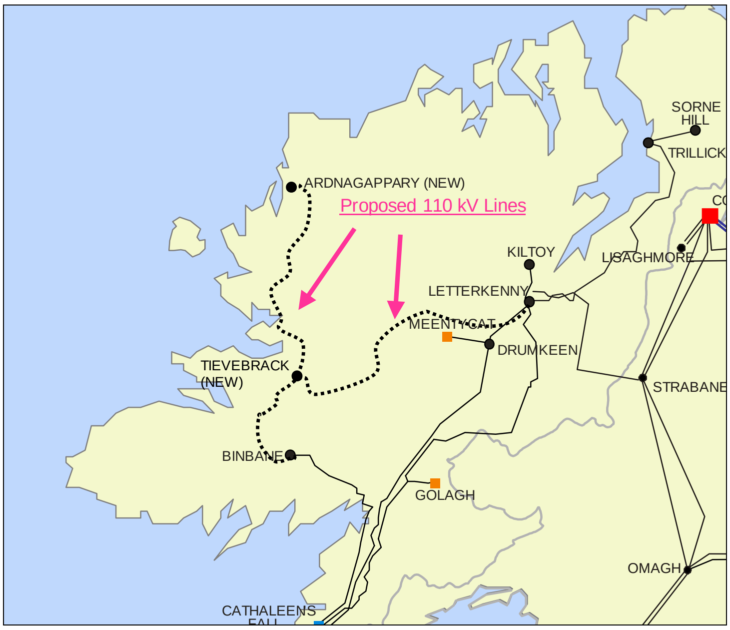

Figure B-11 Proposed Binbane-Letterkenny 110kV line

B.8.2 Reason for Development

Studies have shown from summer 2008 onwards Transmission Planning Criteria are not met in the north Donegal area. When one of the three 110 kV lines from Letterkenny to Cathaleen's Fall or Strabane is out for maintenance, the subsequent tripping of another one of these lines results in the low voltages at Trillick, Kiltoy and Letterkenny 110 kV stations.

The DSO requested a connection to loop the existing tailed Binbane 110 kV station to provide support in North West Donegal area. A Binbane-Letterkenny 110 kV line provides a second connection to Binbane.

The DSO also requested a connection to a new 110 kV station to provide support to north west Donegal. The proposed switching station at Tievebrack, east of Glenties, will provide such a connection point for the new DSO line to Ardnagappary.

This Binbane-Letterkenny 110 kV project is also a required to facilitate the connection of Gate 2 wind farms. All of the Gate 2 wind farm connection offers issued in the Donegal area have signed.

B.9 Glanagow-Raffeen 220 kV Underground/Submarine Cable (CP0587)

B.9.1 Description

This project involves the construction of a 220 kV cable between Glanagow and Raffeen. This cable will comprise a 4 km underground section and a 4.5 km submarine section. The project has been submitted for Planning Approval and subject to favourable outcome from this process it is expected to be completed by July 2011.

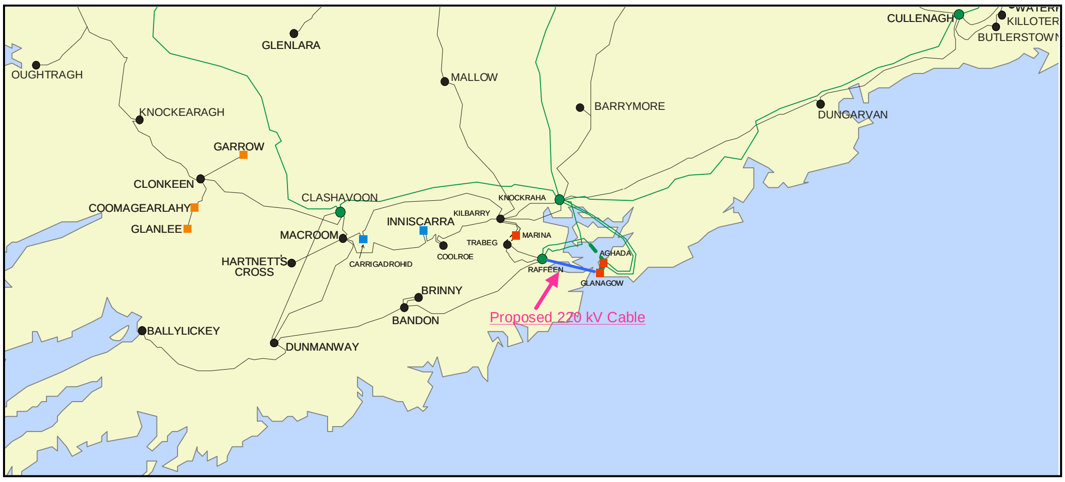

Figure C-1 Proposed Glanagow-Raffeen 220kV cable (the new line shown on the diagram is for illustrative purposes only and does not indicate the actual route)

B.9.2 Reason for Development

EirGrid has executed connection agreements with two new generation units to connect to the transmission system at Longpoint and Glanagow in the Cork harbour area. This will add 876 MW of additional generation, bringing the total power output from the Aghada area to approximately 1,550 MW. At present there is a double circuit 220 kV line from Aghada to Knockraha and a 220 kV circuit from Aghada to Raffeen is also under construction. Even with the new cable however, there is still inadequate capacity to export this level of generation, which is why the Glanagow-Raffeen 220 kV circuit is required.

Appendix C Details of Major Development Projects in The Public Planning Process

Details are provided in this appendix for the following major development project:

C.1 North-South 400 kV Interconnection Development Project

C.2 Tarbert Redevelopment Project

C.3 Moneypoint-Tarbert 220 kV Cable

The projects are shown on a map of the relevant part of the network. The proposed lines are for illustration purposes only and are not meant to indicate actual routes.

C.1 North-South 400 kV Interconnection Development Project (CP0466a & CP0469)

C.1.1 Description

EirGrid and NIE are jointly proposing the construction of a major cross-border transmission infrastructure development, primarily consisting of an approximately 140 km long 400 kV overhead electricity interconnector and associated infrastructure. The proposed interconnection development extends between the existing electricity transmission network in Northern Ireland, from a proposed new substation at Turleenan in Co Tyrone, to the existing electricity transmission network in the Republic of Ireland, terminating at the at the existing Woodland 400 kV substation, near Batterstown, Co. Meath. As at the time the data was gathered for this plan, the project had been submitted for Planning Approval and was expected to be completed by December 2014.[13]

Figure C-2 Proposed North-South Interconnector 400kV Circuit (the new line shown on the diagram is for illustrative purposes only and does not indicate the actual route)

13 In June 2010 the application was withdrawn and is now expected to be resubmitted to An Bord Pleanála in 2011. The expected completion date is under review subject to planning issues in both jurisdictions.

C.2.2 Reason for Development

At present the two systems are connected by a single 275 kV line between Louth and Tandragee, as well as two 110 kV lines and phase shifting transformers which link Letterkenny to Strabane and Corraclassy to Enniskillen. This new circuit will increase transfer capacity between the two systems and avoid situations where a single event could lead to system separation, as the two 110 kV connections are not strong enough on their own should the Louth-Tandragee route fail.

This new circuit will

- Improve competition and economic operation by removing constraints;
- Improve security of supply by allowing sharing of generation across the island;
- Provide required flexibility for renewable generation; and
- Ensure security of supply for the north east.

C.2 Tarbert Redevelopment Project (CP0647)

C.2.1 Description

This project involves primarily the construction of a new 220/110 kV transmission station, located to the west of the Tarbert Island peninsula. This new station would act as the connection node for the majority of the new IPPs and other circuits planned to connect at 220kV and 110 kV. A minimised Tarbert 220kV station (3 line bays and 3 transformer bays) is to be refurbished and rebuilt. The 110 kV station will be decommissioned when the current generation plant in Tarbert connected at 110kV is decommissioned. The existing 110kV circuits will be rerouted into the new 110kV station. This would lead to the retirement of circa 8 km of 110kV double circuit overhead line.

This option would be able to accommodate the movement of the control and protection equipment out of the generation station, the refurbishment of the existing 220kV station as well as future developments.

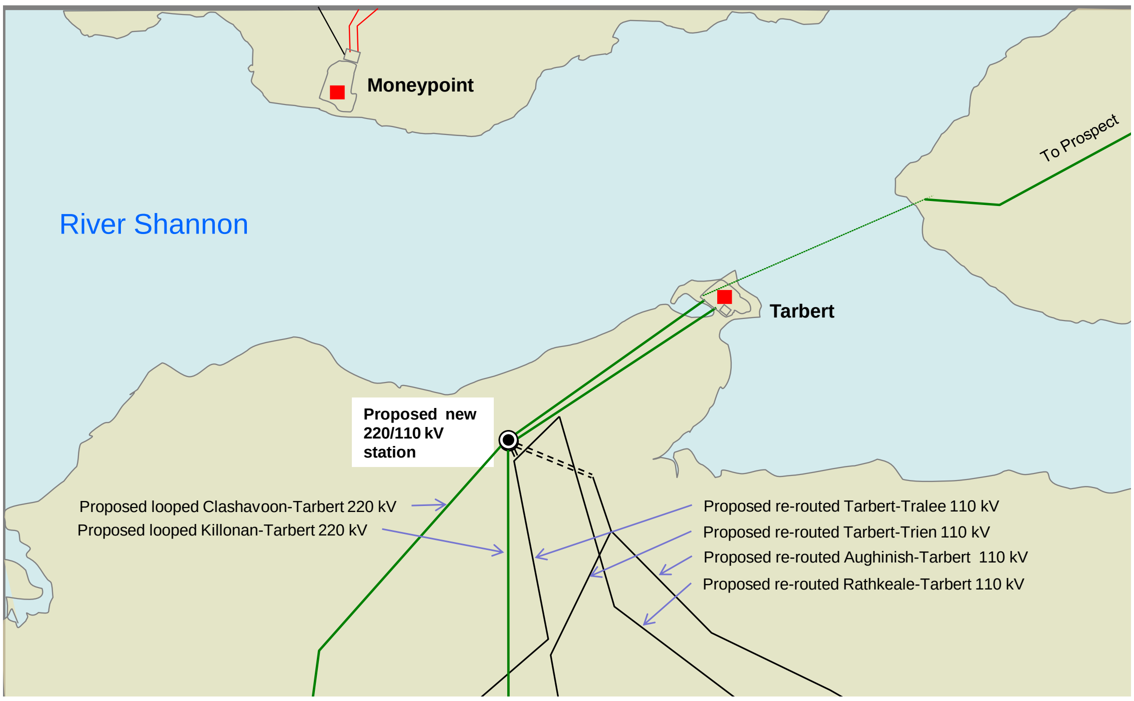

Figure C-2 Proposed Tarbert Redevelopment (the new lines shown on the diagram is for illustrative purposes only and does not indicate the actual route)

C.2.2 Reason for Development

There are a number of drivers for developments in the existing Tarbert 220kV station and the area around the station and these have triggered an overall review of the future development plans for the Tarbert area.

When the station was built originally no control building was built beside the compound. Instead the control and protection equipment were housed in the generation station building. Until recently ESB owned both Tarbert 220kV station and the generation station so this was not an issue. However following the sale of Tarbert generation station to Endesa the location of the control and protection equipment became an issue. As part of the sale agreement the control and protection equipment has to be moved out of the generation station by November 2012.

In addition, EirGrid is aware of the requirement to carry out refurbishment works in Tarbert 220kV station. A condition assessment of the station was carried out and the refurbishment and rebuild options were outlined. A proposal on how to relocate the control and protection equipment out of the generation station to a new building adjacent to the transmission compound was also outlined as part of this work.

Furthermore, future developments in the area consisting of new transmission circuits and applications for connection by new independent power producers also needed to be taken into consideration.

C.3 Moneypoint-Tarbert 220 kV Cable (CP0399)

C.3.1 Description

It is proposed to connect a single circuit comprising of a combination of cable and overhead line at 220 kV from the existing 400 kV busbars at Moneypoint station, to the 220 kV busbars at Tarbert 220 kV station via a single 500 MVA transformer located at Moneypoint station. The project has been submitted for Planning Approval and subject to favourable outcome from this process it is expected to be completed by July 2013.

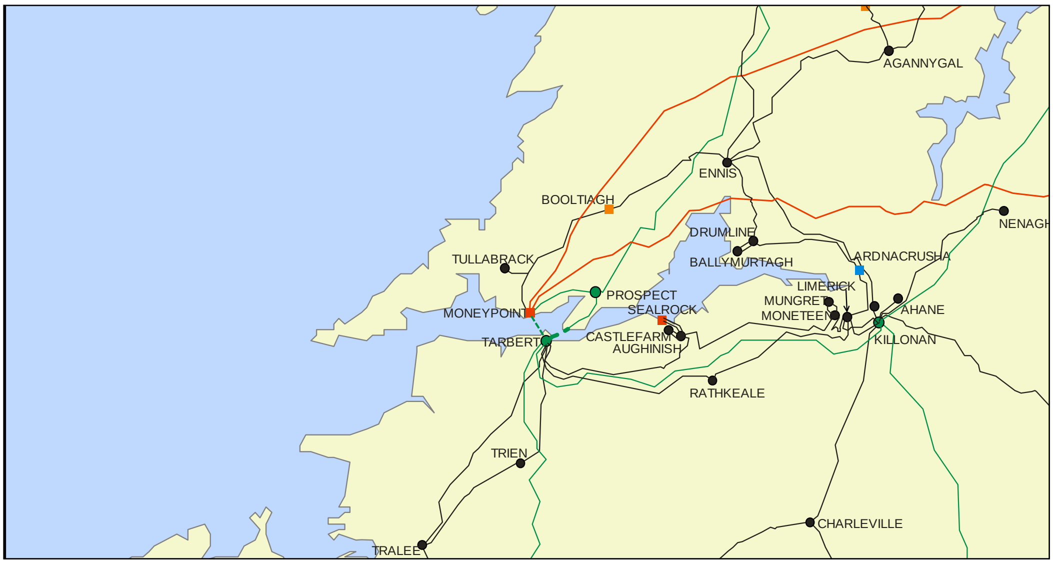

Figure C-3. – Present Transmission Network with a new Moneypoint Tarbert Circuit (shown in dotted blue line).

C.3.2 Reason for Development

The present 400 kV system consists of two 400 kV lines running west to east across the country from Moneypoint to Dunstown and Woodland 400 kV stations. These lines were constructed in the early 1980s to permit the transfer of electrical power from Moneypoint power station in west Co. Clare to the load centre in Dublin.

As a result of demand growth in the west and north west of the country, Oldstreet 400 kV station in east Co. Galway and a new Oldstreet – Cashla 220 kV line were constructed to reinforce the area. This reinforcement also facilitated the connection of additional generation in the Dublin area by providing an additional outlet for Moneypoint generation.

However, further expansion in generating capacity in the Dublin area and in the areas adjacent to the Moneypoint – Dublin corridors, have increased significantly the level of generation within the Dublin – Moneypoint corridor. It should be noted that all the generation in this group would be considered to be low cost base generation.

As a result the loss of either the Oldstreet – Woodland 400 kV line or the Moneypoint – Dunstown 400 kV line can overload the Cashla – Tynagh 220 kV line by more than 10%, thereby violating the Transmission Planning Criteria.

Furthermore the Woodland 400/220 kV transformer can become overloaded following the loss of the Cashla - Tynagh 220 kV line. Although this overload can be removed with remedial action, in future years this will become increasingly more difficult to manage necessitating increased transformer capacity to resolve the problem.

This reinforcement will maintain compliance with the Transmission Planning Criteria alleviating the previously identified network problems by creating an additional path into the south west of the country from the 400 kV network, and as a result diverting power onto this circuit from the Cashla Tynagh 220 kV line.

As well as the alleviation of the network problems this reinforcement option also offers a number of additional benefits:

- Providing another injection point from the 400 kV network to the 220 kV network;
- Platform for transmission network growth into the south west of the country;
- Flexibility in developing the transmission network to meet increased wind generation; and
- Prospect-Tarbert 220 kV line parallel path.

Appendix D Regulation 8(6) of Statutory Instrument 445 (2000)

(a) Within such time that the Commission may direct, the transmission system operator shall prepare a plan (in these Regulations referred to as the “development plan”) for the development of the transmission system in order to guarantee security of supply, which shall relate to a period of 5 calendar years from the date on which the plan is prepared by the transmission system operator.

(b) The transmission system operator shall, at least once each year, revise the development plan, and the revised plan, which shall relate to a period of 5 calendar years following the date on which the plan is revised, shall be submitted to the Commission for approval.

(c) The development plan shall take account of-

- (i) existing and planned generation, transmission, distribution and supply,
- (ii) forecast statements prepared under section 38 of the Act of 1999[14]
- (iii) interconnections with other systems,
- (iv) national and regional Government development objectives.

(d) The development plan shall indicate the manner in which the transmission system operator shall discharge its functions under paragraph 1.

(e) The development plan shall be submitted to the Commission for approval.

(f) The transmission system operator shall-

- (i) engage in a public consultation process, including any other form of consultation that the Commission may direct, before submitting the development plan to the Commission for approval, and
- (ii) report in writing to the Commission on the results of that process not later than when submitting the development plan to the Commission for approval.

(g) The Commission may from time to time give directions to the transmission system operator in respect of -

- (i) the matters to be specified in the development plan,
- (ii) the review and revision by the transmission system operator from time to time of the development plan,

and the transmission system operator shall comply with directions given by the commission under this subparagraph.

[14] Electricity Regulation Act, 1999.

Appendix E Glossary of Terms

Aluminium Conductor Steel Reinforced (ACSR)	A conductor consisting of aluminium wires wound around a steel core.
Bay	A bay in a connection point to a busbar, and comprises switchgear and measurement equipment.
Busbar	An electrical conductor located in a station that makes a common connection between several circuits.
Capacitor	An item of plant normally utilised on the electrical network to supply reactive power to loads (generally locally) and thereby supporting the local area voltage.
Circuit	A line or cable, including associated switchgear, which carries electrical power.
Circuit Breaker	A device used to open a circuit that may be carrying electrical current.
Combined Cycle Gas Turbine (CCGT)	A collection of gas turbines and steam units; waste heat from the gas turbines(s) is passed through a heat recovery boiler to generate steam for the steam turbines.
Contingency	An unexpected failure or outage of a system component, such as a generation unit, transmission line, transformer or other electrical element. A contingency may also include multiple components, which are related by situations leading to simultaneous component outages. The terms "contingency" and "loss" are used interchangeably in this Development Plan.
Current Transformer	Current transformers are commonly used in protection systems to facilitate the measurement of large currents which would be difficult to measure more directly.

Deep Reinforcement	Refers to network reinforcement additional to the shallow connection that is required to allow a new generator or demand to operate at maximum capacity.
Demand	The peak demand figures in Table 3-1 in Section 3 refer to the power that must be transported from grid connected generation stations to meet all customers' electricity requirements. These figures include transmission losses.
Demand-Side Management	The modification of normal demand patterns usually through the use of financial incentives.
Distribution System Operator	In electrical power business, a distribution system operator is an operator that transmits electrical power from the transmission system and small generation plants connected to the distribution system to the consumer.
Dropper	Refers to a short piece of conductor used to connect an overhead line to a line bay.
EirGrid	As part of the EU's electricity liberalisation programme, an independent electricity Transmission System Operator must be set up for each EU member state.
Embedded Generation	Refers to generation that is connected to the distribution system or at a customer's site.
Force majeure	A common clause in contracts that essentially frees both parties from liability or obligation when an extraordinary event or circumstances beyond the control of both parties prevents one or both parties from fulfilling their obligations under the contract.
Gas Insulated Switchgear (GIS)	A compact form of switchgear where the conductors and circuit breakers are insulated by an inert gas.
Gate	A staggered system that facilitates the group processing approach which allows the SO's to process a pre-defined number of connection offers concurrently rather than having to treat each application on an individual independent basis.

Generation Dispatch	The configuration of outputs from the connected generation units.
Grid	A meshed network of high voltage lines and cables (400 kV, 220 kV and 110 kV) for the transmission of bulk electricity supplies around Ireland. The grid, electricity transmission network, and transmission system are used interchangeably in this Development Plan.
Interconnector	The tie line, facilities and equipment that connect the transmission system of one independently supplied transmission network to that of another.
Plan Period	The period of time covered by this Development Plan.
Maximum Export Capacity (MEC)	The maximum export value (MW) provided in accordance with the generator's connection agreement. The MECs are contract values which the generator chooses to cater for peaking under certain conditions that are not normally achievable or sustainable e.g., a CCGT plant can produce greater output at lower temperatures.
Open Cycle Gas Turbine (OCGT)	A gas turbine prime mover in which air is compressed in the compressor element, fuel is injected and burned in the combustor, the hot products are expanded in the turbine element and exhausted to the atmosphere.
Power Flow	The flow of 'active' power is measured in megawatts (MW). When compounded with the flow of ' reactive power', which is measured in megavars (Mvar) ; the resultant is measured in megavolt -amperes (MVA)
Phase Shifting Transformer (PST)	An item of plant employed on the electrical network to control the flow of active power.
Reactive Compensation	The process of supplying reactive power to the network.
Reactive Power	Reactive power is that portion of electricity that establishes and sustains the electric and magnetic fields of alternating current equipment. It is utilised to control voltage on the transmission network

Reactor	An item of plant employed on the electrical network to either limit short circuit levels or prevent voltage rise depending on its installation and configuration.
Shallow Connection	Shallow Connection means the local connection assets required to connect a customer to the transmission system and which are for the specific benefit of that particular customer.
Split Busbar	Refers to a busbar at a given station which is operated electrically separated. Busbars are normally split to limit short circuit levels or to maintain system reliability.
Static Var Compensator	Device which provides fast and continuous capacitive and inductive reactive power supply to the power system.
Summer Valley	The annual minimum that usually occurs in August. Annual minimum demand is typically 36 % of the winter peak.
Summer Peak	The average week-day peak value between March and September, inclusive, which is typically 80 % of the winter peak.
Supervisory Control and Data Acquisition Systems (SCADA)	Used to monitor and control system equipment from the relevant control centre.
Switchgear	A combination of electrical disconnects and/or circuit breakers used to isolate equipment in or near an electrical station.
Tailed connection	A radial (single-circuit) connection into an existing station.
Tee connection	An un-switched connection into an existing line between two other stations.
Transformer	An item of equipment connecting equipment at two different nominal voltages.
Transmission Interface Station	A station that is a point of connection between the transmission system and the distribution system or directly connected customers.

Transmission Losses A small proportion of energy is lost as heat whilst transporting electricity on the transmission system. These losses are known as transmission losses. As the amount of energy transmitted increases, losses also increase.

Transmission Peak The peak demand that is transported on the grid. The transmission peak includes an estimate of transmission losses.

Transmission Planning Criteria The set of standards that the transmission system is designed to meet. The criteria are deterministic as is the norm throughout the world. They set out objective standards which have been found to deliver an acceptable compromise between the cost of development and the transmission service provided.

Transmission System Operator In electrical power business, a transmission system operator is an operator that transmits electrical power from generation plants to regional or local electricity distribution operators.

Uprating To increase the rating of a circuit. This is achieved by increasing ground clearances and/or replacing conductor, together with any changes to terminal equipment and support structures.

Winter Peak This is the maximum annual system demand. It occurs in the period October to February of the following year, inclusive. Thus for transmission planning purposes the winter peak in 2011, the final year of this plan, may occur in early 2012. The winter peak figures take account of the impact of projected Demand Side Management initiatives.

Appendix F References

EirGrid published documents:-

I. Transmission Development Plan 2008-2012 - July 2009

II. Transmission Planning Criteria, October 1998

III. Grid25 - Grid Development Strategy, October 2008

IV. All Island Generation Capacity Statement 2011-2020, December 2010

V. Transmission Forecast Statement 2010-2016, March 2010

Legislation:-

VI. Electricity Regulation Act, 1999.

VII. Regulation 8.6 of Statutory Instrument 445 (2000), entitled European Communities (Internal Market in Electricity) Regulations, 2000

VIII. Statutory Instrument 60 (2005), entitled European Communities (Internal Market in Electricity) Regulations, 2005

C.E.R. published documents:-

IX. CER/05/143; 2006-2010 Transmission Price Control Review – a decision paper, September 2005.

X. CER/08/118; Criteria for Gate 3 renewable generator connection offers – proposed direction to the system operators, July 2008

XI. CER/08/167; Standard Transmission Charges and Timelines – a consultation paper, September 2008.

XII. CER/08/226; Criteria for Gate 3 renewable generator offers and related matters – proposed direction to the system operators, November 2008.

XIII. CER/08/260; Criteria for Gate 3 renewable generator offers and related matters - direction to the system operators, December 2008.

XIV. CER/09/031; Treatment of Conventional Generator Connection Applicants – a consultation paper, February 2009.

XV. CER/09/191; Direction on Conventional Offer Issuance Criteria and Matters Related to Gate 3 – a direction paper, December 2009

Government published documents:-

XVI. National Spatial Strategy for Ireland 2002-2020, November 2002.