TRANSMISSION DEVELOPMENT PLAN

2008-2012

www.eirgrid.com

July 2009

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Appendices

Abbreviations

ACSR	Alluminium Conductor Steel Reinforced
CER	Commission for Energy Regulation
CCGT	Combined Cycle Gas Turbine
CP No.	Capital Project identification number
CT	Current Transformer
DC	Direct Current
DSO	Distribution System Operator
EIS	Environmental Impact Statement
ESB	Electricity Supply Board
GAR	Generation Adequacy Report 2008-2014
GIS	Gas Insulated Switch-gear
HV	High Voltage
IPP	Independent Power Producer
MEC	Maximum Export Capacity
NI	Northern Ireland
NIE	Northern Ireland Electricity
NSS	National Spatial Strategy
PST	Phase Shifting Transformer
RES	Renewable Energy Schemes
SEM	Single Energy Market
SCADA	Supervisory Control and Data Acquisition
SI445	Statutory Instrument 445 (2000)
SONI	System Operator Northern Ireland
SVC	Static Var Compensator
TAO	Transmission Asset Owner
TSO	Transmission System Operator
VT	Voltage Transformer

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, is a component of the backbone infrastructure which supports the economy.

The Transmission Development Plan 2008-2012 is the proposed plan for the development of the transmission system over the five years to 2012 and supersedes the Transmission Development Plan 2007-2011. This five year plan presents the components of the overall long term development of the transmission system where there is some level of certainty. Only projects that are either committed or about to be committed for construction are detailed in this report. All information in this development plan; project details, project expected completion dates, generators with executed connection agreements is correct as of the beginning of July 2009. 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.

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. Grid25 estimates that between now and 2025 it will have to upgrade 2,300km of the existing network and build 1,150km of new infrastructure to meet the needs of consumers and generators, both renewable and conventional. EirGrid has started work on 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.

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 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 level of transmission service provided.

The Role of the Transmission System Operator

The Statutory Instrument 445 (2000), 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 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 2012. ESB also has the role of Distribution System Operator (DSO) with which 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 2008 to 2012

While economic activity has declined sharply over the last year, 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 is forecast to decrease by about 2.7% in 2009 but return to 1.3% growth by 2012. 1,090 MW of new thermal generation and 1,471 MW of wind farm generation capacity have executed agreements for connection to the transmission system.

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.

As recommended by EirGrid, the CER has approved the choice of Woodland as the connection point on the Irish system. Deeside in North Wales is the connection point on the British system. The separate acquisitions of converter station sites in Ireland and Wales are now approved. EirGrid submitted an application to the Strategic Infrastructure Division of An Bord Pleanála on 18th November 2008. The planning application seeks approval for a converter station at Woodland, underground HVDC cable to the transition joint at Rush, Co. Dublin and a subsea HVDC cable beneath the Irish seabed to the 12 nautical mile limit. An oral hearing is scheduled to begin on the 10th of March in North County Dublin.

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 North-West to meet demand;
- 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, Castlebar, Cavan, Cork City, Dunmanway, Galway, Letterkenny, Meath Hill, Newbridge, Tullamore, and Wexford to meet demand;
- Connection of three new DSO stations;
- Connection of 17 new generators to the transmission system;
- Reduction of high short circuit levels in Dublin.

The development plan includes a total of 104 projects that are in progress, 52 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 scopes, particularly those in the preliminary stages of design, can change during the course of a project.

Table 4-1 Estimates of Planned New Transmission Assets

	400 kV	220 kV	110 kV
No of New Stations	3	11	21
Total New Station Bays	17	68	188
Overhead Line, km	120	152	575
Underground Cable, km	0	44	59

	400/220 kV	220/110 kV
Transformers, number of	3	14
Transformers, Total MVA	1400	3750

	110 kV
Capacitor banks, number of	13
Capacitor banks, Total MVA	210

In addition, there are a total of nineteen 110 kV and two 220 kV station bays that are planned to be refurbished at two stations in the Plan Period. There will also be a total of 144 km of 110 kV and 116 km of 220 kV transmission lines that will be involved in refurbishment. 82 km of 220 kV and 333 km of 110 kV transmission circuits will have their thermal ratings increased.

Other Potential Developments

Grid25 and other studies carried out by EirGrid have identified development requirements in each region of 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 may emerge depending on a number of factors not yet certain, 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. Ireland is on target to meet the current target of 15% of energy from renewable sources by 2010.

The Government's renewable generation target for 2020 is to meet 40% of electricity consumption from renewable energy resources. EirGrid's Grid Development Strategy, 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 latest CER direction on "Gate 3", CER/08/260, will deal with connections for circa 4000MW 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.

It will be noted that a significant portion of the investment in this Development Plan will be undertaken in the Border/Midlands/Western (BMW) region. This investment 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 2008 and 2012. 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. The CER in its 2006-2010 Transmission Price Control Review Decision Paper has set a cap on capital expenditure on transmission at €520 million for the period. The impact of this capital constraint will be continually reviewed as project designs and costs evolve.

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 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 cable and plays a vital role in the supply of electricity. It is the backbone of the power system and provides the means to deliver 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) bring their product to large customers and to major depots for onward distribution to smaller customers.

1.1 The Role of the Transmission System Operator

The Statutory Instrument 445 (2000)[1], 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 has the legal responsibility for developing the transmission system.

The TSO'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 the TSO. This Development Plan provides the TAO 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 2012. ESB also has the role of Distribution System Operator (DSO) with which the TSO coordinate planning and development requirements.

1.2 The Transmission Development Plan

This report presents EirGrid's view of how the future transmission needs are likely to change and its plan to develop the network between now and 2012 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 level of certainty and a description of other areas where further development is likely to be required.

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

Expected completion dates for developments may change because of the following reasons:

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

As such, some of the project dates included in this plan differ from the expected dates in the Transmission Development Plan 2007-2011.

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 2008 to 2012 in the process at this point in time. All information in this development plan; project details, project expected completion dates, generators with executed connection agreements is correct as of the beginning of July 2009. 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 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.

Grid Development Strategy

In October 2008, EirGrid published Grid25, 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 and where new high capacity infrastructure is required, building it at a voltage of

400 kV. Grid25 estimates that between now and 2025 it will have to upgrade 2,300km of the existing network and build 1,150km of new infrastructure to meet the needs of consumers and generators, both renewable and conventional. EirGrid has started work on 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.

All Island Joint Planning

As part of the all Island Single Energy Market (SEM) project, EirGrid and System Operator Northern Ireland (SONI) have set up joint structures and arrangements to carry out All Island transmission planning. 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 Transmission Development Plans.

1.4 Document Structure

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

Chapter 1 gives the purpose and context of the plan.

Chapter 2 provides information on the TSO's legal requirements in relation to development and describes the TSO's planning process and strategies employed.

Chapter 3 describes the factors that drive network development and presents the TSO's forecasts and assumptions relating to the drivers for this plan.

Chapter 4 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.

Chapter 5 lists areas where development needs are expected to emerge in the future.

Appendix A includes a map of the existing network and a second map illustrating the locations of major development projects.

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 Statutory Instrument 445 (2000) which obliges the TSO to produce this Development Plan.

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 chapter provides a high level overview of the approach that EirGrid follows to determine the network requirements, find the appropriate solution and implement the necessary works by presenting the context of transmission planning, the objectives, strategies and criteria as well as an explanation of the planning process within EirGrid.

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.

The contents of this chapter are set out under the following headings:

§ Statutory and Legal Requirements;

§ Development Objectives & Strategies;

§ Transmission Planning Criteria;

§ The Network Development Planning Process.

2.1 Statutory and Legal Requirements

Statutory Instrument 445 (2000)[1], modified by Statutory Instrument 60 (2005)[2], outlines the roles and responsibilities of the Transmission System Operator. Under Regulation 8(1)(a) of Statutory Instrument 445 (2000), the Transmission System Operator 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.*

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

[2] 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 Republic of Ireland. It also requires EirGrid to strive for a balance between development to improve security and reliability and the cost and environmental impact of the 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 Statutory Instrument 445 (2000) Regulation 8(6) which deals with the Development Plan is included in its entirety in Appendix D.

In preparing this development plan the Transmission System Operator has taken account of other Regulations:

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*;

(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 the Transmission System Operator’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)

2.2 Development Objectives and Strategies

An objective of the Transmission System Operator 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 Chapter 3.

EirGrid plans the development of the grid taking account of the long-term needs and the economics of various development options. EirGrid's recently published Grid Development Strategy, Grid25, provides an indication of the transmission development requirements out to 2025. EirGrid is working on bringing forward more detailed projects to meet the needs identified. Some Grid25 reinforcement projects have been identified and are included in this Development Plan, refer to Chapter 4. As other solution proposals emerge they will be included in future 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 2.4.1 under "*Select Optimum Development Project*". In considering these factors, EirGrid adopts a number of high level strategies, described below, to optimise development.

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 more environmentally friendly 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:

§ 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;

§ installing 400/220 kV and 220/110 kV stations rather than new lines where economic 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 while the cost of development is unduly onerous.

Overhead lines are normally used 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.

2.3 The Transmission Planning Criteria

The requirement for grid development is identified when simulation of the 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 Transmission

Planning Criteria (TPC) and can be accessed on EirGrid's website, www.eirgrid.com (under "Publications" on the front page).

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 is taken into account in selecting a transmission enhancement strategy as described in the previous section. 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	ü	ü	ü
Overlapping single contingency and generator outage	P	ü	ü
Trip-Maintenance i.e., loss of any single item of generation or transmission plant when another circuit is out on maintenance	O	ü	ü

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* refers to the average week-day peak value between March and September inclusive, which 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, while network maintenance, normally carried out 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 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 The Network Development Planning Process

2.4.1 Network Development

The network development planning process is of necessity a dynamic process to deal with the ever-evolving requirements for transmission services. 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.

Update the Network Model: 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 Chapter 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 planning standards. 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 Distribution System Operator (DSO) connection. 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 meets the statutory requirements, detailed in section 2.1.

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 Transmission Planning Criteria;
- Meeting Government's Objectives;
- Environmental constraints;
- 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.

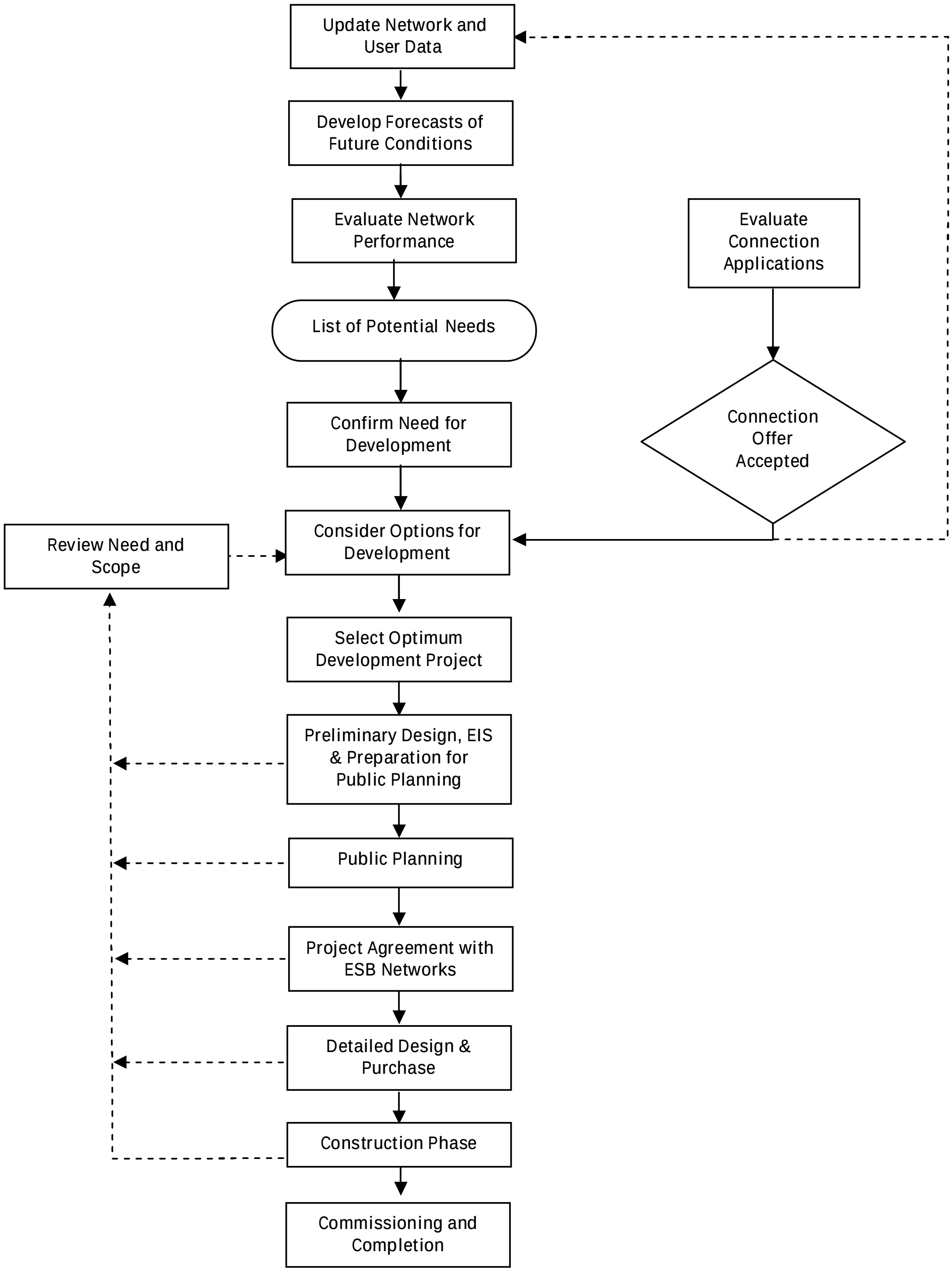


Figure 2-1 Flow Chart of Network Development Process

Preliminary Design, EIS 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 and local representative bodies). 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 (EIS) as 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 certain types of strategic infrastructure will apply first to An Bord Pleanála for a decision on whether the particular project is of strategic importance. Where An Bord Pleanála decides that the project is of strategic importance an application with an EIS can be made directly to An Bord Pleanála. The public, the Local Authority (including the elected members) and interested stakeholders will be consulted and their views taken into account.

An Bord Pleanála may also decide that the particular project is not of strategic importance and that the planning application be lodged with the local authority in the traditional manner. 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 agreed arrangements, previously referred to, 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 will have a client engineering role throughout these phases.

Detailed Design and Purchase: When planning permissions 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 it would be necessary to re-assess 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.

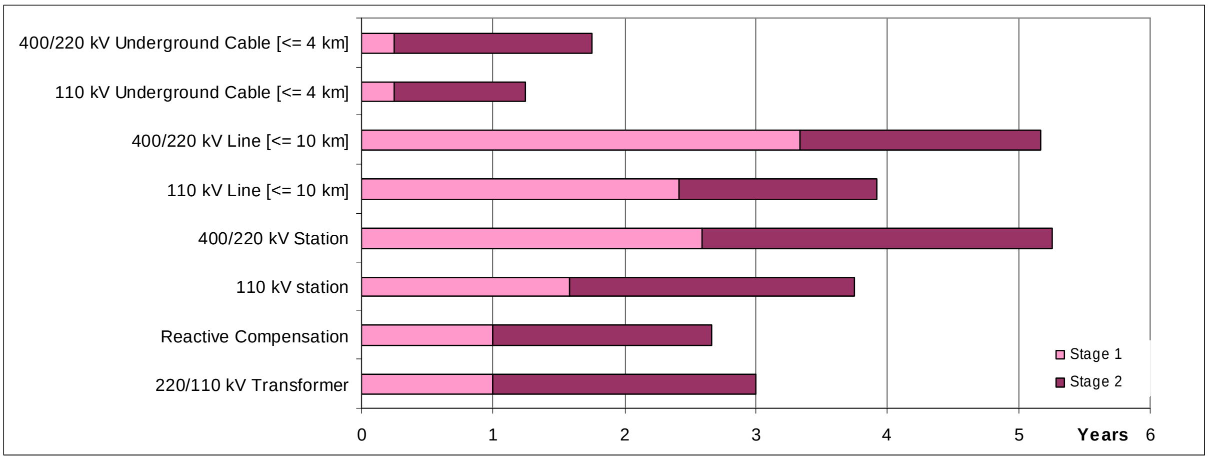


Figure 2-2 Typical Lead times for Development Projects

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; stage 2 the more detailed design, purchase and actual construction. Because of the uncertainty in the public planning process these lead-times should be considered indicative only.

The typical lead times shown in Figure 2-2 are detailed in a document which the CER issued for consultation on the 11th of September 2008, 'Standard Transmission Charges and Timelines', CER/08/167. It should be noted that 400 kV development projects are not covered in the CER document, however they have similar lead times to 220 kV development projects. Typical lead times are given in Figure 2-2 for underground cable projects up to 4 km; for every additional kilometre the stage 2 timeline increases by 2 months. For overhead line projects greater than 10 km the stage 2 timeline increase by 2 weeks for every additional kilometre.

2.4.2 Refurbishment

Refurbishment involves the replacement of equipment to extend the life of the transmission assets. The development of a refurbishment programme is a complex process as described below. While age of plant may be a trigger which initiates the process it is by no means the only consideration. Other factors which impact on the decision to refurbish plant include safety and environmental considerations, increasing fault frequency, increasing cost and complexity of maintenance, lack of spares, and plant obsolescence.

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”.

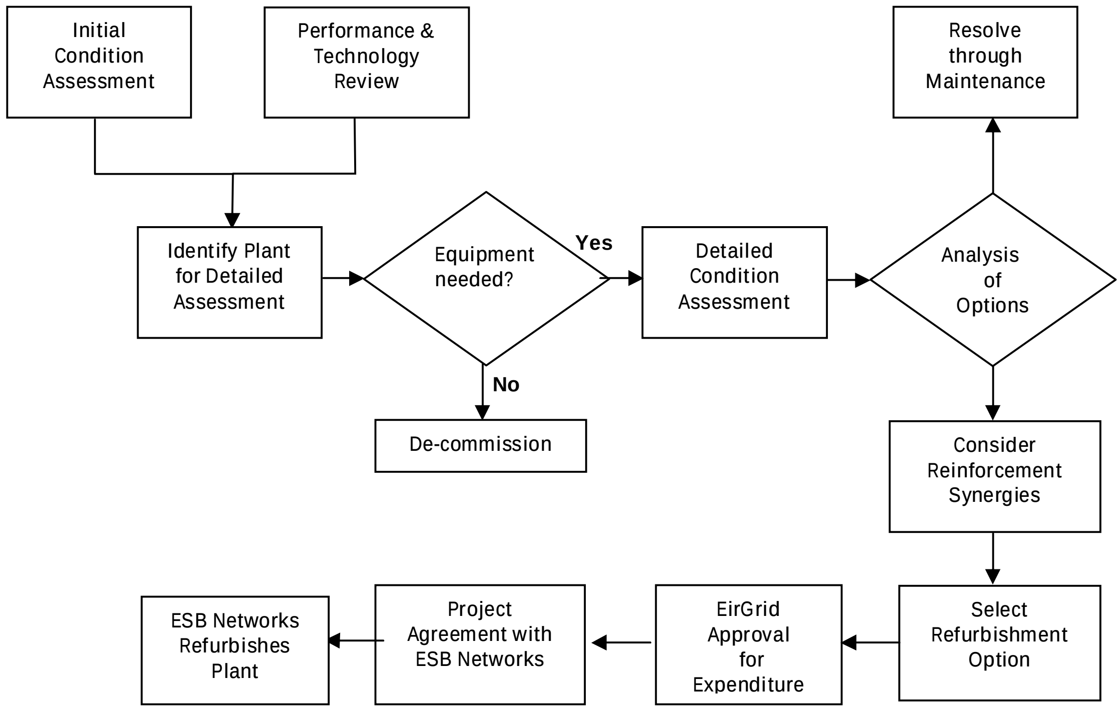


Figure 2-3 Flow Chart of Network Refurbishment Process

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 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.

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: 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.

Consider Reinforcement Synergies: 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.

Select Refurbishment 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 agreed arrangements, previously referred to, 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.

Refurbish Plant: Following project agreement ESB Networks carry 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 the TSO "to plan the long term ability of the transmission system to meet reasonable demands for the transmission of electricity". This chapter 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;
- Condition of the Network.

These assumptions provide the context for the current Development Plan 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 it is a statutory duty for the TSO 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 potentially 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) 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 under renewable generation.

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;
- 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[1].

Table 3-1 presents the forecasts of transmission demand for the five years 2008 to 2012. These correspond to the median demand forecasts published in the *Update Generation*

[1] Section 3 of the TSO's Generation Adequacy Report 2009-2015 explains the correlation between economic performance and electricity demand.

Adequacy Report 2009-2015 available on www.eirgrid.com, which are calculated based on ESRI forecasts of economic activity.

Three demand values are presented for each year:

- The annual maximum, also referred to as the winter peak;
- The average summer peak;
- The annual minimum, also referred to as the summer valley.

Table 3-1 Transmission Demand Forecasts, MW

Year	Summer Peak 80	Summer Valley 36	Winter Peak
2008	3,902	1,756	4,878
2009	3,796	1,708	4,745
2010	3,748	1,687	4,685
2011	3,778	1,700	4,722
2012	3,828	1,723	4,785

Appendix C of EirGrid's *Transmission Forecast Statement 2008-2014* 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. The demand figures in the Forecast Statement are higher than those given in Table 3-1 above as they are based on demand figures forecast in 2008 and not the updated GAR figures published on 7th July 2009. Transmission interface stations are the points of connection between the transmission system and the distribution system, or directly connected customers.

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 the geo-diversity of 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.

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 the TSO. The TSO will make a connection offer having considered the implications for the transmission system. Once the connection offer is accepted, the TSO and DSO cooperate in progressing 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 TSO element of the project is minor, the DSO may have progressed its element of a project to a different stage ahead of the TSO. Section 5.2.2 lists such cases. The TSO is confident however that it will deliver its element at a suitable time.

The transmission works at Macroom 110 kV station to connect the new Hartnett's Cross 110 kV station and the transmission works at Killonan 110 kV station to connect the new Nenagh 110 kV station have been completed. Completion of the distribution works is outstanding for these two projects.

Table 3-2 DSO 110 kV Station Connection Projects

110 kV Station	Location
Athy	Athy, Co. Kildare
Ballycummin	Raheen, Co. Limerick
Balgriffin	Balgriffin, co Dublin
Banoge	Gorey, Co. Wexford
Ardnagappary	Na Doire Beaga, Co. Dún na nGall
Carrowbeg	Westport, Co. Mayo
Charlesland[2]	Greystones, Co. Wicklow
Finnstown	Adamstown, Co. Dublin
Kentstown Road	Navan, Co. Meath
Hartnett's Cross	Macroom, Co. Cork
Nenagh	Nenagh, Co. Tipperary
Salthill	Salthill, Co. Galway
Singland	Garryowen, Co. Limerick
Screeb	Maam Cross, Co. Galway

The DSO has plans for other new 110 kV stations, for which the grid connection project has not yet been initiated. It is likely that some of these stations will be connected within the period of the plan. The potential for future developments is discussed in Chapter 5.

[2] This station is under review by the DSO

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

3.2.3 Demand Reductions

Closure 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 July 2009, the TSO has not received notification of any significant demand reduction from its directly connected customers.

3.2.4 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 further developed through a series of Regional Planning Guidelines prepared by each Regional Authority. The NSS seeks to ensure that each region grows 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. However, the TSO 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 Development Plan is based on updated demand forecasts which are derived using the latest information on regional demand shifts. EirGrid, therefore, 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 415 MW, which is approximately 8.7% of 2009 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 2008-2014* 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 i.e., that 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 and hence require deep network reinforcement.

At start of July 2009 some 7,404 MW (net) of generation capacity was installed in Ireland. Of this 6,677 MW is connected to the transmission system and 727 MW is connected directly to the distribution system. Since the publication of Transmission Development Plan 2007-2011, 288 MW of generation was installed in Ireland, all of which is wind generation. Of this 159 MW is connected to the transmission system and 130 MW to the distribution system.

The assumptions regarding the changes in generation from 2008 underlying the development plan are dealt with in the following categories:

- New Thermal Generation Connections;
- New Renewable Generation;
- 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 to directly connect the generator to the grid. Any further strengthening of the network that is required, referred to as deep reinforcement, to integrate the generation is implemented by the TSO and the TAO and the costs are reflected in the transmission tariff to the customers.

Table 3-4 lists the generators, as yet not connected, that have executed agreements for connection to the grid as of the start of July 2009. Capacity values listed are the maximum continuous rating (exported) which may differ from contracted MEC values.

Table 3-4 Future Planned Generation Connections

Generator (owner)	Description
Aghada (ESB)	431 MW CCGT
WhiteGen(Bord Gáis)	445 MW CCGT
Edenderry Peaking (Greener Ideas Ltd)	116 MW
Nore Power (Bord Na Móna)	98 MW

In addition to these committed generators, as of the beginning of July 2009, 24 thermal generators, with a total capacity of 4,444 MW have submitted complete application forms to the TSO for grid connections. At the start of July 2009 five thermal generators with a total capacity of 979 MW and two pumped storage generators, with a capacity of 2x70 MW, have live connection offers.

The CER has issued a consultation paper, 'Treatment of Conventional Generator Connection Applicants', CER/09/031, which considers the number of conventional generator applicants that should be issued with an offer as part of Gate 3. The paper presents two options: a "big bang" approach, offering a maximum of 3,400 MW of conventional generation applicants an offer by order of date or other criteria, and a "small steps" approach, in which only a sub set of the 3,400 MW would receive an offer.

In the *Transmission Forecast Statement 2008-2014* the opportunities for connecting new generation to the system were presented. The level of generation that could be connected without requiring transmission reinforcement was indicated at a number of different 220 kV and 110 kV stations across the network. Any new generator wishing to connect at a different location to those listed or exceeding the level at a particular station may require further deep reinforcement to achieve full access to the grid. The degree of that reinforcement can only be determined once the application has been submitted and the various solution options identified and studied.

3.3.2 New Renewable Generation

A significant proportion of new renewable generation is expected to be provided by Wind Powered Generation (WPG). Table 3-5 lists the wind farms and MEC changes to existing wind farms with executed agreements for connection to the transmission system as of the start of July 2009.

Table 3-5 TSO Contracted Wind Farm Connections and MEC Changes to Existing Wind Farms.

Generator	Transmission station connection point	Description
Athea Phase 1 & 2	Athea	68 MW
Boggeragh	Boggeragh	57 MW
Booltiagh Phase 2 & 3	Booltiagh	12 MW
Castledockrill	Castledockrill	41.4 MW
Cloghboola	Cloghboola	46 MW
Curragh (Coomacheo Ext)	Garrow	18 MW
Dromada	Athea	46 MW
Garvagh	Garvagh	58.225 MW
Glanlee (MEC Increase)	Glanlee	6MW
Keelderry	Derrybrien	29.75 MW
Kingsmountain	Cunghill	11.05 MW
Knockacummer	Knockacummer	87 MW
Lisheen	Lisheen	55 MW
Mulreavy Phase 2	Mulreavy	82 MW
Meentycat Phase 2	Meentycat	14 MW
Ratrussan	Ratrussan	22 MW[3]

The Government's Renewable Energy policy, reflecting the RES-E 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 33% by 2020. The target for 2020 was increased to 40% as of 15th October 2008. Wind power generation is expected to be the major contributor to the 2010 target. This 15% target can be achieved with about 1,350 MW of wind power generation installed by 2010. The figures for wind generation, both transmission and distribution connected, as at the beginning of July 2009 are:

- Connected wind generation: 1,070.9 MW
- Signed connection offers: 1,463.5 MW
- Live connection offers in Gate 2: 48.2 MW
- Gate 3 : 4008.4 MW
- Other applications outside Gate 3: 8,573 MW

The total for wind farms connected or with executed connection agreements is 2,534 MW.

[3] The total contracted MEC for Ratrussan wind farm is 70 MW, 48 MW is currently installed and an additional 22 MW yet to connect.

At the start of July 2009, all Gate 2 offers had been issued, with 48.2 MW of connection offers not yet executed. Some of these generators will be in place by 2010 enabling the 15% target to be achieved.

On the 11th July 2008 the Commission for Energy Regulation published a proposed direction (CER/08/118) on Gate 3 connection policy which set out how 3,000 MW of wind generation is to be processed. To take account of the increase to the Government's renewable generation target for 2020 from 33% to 40%, the Commission for Energy Regulation published a second proposed directive on the 13th November (CER/08/226) providing for an increase to the planned size of Gate 3 to circa 3,900 MW of renewable generation. A further direction (CER/08/260) provided the additional 900 MW with an opportunity to increase their MEC by up to 20%, capped at 4 MW, bringing the size of Gate 3 to circa 4,000 MW.

EirGrid's Grid Development Strategy, Grid25, highlighted the need for extensive upgrading of the transmission grid over the next 10 to 15 years to meet long-term demands for transmission services. Much of this upgrading is driven by the need to provide access for renewable generation up to the levels required to meet the Government's 40% target level as most of the wind applications are in areas remote from the main demand centres. EirGrid has started work on 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.

3.3.3 Planned Generation Closures

In June 2007, ESB announced that it intends to close or divest a number of units at the Great Island and Poolbeg generation stations in addition to those at Tarbert station. It was also announced that the steam turbine at Marina will be decommissioned, although the larger gas turbine will remain operational.

In July 2008 it was announced that the Spanish power company Endesa have agreed to purchase Great Island and Tarbert generation stations as well as Rhode and Tawnaghmore peaking plants from ESB.

The network has been designed to accommodate these existing generators. These provide reactive power capability to the local network, which assists the system operator to maintain voltages within allowable limits, and may in certain cases help reduce inter-area power flows by supplying the local demand. Divestment of these generators, therefore, would remove reactive support and local power infeed. It is likely that this would lead to the need for network reinforcements in at least one of the locations if the plant is not kept in operation or replaced with generation which provides similar active and reactive power capabilities in the same area in a minimum time after the closure.

Existing generators are required to give 24 months notice to EirGrid for the closure or reduction in output of any generator unit. In the absence of such notice of plant closures, all other existing generation capacity must be assumed to remain in service for the purposes of planning the system.

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 Transmission Development Plan.

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 the 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 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 2008-2014* indicates that short circuit levels in Dublin and Cork are sufficiently high to warrant close monitoring. Plans are in place to maintain short circuit levels within safety standards where they would otherwise exceed those standards.

Dublin

The fifth Finglas 220/110 kV transformer (CP264), in addition to the inter-bus reactor in Poolbeg 220 kV station installed in May 2008, will provide a solution to reduce the short circuit level in North and East Dublin. The TSO and DSO are working together to provide additional operational measures to reduce the short circuit levels in Dublin.

Cork

As a result of the planned connection of two new large generators in East Cork (see Table 4-8 & 4-9 in section 4), the short circuit currents in Cork have to be addressed. EirGrid is actively progressing solutions including a combination of operational measures and switchgear upratings to deal with high short circuit levels in these areas.

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 and at 110 kV.

The new trading arrangements under the All Island Single Electricity Market took effect in November 2007. The tie-lines have effectively become internal circuits within the new market. Transfers on the current tie-lines are constrained.

EirGrid and NIE are working on provision of a new major tie-line which will form a significant part of the robust infrastructure that is required to meet the needs of the new All Island Single Energy Market and enhance security of supply for consumers. Along with other network developments it is expected to alleviate constraints thus providing 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 project, identified as CP466, is listed as a Network Reinforcement Project in the preliminary design phase in Section 4.1 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.

As recommended by EirGrid, 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. The separate acquisitions of converter station sites in Ireland and Wales are now approved. EirGrid submitted an application to the Strategic Infrastructure Division of An Bord Pleanála on 18th November 2008. The planning application seeks approval for a converter station at Woodland, underground HVDC cable to the transition joint at Rush, Co. Dublin and a subsea HVDC cable beneath the Irish seabed to the 12 nautical mile limit. An oral hearing is scheduled to begin on the 10th of March in North County Dublin.

3.5 *Condition of the Network*

The decision whether to refurbish particular transmission assets is based on detailed condition assessments, as discussed in Section 2.4.2. The age of the assets is one of the contributory factors to the need to refurbish. 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 3-7.

3.5.1 Line Refurbishments

The expected lifespan of a transmission line is of the order of 40 years, after which either major refurbishment or uprating are generally required. The majority of the existing transmission lines were constructed after 1960 and of those which were constructed pre 1960 the majority 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 earlier the initial step is to determine the 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.

Table 3-7 Transmission Asset Age Profile [Source: ESB Networks]

	Up to 1969	1970 1979	1980 1989	1990 1999	2000 2006	Total
Overhead lines-circuit (kms)						
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	6,307.0
Underground cables –circuit (kms)						
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

	Up to 1969	1970 1979	1980 1989	1990 1999	2000 2006	Total
110 kV cables	4.3	5.5	1.8	2.8	13.3	27.8
Total:-	4.3	53.4	19.7	17.5	41.9	136.9
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

The transmission lines that have been approved for refurbishment are listed in Section 4.4. 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 closer to the time of their implementation.

The transmission lines that are under consideration for refurbishment are listed below. The scopes of work are currently under investigation, including the possibility of uprating certain of the conductors.

- Carrickmines-Dunstown 220 kV (41.6 km);
- Flagford-Lanesboro 110 kV (30.6 km);
- Flagford-Sligo 220 kV (50.5 km);
- Gorman-Maynooth 220 kV (36.3 km);
- Gorman-Louth 220 kV (32.4 km);
- Kilbarry-Knockraha No. 1 110 kV (11.9);
- Limerick-Rathkeale 110 kV (29.11);

- Lisdrum-Shankill 110 kV (39.3 km);
- Lisdrum-Louth 110 kV (40.4 km).

3.5.2 Station Refurbishments

The process by which substation refurbishment projects are developed has been described earlier in Chapter 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.

As can be seen in Table 3.7 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.

While age is one potential trigger for carrying out extensive substation plant replacement/refurbishment it is not the only one. Other factors which, either on their own or in combination, may lead to refurbishment proposals being developed include:

There are other factors in addition to the age of plant which drives substation refurbishment;

- The need to upgrade the control, instrumentation, protection and telecommunications equipment within the station to leverage increased opportunity provided by modern 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.
- 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 are among those currently under consideration for refurbishment/replacement:

- Tarbert 220kV Station
- Killonan 220kV station
- Great Island 220kV station
- Louth 220kV station
- Maynooth 220kV station
- Finglas 220kV station
- Aghada 220kV station
- Carlow 110kV station

- Dundalk 110kV station
- Rathkeale 110kV station
- Moy 110kV station
- Navan 110kV station

3.6 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 significantly over the period of the plan.

While economic activity has declined sharply over the last year, 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. 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.

Gate 2 offers have been issued and as of the start of July 2009 all but 5 offers have been accepted. The CER's Gate 3 will process just over 4,000 MW of wind farm applications and over 6,000 MW of conventional generators. Grid25 has indicated that a significant investment in transmission infrastructure is required to accommodate these levels of generation. This is discussed further in Chapter 5.

EirGrid and the CER are progressing the delivery of a new 500 MW HVDC interconnector between Ireland and Great Britain. As recommended EirGrid, the CER has approved the choice of Woodland as the connection point on the Irish system for the interconnector. Network studies indicate that there will be a requirement for additional transmission infrastructure to permit power flows of 500 MW to and from Great Britain through Woodland station.

4 Planned Network Developments

The transmission network development planning process for the transmission network followed by EirGrid was outlined in Section 2.4. This chapter 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 104 projects that are in progress, 52 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 scopes, particularly those in the preliminary stages of design, can change during the course of a project.

Table 4-1 Estimates of Planned New Transmission Assets

	400 kV	220 kV	110 kV
No of New Stations	3	11	21
Total New Station Bays	17	68	188
Overhead Line, km	120	152	575
Underground Cable, km	0	44	59

	400/220 kV	220/110 kV
Transformers, number of	3	14
Transformers, Total MVA	1400	3750

	110 kV
Capacitor banks, number of	13
Capacitor banks, Total MVA	210

In addition, there are a total of nineteen 110 kV and two 220 kV station bays that are planned to be refurbished at two stations in the Plan Period. There will also be a total of 144 km of 110 kV and 116 km of 220 kV transmission lines that will be involved in refurbishment. 82 km of 220 kV and 333 km of 110 kV transmission circuits will have their thermal ratings increased.

The development projects presented in this chapter are categorised under four sub-sections relating to the main development drivers:

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

Within each sub-section and where relevant development projects are listed in separate tables, 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;
  - The initial stage of procurement and engineering design;
  - 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.
- Developments in the Preliminary Design Phase - projects or developments that have been approved at the appropriate level internally and are at the preliminary design stage.

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.

The tables present the following project information:

- Capital Project number (CP No.) – each project is referenced with a Capital Project number for coordination between the TSO and TAO;
- Project Description provides a project title and a brief description of the works involved; For projects in the Preliminary Design stage, the project descriptions provided are the TSO's current best estimates and are liable to change;
- Major New Equipment – a high level equipment list where appropriate describing the new transmission assets (e.g. bays, line in km[1], etc.) added to the network on completion of the project (not provided for refurbishment projects where no new assets are added);
- Reason for Development – a brief description of the reason for the network development projects (omitted for DSO and Generator connections, where the reason for the development is in all cases the connection);
- Expected Completion Date (E.C.D.) – 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.

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

- Expected Project Agreement Date (E.P.A.D.) – this is the date the project could enter the detailed design and construction phase following agreement of the project scope with the TAO, and is provided for projects not yet in this phase. The date estimate is subject to the public planning process and construction start-up and may be liable to change.

A map in Appendix A illustrates the location of the larger network development projects.

The TSO and the TAO are co-ordinating other capital projects additional to the projects listed below. They 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

Section 4.1 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 lists the Network Reinforcement projects that are in the detail design and construction phase. Appendix B presents more detailed information for the larger network reinforcement projects. Table 4-3 lists the Network Reinforcement projects that are in the public planning process. Appendix C presents more detailed information for the larger network reinforcement projects in the public planning process and Table 4-4 lists the Network Reinforcement projects that are in the preliminary design phase.

Table 4-2 Network Reinforcement Projects in the Detailed Design & Construction Phase

CP No	Project Description	Major New Equipment	Reason for Development	E.C.D.
CP175	<u>Charleville-Killonan 110 kV line:</u> Uprate the conductor to an equivalent rating of 300mm2 @ 80°C. Replace the 110 kV line/earth/busbar disconnects on the Killonan bay at Charleville	Uprate 110 kV line: 37 km	To avoid overloading of the 110 kV line during certain contingencies, as a result of new wind generation in the south.	Jun-10
CP211	<u>Sranangh 220 kV Station and Line:</u> A new Srananagh 220/110 kV station connected by a new 220 kV line to Flagford 220 kV station; A 250 MVA 220/110 kV transformer installed at the station; The Cathaleen's Fall–Sligo 110 kV line looped into the new Srananagh station to form the Sligo-Srananagh 110 kV line and the Cathaleen's Fall–Srananagh No.1 110 kV	<u>220 kV Station:</u> 250 MVA Trfr: 1 220 kV bays: 2 110 kV bays: 7 <u>In other stations:</u> 220 kV bays: 1 110 kV bays: 1	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.	110 kV works: Jun-09 220 kV works: Dec-10

CP No	Project Description	Major New Equipment	Reason for Development	E.C.D.
	line; The Cathaleen's Fall–Corderry 110 kV line looped into the new Srananagh station to form the Corderry-Srananagh 110 kV line and Cathaleen's Fall–Srananagh No.2 110 kV line; A second line from Sligo to Srananagh constructed at 110 kV.	New Lines: 220 kV: 56 km 110 kV: 49 km		
CP217	Newbridge loop-in of the Blake-Cushaling-Maynooth 110 kV line: Looping of the Blake–Cushaling–Maynooth 110 kV line into Newbridge 110 kV station, creating the Cushaling–Newbridge and Blake–Maynooth–Newbridge 110 kV lines.	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.	Dec-09
CP218	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 the Arva-Navan 110 kV line in 2010 and either of the existing Gorman-Navan 110 kV lines from 2012 under certain contingencies.	Dec-10
CP241	Lodgewood 220 kV 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 250 MVA 220/110 kV transformer. Planning permission granted for the new 220 kV station and planning permission for the new Crane–Lodgewood 110 kV line.	220 kV Station: 250 MVA Trfr: 1 220 kV bays: 5 110 kV bays: 5 In other station: 110 kV bays: 1 New Line: 220 kV: 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-11
CP246	Tarbert-Tralee No.2 110 kV line: A second line from Tarbert to Tralee constructed at 110 kV.	110 kV bays: 2 110 kV line: 47 km	This is needed to overcome 110 kV line overloads and voltage collapse in the Tralee area. The final completion date is currently under review.	Dec-11
CP254	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.	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.	Nov-10
CP264	Finglas 5th 220/110 kV Transformer: Installation of a fifth 250 MVA 220/110 kV transformer and coupler.	220 kV bay: 1 110 kV bay: 1 220/110 kV 250 MVA Trf: 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.	Dec -09
CP292	Gorman-Meath Hill 110 kV Line: A second 110 kV line will be constructed between Gorman and Meath Hill 110 kV stations.	110 kV bays: 2 110 kV line: 26 km	The DSO has requested a second connection to Meath Hill 110 kV station	Jun-11

CP No	Project Description	Major New Equipment	Reason for Development	E.C.D.
CP374	Arva-Shankill No. 2 110 kV Line: A second 110 kV line constructed between Arva and Shankill 110 kV stations.	110 kV bays: 2 110 kV line: 21 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.	Jun-11
CP385	Drybridge-Louth 110 kV line: Uprating of line to equivalent rating of 430 mm^2 @ 80°C.	Uprate 11 0kV line: 33 km	The uprate will avoid unacceptable overloading of the line during certain maintenance contingencies in the Louth area.	Dec-09
CP406	Cashla-Cloon 110 kV line Uprating of the line to 430 mm^2 @ 80°C	Uprate 110 kV line: 23 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Dec-10
CP451	Dungarvan-Knockraha 110 kV line: Uprate line (from busbar to busbar) to equivalent of 430 mm^2 @ 80°C.	Uprate 110 kV line: 54 km	This uprate is necessary to avoid unacceptable overloading of the 110 kV line during certain contingencies as a result of new generation in the South West.	Dec-10
CP454	Ardnacrusha-Limerick 110 kV line: Refurbishment and to uprate the line to the equivalent of 430 mm^2 conductor operating at 80°C including addition of a small section of underground cable	Uprate 110 kV line: 12 km	A complete line condition assessment indicated that the line needs to be refurbished. In addition the need of uprating has been identified to avoid potential overloads of the line.	Apr-09
CP467	North East Reactive Compensation: Installation of 2 fixed capacitor units at Lisdrum 110 kV station, 1 deployable capacitor unit at the 110 kV busbar in Louth station.	110 kV bays: 3 30 Mvar Cap: 1 15 Mvar Cap: 2	To resolve the temporary and long-term voltage problems in the north-east	Louth: Dec-09 Lisdrum: Dec-10
CP480	Killoteran-Waterford 110 kV line: Undergrounding of the entire Killoteran-Waterford 110 kV circuit.	110 kV cable: 5 km	Waterford County Council requested that the entire line be undergrounded.	Jun-09
CP511	Killonan 220 kV station: Installation of a 4^{th} 220/110 kV transformer. The unit will be a 250 MVA transformer.	220/110 kV 250 MVA Trfr: 1	Required to avoid overloading the existing 63 MVA transformers when the 125 MVA transformer is out for maintenance and one of the remaining 63 MVA transformer trips.	Oct-10
CP512	New capacitors at Kilkenny: Two new 15 Mvar capacitors at Kilkenny 110 kV Station.	110 kV bays: 2 Caps.: 2 x 15 Mvar	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.	Dec-09
CP 513	Carrickmines 220 kV station: Installation of a 3^{rd} 250 MVA 220/110 kV transformer (double wound)	220/110 kV 250 MVA transformer: 1	Necessary to avoid unacceptable voltage levels in the area when one transformer is out for maintenance and the subsequent loss of the second transformer.	Aug-09

CP No	Project Description	Major New Equipment	Reason for Development	E.C.D.
CP514	New capacitor at Ardnacrusha: One new 30 Mvar capacitor at Ardnacrusha 110 kV Station.	110 kV bays: 1 Caps.: 1 x 30 Mvar	To ensure that voltages in the Ardnacrusha area continue to comply with standards and to permit the connection of new load in the area.	Dec-09
CP515	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 and to permit the connection of new load in the area.	Dec-10
CP528	New capacitor at Kilteel: One new 30 Mvar capacitor at Kilteel 110 kV Station.	110 kV bays: 1 Caps.: 1 x 30 Mvar	To ensure that voltages in Kildare continue to comply with voltage standards following the looping of Kilteel station and to minimise the risk of voltage collapse.	Dec-10
CP529	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 Transmission Planning Criteria and to minimise voltage drop violations.	Dec-10
CP549	Shannonbridge-Dallow T – Portlaoise 110 kV line; Partial line uprate so all of the line is equivalent of 430 mm^2 conductor operating at 80°C	Uprated 110 kV line: 18.3 km of total 66.7 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Sep-10
CP552	Athlone-Shannonbridge 110 kV line: Uprate of the line so it is the equivalent rating of 430 mm^2 conductor operating at 80°C and uprate all equipment for this rating.	Uprated 110 kV line: 21 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Oct-10
CP568	Poolbeg-Shellybanks 220 kV cable: Uprate of the Poolbeg-Shellybanks 220 kV cable so it is equivalent of 1600 mm^2 conductor.	Uprated 220 kV line: 0.6 km	Thermal uprating from 250 MVA to 570 MVA in line with rest of the Dublin 220 kV cable network.	Mar-10
CP584	Shannonbridge-Ikerrin T 110 kV line uprate: Uprate of the line so it is the equivalent rating of 430 mm^2 conductor operating at 80°C and uprate all equipment for this rating.	Uprated 110 kV line: 54 km	The uprate will avoid unacceptable overloading of the line during certain contingencies.	Sep-10
CP588	Kilbarry-Mallow 110 kV line: Uprate the line to the equivalent of 430mm^2 conductor operating at 80°C.	Uprate 110 kV line: 29 km	The need of uprating has been identified to avoid potential overloads of the line.	Jul-09
CP590	Raffeen-Trabeg 110 kV line: Uprate the line to the equivalent of 430mm^2 conductor operating at 80°C.	Uprate 110 kV line: 9 km	The need of uprating has been identified to avoid potential overloads of the line.	Jul-09
CP626	Killonan-Knockraha 220 kV line: Uprate the conductor to an equivalent rating of at least 518 MVA. Replace the existing conductor with a High Temperature Low Sag (GAP) conductor.	Uprate 220 kV line: 82 km	To avoid overloading of the line during certain contingencies as a result of new wind generation in the south.	Dec-10

Table 4-3 Network Reinforcement Projects in the Public Planning Process

CP No	Project Description	Major New Equipment Estimates	Reason for Development	E.P.A.D. – E.C.D.
CP592	Aghada-Raffeen 220 kV circuit: 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	This is necessary to ensure a reliable supply of electricity to Cork city and harbour area.	Dec-09 – Mar-10
CP586	Knockraha 220 kV station: Installation of a 3rd transformer, 250 MVA 220/110 kV	22/110 kV transformer 250 MVA: 1 220k V bay: 1 110 kV bay:1	Two new CCGTs in Cork drive the need for additional transformer capacity in Knockraha 220 kV station.	Nov-09 – Oct-10

Table 4-4 Network Reinforcement Projects in the Preliminary Design Phase.

CP No	Project Description	Major New Equipment Estimates	Reason for Development	E.P.A.D. – E.C.D.
CP250	Castlebar-Tonroe 110 kV line: A new Castlebar-Tonroe line constructed at 220 kV and operated at 110 kV.	110 kV bays: 2 220 kV line: 60 km (energised at 110 kV)	To alleviate unacceptable overloads of the Cunghill - Sligo 110 kV line in 2011 and other lines in the area from 2012 during certain contingencies. The line also forms part of a long term development to introduce 220 kV to support future load growth.	Under Review
CP261	Athlone-Shannonbridge No. 2 110 kV line: A second 110 kV line constructed between Athlone and Shannonbridge 110 kV stations.	110 kV bays: 2 110 kV line: 25 km	To alleviate unacceptable voltages at Athlone and overloading of the existing Athlone-Shannonbridge 110 kV line under contingency conditions.	Mar-11 – Mar-13
CP399	Moneypoint-Tarbert 220 kV circuit: A new submarine cable constructed across the Shannon Estuary from Moneypoint in Co. Clare to Tarbert in north Co. Kerry.	400 kV bays: 1 220 kV bays: 1 500 MVA Trfr: 1 220 kV cable: 10 km	To provide an alternative route for power into the south west as well as an additional link between the 400 kV and 220 kV networks.	Mar-11 – Jun-12
CP466	New North-South Circuit: Construction of a new north-south circuit at 400 kV between Northern Ireland and a new station in Co. Cavan.	400 kV Station: 400/220 kV 500 MVA Trfr: 1 400 kV bays: 5 220 kV bays: 3 New Lines: 400 kV line: 50 km 220 kV line: 5 km	To increase transfer capacity between the two systems in both directions and avoid situations where a single event could lead to system separation.	Apr-11 – Dec-12
CP467	North East Reactive Compensation: 2 redeployable capacitor units at Shankill 110 kV station.	110 kV bays: 2 30 Mvar Cap: 1 15 Mvar Cap: 1	To resolve the temporary and long-term voltage problems in the north-east	Oct-09 – Dec-10

CP No	Project Description	Major New Equipment Estimates	Reason for Development	E.P.A.D. – E.C.D.
CP468	New 400/220 kV Station in the West Midlands near Nenagh: Construction of a new 400/220 kV station, near Nenagh in Co. Tipperary, connected into the Dunstown-Moneypoint 400 kV line; looping of the existing Killonan-Shannonbridge 220 kV line into the new station to form the West Midland-Shannonbridge and West Midland-Killonan 220 kV lines; uprating of the West Midland-Killonan 220 kV section.	400 kV Station: 400 kV bays: 3 220 kV bays: 3 400/220 kV 500 MVA Trf: 1 New Lines: 400 kV line: 10 km 220 kV line: 30 km	To reinforce the 220 kV network to the south and avoid overloading of this network following the loss of the planned Moneypoint Tarbert circuit.	Under Review
CP469	New 400 kV line from Kingscourt - Woodland: A new 400 kV line constructed between the existing Woodland 400 kV station, in south east Co. Meath and a new 400 kV station in Co. Cavan, connected into the Flagford-Louth 220 kV line. (See project CP466 regarding this station.)	400 kV line: 60 km 400 kV bays: 1	The loading on the transmission network is reaching the capacity of the corridor between Dublin and the North East. Unacceptable overloads and low voltages in the area will occur in the future under contingency conditions. This project forms part of the long term development to meet the future demand of the area.	Apr-11 – Dec-12
CP500	Knockanure 220/110 kV station: A new 200/110 kV station looping in the	220 kV station: 220 kV bays:8 110 kV bays:11 220/110 kV trfr: 1x250 MVA 110kV new line for loop ins: 10km	To facilitate the connection of wind farms in the south west area.	Apr-12 - Apr-14
CP501	Clashavoon – Dunmanway 110 kV line: Construction of a new 110 kV line from Clashavoon to Dunmanway station and associated stations works.	110 kV Bays: 2 110 kV Line: 35 km	The construction of a Clashavoon - Dunmanway 110 kV line will resolve the low voltage and line overloads under certain contingencies, and makes some provision for expected increases in wind generation	May-11 – May-13
CP575	Corraclassy-Gortawee 110 kV line uprate: Uprate the line to the equivalent of 430mm^2 conductor operating at 80°C.	110 kV line uprate: 10.9km	The need of uprating has been identified to avoid potential overloads of the line.	Aug-09– Dec-10
CP597	Reinforcement of the Ardnacrusha and Ennis area	TBC – two separate schemes being considered	To alleviate low voltage levels in the Ardnacrusha and Ennis areas during the summer maintenance of certain existing overhead lines in the area.	Dec-12 – Dec14
CP583	Carrickmines 4th 220/110 kV transformer: A 4th 250 MVA 220/110 kV transformer in the Carrickmines 220 kV station	220 kV bays: 1 250 MVA 220/110 kV trfr: 1	Necessary to avoid unacceptable voltage levels in the area when one transformer is out for maintenance and the subsequent loss of the second transformer	Dec 12
CP587	Glanagow-Raffeen 220 kV circuit: New 220 kV underground cable from Glanagow to Raffeen.	220 kV station: 220 kV bays: 6 220 kV cable: 10 km	This is necessary to ensure a reliable supply of electricity to Cork city and harbour area.	Sep-10 – Mar-11
CP585	Laois 400 kV station:	400 kV station:	Reinforcement will deal with	Dec-11 –

CP No	Project Description	Major New Equipment Estimates	Reason for Development	E.P.A.D. – E.C.D.
	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 line which is built to 110 kV standards.	400 kV bays: 6 110 kV bays: 7 400/110 kV 250 MVA Trf: 2 110 kV station: 110 kV bays: 4 In other 110 kV station: 110 kV bays: 1 110 kV OHL: 30 km	voltage problems in the Carlow/Kilkenny area.	Dec-14
CP594	New capacitor bank at Mullingar: Installation of 2x15Mvar capacitors at Mullingar station	110 kV bays: 2 Caps: 2 x 15 Mvar	To ensure that voltages in the Mullingar area continue to comply with standards and to permit the connection of new load in the area.	Jun-10 – Sep-10
CP596	New circuit to Mullingar: A new 110 kV circuit from Mullingar to either Kinnegad or Derryiron 110 kV stations.	110 kV bays: 2 110 kV line: 30 km	Required to ensure voltage levels at Mullingar remain within standards during certain contingencies.	Feb-12 – Dec-13
CP620	Arva-Gortawee 110 kV line uprate: Uprate the line to the equivalent of 430mm^2 conductor operating at 80°C.	110 kV line uprate: 30.6 km	A condition assessment of the line identified the need for refurbishment, while system studies indicated the need to uprate.	Jul-10 – Nov-10
CP634	Dungarvan 110 kV busbar uprate	110 kV busbar uprate: 1	Required to match the busbar rating with that of the Dungarvan-Knockraha 110 kV line.	Oct-09 - Dec-10
CP635	Corderry and Carrick-on-Shannon busbar uprate	110 kV busbar uprates:2	Required to match the busbar and line droppers with that of the Corderry-Carrick-on-Shannon 110 kV line	Dec-09 – Dec-10
CP638	Circuit breaker uprates in Limerick 110 kV station and Knockraha 220 kV stations	220 kV coupler uprate: 1 110 kV circuit breaker uprate: 2	Replacement of existing circuit breakers on T141 and T142 in Limerick 110 kV station and the circuit breaker in Knockraha 220 kV station with higher rated circuit breakers.	Nov-09 – Dec-10
CP647	Kilpaddoge 220/110 kV station: New station to the west of the existing Tarbert station. Kilpaddoge will loop in the existing Clashavoon-Tarbert 220 kV, Killonan-Tarbert 220 kV, Aughinish-Tarbert 110 kV, Rathkeale-Tarbert 110 kV, Tarbert-Trien 110 kV, Tarbert-Tralee No. 1 and planned No. 2 110 kV lines.	TBC	Required to accomodate planned generation in the south west and the refurbishment of the existing Tarbert 220 kV station.	Mar-12 – Mar-14
CP650	Ballyvouskil 220/110 kV station: Looped into the existing Clashavoon-Tarbert 220 kV line. In addition a new 110 kV line will be constructed from the new station to the eixisting Garrow 110 kV station.	220 kV station: 220 kV bays: 3 110 kV bays: 3 220/110 kV trfr: 1 x 250 MVA 110 kV line: 25km	Required to accommodate planned generation in the south west area.	Apr-12 – Jul-14

CP No	Project Description	Major New Equipment Estimates	Reason for Development	E.P.A.D. – E.C.D.
CP651	Kishkeam 220/110 kV station: Looped into the existing Clashavoon-Tarbert 220 kV line. In addition two new 110 kV lines will be constructed from the new station; the first to the existing Glenlara 110 kV station and the second to the planned Cordal 110 kV station.	220 kV station: 220 kV bays: 3 110 kV bays: 3 220/110 kV trfr: 1 x 250 MVA 110 kV line: 25km	Required to accommodate planned generation in the south west area.	Apr-12 – Jul-14

4.2 Demand Customer and DSO Connections

Most demand connections to the transmission system are sought by the DSO which applies for new station connections. Table 4-5 only lists the development projects in the detailed design and construction phase that relate directly to the connection of new TSO/DSO interface stations to the grid, or to changes in existing connection arrangements. Table 4-6 lists the development projects in the public planning process and Table 4-7 lists the development projects in the Preliminary Design Phase.

The DSO has further development plans which are at various stages of preparation, several at an advanced stage; more details are given in Chapter 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 4-5 DSO Connection Projects in the Detailed Design & Construction Phase

CP No.	Project Description	Major New Equipment	E.C.D.
CP074	New 110 kV bays at Binbane 110 kV Station Two new 110 kV bays constructed at Binbane station to facilitate the replacement of the existing 31.5 MVA 110/38 kV transformer with two 63 MVA units; to facilitate the connection of DSO wind farms.	110 kV bays: 2	Dec-09
CP075	Ballycummin 110 kV Station: New looped station into the Limerick-Moneteen 110 kV line.	110 kV station: 110 kV bays: 5 110kV line: 0.2 km	Mar-11
CP173	Banoge 110 kV Station: The existing Arklow–Crane 110 kV line looped into a new Banoge 110 kV station, creating new Arklow–Banoge and Banoge– Crane 110 kV lines.	110 kV station: 110 kV bays: 4 110 kV line: 6 km	Dec-10

CP No.	Project Description	Major New Equipment	E.C.D.
CP197	Cushaling-Thornsberry 110 kV line: Construction of a new Cushaling-Thornsberry 110 kV line as a second connection to Thornsberry 110 kV station.	110 kV bays: 2 110 kV line: 30 km	Dec-10
CP201	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.	110 kV station: 110 kV bays: 5 110 kV line: 18 km	Dec-09
CP285	Kilteel 110 kV loop in and 110 kV Transformer bay: The present connection of Kilteel is a solid T off the Maynooth-Monread 110 kV line. The T will be removed and the line between Maynooth and Monread will be looped into Kilteel 110 kV station. The DSO have also requested a second 110 kV transformer bay for a new 31.5 MVA transformer.	110 kV bays: 2 110 kV line: 2 km	Dec-09
CP376	Singland 110 kV station : New 110 kV GIS station looped into the existing Ardnacrusha-Killonan 110 kV 110 kV line.	110 kV station: 110 kV bays: 5 110 kV cable: 1 km	May-09
CP402	Charlesland 110 kV Station: The existing Ballybeg-Carrickmines 110 kV line will be looped into a new Charlesland 110 kV station, near Greystones in Co. Wicklow.	110 kV station: 110 kV bays: 4 110 kV circuit: 10 km	Under Review
CP489	Castlebar 110 kV Station – New 110 kV line bay for Carrowbeg: A new tail fed 110 kV station called Carrowbeg, near Westport, Co. Mayo. Installation of 110 kV equipment in an existing line bay in Castlebar 110 kV station. It is proposed the new station will supply 1 MVA of new load and accommodate the transfer of 22 MW from Castlebar 110 kV station.	110 kV bay: 1	Jun-09
CP507	Arklow 2x20 MVA transformers: Two new transformers in Arklow station to accommodate growing load in the area.	110 kV bays: 2	Dec-09
CP523	Inchicore 4th transformer: A 4th 220/110 kV 250 MVA transformer in Inchicore station. The 220 kV busbar will also be extended, allowing sectionalising into two sections. This will maintain security of supply and alleviate existing 220 kV short circuit problems.	220 kV bays: 3 250 MVA 220/110 kV trfr: 1	Sep-09
CP535	College Park 110 kV Station 3rd transformer bay: Connection of 1x20 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-09
CP543	New Salthill 110 kV Station and new 110 kV line bay for Screeb 110 kV station: New looped 110 kV station, built in the existing Salthill 38 kV station. The station will be looped into the Cashla-Galway No. 4 110 kV line. The station includes a new 110 kV line bay for Screeb 110 kV station which will be tail fed from Salthill station.	110 kV line bays:5 110 kV trfr bays: 3 110 kV cable: 12 km	Apr-11

Table 4-6 DSO Connection Projects in the Public Planning Process

CP No.	Project Description	Major New Equipment Estimates	E.P.A.D. – E.C.D.
CP421	Binbane-Tievebrack-Letterkenny 110 kV line and a 110 kV bay in Tievebrack station for 110 kV DSO link to the Ardnagappary 110 kV station at Doire Beag: A new 110 kV line between Binbane 110 kV station and Letterkenny 110 kV station, in Co. Donegal; this new line looped into a new 110 kV switching station at Tievebrack, east of Glenties. Also included in this project is one 110 kV line bay for a new DSO 110 kV line to the Ardnagappary 110 kV DSO station at Doire Beag.	110 kV bays: 5 110 kV line: 70 km In other stations: 110 kV bays: 1	May-10 – Jul-11

Table 4-7 DSO Connection Projects in the Preliminary Design Phase

CP No.	Project Description	Major New Equipment Estimates	E.P.A.D. – E.C.D.
CP385	Southgreen 110 kV station: A new 110/MV kV station near Kildare to loop into the existing Newbridge-Portlaoise 110 kV circuit. The station will have 2 x 20 MVA 110/MV kV transformers.	TBC	Under Review
CP437	Balgriffin 220 kV 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 station using cable and constructed with GIS.	220 kV station (GIS): 250 MVA Trfr: 4 220 kV bays: 7 110 kV bays: 10 In other station: 220 kV bays: 1 220 kV cable: 15 km	Jul-10 – Dec-12
CP506	Finnstown 220 kV station: Construction of a new 220/110 kV GIS station near Adamstown, Co. Dublin. The existing Inchicore-Maynooth No 1 and No 2 220 kV lines will be looped into the new station. Required to cope with predicted load demand in the western network of Dublin.	220 kV station: 220/110 kV 250 MVA Trfr: 4 220 kV bays: 11 110 kV bays: 15	Apr-11 – Apr-13
CP542	Kentstown 110 kV Station: New looped 110 kV station into Gorman-Platin 110 kV line. The new station will supply 8.8 MW of new load, accommodate the transfer of 11.1 MW of existing demand from Navan 110 kV station.	110 kV station 110 kV bays: 5	Under Review
CP627	Bandon 110 kV station – new bay for 110/38 kV transformer: A transformer bay for installation of a new 110/38 kV transformer in Bandon 110 kV station.	110 kV trfr bay: 1	May-10 – Dec-12
CP628	Doon 110 kV station – new bay for 110/38 kV transformer: New transformer bay for installation of a new 110/38 kV transformer in Doon 110 kV station and uprate of a second transformer bay for uprated transformer.	110 kV trfr bay: 1 110 kV trfr bay uprate: 1	Apr-10 – Dec-10

CP No.	Project Description	Major New Equipment Estimates	E.P.A.D. – E.C.D.
CP629	Monread 110 kV station – new bay for 110/10 kV transformer: A transformer bay for installation of a new 110/10kV 20 MVA transformer in Monread 110 kV station.	110 kV trfr bay: 1	Feb-10 – Dec-10
CP630	Carlow 110 kV station- uprate two 110 kV transformer bays: Uprate of two existing 110 kV transformer bays to accommodate the uprate of two transformers from 31.5 MVA to 63 MVA.	110 kV trfr bay uprate: 2	Apr-10 – Dec-12
CP631	Waterford 110 kV station – uprate 110 kV transformer bay: An uprate of the transformer bay for installation of a new 110/38 kV transformer in Doon 110 kV station	110 kV trfr bay uprate: 1	Apr-10 – Sept-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 (E.C.D.) is the TSO'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 4-8 lists the generator connection projects that are in the Detailed Design & Construction Phase. Table 4-9 lists the generator connection projects that are in the Public Planning Process. Table 4-10 lists the generator connection projects that are in the Preliminary Design Phase.

Table 4-8 Generator Connection Projects in the Detailed Design & Construction Phase

CP No.	Project Description	Major New Equipment	E.C.D
CP531	IPP89 Aghada CCGT Connection: A new 220 kV station, tail connected to Aghada 220 kV station.	220 kV station: 220 kV bays: 1 220 kV cable: 1.4 km	Jan-09

CP No.	Project Description	Major New Equipment	E.C.D
CP479	IPP55 Athea Phase 1 Connection: New Athea 110 kV station connected to the existing Trien 110 kV station, for the connection of Athea wind farm. Shallow connection works (IPP).	110kV station 110 kV bays: 4 110 kV OHL: 11 km	Sep-09
CP530	IPP102 WhiteGen CCGT Connection: Glanagow 220 kV connection; new 220 kV station, initially tail connected to Aghada 220 kV station.	220 kV station: 220 kV bays: 3 220 kV cable: 4 km	Jul-09
CP555	IPP111 Castledockrill Connection: Shallow connection works (IPP build). Associated with Lodgewood station, see CP241 in Table 4-2.	110 kV station 110 kV bays: 2 110 kV cable: 6.6 km	Dec-11
CP599	IPP48E Coomagearlahy Extension: Shallow connection works. Second bay in Coomagearlahy 110 kV station.	110 kV bays: 1	Dec-09

Table 4-9 Generator Connection Projects in the Public Planning Process

CP No.	Project Description	Major New Equipment Estimates	E.P.A.D. – E.C.D.
CP563	IPP62 Garvagh Connection: Shallow connection works (IPP build). Installation of Garvagh 110 kV bay in Corderry 110 kV station	110 kV station 110 kV bays: 2 110 kV cable: 7 km	Jul-09 – Sep-09

Table 4-10 Generator Connection Projects in the Preliminary Design Phase

CP No.	Project Description	Major New Equipment	E.P.A.D. – E.C.D.
CP553	IPP91B Lisheen Connection: Shallow connection works (ESB build)	110 kV bays: 2	Apr-09 – Jul-09
CP600	IPP57 Boggeragh Connection: Shallow connection works. Installation of Boggeragh 110 kV bay in Clashavoon station.	110 kV station: 110 kV bays: 3 220 kV bay: 1 110 kV OHL: 15 km 220/110 kV trfr: 1 x 250 MVA	Jun-09 – Dec-09

CP No.	Project Description	Major New Equipment	E.P.A.D. – E.C.D.
		110 kV bay: 1	
CP601	IPP120 Dromada Connection: Shallow connection works.	110 kV cable: 10 km 110 kV bay: 1	May-09 – Oct-09
CP602	IPP044 Keelderry Connection: Shallow connection works.	110 kV station 110 kV bays: 4 110 kV OHL: 10 km	Jan-10 – Oct-10
CP603	IPP88 Mulreavy Connection: Shallow connection works.	110 kV station: 110 kV bays: 3 110 kV OHL: 35 km	Aug-11 – Jul-13
CP606	IPP61 Knockacummer Connection; Shallow connection works.	110 kV station 110 kV bays: 3 110 kV cable: 10 km	Dec-11 – Jul-14
CP607	IPP55B Athea Phase 2 Connection; Shallow connection works.	TBC	Sep-11 – Jun-13
CP608	IPP119 Cloghboola Connection: Shallow connection works.	110 kV station: 110 kV bays: 3 110 kV OHL: 15 km	Dec-11 – Feb-14
CP614	IPP142 Edenderry Peaker Connection: Transmission work for the connection of Edenderry peaking plant to Cushaling 110 kV station	110 kV bays: 2	May-09 – Dec-09
CP615	Glenree 110 kV 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 wind farms	110 kV bays: 4	Feb-10 – June-10
TBC	Cauteen 110 kV station: Connection of new 110 kV station, loped into the Killonan-Tipperary 110 kV line. This station will facilitate the connection of new DSO wind farms	TBC	TBC

4.4 Connection of Interconnectors

This section outlines the projects that relate directly to the connection of interconnectors to the transmission system. Table 4-11 lists the interconnector connection projects that are currently in the Preliminary Design Phase.

Table 4-11 Interconnector Connection Projects in the Preliminary Design Phase.

CP No.	Project Description	Major New Equipment	E.C.D.
N/A	East West Interconnector Connection: Shallow connection of the East-West Interconnector into Woodland 400 kV station.	400 kV bays: 1	Dec-12

4.5 Refurbishments

This section details the development projects relating to upgrading of existing transmission equipment.

Table 4-12 lists the refurbishment projects that are currently in the Detailed Design and Construction Phase.

Table 4-12 Refurbishment Projects in the Detailed Design & Construction Phase.

CP No.	Project Description	Reason for Development	E.C.D.
CP192	Kilbarry 110 kV Station refurbishment	A survey of the station found that many items required replacing due to old age, poor condition and no longer meeting modern requirements. Majority of the work has been completed. There are some protection works outstanding which require outages to complete.	Mar-10
CP213	Knockraha 220 kV Station refurbishment	Due to the age and condition of the existing station a full refurbishment of the entire station was undertaken. The replacement of all the HV equipment was included in this project. A new Control Room was constructed and all the relays and control equipment was replaced. Most of the work has been completed. There are some protection works outstanding which require outages to complete.	Dec-09
CP225	Shannonbridge 220/110 kV Station refurbishment	The closure of the old power station on site necessitated the replacement of relays and control equipment to transfer the control functions. Due to the age and condition of the existing station a full refurbishment of the entire station is required. Most of the work has been completed. There are some protection works outstanding which require outages to complete.	Dec-09
CP228	Marina 110 kV Station Replacement	The existing Marina Station is obsolete and in poor condition, thus requiring major refurbishment. Due to operational, environmental and site restrictions a new GIS station is required to replace it. New GIS 110 kV station; 110 kV bays: 12	Jun-10

CP No.	Project Description	Reason for Development	E.C.D.
CP322	Protection Upgrades at Major Transmission Stations	The obsolete protection equipment at various stations will be replaced as part of an ongoing refurbishment programme.	2009 to 2012
CP356	Prospect 220 kV Station relay replacement/ upgrade dist rec/ signals to NCC	Station requires upgrading	Dec-09
CP386	Flagford-Lanesboro 110 kV line refurbishment	A condition survey recommended the line be refurbished	Sep-09
CP400	Remote Control Upgrade	This project involves the installation of new SCADA facilities in the Maynooth, Cathleen's Fall and Newbridge stations to improve the remote control capabilities.	Dec-09
CP417	Flagford-Sligo 110 kV line refurbishment	A condition survey recommended the line be refurbished	Dec-10
CP499	Cashla 220 kV station (Prospect Bay) CB Replacement	Requirement to replace the existing Circuit Breaker in the Prospect Bay at Cashla 220 kV Transmission Station. The existing Circuit Breaker is nearly 30 years old.	Jun-09
CP503	Tarbert T2101 and T2102 Protection Upgrade	Protection testing on Tarbert T2102 & T2102 found that the protection on both transformers was operating incorrectly	Sep- 09
CP536	Installation of surge arrestors at various stations	Surge arrestors are required at a number of stations around the country	Dec-09
CP570	Kilbarry-Knockraha No. 1 110 kV line refurbishment	A condition survey recommended the line be refurbished	Dec-09
CP572	Gorman-Louth 220 kV line refurbishment	A condition survey recommended the line be refurbished	Dec-09
CP573	Gorman-Maynooth 220 kV line refurbishment	A condition survey recommended the line be refurbished	Dec-09
CP580	Carrickmines 220 kV Station – GIS development	Requirement due to the assets condition, expansion needs; scope of to include the 4th 220/110 kV 250 MVA transformer (see CP 583 in Table 4-4)	Dec-12

CP No.	Project Description	Reason for Development	E.C.D.
CP589	Aghada-Knockraha No 1 & 2 220 kV line – refurbishment	Refurbishment of the Aghada-Knockraha 1 and 2 220 kV lines	Jun-09
CP632	Carrickmines-Dunstown 220 kV line refurbishment	A condition survey recommended the line be refurbished	Dec-09

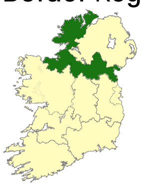
Refurbishment projects do not normally require planning permission as they involve replacing "like-for-like" equipment. However some projects do involve a much higher level of detailed design.

4.6 Regional Benefits

Most of the network is performing within the required standards at present. Some areas have been identified as likely to go outside standards in the absence of network reinforcement as the demand increases and/or new generation is connected. The network reinforcement projects identified in the above sections 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 Castlebar-Tonroe 110 kV line will benefit all Mayo, not just the towns of Castlebar and Ballaghaderreen (Tonroe).

Border Region



Srananagh 220 kV station will extend the 220 kV network and will strengthen the Western part of the Border region.

Binbane-Letterkenny establishes a connection for a new DSO station giving much needed relief to the distribution system in Donegal. It will also increase the capacity for new generation in north Donegal and provide for future demand growth.

The Arva-Shankill No. 2 110 kV line will overcome capacity problems supplying the Cavan and Monaghan loads.

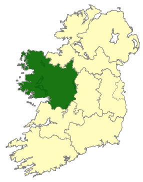
The Gorman-Meath Hill 110 kV line will provide a second circuit to Meath Hill, giving more reliability to the supply in east Cavan. The Gorman-Navan 110 kV line will improve the quality of supply to Navan and surrounding areas.

An uprate of the existing Drybridge-Louth 110 kV line will reduce line loading and strengthen the reliability of supply to the area.

Reactive compensation at Lisdrum, Shankill and Louth stations will improve the voltage profile across the north-east and bring the area within standards.

The 400 kV line from Woodland to a new station connected into the Flagford-Louth 220 kV line is a major addition to the transmission system. It will provide a step change in the ability to transfer power northwards from Dublin where there is currently an excess of generation capacity. This will benefit the whole North-East as well as the North-West and will also assist in cross-border trading.

West Region

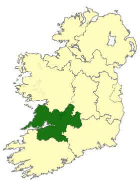


Castlebar-Tonroe 110 kV line will provide a fourth connection into Mayo and enables the network to meet the forecast demand in Mayo well beyond the Plan Period.

The looping of the Dalton-Galway 110 kV line into Cashla station will create a fourth 110 kV circuit between the Cashla 220 kV station and Galway 110 kV station. It also removes the Mayo load from Galway station, thus improving the supply to both Galway and Mayo. This will allow for demand growth at Galway for the foreseeable future.

The looping of Salthill station into the Cashla-Galway 4th 110 kV line will strengthen the supply to load in the west of Galway city.

An uprate of the existing Cashla-Cloon 110 kV line will reduce line loading and strengthen the reliability of supply to the area.

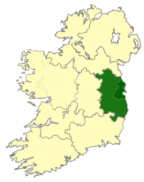


Mid-West Region

The Moneypoint to Tarbert 220 kV circuit will provide an additional high capacity path from the 400 kV system into the South-West. 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 all electricity customers. The 400/220 kV station near Nenagh is currently under review.

The installation of reactive compensation at Thurles, Ardnacrusha, and Drumline 110 kV stations will maintain system voltage within those areas.

Dublin and Mid-East Regions



The looping of the Blake-Cushaling-Maynooth 110 kV line into Newbridge provides two more circuits to Newbridge. This will provide essential infrastructure support to this fast growing region.

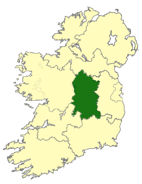
Reactive compensation at Kilteel will maintain system voltages within standards in this area.

Connection of generation in Dublin has raised short circuit current levels. The provision of a series reactor in Poolbeg, sectionalising the system in Dublin has kept the short circuits level within safety limit and the approved fifth transformer in Finglas will help to manage the operability of the sectionalised transmission system.

Kentstown 110 kV station, looped into the Gorman-Platin 110 kV line, will provide additional capacity for the expected load increase in the Navan area.

Balgriffin 220 kV station will provide additional capacity for the rapidly increasing load on the northern fringes of Dublin city.

Finnstown 220 kV station will also provide additional capacity for the expected load increase in the western network of Dublin.



Midland Region

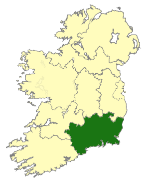
Athlone-Shannonbridge 2 110 kV line will provide greater reliability for customers supplied by Athlone 110 kV station and improve the ability of the network to move power from the south to the north-west. Athlone-Shannonbridge 1 110 kV line uprate will also increase reliability of the network.

The Cushaling-Thornsberry 110 kV line will provide a second circuit to Thornsberry station which will make supply to Tullamore and the surrounding area more secure and allow for further demand growth.

The new 400 /110 kV station in Laois will strengthen the 110 kV networks in Kildare and further south in Kilkenny and Carlow.

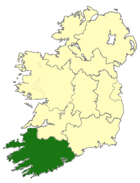
Reactive compensation at Mullingar 110 kV station and a new circuit from Mullingar to either Kinnegad or Derryiron will ensure that voltage standards are maintained in the area.

South-East Region



The proposed Lodgewood 220 kV station near Enniscorthy will connect the 220 kV network to the 110 kV network providing a more reliable supply into Co. Wexford.

The planned reactive compensation in Kilkenny will substantially improve the voltage performance for this area. This will be greatly improved with the proposed Laois 400 kV station, due to connect in 2014. The station will connect the 400 kV network to the 110 kV network and provide and more reliable supply in the Carlow/Kilkenny.



South-West Region

A number of important network projects identified above will enhance the network infrastructure in the South-West.

The connection of two CCGTs in east Cork and the associated network developments will provide a more secure supply to Cork City and harbour area. The area around Tralee and Killarney is currently outside standards; the planned Tarbert-Tralee No. 2 110 kV line will rectify this situation.

The Moneypoint to Tarbert 220 kV circuit will provide an additional high capacity path from the 400 kV system into the South-West. 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 all electricity customers.

The Clashavoon-Dunmanway 110 kV line will improve security of supply in west Cork during maintenance outages of transmission equipment.

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

5 Other Potential Developments

This chapter 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.

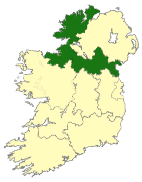
The two categories of potential development are discussed separately below.

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. Grid25 estimates that in addition to the projects included in Chapter 4, it will have to upgrade 2,300km of the existing network and build 1,150km of new infrastructure between now and 2025 to meet the needs of consumers and generators, both renewable and conventional.

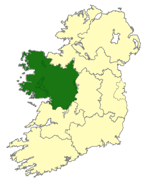
Detailed studies are being carried out to identify network solutions which will be brought forward in the planning process and ultimately to construction. Some Grid25 reinforcement projects have been identified and are included in this Development Plan. The key areas for further development as outlined in Grid25 are presented below. The information is presented using the statutory regional designations.

Border Region



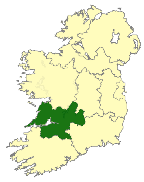
- Strengthening of power circuits between the North West and North East to facilitate power flows;
- Further integration of the Donegal and Northern Ireland networks;
- Upgraded networks supplying Dundalk;
- Upgrading about 490 km of the existing transmission network.

West Region



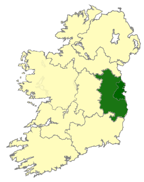
- Major infrastructural development from Mayo to the main bulk transmission system in the eastern part of the region;
- Upgrading about 365 km of the existing transmission network.

Mid-West Region



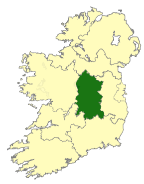
- Strengthening the transmission capacity across the Shannon Estuary;
- Upgraded networks supplying the large urban centres of Ennis and Limerick;
- Up-rating over 260 km of existing networks to facilitate higher capacity power flows, using existing corridors where possible.

Dublin and Mid-East Regions



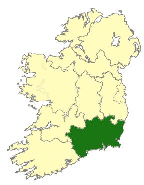
- Strengthening of network into and out of the region to allow the demand to be met by renewable generators located mainly in the west of the country;
- Strengthening of network serving Dublin city load;
- Development to allow north-south flows to by-pass the network serving the Dublin load;
- Reinforcement of the network to cater for strong growth in Kildare and north Wicklow;
- Upgrading approximately 515 km of the existing network

Midland Region



- Upgrading 250 km of transmission network to facilitate power flows from both renewable and conventional sources and maximise the use of existing power corridors.

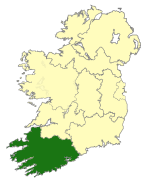
South East Region



- Strengthening of the 220 kV links to both Dublin and Cork to facilitate increased power flows
- Strengthening the networks supplying the major cities and towns in the region

- Reinforcement of current infrastructure while maximising the use of existing corridors where possible, through uprating approx. 480 km of existing 110 kV and 220 kV circuits.

South West Region



- Significant strengthening of capacity between the south-west and the south-east to allow excess power to flow from both renewable and conventional sources to supply demand in other parts of the country;
- Upgrading of approx 165 km of transmission network.

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 currently 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 however 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 at the following locations:

- Bracklone, Portarlington, Co. Laois;
- Donore Road, Drogheda, Co. Louth;
- New Ross, Co. Wexford.

5.2.2 Additional DSO Transformers

The DSO plans include connection of the following additional transformers:

- Two transformers; one 110 kV / 38 kV and one 110 kV / MV, at Mullagharlin 110 kV station;
- Two 110 kV / MV transformers at Portlaoise 110 kV station;
- One 110 kV/MV transformer in Wexford 110 kV station;
- Two 110 kV / MV transformers at Corduff 110 kV station;
- Two 110/20 kV transformers at Drumline 110 kV station;
- One 110/20 kV transformer at Garrow 110 kV station.

APPENDIX A NETWORK MAPS

Figure A-1 Map of the Transmission System at January 2008

Figure A-2 Map Indicating the Planned Network Developments 2008-2012

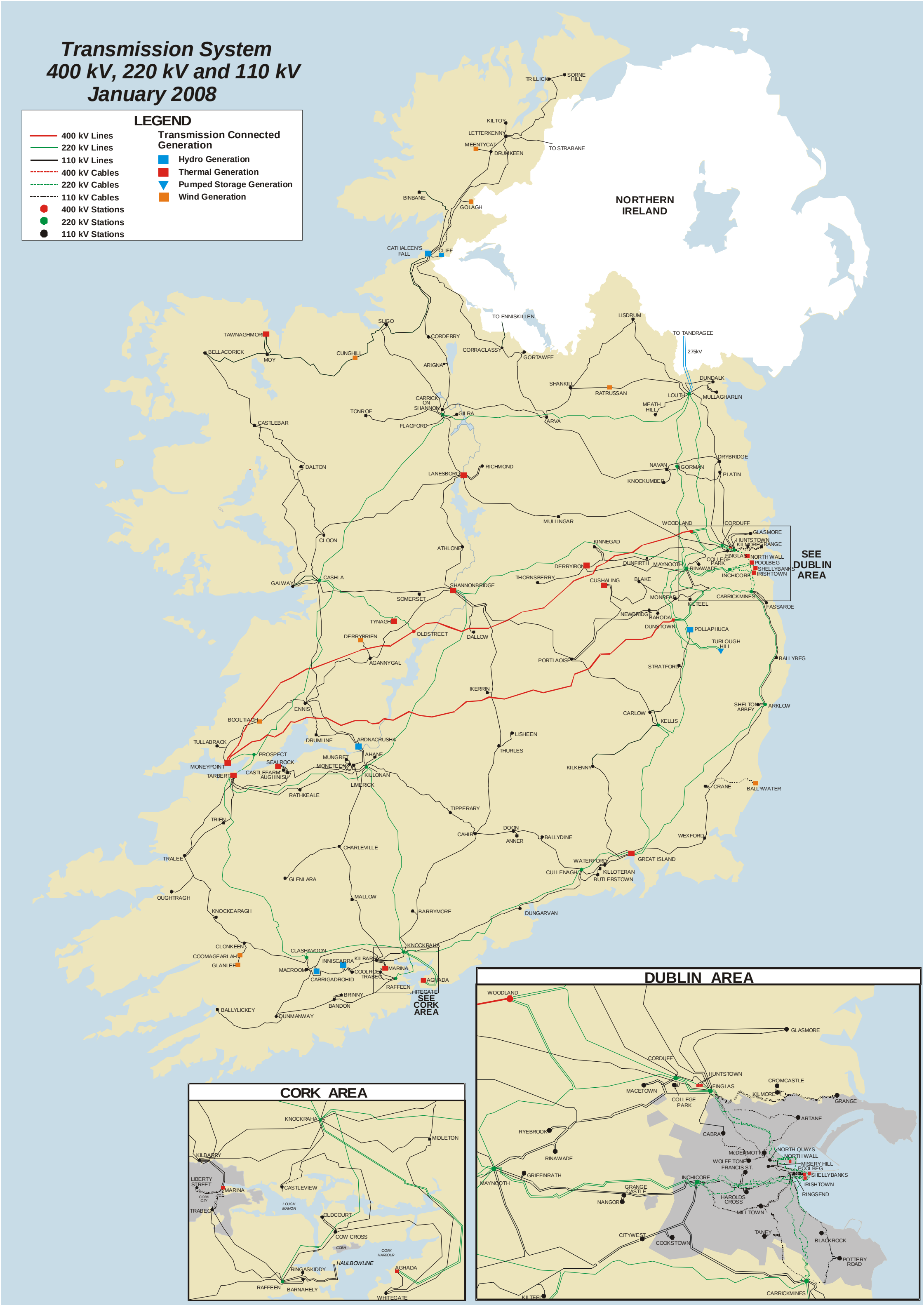


Figure A-1 Map of the Transmission System at January 2008

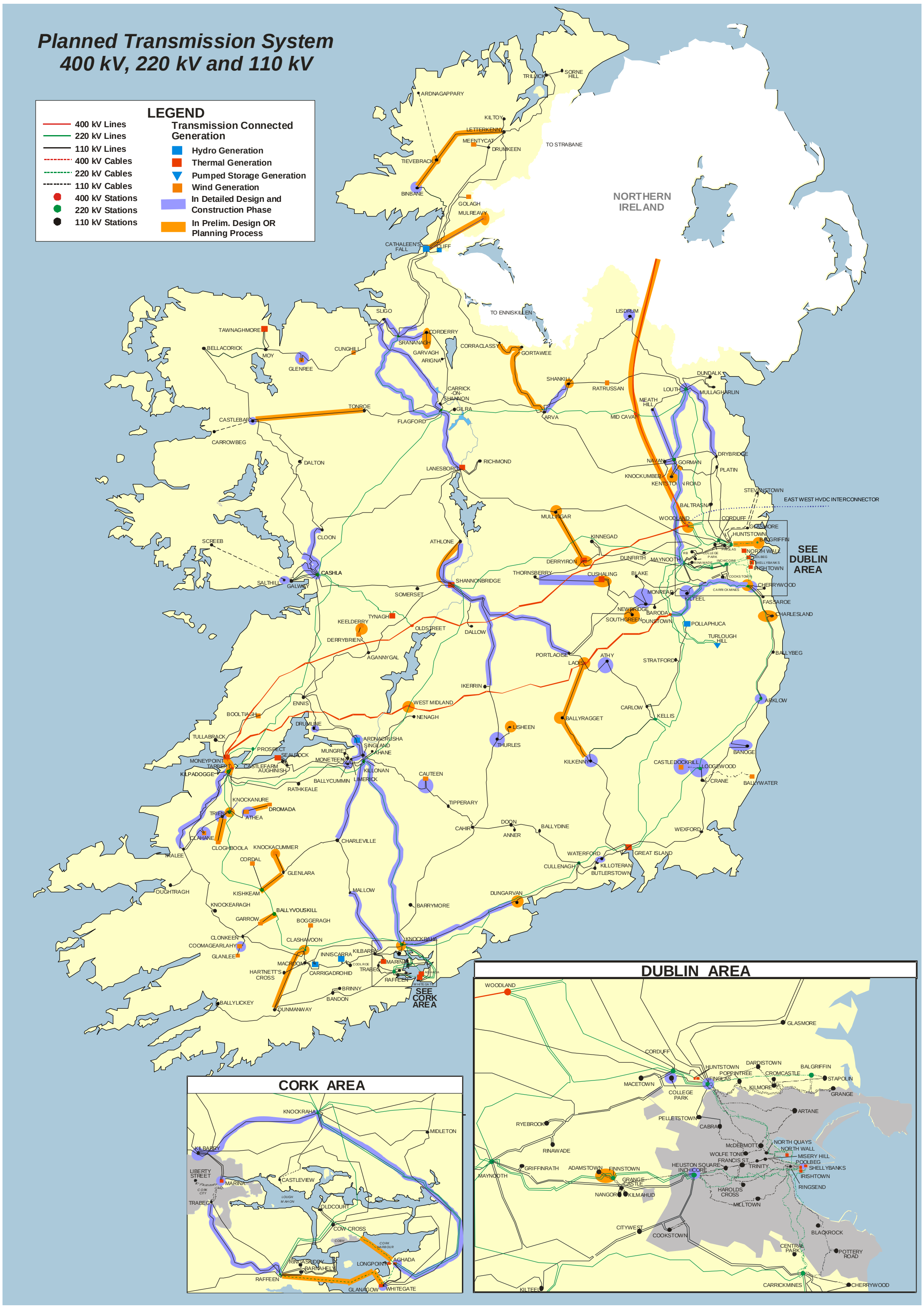


Figure A-2 Map Indicating the Planned Transmission Network Developments 2008-2012. The lines for projects in the preliminary design phase are indicative only and do not represent a proposed route.

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 Blake–Cushaling–Maynooth 110 kV line looped into Newbridge Station

B.2 Cushaling-Thornsberry 110 kV line

B.3 Dalton–Galway 110 kV looped into Cashla 220/110 kV station

B.4 Gorman-Meath Hill 110 kV line

B.5 Srananagh 220 kV Project

B.6 Tarbert–Tralee No. 2 110 kV line

B.7 Lodgewood 220 kV station

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

B.1 BLAKE-CUSHALING-MAYNOOTH LOOP INTO NEWBRIDGE (CP217)

B.1.1 Description

This project involves looping the existing Blake–Cushaling–Maynooth 110 kV line into Newbridge 110 kV station in Co. Kildare. This project is due for completion in December 2009.

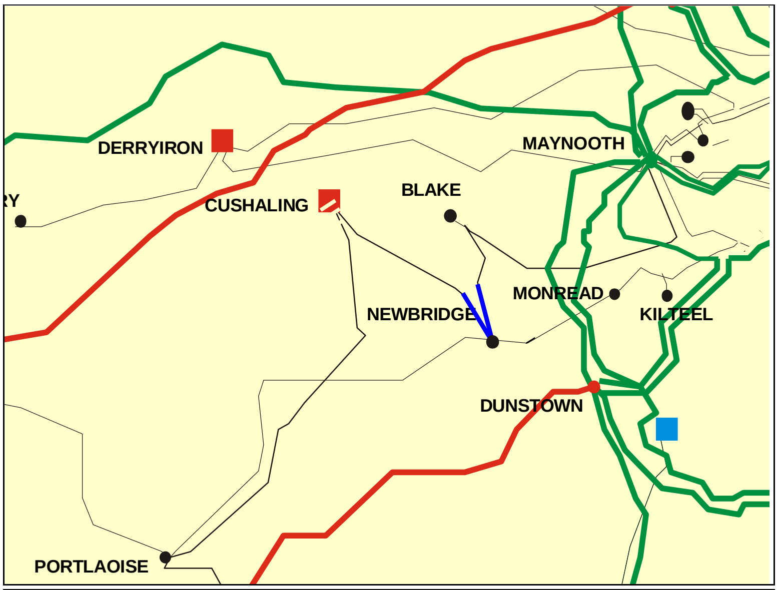


Figure B-1 – Proposed Blake-Cushaling-Maynooth loop into Newbridge

B.1.2 Reason for Development

For an outage of the line between Maynooth and Kilteel or Monread, the entire load in the area must be supplied from the Portlaoise end. This contingency leads to voltages below the minimum specified in the Transmission Planning Criteria.

Most recent load forecasts indicate that from 2008 over 80 MW of distribution load would be lost for the trip maintenance combination of Kilteel–Maynooth and Newbridge–Portlaoise 110 kV lines, therefore violating the Transmission Planning Criteria. This trip-maintenance combination would also lead to unacceptably low voltages.

The expansion plans of one of Co. Kildare's key industrial customers are subject to reinforcement of the existing network, including the completion of this project.

In addition two new 110 kV stations (near Newbridge and Portlaoise) are planned to provide additional infeeds to the local distribution networks from the main transmission system and meet the increasing electricity demand of industrial, commercial and domestic customers in the area. These essential stations cannot be connected until the two proposed transmission lines are completed.

The timely delivery of this project is a key element of the strategic long term plans to continue to provide Co. Kildare and west Co. Wicklow with an adequate electricity network to meet this growth.

B.2 CUSHALING-THORNSBERRY 110 KV LINE (CP 197)

B.2.1 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 2010.

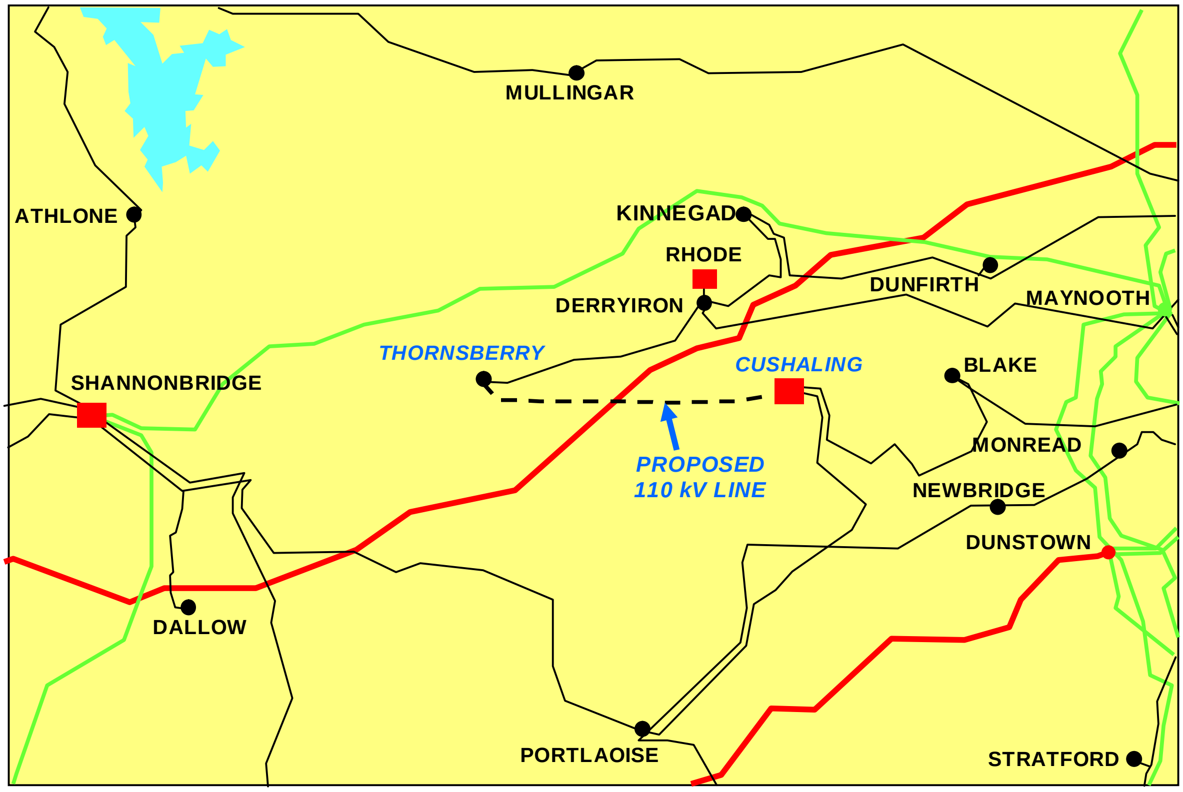


Figure B-2 Proposed Cushaling-Thornsberry 110 kV line

B.2.2 Reason for Development

The Distribution System Operator (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.

B.3 DALTON-GALWAY LOOP INTO CASHLA STATION (CP254)

B.3.1 Description

There are three 110 kV circuits between Cashla 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 2010.

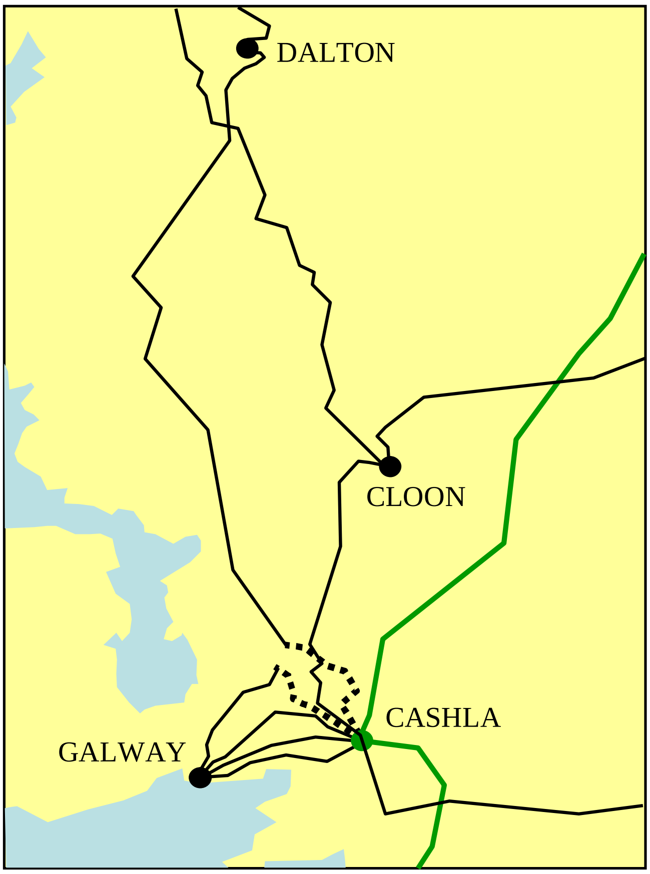


Figure B-3 – Illustration of Dalton-Galway loop into Cashla station

B.3.2 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 Transmission Planning Criteria are 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 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.

B.4 GORMAN-MEATH HILL 110 KV LINE (CP 292)

B.4.1 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 2011.

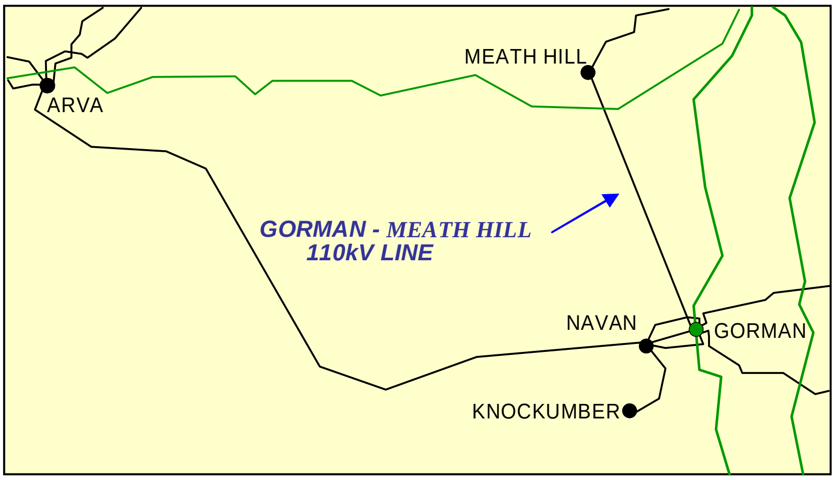


Figure B-4 Proposed Gorman–Meath Hill 110kV line

B.4.2 Reason for Development

The Distribution System Operator (DSO) requested and accepted an offer from the TSO 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.5 SRANANAGH 220 KV PROJECT (CP211)

B.5.1 Description

This project involves construction of a new Srananagh 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. A number of 110 kV lines connected into the new station, makes Srananagh a new hub for power flows into the north-west. The 110 kV sections of this project are due for completion in June 2009 while the 220kV work is due for completion in 2010.

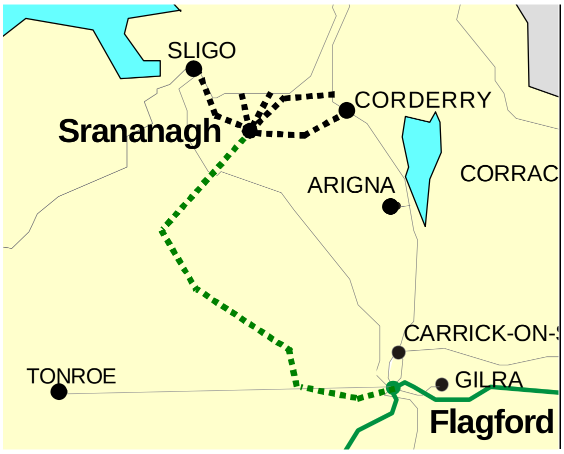


Figure B-5 New Srananagh 220 kV station and 220/110 kV lines

B.5.2 Reason for Development

From summer 2006, the Transmission Planning Criteria are violated under maintenance/trip conditions. Loss of any one of a number of 110 kV lines during an outage for maintenance of another leads to network overloads and/or voltage collapse in the North West.

The Flagford-Srananagh 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.6 TARBERT–TRALEE NO. 2 110 KV DEVELOPMENT (CP 246)

B.6.1 Description

A second line, approximately 47 km in length, from Tarbert to Tralee in Co. Kerry constructed to overcome line overloads and voltage collapse in the Tralee area. Based on current progress, the expected completion date has been revised to 2011.

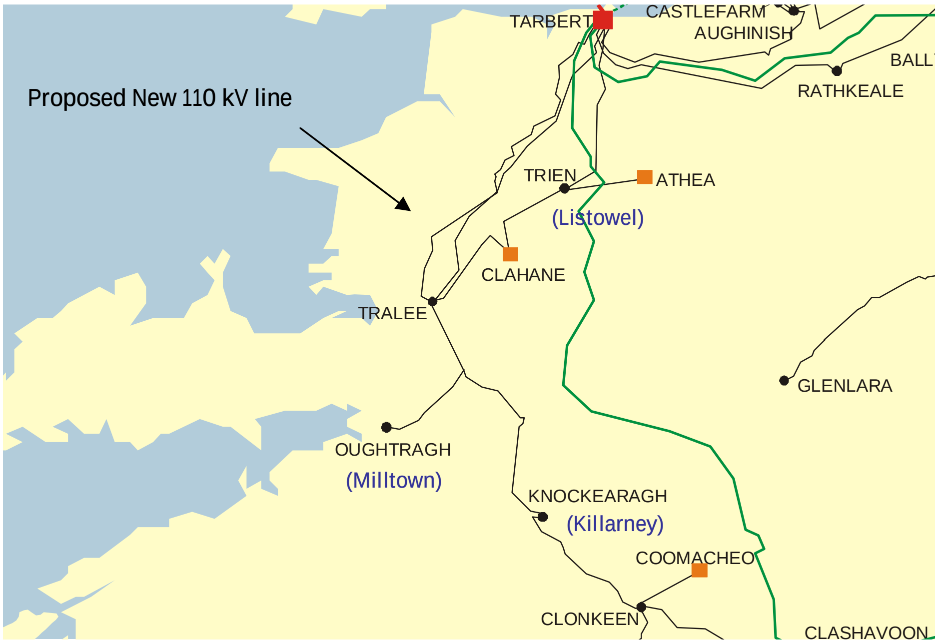


Figure B-6 Proposed new Tarbert-Tralee No.2 110 kV line

B.6.2 Reason for Development

There are three existing 110kV lines supplying Tralee 110 kV station. A fault tripping of either the Tarbert-Tralee No. 1 110 kV or Tarbert-Trien 110 kV line would result in high overloads of the remaining line.

Consequently, there is a risk of seriously decreased standard of supply to all customers, including potential damage to customer equipment.

The Tarbert-Tralee No.2 110 kV line meets 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.

B.7 LODGEWOOD 220 KV STATION (CP 241)

B.7.1 Description

This project comprises of a new 220/110 kV station at Lodgewood east of Ferns town in Co. Wexford, into which the Arklow-Great Island 220 kV line will be looped. The new station will be linked to Crane 110 kV station by a new 110 kV line, approximately 7 km in length. This project is due for completion in 2011.

Figure B-7 Proposed Lodgewood 220 kV Station

B.7.2 Reason for Development

This development is required to maintain system voltages within standards, to avoid overloads on the 110 kV lines in Wexford and to avoid the loss of the combined load fed by Wexford, Crane and Banoge stations following a maintenance-trip contingency of Great Island-Wexford and Arklow-Banoge 110 kV lines. Lodgewood will also facilitate the connection of wind farms.

B.8 ARVA-SHANKILL NO. 2 110 KV LINE (CP 374)

B.8.1 Description

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

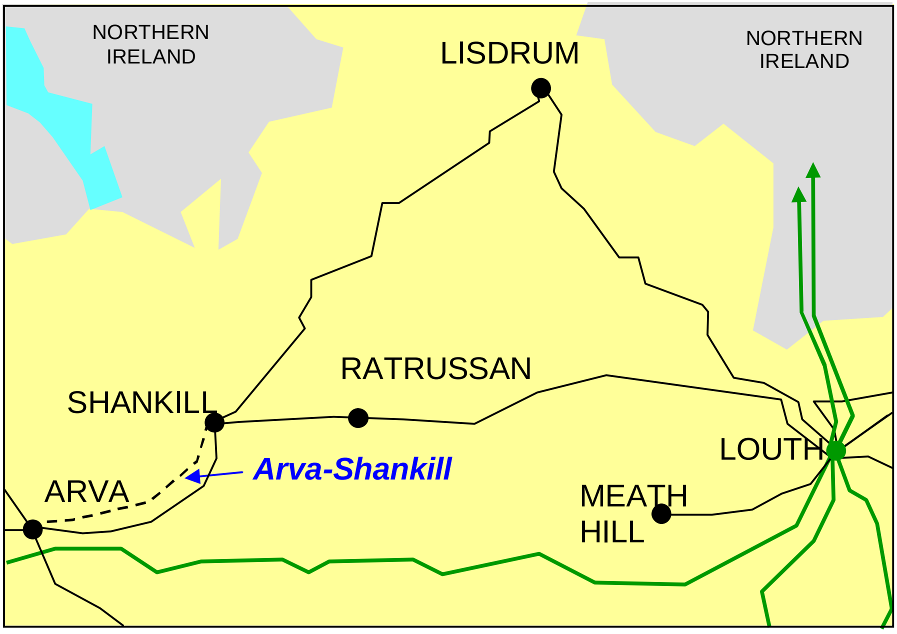


Figure B-8 Proposed Arva-Shankill No.2 110kV line

B.8.2 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.

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 Binbane-Letterkenny 110 kV line

The project is 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 BINBANE-LETTERKENNY 110 KV LINE (CP 421)

C.1.1 Description

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 Distribution System Operator (DSO) 110 kV connections to the Ardnagappary area of Donegal. The project has been submitted for Planning Approval and subject to favourable outcome from this process it is expected to be completed in 2011.

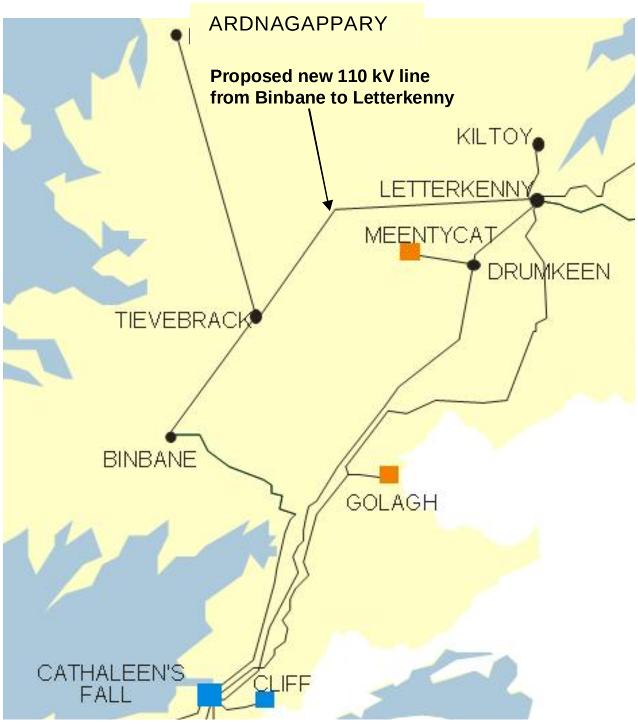


Figure C-2 Proposed Binbane-Letterkenny 110kV line(the line is indicative and does not suggest a preferred route).

C.1.2 Reason for Development

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. 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 Distribution System Operator (DSO) also requested a connection to loop the existing 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 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.

This 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.

APPENDIX D REGULATION 8(6)

8 (6) (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,

(iii) interconnections with other systems, and

(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, and

(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.

APPENDIX E GLOSSARY

Aluminium Conductor Steel Reinforced (ACRS)	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	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 Chapter 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.
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.
Gas Insulated Switchgear	A compact form of switchgear where the conductors and circuit breakers are insulated by an inert gas.
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.
Maximum Export Capacity	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.
Plan Period	The five-year period covered by this Development Plan i.e., 2008 to 2012 inclusive.

Power Flow	The flow of 'active' power is measured in MegaWatts (MW). When compounded with the flow of 'reactive power', which is measures in MegaVars (Mvar); the resultant is measured in MegaVolt-Amperes (MVA)
Phase Shifting Transformer	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.
Supervisory Control and Data Acquisition systems	Used to monitor and control system equipment from the relevant control centre.
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% lower than the winter peak.
Summer Peak	The average week-day peak value between March and September, inclusive, which is typically 20% lower than the winter peak.
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.
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.
Voltage Transformer	Voltage transformers are commonly used in protection systems to facilitate the measurement of large voltages which would be difficult to measure more directly
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 2007-20112 - February 2008

II. Transmission Planning Criteria, October 1998

III. Grid25 - Grid Development Strategy, October 2008

IV. Generation Adequacy Report 2009-2015, February 2009

V. Update Generation Adequacy Report 2009-2015, July 2009

VI. Transmission Forecast Statement 2008-2014, October 2008

E.U. published documents:-

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.

Government published documents:-

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