TRANSMISSION DEVELOPMENT PLAN 2013-2023

Draft for Public Consultation

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Table of Contents

EXECUTIVE SUMMARY

The Transmission Development Plan (TDP) 2013-2023 is the plan for the development of the Irish transmission system and interconnection[1] over the ten years from 2013 and supersedes the Transmission Development Plan 2012-2022. This ten year plan presents those components of the overall long-term development of the transmission system where there is a high level of certainty. In addition, 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 No. 445 of 2000, European Communities (Internal Market in Electricity) Regulations and Condition 8 of the Transmission System Operator Licence.

Drivers of Transmission Network Development

The Irish electricity industry and its development take their direction from a number of broad national and European Union (EU) imperatives or strategic objectives. These set the context for the capital investments that are made in the Irish transmission network and may be summarised as follows:

- Ensuring the security of electricity supply;
- Ensuring the competitiveness of the national economy; and
- Ensuring the long-term sustainability of electricity supply in the country.

In order to achieve these strategic objectives, it is necessary to continue to invest in the development and maintenance of the electricity transmission system. Specific drivers of investment in transmission network infrastructure are therefore identified, and may be described as:

- Securing transmission network supplies;
- Promoting market integration; and
- Promoting the integration of Renewable Energy Sources (RES) and complementary thermal generation.

To ensure adequate security of electricity supply; further market integration; and the integration of renewable energy sources, it is necessary to provide ongoing and timely reinforcement of the Irish electricity transmission system.

As demand or generation changes; or as the transmission system becomes more interconnected with neighbouring systems; or as new demand or new generation are connected; the flow of electrical energy throughout the transmission system changes. To accommodate these changes in power flows it is often necessary to reinforce the transmission network to ensure adequate performance and reliability levels are maintained.

[1] Please note that this is not an all island (i.e. Ireland and Northern Ireland) transmission development plan.

In addition, the condition of assets is also a factor where the timely maintenance or replacement (where necessary) of transmission network assets are required to provide the requisite level of security of supply.

It is possible to separate the resulting reinforcement needs into a number of categories, namely:

- Reinforcements required to support changes in, or connection of, new demand;
- Reinforcements required to support changes in, or connection of, new generation;
- Reinforcements related to interconnection;
- Reinforcements to facilitate inter-regional power flows; and
- Reinforcements to address the condition of existing assets.

Transmission Network Reinforcements

This development plan considers projects that are in progress, i.e. 133 individual projects. These projects form part of EirGrid's strategic development plan, Grid25 and are distributed throughout the regions of Ireland (refer to Table 1 below). The developments emerging from Grid25 aim to maintain security of supply standards across all parts of the network further enabling economic development in all regions.

Project Category	Border, Midlands, West Planning Area	South-West, Mid-West Planning Area	South-East, Mid-East, Dublin Planning Area	Various Locations Across the Country	TOTAL
New Build	11	13	9	0	**33**
Uprate / Modify	17	27	21	2	**67**
Refurbish / Replace	3	9	11	7	**30**
Other[2]	0	0	1	2	**3**
TOTAL	**31**	**49**	**42**	**11**	**133**

Table 1 Summary of Number of Projects in Progress by Region and Project Category

[2] Projects that cannot readily be categorised under the three main categories are classified as Other.

Capital Expenditure

The transmission development requirements will require a significant level of expenditure for the period addressed by this Development Plan (i.e. 2013-2023) and beyond. A portion of this expenditure was the subject of discussions with the Commission for Energy Regulation (CER) in the context of the determination of transmission revenues for the 2011-15 period, with the expenditure for the period beyond 2015 to be addressed by future price reviews.

The CER's determination of allowable transmission revenues for the current price review period (CER/10/206) made provision for a transmission network spend of €1.45 billion. It was recognised this provision would have to respond flexibly to both the number and pace of development of new projects which would itself be influenced by the external environment including level of new generation connecting, system demand etc.. In addition, the CER has put in place a new programme (PR3 Transmission Capital Expenditure Monitoring) with EirGrid for the monitoring of transmission capital expenditure. This framework will enable the transmission allowance to flex to the identified needs of the system in the future.

Data Management

Transmission system development is continuously evolving. To facilitate the comparison of system development projects year-on-year and in the interest of routine reporting, data is represented at a fixed point in time, i.e. at the data freeze date. The TDP therefore summarises transmission projects and the changes that have occurred since the last TDP with data applicable as at the 31st of March 2013.

Conclusion

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

With the projects outlined in this Transmission Development Plan, coupled with the on-going review of the needs of the transmission infrastructure in response to the changing environment, EirGrid is confident that the needs of Irish society and its economy will be met well into the future.

1 INTRODUCTION

The transmission system is a meshed network of 400 kV, 275 kV, 220 kV and 110 kV high voltage lines and cables and plays a vital role in the reliable supply of electricity. It is the backbone of the power system and provides the means to efficiently deliver bulk power from generation sources to demand centres within acceptable technical security and reliability standards.

Electricity supply is an essential service in Ireland's society and economy, where a reliable electricity infrastructure providing quality performance is vital for the country's socio-economic development. The development of that infrastructure is therefore of national strategic importance.

This Transmission Development Plan (TDP) outlines the drivers of network development, the resultant network investment needs and the planned projects which are required to address those needs for the period 2013 to 2023.

1.1 Statutory and Legal Requirements

1.1.1 National Requirements

There are a number of national documents which give effect to the electricity market arrangements and detail the roles and responsibilities of EirGrid as Transmission System Operator (TSO), these are:

- Statutory Instrument (SI) No. 445 of 2000[3] as amended
- Statutory Instrument (SI) No. 147 of 2011[4]
- EirGrid's Transmission System Operator Licence[5]

The sections in these documents which have an impact on transmission network planning and on the Transmission Development Plan are discussed below.

EirGrid's Statutory Obligations

Under Regulation 8(1)(a) of SI445/2000 and echoed in Condition 3 of the TSO Licence, the TSO is assigned the following exclusive function:

> *"to operate and ensure the maintenance of and, if necessary, develop a safe, secure, reliable, economical, and efficient electricity transmission system, and to explore and develop opportunities for interconnection of its system with other systems, in all cases*

[3] Statutory Instrument No. 445 of 2000, European Communities (Internal Market in Electricity) Regulations

[4] Statutory Instrument No. 147 of 2011, European Communities (Renewable Energy) Regulations 2011

[5] The current TSO Licence was issued by the CER to EirGrid in 2009 and came into legal effect on the 2nd of March 2009

with a view to ensuring that all reasonable demands for electricity are met having due regard for the environment."

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

EirGrid has a statutory obligation under Regulation 8(6) of SI445/2000 and a licence obligation under Condition 8 of the Transmission System Operator licence to produce a Transmission Development Plan.

Transmission Development Plan

As part of the preparation of the Transmission Development Plan, EirGrid is required to consult with System Operator Northern Ireland (SONI) in revising its plan to ensure that the information set out in the Development Plan continues to be accurate in all material respects. EirGrid is also required to engage in a public consultation process on the Development Plan prior to submitting it to the Commission for Energy Regulation (CER) for approval.

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

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.*

SI445 8(1)(c) (as inserted by SI60/2005 Regulation 6(1)(b)) *to plan the long term ability of the transmission system to meet reasonable demands for the transmission of electricity*; and

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

SI445 8(1A) (as inserted by SI60/2005 Regulation 6(2)) *In performing its functions the transmission system operator shall take into account the need to operate a co-ordinated distribution system and transmission system;*

Regulation 8(8) of SI 445/2000 precludes EirGrid from developing generation directly:

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

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.

Market Integration

The licence to operate the Irish transmission system was granted by the CER to EirGrid in accordance with SI445/2000, as amended. The current TSO licence came into legal effect on the 2nd of March 2009. The licence specifically requires EirGrid to "explore and develop opportunities for interconnection of its system with other systems", as also required under Regulation 8(1)(a) of SI445/2000.

Renewable Energy

EirGrid has a statutory obligation under Regulation 4(1) of SI147/2011 to ensure that electricity generated from renewable sources may be transmitted. Under the Regulation EirGrid must, when dispatching generating units, give priority to generating units using energy from renewable sources in so far as the secure operation of the electricity system permits.

Interaction between TAO and TSO

Regulation 19 of SI445/2000 gives the Transmission Asset Owner (TAO), the ESB, the responsibility to carry out construction work in accordance with EirGrid's development plan:

SI445 19(a) *The transmission system owner shall…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).*

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 over the applicable period of the plan.

Notwithstanding the obligations outlined above and in the following section, EirGrid is obliged, under Regulation 8(1)(i) of SI445/2000, 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. The connection offer process is regulated by the CER, and Condition 5 of the Transmission System Operator licence requires EirGrid to make connection offers in accordance with regulatory approved processes, terms, conditions and directions.

Certification of EirGrid as TSO for Ireland

In May 2013, in accordance with Article 1 of the European Commission (EC) Decision of 12th April 2013 (C(2013) 2169 final), pursuant to Article 3(1) of Regulation (EC) No 714/2009 and Article 10(6) of Directive 2009/72 the CER certified EirGrid as the transmission system

operator for Ireland with immediate effect (CER/13/118). It shall be implemented and monitored in accordance with the requirements of Article 1 of the EC's Decision.

1.1.2 European Requirements

There are a number of European Union (EU) documents which have an impact on EirGrid as Transmission System Operator and which are relevant to the Transmission Development Plan:

- Regulation (EC) No 714/2009
- Directive 2009/72/EC
- Directive 2009/28/EC
- Directive 2012/27/EC

The sections in these documents which have an impact on the Transmission Development Plan are discussed below.

Transmission Development Plans at the European Level

Regulation (EC) 714 of 2009 deals with, among other things, the development of the internal European market in electricity and the establishment of the European Network of Transmission System Operators for Electricity (ENTSO-E). In accordance with Article 4 all transmission system operators are required to cooperate at the Community level through ENTSO-E.

ENTSO-E is required to adopt a Community-wide ten-year network development plan (the TYNDP) every two years (Article 8, paragraph 3(b)) and produce corresponding regional investment plans (Article 12) every two years.

Directive 72 of 2009, which also develops the internal European market in electricity, among other things deals with network development at the member state level. Paragraph 1 of Article 22 requires transmission system operators to submit a ten-year network development plan for their system to the national regulatory authority. Paragraph 4 of Article 22 requires the regulatory authority to consult all actual or potential system users on the ten-year network development plan.

Market Integration

European regulations and directives (Regulation (EC) No 714/2009 of the European Parliament and the Council of 13 July 2009; and Directive 2009/72/EC) highlight the following:

- The importance of completing the internal market in electricity and creating a level playing field for all electricity undertakings in the Community; and

- The need for the creation of interconnection capacities to achieve the objective of a well-functioning, efficient and open internal market.

Renewable Energy

Directive 28 of 2009 deals with the promotion of the use of renewable sources. Paragraph 2 of Article 16 requires Member States to ensure that transmission system operators guarantee the transmission of electricity from, and provide priority access to, renewable energy sources. Paragraph 2 also requires Member States to ensure that transmission system operators provide priority dispatch to renewable energy sources in so far as the secure operation of the national electricity system permits.

Energy Efficiency

Directive 27 of 2012 deals with the promotion of energy efficiency. Paragraph 5 of Article 15 requires Member States to ensure that transmission system operators guarantee the transmission of electricity from, and provide priority access to, high-efficiency cogeneration. Paragraph 5 also requires Member States to ensure that transmission system operators provide priority dispatch to high-efficiency cogeneration in so far as the secure operation of the national electricity system permits.

Reconciling TDP and TYNDP Obligations

In preparing this Transmission Development Plan, EirGrid has taken account of these requirements above. This Transmission Development Plan and future Plans will explicitly cover periods of ten years in order to explicitly align to the TYNDP produced at the European level. EirGrid publishes this Transmission Development Plan for consultation. Following the consultation EirGrid will update the Plan as required. All consultation responses and a report on those responses will be provided to the Commission for Energy Regulation for review. In addition, EirGrid will submit the Transmission Development Plan to the Commission for Energy Regulation for approval.

1.2 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 is dynamic to meet the ever-evolving needs and to enable the strategic development of the system in the long-term.

There are a number of national, all island and European considerations that are shaping the medium and long term development of the transmission network; these are outlined below.

1.2.1 Grid Development Strategy

EirGrid published its Grid Development Strategy, Grid25, in October 2008. Grid25 outlines EirGrid's strategy for the long-term development of the transmission system.

The strategy adopted aims to achieve a balance between the costs and impact of new infrastructure, while maximising the capability of the existing grid.

Government Policy Statement on the Strategic Importance of Transmission and Other Energy Infrastructure of the 17th of July 2012 specifically endorses and supports the Grid25 Investment Programme and reaffirms that it is Government policy and in the national interest, not least in the current economic circumstances, that the investment programme is delivered in the most cost effective and timely way possible.

This TDP presents the developments required to deliver the Grid25 strategy, meeting future requirements as they are known at this time including the requirement to accommodate renewable generation under the Group Processing Approach[6]. Each of the projects contained within this Plan are the product of on-going reviews that take into account the changing economic conditions to ensure that projects are cost effective and optimally timed.

1.2.2 All Island and European Context

EirGrid's TSO licence obliges it and System Operator Northern Ireland (SONI) to carry out all island transmission planning through joint structures and arrangements. This is illustrated by the recent development and publication of All Island Generation Capacity and Transmission Forecast Statements. The key principles and arrangements are outlined in Schedule 4 of the System Operator Agreement. Joint planning studies also involve Northern Ireland Electricity (NIE), the licensee 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, particularly in border areas, will be optimised for the island as a whole. This TDP includes developments resulting from the joint planning process.

As outlined above the European Regulation 714 requires all European TSOs to cooperate through the European Network of TSOs for electricity (ENTSO-E). ENTSO-E has set up six regional groups to co-ordinate planning and development at regional level. EirGrid and SONI are members of the Regional Group North Sea (RGNS), which also includes the TSOs of Belgium, Denmark, France, Germany, Great Britain, Luxembourg, Netherlands, and Norway. One of the duties of RGNS is to produce a Regional Investment Plan (RegIP) every two years, which together with the other five RegIPs, will feed into ENTSO-E's Ten Year Network Development Plan. A number of major projects of European Significance identified in this

[6] The CER approved connection offer process whereby generation connection applications are processed on a grouped or "gate" basis; the most recent being Gate 3.

TDP, using the following label: "  TYNDP/TYNDP_Project_No", are also included in the RGNS RegIP and the TYNDP, which were issued in Summer 2012[7].

1.3 The Transmission Development Plan 2013

This Plan represents all the transmission projects that are progressing for the period 2013 to 2023. The Transmission Development Plan presents EirGrid's view of how future transmission needs are likely to change and its plan to develop the network to meet those needs over the next ten years. All project information in this TDP (i.e. project details, project phase and project estimated completion dates) is correct as of the 31st of March 2013.

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 requirements, that new developments will emerge that could impact the plan as presented. These changes will be identified in future studies and accommodated in future development plans, and as such, the long-term development of the transmission system is under review on an on-going basis.

This plan comprises a list of development projects that are in progress. These development projects have received internal EirGrid capital approval. There is also a description of other areas where further development projects are likely to be required.

1.4 Data Management

Transmission system development is continuously evolving. To facilitate the comparison of system development projects year-on-year and in the interest of routine reporting, data is represented at a fixed point in time, i.e.at the data freeze date. The TDP therefore summarises transmission projects and the changes that have occurred since the last TDP with data applicable as at the 31st of March 2013.

It should be noted that the estimated completion dates (ECDs) for some transmission projects are available and updated on an on-going basis at the following 2 websites:

- On the EirGrid website, Associated Transmission Reinforcements:

  http://www.eirgrid.com/customers/gridconnections/generatorconnections/associatedtransmissionreinforcements/

- On the CER website, PR3 Transmission Capital Expenditure Monitoring:

  http://www.cer.ie/en/electricity-transmission-network-reports-and-publications.aspx?article=7e5e12b2-8502-4735-80b0-ba1ec3d973eb

[7] https://www.entsoe.eu/major-projects/ten-year-network-development-plan/tyndp-2012/

1.5 Planning Area Categorisation

As power flows on the transmission system are not contained within specific counties, from a transmission planning perspective it is more appropriate to represent groups of counties as natural planning areas. There are 3 planning areas that best reflect the conditions and power flows on the transmission system; these are:

- The Border, Midlands & West
- The Mid-West & South-West
- The South-East, Mid-East and Dublin

These 3 planning areas are aligned with the 8 statutory planning regions in Ireland as outlined in the National Spatial Strategy. The regions and planning areas are illustrated in map below.

Figure 1-1 Illustration of the 3 Planning Areas and the underlying Statutory Regions

Planned projects are categorised in Chapter 6 “Regional Perspective of the Plan” on a planning area basis as defined above.

1.6 Document Structure

This document contains an Executive Summary, followed by seven main sections and five appendices. The structure of the document is as follows:

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

Section 1: Introduction: EirGrid's statutory and legal obligations are introduced. The purpose and context of the plan is outlined.

Section 2: Approach & Methodology: describes the EirGrid's approach to the network planning process and the strategies employed.

Section 3: Investment Needs: the drivers of network development are introduced and discussed, from which the needs of the network are identified through the application of the transmission development approach discussed in section 2

Section 4: Modifications to the Plan since TDP 2012: provides information on the changes to the transmission plans between TDP 2012 and TDP 2013.

Section 5: Planned Network Developments: summarises the development projects that are currently in progress. These are the transmission projects which solve the network needs identified and discussed in section 3.

Section 6: Regional Perspective of the Plan: summarises and categorises the development projects that are currently in progress by planning area.

Section 7: Summary of Environmental Appraisal Report: summarises the Environmental Appraisal Report of the TDP 2013.

Appendix A Project Terms

Appendix B Changes since TDP 2012

Appendix C Planned Network Developments

Appendix D: Irish Projects in European TYNDP

Appendix E Abbreviations and Glossary of Terms, provides a glossary of terms used in the document

Appendix F References, provides a list of references used in the document

2 APPROACH AND METHODOLOGY

2.1 Development Objectives and Strategies

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

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

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

The need for development is determined by assessing long-term future network performance against technical standards embodied in the Transmission Planning Criteria (TPC), as described in the next section. When it is established that changes on the network cannot be accommodated without violating the criteria, a wide range of issues is taken into account in selecting a transmission enhancement strategy. These include long-term economic assessments that attempt to take into account the costs and benefits associated with each of the viable transmission reinforcement options.

The factors considered in selecting the optimum development project are described in Section 2.4 under "Select Optimum Development Project". In considering these factors, EirGrid adopts a number of high level strategies to optimise development, as described below.

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

- Using higher capacity conductors to uprate existing lines and allow greater power flows;
- Installing phase shifting transformers, as is the case 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 economically viable to relieve the stress on the underlying 220 kV and 110 kV networks and make better use of the capacity of the high voltage networks; and

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

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

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 project with a higher upfront cost 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.

Overhead lines are generally the preferred means to provide new transmission circuits[8, 9] as they are more readily maintainable and repairable and so provide a more reliable[10] and less expensive means of supply than underground cables[11, 12]. Underground cables are considered where appropriate such as in city centres or urban areas. However, consideration is given to these and other technological alternatives in specific respect of every project.

2.2 The Transmission Planning Criteria

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

[8] The Ecofys Report ('Study on the Comparative Merits of Overhead Electricity Transmission Lines Versus Underground Cable' is available for viewing on the website of the Department of Communications, Energy and Natural Resources at www.dcenr.gov.ie/Energy

[9] International Expert Commission (IEC) Report: The Review by the International Expert Commission is available for viewing on the website of the Department of Communications, Energy and Natural Resources at www.dcenr.gov.ie/Energy

[10] CIGRÉ report Update of Service Experience of HV Underground and Submarine Cable Systems, 2009.

[11] Standard charges for electricity transmission are published annually by the Commission for Energy Regulation at www.cer.ie

[12] Parsons Brinckerhoff Report (Electricity Transmission Costing Study, January 2012)

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 varying problems. Rather than attempting to carry out subjective benefit analysis in each case it is preferable to plan to meet an objective standard and carry out analysis of the range of options available to comply with the standard.

Once a violation of the criteria has been identified, a wide range of issues are taken into account in selecting a transmission enhancement strategy as described in Section 2.4 of this document. 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, amongst others, 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 indicates the contingencies normally tested for three separate demand scenarios. The Winter Peak represents the forecast maximum annual demand. The Summer Peak, which refers to the average week-day peak value between March and September inclusive, is typically 20% lower than the winter peak. This demand level is of interest because although the overall grid power flow may be lower in summer than in winter, this may not be the case for flows on all circuits. In addition, the capacity of overhead lines is lower because of higher ambient temperatures. Finally, network maintenance outages, normally taken in the March to October period, can deplete the network, further reducing its capability to transport power.

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

Table 2-1 Contingency types tested for different demand scenarios

The Summer Valley is the annual minimum which generally occurs in August. Annual minimum demand is typically 35%[13] of the annual maximum demand. Analysis of summer valley cases is concerned with the impact of low demand and corresponding low levels of generation. This minimum condition is of particular interest when assessing the capability to connect new generation. With local demand at a minimum, the connecting generator must export more of its power across the grid than at peak times.

2.3 Planning and Environmental Considerations

2.3.1 A Dynamic Process

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

Strategic Environmental Assessment is a systematic process of predicting and evaluating the likely significant environmental effects of implementing a proposed plan or programme in order to ensure that these effects are adequately addressed at the earliest stage. A Strategic Environmental Assessment (SEA) has been prepared and adopted by EirGrid in respect of the Grid25 Implementation Programme (IP) (2011-2016) which outlines a practical strategic overview of how the early stages of Grid25 are intended to be implemented. The purpose of the SEA is to anticipate and avoid, where possible, potential adverse environmental impacts arising from the IP.

The IP and associated SEA will have a 5 year lifespan, with review and drafting process for the subsequent IP and SEA commencing within the final year of that lifespan i.e. 2016. However, the content of these documents will be subject to ongoing review and update over the period of *Grid25*, in the context of the preparation of Transmission Development Plans. In this regard, an Environmental Appraisal Report (EAR) has been produced to accompany this TDP, and will be produced to accompany subsequent TDPs, to demonstrate how that TDP is in accordance with the provisions of the IP and SEA, or to identify any updates to these documents. This relationship is set out graphically at Figure 2-1.

The TDP 2013 – 2023 has been subject to an Environmental Appraisal and has been assessed as being in accordance with the provisions of the IP and SEA (please refer to Section 7 Summary of Environmental Appraisal Report and the accompanying document to

[13] Previously, it was 36.

this TDP titled Environmental Appraisal Report of the Transmission Development Plan 2013 - 2023).

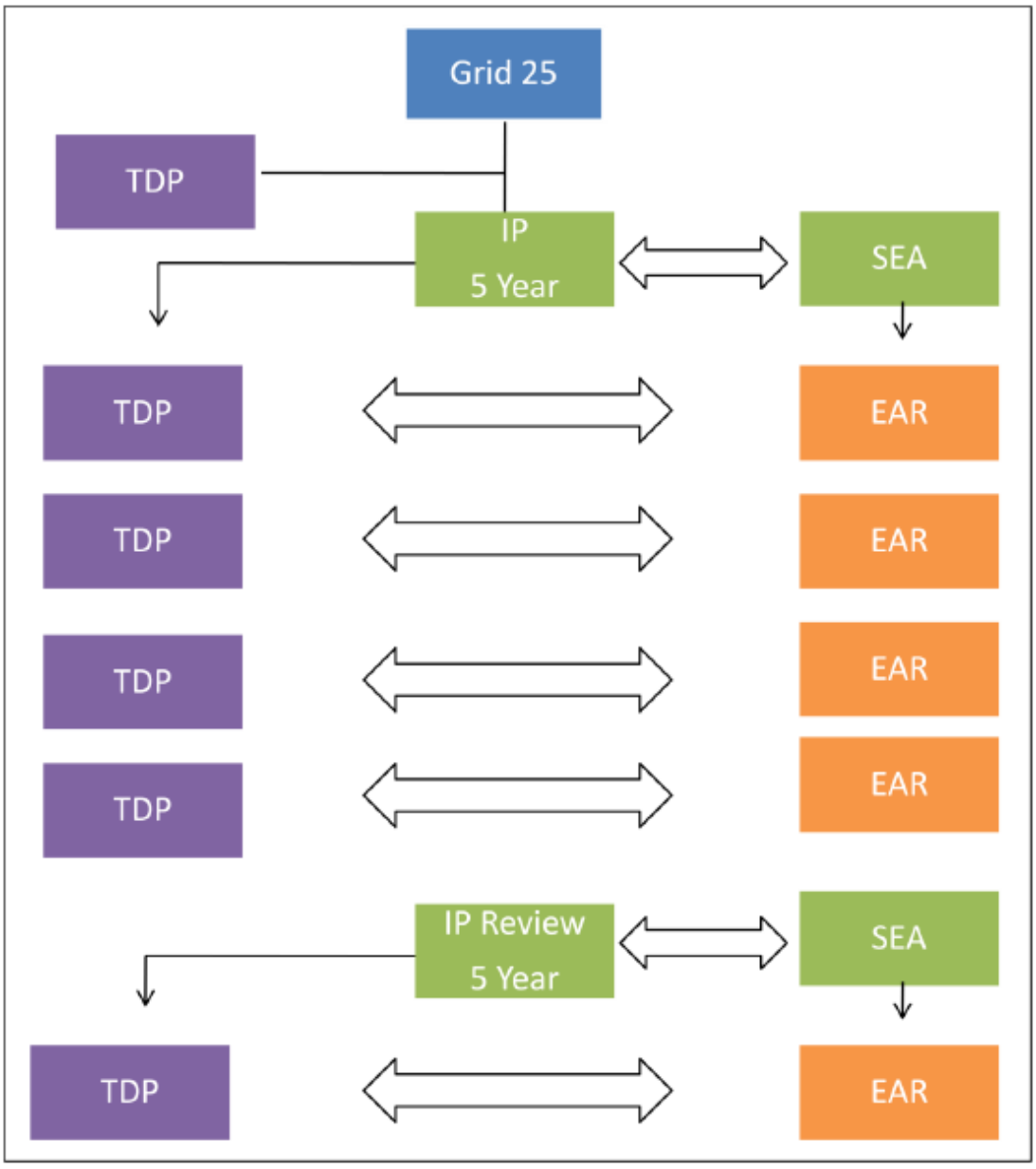


Figure 2-1 Structure for Grid25 strategy and associated Implementation Programme, SEA, Transmission Development Plan and associated Environmental Appraisal Report (extract from EirGrid Grid25 Implementation Programme 2011-2016)

2.3.2 Planning Considerations

Statutory Consent for transmission projects is sought on a project-by-project basis as required under the Planning and Development Acts 2000 to 2011. At the outset, An Bord Pleanála (ABP) determines if a proposed development falls within the scope of Section 182A of the Planning and Development Acts 2000 to 2011, which relates to Strategic Infrastructure

Development. If it does fall within Section 182A, an application for approval is made directly to the Strategic Infrastructure Division (SID) of An Bord Pleanála. If An Bord Pleanála determines that the proposal does not fall within Section 182A, an application for Permission must be made to the relevant Local Planning Authority.

The competent Planning Authority (An Bord Pleanála or Local Planning Authority) will determine whether the application for development is in accordance with the principles of proper planning and sustainable development. These considerations include:

- EU directives and governing Statutory and Strategic Policy;
- Conformity with the provisions of key documents such as relevant Development Plans and Regional Planning Guidelines;
- Input from Prescribed Bodies such as the relevant Local Planning Authority, Department of Communications, Energy & Natural Resources, Department of the Environment, Community & Local Government, and National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht;
- Requirements to protect designated areas on account of their ecological, cultural, archaeological, visual, or other sensitivity and/or significance.

EirGrid has developed a five-stage Project Development and Consultation Roadmap (shown in Figure 2-2) for its larger high voltage transmission infrastructure projects. Each stage of the process of project development includes appropriate public and stakeholder consultation.

Figure 2-2 - EirGrid Project Development and Consultation Roadmap

In addition to this, a number of EirGrid projects comprise uprate, refurbishment and maintenance works. Under the current Planning and Development legislation, such works may comprise exempted development – development which does not require a prior Grant of Approval or Permission. EirGrid currently undertakes a process to confirm both its consideration of the exempted status of such works, as well as a Screening for Appropriate Assessment, which is a Statutory obligation under the current Birds and Habitats Legislation. This process can include an application to the relevant Planning Authority for a Statutory Declaration of Exempted Development.

The Programme Management Office of EirGrid includes experienced professional planning and ecological consultants to assist in the development of transmission infrastructure

development projects, and in other aspects of grid development, from a planning and environmental perspective.

2.3.3 Environmental Considerations

Applications for Statutory Consent are accompanied – where required or relevant – by an Environmental Report (ER) or Environmental Impact Statement (EIS), and include Appropriate Assessment (AA) to comply with Statutory requirements under legislation related to the Environmental Impact Assessment Directive and the Habitats Directive. These requirements are transposed into Irish law in the Planning and Development Acts 2000-2011 and associated Regulations 2001-2011. As noted above, exempted development is also subject to Appropriate Assessment as it is now a requirement for EirGrid, as a designated Public Authority, to screen all plans or projects for Appropriate Assessment under the European Communities (Birds and Natural Habitats) Regulations 2011.

Environmental Impact Assessment

Environmental Impact Assessment (EIA) is the process of examining the environmental effects of projects, from consideration of environmental aspects at design stage, to preparation of a non-Statutory Environmental Report (ER), through to preparation of an Environmental Impact Statement (EIS). Projects where an EIS is mandatory are identified in Annex I of the EIA Directive. This includes transmission of electricity by overhead cables where the voltage is 200 kV or more and a length of more than 15 km. An EIS may be required for sub-threshold development where likely significant impacts on the environment are identified by the relevant Planning Authority or An Bord Pleanála.

The content and scope of the EIS is defined by the EIA Directive; however, detail varies between projects depending on local environmental sensitivities.

Appropriate Assessment

In tandem with the process of EIA, the process of Appropriate Assessment (AA) must be conducted. Where a high voltage transmission infrastructure project, alone or in combination with other plans or projects, is likely to have significant impacts on designated nature conservation sites of European importance (Natura 2000 sites) i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), or the risks of such effects cannot be excluded during a Screening process, an AA is required under the Habitats Directive. The overall AA process is different from EIA as it is a four stage process, which only addresses ecological impacts to designated Natura 2000 sites.

Stage 1: Screening - identifies potential significant impacts on Natura 2000 site(s). If potential significant impacts cannot be ruled out without the application of mitigation measures, then a full Appropriate Assessment is needed.

Stage 2: Appropriate Assessment – identifies potential impact on the integrity of the site(s) and assessment of proposed mitigation measures. The AA is based on survey work and best available scientific evidence. A Natura Impact Statement (NIS) is prepared and included (as a separate document) with the EIS.

Stage 3: Assessment of alternative solutions – identifies alternative ways to proceed with the project that would avoid any likely significant adverse impacts on integrity of Natura 2000 site(s) which are identified in the Stage 2 AA.

Stage 4: Assessment where no alternative solutions exist and where adverse effects remain - assessment of compensatory measures where, in light of assessment of Imperative Reasons of Over-riding Public Interest (IROPI), the project is allowed to proceed.

2.3.4 Environmental Constraints Mapping

EirGrid has moved to copper-fasten the incorporation of planning and environmental considerations into the TDP by ensuring that environmental considerations are incorporated into the conception, development and design of projects. This has been implemented through the development of new planning instruments, including a comprehensive national mapping of planning and environmental sensitivities (Environmental Constraint Mapping) to guide high-level strategies and plans.

2.3.5 Emerging Practice

The most immediate effect of these developments has been a broadening of the range of the main alternatives that are considered at the earliest stage of project planning, in accordance with EirGrid's Project Development and Consultation Roadmap process. Where relevant, projects commence with high level technical, planning and environmental considerations of alternative strategies for dealing with the particular identified challenge. Such alternative strategies include transmission network configuration; re-use of existing routes; and overhead, underground or underwater solutions.

These considerations result in the development of general routing studies which set out spatially-specific alternatives based on this analysis. These are then progressed by systematic analysis and comparison, in consultation with relevant stakeholders, until an emerging preferred route is identified. This route is then refined and the design is developed to become the subject of an application for Statutory Consent. As noted above, the process of project development occurs to the greatest extent practicable or appropriate in consultation and engagement with the general public, Statutory and non-Statutory stakeholders, affected landowners, the relevant Planning Authority, and An Bord Pleanála (where a project is deemed to constitute Strategic Infrastructure Development (SID).

2.4 The Network Development Planning Process

The network development planning process is of necessity a dynamic process as requirements for transmission services are continuously evolving. The Development Plan is a snap shot in time of the development needs in the process. Figure 2-3 illustrates the various stages in the Network Development Process which are described below. Figure 2-3 also illustrates the correlation between the phases of the Network Development Process and the stages of the Project Development and Consultation Roadmap shown in Figure 2-2.

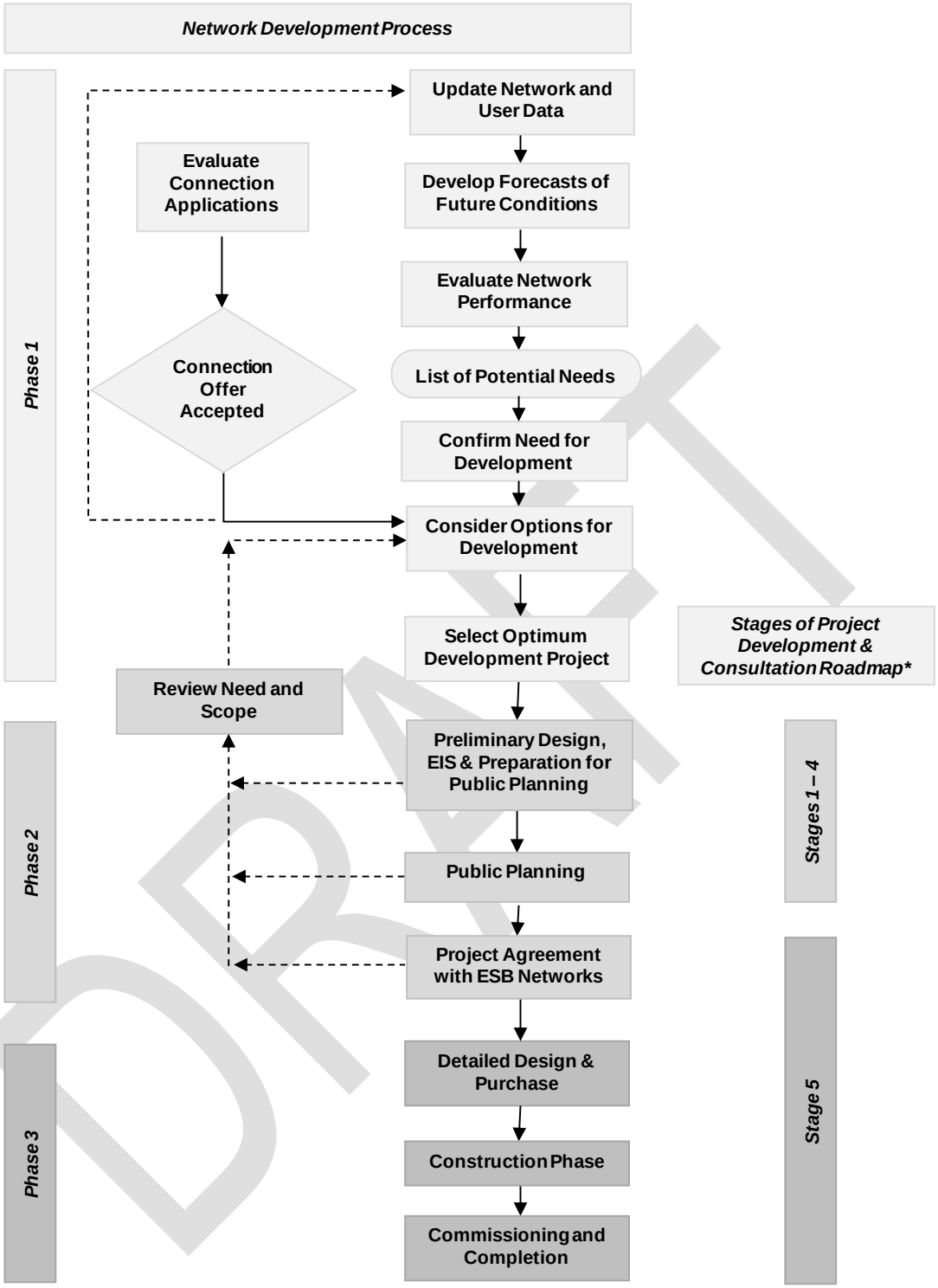
Update the Network & User Data: The beginning of the process involves reviewing and updating the network and user information that defines the network model.

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

Evaluate Network Performance: The network models are used to assess the future long-term performance of the network against the standards set out in the Transmission Planning Criteria (available on EirGrid's website, www.eirgrid.com, under "Publications"). System studies identify areas of weakness which may require development. The studies include an assessment of various factors such as: diverse demand levels and generation dispatches; different interconnection power transfers; generation closure; and network stability. Market models are used to indicate future generation and exchange patterns. 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 is carried out for generation and demand applications that are processed. EirGrid processes generation applications on a grouped or individual basis depending on the type of application submitted. The CER decides which generation applicants are processed and how they are processed. EirGrid makes a connection offer to every demand applicant on an individual basis.

Connection Offer Accepted: If the applicant signs the connection agreement the shallow connections are progressed in accordance with contractual milestones, while the deep reinforcement options are considered for optimisation. In some instances, EirGrid will progress plans for works prior to offer acceptance where these are required for the strategic development of the grid for the benefit of all customers and to ensure that the grid is developed in good time.



* An outline of the Stages of EirGrid's Project Development and Consultation Roadmap is shown here in the Network Development Process Flow Chart to illustrate the correlation between the two. Refer to Figure 2-2 for the details on the Stages in the Roadmap.

Figure 2-3 Flow Chart of Network Development Process

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

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

Public Consultation: The public is consulted and their input is sought on matters which may affect them regarding the proposed development. The main goals are improving the efficiency, transparency and public involvement in the proposed project. The process usually involves notification - to publicise the matter to be consulted on; consultation - a two-way flow of information and opinion exchange; as well as participation.

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

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

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

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

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

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

Some projects do not comprise strategic infrastructure, and an application will be lodged with the relevant planning authority. The planning authority decides whether or not to grant planning permission for the project. If planning permission is granted it may subsequently be appealed to An Bord Pleanála, subject to the appellant/s having lodged an objection to the planning application with the relevant local planning authority in the first instance.

Once planning permission is secured by either of the above processes, the requirement for the project is reviewed and the project cost is re-evaluated before progressing to the next phase.

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

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

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

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

Commissioning and Completion: When the development is constructed it must undergo commissioning, 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, for example, 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 other mitigating circumstances then it would be necessary to reassess the project. The process allows investments to be optimised and ensures that the network development plan matches network reinforcement requirements as closely as possible.

Figure 2-4 shows the typical lead-times for various types of development projects from the decision to proceed with a selected project, i.e. at the end of Phase 1, to final completion. Phase 2 includes preliminary design and public planning and the periods are based on estimates made by EirGrid. Phase 3 includes detailed design, procurement, construction, commissioning and energisation. The Phase 3 timelines are based on standard lead-times and estimates received from ESB Networks.

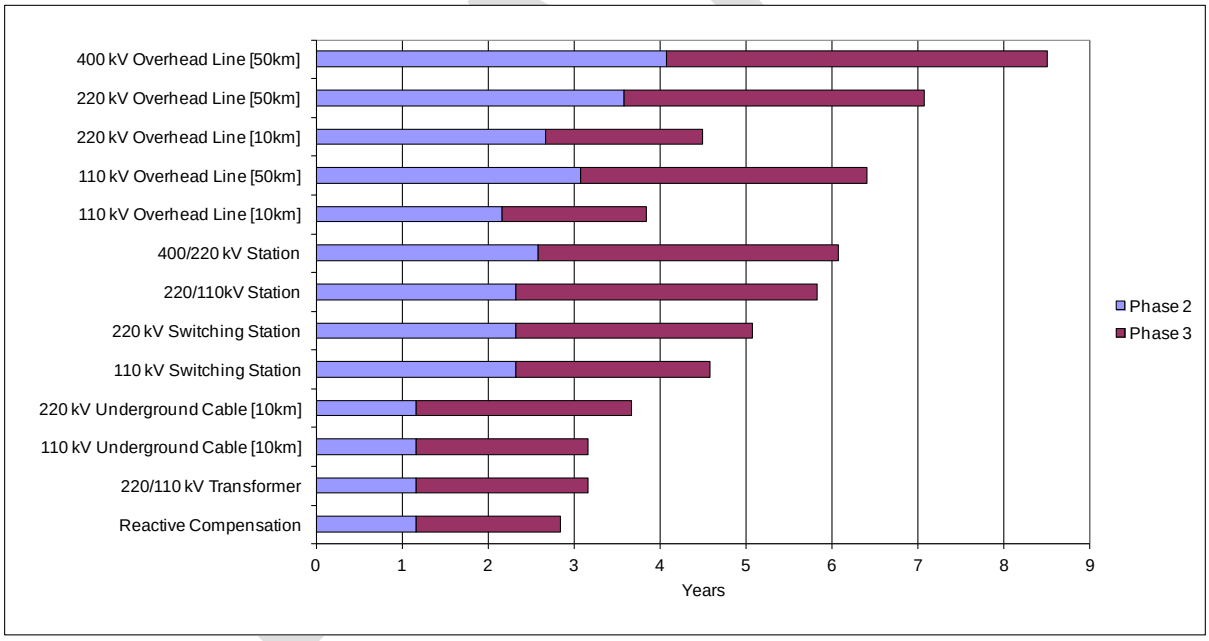


Figure 2-4 Typical Lead-times for Development Projects

Timelines for two different lengths of 110 kV and 220 kV overhead lines are given to illustrate the possible range of delivery timelines. In practice, projects (even those of a seemingly similar type) have a significant distribution in the time for their delivery and therefore a 'standard' lead-time and a 'standard' project type does not always apply. The current single point estimate for completion accords no recognition to this probability distribution of delivery times. The 'standard' lead-time (i.e. the single point estimate quoted for the delivery of projects) is therefore not a normally distributed

point estimate but a largely 'best case' point estimate against a distribution which has a significant variance.

It should be noted that the timelines for all circuits include the provision of bay equipment at both ends of the circuits, and that switching stations do not include transformers or equipment at other voltages. The periods quoted for underground cables assume that they do not require planning permission; however, under planning legislation, cables may be de-exempted in circumstances where appropriate assessment is required.

The values in the chart are based on all consents being un-contentious and uninterrupted access to sites.

2.5 Refurbishment Planning Process

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

The process of network refurbishment is illustrated in Figure 2-5 with each of the steps described below. The main inputs into the process are represented by the two blocks titled "Initial Condition Assessment" and "Performance and Technology Review".

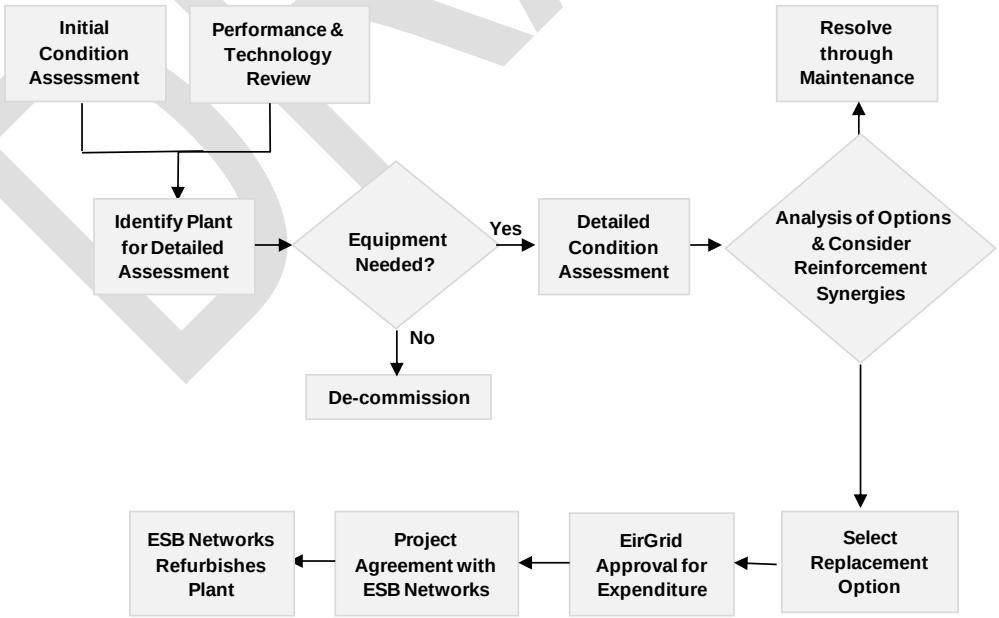


Figure 2-5 Flow Chart of Network Refurbishment Process

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

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

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

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

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

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

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

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

Select Replacement Option: The chosen option is determined by factors such as cost, economic trade-off, remaining useful life of the asset, environmental considerations, system safety,

security and reliability. A final scope of work for the selected option is developed and an estimated cost prepared.

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

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

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

3 INVESTMENT NEEDS

3.1 Strategic Context of Transmission Network Investment

Electricity is a key factor of production and the ability to provide a secure, reliable and stable electricity supply is seen as essential to enabling economic activity and economic growth.

Consequently, the development of the electricity system is influenced by national and European Union imperatives that focus on ensuring security of electricity supply; ensuring the competitiveness of the national economy; and ensuring the long-term sustainability of electricity supply in the country. These national and EU imperatives are reflected in policies and their stated policy objectives.

Security of supply is concerned with generation adequacy and the availability of generation to meet the fluctuating demand needs over time. In this respect, security of supply is enhanced by having access to a broader number of generators, and a broader range of primary energy types and sources. Hence, electricity policy would seek to promote broadening the country's access to generation and would hence seek to promote further interconnections with neighbouring countries.

Security of supply is also concerned with the reliability of the transmission network. Policy therefore seeks to promote the timely development of the transmission network to maintain an acceptable level of performance and reliability, thereby ensuring that transmission network performance is not a barrier to economic development.

In addition to being secure, reliable and stable, electricity supply needs to be competitively priced. This is achieved, on the one hand, by ensuring that the production cost is as low as possible, and on the other hand, by ensuring that the infrastructure investments required to deliver the electricity to areas where it is consumed are cost-effective and optimally timed.

Low or competitively priced electricity is viewed as the product of a competitive electricity market. As a result, electricity policy generally seeks to promote increased competition. This is achieved, from a transmission infrastructure perspective, through further market integration i.e. removing network constraints and broadening the market by interconnecting to neighbouring electricity markets.

Ireland is heavily reliant on imported fossil fuels for the generation of electricity. The long-term sustainability of the Irish economy is impacted by the sustainability of the fossil fuels upon which it relies. Furthermore, the production of greenhouse gasses as a result of the burning of fossil fuels has a long-term environmental impact and is not seen to be environmentally sustainable. These two factors therefore drive the integration of energy produced from renewable sources.

3.2 Drivers of Transmission Network Investment

The Irish electricity supply industry and its development take their direction from a number of broad national and European Union imperatives or strategic objectives. These set the context for the capital investments that are made in the Irish transmission network and may be summarised as follows:

- Ensuring the security of electricity supply;
- Ensuring the competitiveness of the national economy; and
- Ensuring the long-term sustainability of electricity supply in the country

In order to achieve these strategic objectives, it is necessary to continue to invest in the development and maintenance of the electricity transmission system. Specific drivers of investment in transmission network infrastructure are therefore identified, and may be described as:

- Securing transmission network supplies;
- Promoting market integration; and
- Promoting the integration of Renewable Energy Sources (RES).

Each of these drivers is discussed in further detail below:

3.2.1 Security of Supply

Security of supply generally addresses two separate issues:

- The availability of primary energy resources to generate sufficient electricity to meet demand; and
- The ability of the transmission network to reliably transport electrical energy from the generators where it is generated to the demand centres where it is consumed.

From the perspective of meeting the strategic objective of ensuring the security of electricity supply, the Transmission Development Plan is aimed at addressing the security of supply issues that relate to the transmission network. Therefore, for this document, security of supply is taken to mean the ability of the transmission network to reliably transport electrical energy from where it is generated to the demand centres where it is consumed.

3.2.2 RES Integration

Developing renewable energy is an integral part of Ireland's sustainable energy objectives and climate change strategy. With lower or no net emissions from renewable energy sources compared to fossil fuels, renewable energy sources contribute of the decarbonisation of the energy supply and reduction in greenhouse gases emissions.

They also contribute to energy security, being, for the most part, an indigenous energy source. In a period of increasing and volatile energy costs renewable energy sources can also contribute to cost competitiveness by reducing dependence on imported fossil fuels.

Irish renewable energy policy is framed in the context of European and other international targets:

- In June 2009 the European Commission published EU Directive (2009/28/EC) on the promotion of the use of energy from renewable sources.
- The Irish government in the Energy White Paper has set the target for renewable energy in electricity generation as a total contribution to gross electricity consumption of 40% by 2020.

In order to fulfil both European and national renewable targets, many RES-related projects are expected to be initiated throughout the period of this plan as part of the Group Processing Approach. Many of these projects are located in rural areas where the transmission network is less developed. Therefore, there are significant challenges in

extending and reinforcing the grid to connect new RES and resolve the associated pressure placed on the electricity transmission system in these rural areas.

3.2.3 Market Integration

In the European context, market integration is based on the view that the more integrated the EU electricity markets, the more the flow of electrical energy from areas where it is cheap to produce to areas where it is more highly valued will be facilitated.

Other benefits would include:

- The facilitation of increased penetration from variable inputs like wind via greater network interconnection;
- A more competitive electricity market aimed at driving electricity prices down;
- Improved efficiency and more optimal use of existing transmission capacity; and
- The provision of improved network security across the EU

The integration of RES and other forms of low carbon generation significantly increases the power exchange opportunities across the region. Differences in national targets and incentives, combined with the various availabilities of renewable sources across Europe are expected to lead to greater penetration of RES in certain areas when compared to others highlighting the need to reinforce the transmission grids between and within the countries.

3.3 Network Development Needs

To ensure adequate security of electricity supply; further market integration; and the integration of renewable energy sources, it is necessary to provide ongoing and timely reinforcement of the Irish electricity transmission system.

EirGrid has a statutory duty to support the development of the Irish economy and society by ensuring the network is able to support all reasonable demands for electricity. In addition, it is a requirement for the system operator to enter into agreement for connection with parties seeking to connect to the system under such terms approved by the Commission for Energy Regulation.

Therefore, as demand or generation changes; or as the transmission system become more interconnected with neighbouring systems; or as new demand or new generation are connected; the flow of electrical energy throughout the transmission system changes. To accommodate these changes in power flows it is often necessary to reinforce the transmission network to ensure adequate performance and reliability levels are maintained.

In addition, the condition of assets is also a factor where the timely maintenance or replacement (where necessary) are required to ensure an adequate level of security of supply.

As stated previously in section 2.2, the primary measure of whether the transmission network meets the required levels of reliability is to compare its performance with the requirements of the Transmission Planning Criteria (TPC)[14]. The TSO licence granted to EirGrid by the CER specifically requires EirGrid to ensure the maintenance of and, if necessary, develop the transmission system in accordance with the Transmission System Security and Planning Standards, also known as the Transmission Planning Criteria.

It is possible to separate the resulting reinforcement needs into a number of categories, namely:

- Reinforcements required to support changes in, or connection of, new demand;
- Reinforcements required to support changes in, or connection of, new generation;
- Reinforcements related to interconnection;
- Reinforcements to facilitate inter-regional power flows; and
- Reinforcements to address the condition of existing assets.

Figures 3-1 and 3-2 illustrate the areas of change on the network and the resultant network development needs over the period of this plan.

Each of the changes is discussed in further detail below.

[14] Referred to as the Transmission System Security and Planning Standards in the Transmission System Operator Licence, CER, CER/06/123, 29 June 2006

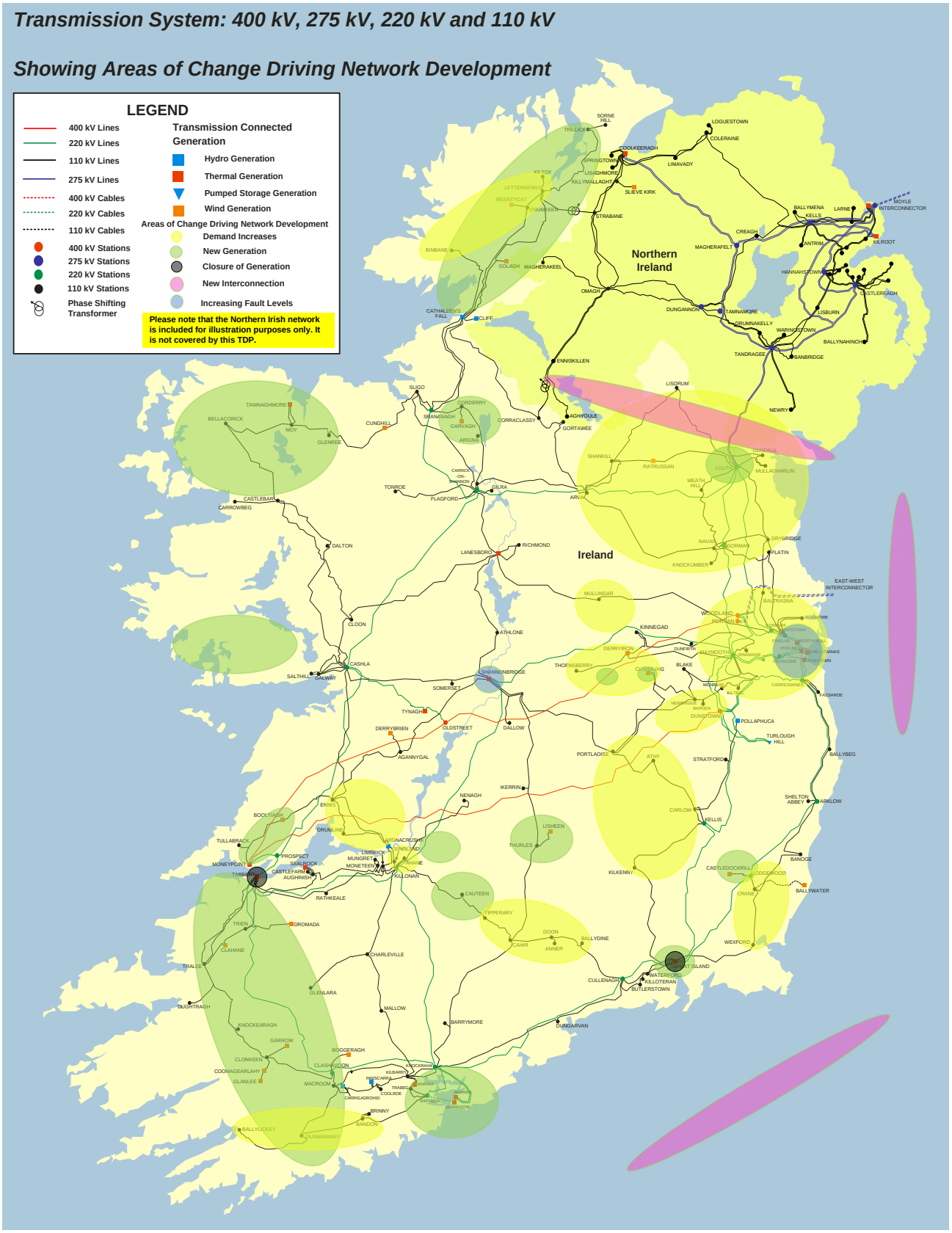


Figure 3-1 Network Map Showing Areas of Change Driving Network Development

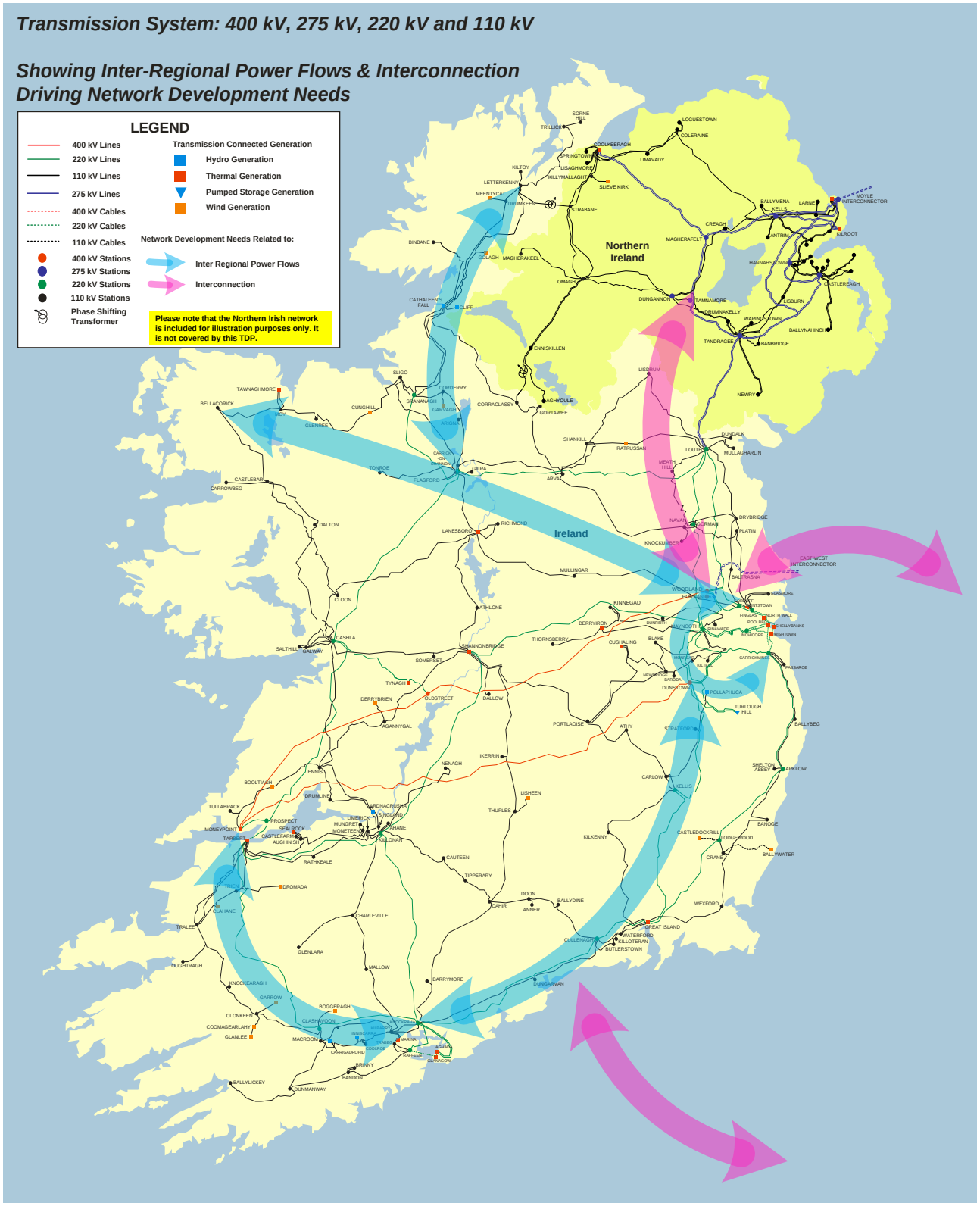


Figure 3-2 Network Map Showing Network Development Needs Related to Inter-regional Power Flows and Interconnection

3.3.1 Changes in Demand

Demand for electricity can change gradually in an area due to a general increase in economic activity and a resultant greater use of electricity in industrial units, commercial buildings, farms and houses. Alternatively a large demand customer may connect to the transmission system, or close, causing a step change in demand. The demand customer could be a large industrial plant or a new DSO station. Both the generic demand growth and the connections of new demand may give rise to higher power flows and may trigger the need to reinforce the grid as a result.

Additionally, the grid will need to be developed to make the connection of new large demand customers to the grid whether connecting to an existing or new station.

Closure or reduction in the size of demand facilities can reduce the power flows on lines feeding the load. However, in certain cases where the demand is absorbing local generation and reducing the amount of generation exported from the area, the closure can lead to increased power flows.

While economic activity has declined sharply in the recent past, it is expected that over the period of this TDP and beyond there will be a return to growth, albeit at more modest levels than those experienced over the previous decade.

In this context Table 3-1 below summarises the forecasts of transmission demand for the years 2013 to 2023. The forecasts of winter peak demands correspond to the median transmission peak demand forecasts published in the All Island Generation Capacity Statement 2013-2022 available on www.eirgrid.com. The forecasts of summer peak and summer valley demands assume figures of 80% and 35%[15] respectively of the annual maximum demand, which is consistent with historical demand data. Further demand information, on a regional basis, is given in the regional discussions in Chapter 6.

[15] Previously, it was 36%.

Year	Winter Peak (MW)	Summer Peak (MW)	Summer Valley (MW)
2013	4,768	3,814	1,669
2014	4,825	3,860	1,689
2015	4,888	3,910	1,711
2016	4,946	3,957	1,731
2017	4,996	3,997	1,749
2018	5,048	4,038	1,767
2019	5,114	4,091	1,790
2020	5,210	4,168	1,824
2021	5,281	4,225	1,848
2022	5,346	4,277	1,871
2023[16]	5,412	4,329	1,894

Table 3-1 Transmission Peak Demand Forecasts

Areas in the transmission network where changes in demand are resulting in network development needs are highlighted on the map in Figure 3-1.

3.3.2 Changes in Generation

Because of the relative size of individual generators, changes in generation installations, whether new additions or closures can have a more significant impact on power flows than demand. This is equally so in the case of interconnectors which are treated as generators during periods when power is imported. This can be illustrated by considering the single largest in-feed in Ireland. Prior to the East West Interconnector (EWIC), Whitegate CCGT was the single largest in-feed (445 MW). Subsequently, EWIC, which has a contracted import capacity from Great Britain of 500 MW and represents approximately 10% of the forecast 2013 Winter Peak demand, is now the largest in-feed.

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. This is known as the shallow connection. 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 groups of generators, leads to large-scale deep reinforcements. However, even relatively small generators may require some deep reinforcements. Embedded generation, which is

[16] All Island Generation Capacity Statement 2013-2021 details forecasts up to and including 2022, here the 2023 forecasts are extrapolated from the 2022 forecasts.

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

The connection of large generators combined with the increasingly meshed nature of the transmission network results in lower system impedance and consequently increased short circuit levels. High short circuit levels may cause catastrophic failure of high voltage equipment and so are a safety issue and measures must be taken to prevent these occurring. Investigations for the connection of new power stations and transmission reinforcement take into account the impact of the development on short circuit levels. The two most common methods of resolving short circuit level problems are upgrading the station equipment with higher rated switchgear and equipment, or reconfiguring the stations and network to reduce the number of 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.

Those areas where the network is close to or already at the fault rating of installed equipment are highlighted on the map in Figure 3-1. This will require new network developments to ensure security of supply is maintained.

A large number of applications for the connection of new generation, particularly of renewable wind generation, have been received. To manage the high volume of applications for connection in a fair and pragmatic manner, the CER has directed that applications are dealt with in tranches, or gates; the most recent being Gate 3. Table 3-2 highlights the level of new generation expected to connect over the period of this TDP and these generators are accommodated by the reinforcements included in this Plan, including the identified future potential projects discussed in chapter 6.

In addition to the connection of new generation, a number of generators plan to close over the period of this Plan; these are:

- Tarbert 1, 2, 3 and 4 (590 MW)
- Great Island 1, 2 and 3 (216 MW)

Currently there are plans for new generators to be installed at these sites. A new 431 MW CCGT is currently under construction at Great Island. While an application for a new 285 MW generator at Tarbert is in the applications queue.

Areas in the transmission network where changes in generation are resulting in network development needs are highlighted on the map in Figure 3-1.

In this context Table 3-2 below summarises the MW associated with connected generators and interconnection, contracted generators and generators with live offers. Figure 3-3 below shows both the forecast demand and generation for the period of the plan. It should be noted that for illustration purposes only, all contracted generation is assumed to connect by 2016, all generators with live connection offers are assumed to connect by 2020 and those generators that plan to close do so by 2020. Further generator information is given in the regional discussions in Chapter 6.

	Connected Generator / Interconnection Capacity (MW)	Contracted Generator / Interconnection Capacity (MW)	Generators / Interconnectors with Live Offers (MW)	Total (MW)
Wind at Transmission	787	810	1,608	3,205
Wind at Distribution	898	790	1,608	3,296
Thermal at Transmission	6,160	1,229	438	7,827
Thermal at Distribution	218	125	143	486
Hydro[17]	238	2	2	242
Pumped Storage	292	70	0	362
Interconnector	500	0	0	500
Other[18]	63	81	7	151
TOTAL	**9,156**	**3,107**	**3,806**	**16,069**
TOTAL (Cumulative)	**9,156**	**12,263**	**16,069**	**-**

Table 3-2 Summary of Connected Generators and Interconnection, Contracted Generators and Generators with Live Offers[19]

[17] Transmission and distribution.

[18] Consists of biogas, biomass, hybrid, land fill gas and wave projects.

[19] There is a further 13.3 GW of wind generation and 9.5 GW of other types of generation in the applications queue.

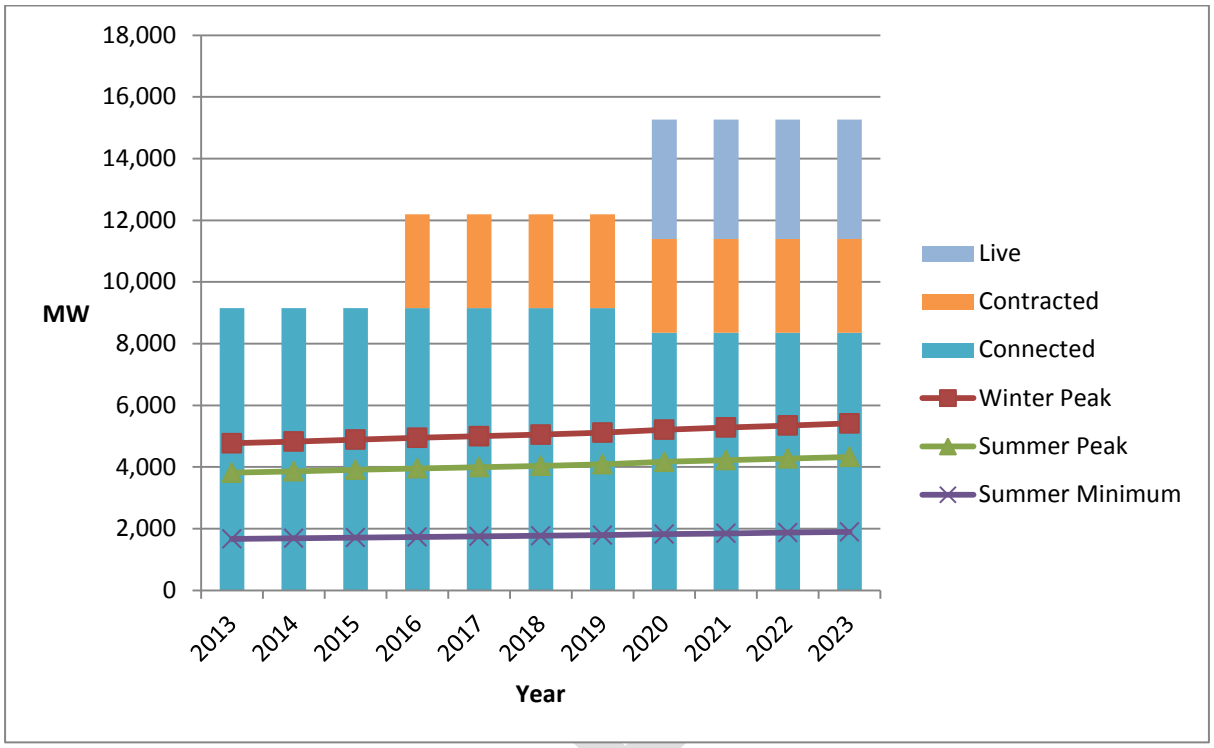


Figure 3-3 Summary of Forecast Demand and Generation for the Period of the Plan

To fully take advantage of the RES resources in Ireland while providing security of supply to all electricity consumers the transmission system has to have the capability of transferring power from RES and thermal generation (and a mixture of both) to where it is needed. This means that the transmission system has to cope with multiple power flow patterns which result from the combination of demand and generation depicted in Figure 3-3.

3.3.3 Changes in Interconnection

For market integration to be realised, it is necessary for physical connections to be put in place i.e. interconnections are required to be built.

The motivation for the construction of interconnections is primarily economic as the resulting broadening of the energy market increases competition and the potential for prices to be reduced.

Furthermore, interconnections promote access to a broader generation base thereby enhancing security of supply and potentially deferring the need for additional generation to be constructed to meet security of supply standards or requirements.

Future fuel cost differences may lead to new reinforcement projects in the TDP. To this end, recent investigations conducted by EirGrid, and supported by similar investigations within the European Union, have indicated that there is merit in further interconnections between Ireland

and Great Britain, and between Ireland and France. Investigations into these interconnections are now being actively pursued.

Areas in the transmission network where new interconnection-related projects have been initiated are highlighted on the map in Figure 3-1.

The following interconnections are addressed in this TDP:

- North – South Interconnector between Ireland and Northern Ireland;
- A possible second interconnector between Ireland and Great Britain; and
- A possible interconnector between Ireland and France.

3.3.4 Changes in Inter-Regional Power Flows

Changes in local demand; the further internal integration of the all island Single Electricity Market; the further integration with adjacent countries; and the integration of significant levels of new generation (both conventional and renewable) have the potential to significantly change the flow of electrical power throughout the transmission network.

Given the extent of the likely changes that are envisaged for Ireland, particularly in respect of the RES targets, there is now a growing need to accommodate a much broader range of plausible or credible flow patterns across the network for which greater transmission network flexibility is required.

In the Irish context, the following inter-regional power flows may be defined:

- South – West power flow;
- South – East power flow;
- North-West – East power flow; and
- West – South power flow.

Figure 3-2 illustrates the inter-regional power flows resulting from changes in demand and generation that will drive the need for network reinforcements over the next ten years and beyond.

3.3.5 Changes in Asset Condition

Transmission network assets have a finite lifespan. The useful life of transmission assets are impacted by, amongst other factors, the age of the asset; technology type and its propensity for obsolescence; maintenance adequacy and effectiveness; environmental conditions; and utilisation.

Routine condition assessments are carried out to assess the condition of the assets and estimate remaining useful life in order to ensure that security of supply is not compromised.

Typically, where asset condition is poor, assets are either refurbished; replaced on a like-for-like basis; or replaced with higher rated equipment to cater for future needs.

More recently, due to the high cost of refurbishment relative to new build, especially where obsolescence of equipment is a factor (typically regarding Gas Insulated Substation (GIS) technology), full replacement or the complete rebuilding of stations is found, on occasion, to be a cost effective solution. This becomes more relevant when the impact on the operation of the transmission system and the complex arrangements necessary to implement the necessary equipment outages are factored into the decision.

As a trend, refurbishment projects are also being combined with projects that seek to increase installed capacity as small cost differentials and the growing operational complexity of seeking successive outages (i.e. for refurbishment and subsequently for capacity increases) make such a course of action both cost-effective and prudent.

Figure 3-4 below summarises how the drivers, reinforcement needs and the resultant projects relate to each other.

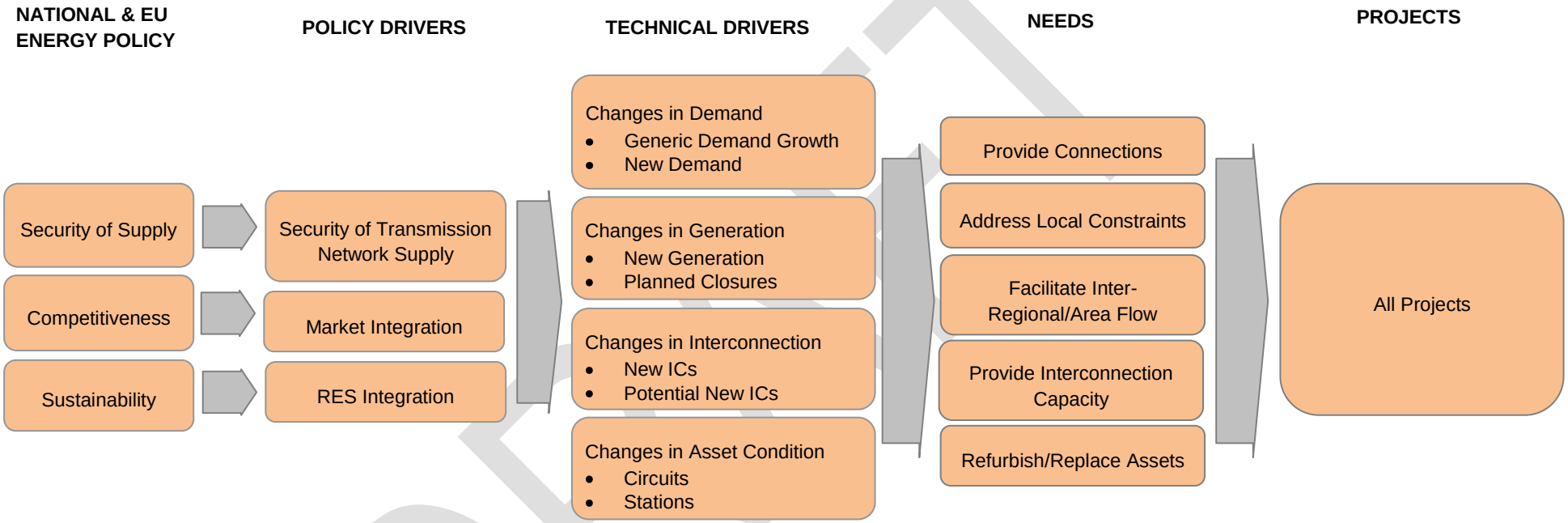


Figure 3-4 Summary of how Drivers, Needs and Projects relate to each other

4 MODIFICATIONS TO THE PLAN SINCE TDP 2012

Transmission Development Plan 2012 is available on www.eirgrid.com. The information in TDP 2012 was accurate and correct as at the TDP 2012 data freeze date of the 31st of March 2012.

This plan is accurate and correct as at the 31st of March 2013. The changes that have occurred since the 31st of March 2012, and which are represented in this plan (TDP 2013) are summarised in Tables 4-1a, 4-1b and 4-1c below.

Description of Projects	***No. of Projects***	***Cumulative No. of Projects***
Projects Active in TDP12	136	136
Completed Projects	35[20]	101
Cancelled Projects	1	100
TDP12 Projects Active in TDP13	100	-

Table 4-1a Summary of Changes since TDP 2012

Table 4-1a describes how the opening balance of projects active in TDP 2013 (100) is calculated from the number of active projects that were in TDP 2012 (136). Of the 136 active projects in TDP 2012, 35 have been completed and one has been cancelled. This means that 100 TDP 2012 projects are also active in TDP 2013; this figure is used in Table 4-1c below.

Description of Projects	***No. of Projects***	***Cumulative No. of Projects***
New Projects	35	35
Completed New Projects	2[21]	33
New Active Projects	33	-

Table 4-1b Summary of Changes since TDP 2012

[20] These are summarised in section 4.1 and detailed in Appendix B.

[21] These are 2 new projects that were not in TDP 2012 but were completed during the year. They are summarised in section 4.1 Project Completions and detailed in Appendix B.

Table 4-1b shows the number of new projects that are introduced in TDP 2013 (33). Initially there were 35 new projects; however, of these two have been completed already. This means that 33 new projects are introduced in TDP 2013; this figure is used in Table 4-1c below.

Description of Projects	***No. of Projects***	***Cumulative No. of Projects***
TDP12 Projects Active in TDP13	100	100
New Active Projects	33[22]	133[23]
Cancelled/Deferred Projects	3[24]	136
Projects with Dates to be Confirmed	8[25]	144
Completed Projects	37[26]	181
Total	181	

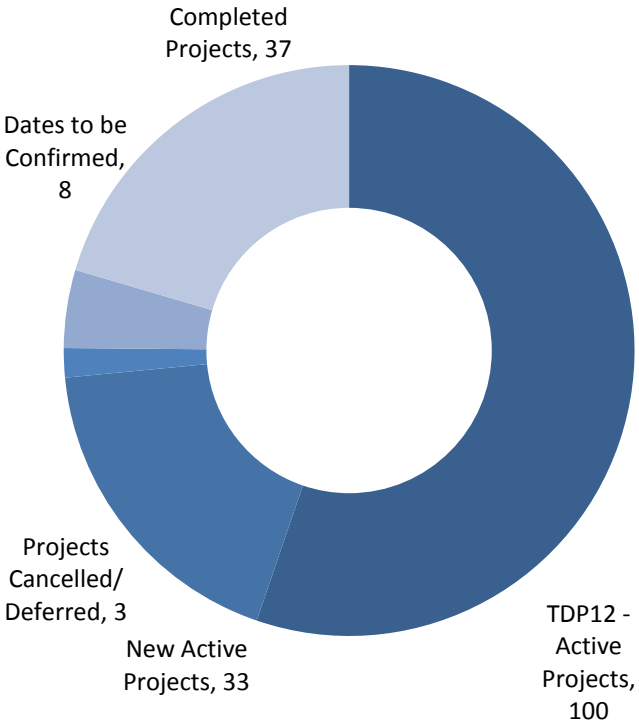


Table 4-1c Summary of Changes since TDP 2012

From Table 4-1, the following can be seen:

- TDP 2013 refers to a total of 181 projects;
- TDP 2013 includes 144 projects that have been approved internally in EirGrid; of these 133 are in progress, three are cancelled/deferred and there are eight whose expected energisation dates have yet to be confirmed by the customer[27];
- Of those 133 active projects, 100 were in TDP 2012, while the other 33 projects are new to this plan;

[22] These are summarised in section 4.2.

[23] These are summarised in chapter 5, discussed in chapter 6 and listed in Appendix C.

[24] These are summarised in section 4.3 and detailed in Appendix B.

[25] These are summarised in section 4.3 and detailed in Appendix B.

[26] These are summarised in section 4.1 and detailed in Appendix B.

[27] These eight projects involve the provision of the transmission element of customers' shallow connections.

- Of those three cancelled/deferred projects, two were also listed as deferred in TDP 2012, while there is one additional cancelled project; and
- The eight projects whose expected energisation dates have yet to be confirmed by the customer were also listed as such in TDP 2012.

4.1 Project Completions

There are 37 projects that have been completed since the 31st of March 2012 up to the 31st of March 2013, the data freeze dates for TDP 2012 and 2013. The 37 projects are listed in Table B-1 in Appendix B[28]. Table 4-2 below summarises the completed projects by voltage and general equipment.

New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	1	1	3	5
Number of New Station Bays[29]	2	6	34	42
New Overhead Line (km)	0	56	78	134
New Underground/Undersea Cable (km)	0.5	0	12	12.5
Number of New Reactive Devices	0	0	0	0
Total New Reactive Power (Mvar)	0	0	0	**0**
	400/220 kV	**400/110 kV**	**220/110 kV**	**Total**
Number of New Transformers	0	0	4	4
Total New Transformer Capacity (MVA)	0	0	1,000	1,000

Table 4-2a Summary of Completed New Assets by Voltage and Equipment

Uprated/Refurbished/Upgraded Assets	400 kV	220 kV	110 kV	Total
Uprated Overhead Line (km)	0	126	185	311
Refurbished Overhead Line (km)[30]	0	88	269	357
Number of Busbars Uprated/Replaced	0	0	6	6
Number of Stations Refurbished/Replaced/Redeveloped	0	0	2	2
Number of Protection Systems Upgraded	0	0	2	2

Table 4-2b Summary of Uprated/Refurbished/Upgraded Assets by Voltage and Equipment

[28] Prior to reviewing Appendix B consult Appendix A Project Details which provides some of the terms that are used to describe projects.

[29] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[30] The lengths of line refurbished quoted in the table are the sum of the lengths of the individual lines. However, due to the nature of refurbishment work the length of line refurbished may in fact be less.

4.2 New Projects

There are 33 new projects included in TDP 2013 that were active at the data freeze date of the 31st of March 2013 and which were not in TDP 2012. Table 4-3 below summarises the new projects by voltage and general equipment. These are estimates only because project scopes can change during the course of a project, particularly in the preliminary stages of design.

Planned New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	0	0	2	2
Number of New Station Bays[31]	0	7	35	42
New Circuit[32] (km)	0	0	40	40
Number of New Reactive Devices	0	0	0	0
Total New Reactive Power (Mvar)	0	0	0	0
	400/220 kV	400/110 kV	220/110 kV	Total
Number of New Transformers	0	0	0	0
Total New Transformer Capacity (MVA)	0	0	0	0

Table 4-3a Summary of Planned New Assets by Voltage and Equipment

Planned Uprates/Refurbishments/Upgrades	400 kV	220 kV	110 kV	Total
Circuit to be Uprated (km)	0	0	73	73
Circuit to be Refurbished (km)[33]	229	25	54	308
Number of Busbars to be Uprated	0	0	3	3
Number of Stations to be Refurbished/Replaced/Redeveloped	0	3	1	4
Number of Protection Systems to be Upgraded	0	4	6	10

Table 4-3b Summary of Planned Uprates/Refurbishments/Upgrades of Assets by Voltage and Equipment

4.3 Projects Cancelled/Deferred & Dates to be Confirmed

Three projects that were listed in TDP 2012 have either been cancelled or deferred; these projects are listed in Table B-2 in Appendix B. The drivers of these investments have either eased or disappeared.

[31] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[32] It is not possible at this early stage to split estimated new build line lengths between overhead line and underground cable

[33] The lengths of line to be refurbished quoted in the table are the sum of the lengths of the individual lines. However, due to the nature of refurbishment work the length of line to be refurbished may in fact be less.

In addition, there are eight projects whose expected energisation dates have yet to be confirmed by the customer. These projects involve the provision of the transmission element of customers' shallow connections. These projects are listed in Table B-3 in Appendix B.

5 PLANNED NETWORK DEVELOPMENTS

5.1 Overview of the Plan

The transmission network development planning process followed by EirGrid is outlined in Section 2.4. This chapter summarises the network development projects that result from that process.

The development plan includes a total of 133 projects that are in progress. These projects are categorised as either New Build, Uprate/Modify or Refurbish/Replace related projects. In addition, projects that cannot readily be categorised under the three main categories are classified as Other. New Build projects are projects that involve the construction of new stations or new circuits. It also includes projects that involve the installation of new equipment in existing stations e.g. the installation of new transformers or new reactive devices within existing stations. Uprate/Modify projects are projects that involve the uprating of existing assets e.g. changing equipment to increase the capacity rating of circuits or busbars. It also includes projects that involve the modification of existing assets e.g. the installation of new couplers or new bays in existing stations or the reconfiguration of existing stations. Refurbish/Replace projects are projects that involve the maintenance of existing stations or existing circuits. It also includes projects that involve the replacement of existing assets e.g. replacement of stations at or close to the end of their useful life or replacement and upgrading of protection in existing stations. Table 5-1 below summarises the 133 projects into their respective categories.

Project Category	No of Projects
New Build	33
Uprate/Modify	67
Refurbish/Replace	30
Other	3
Total	**133**

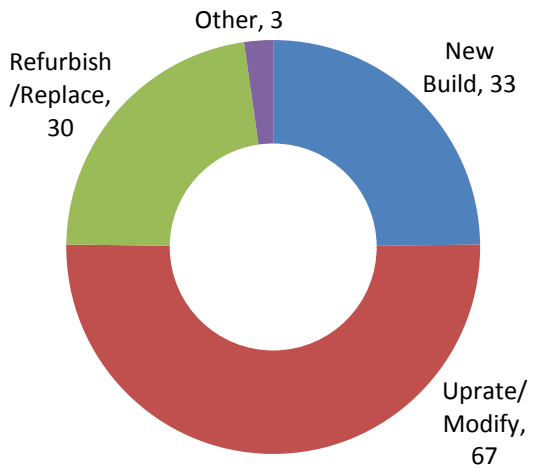


Table 5-1 Summary of Projects by Category

The statistics associated with the 133 projects are presented in Table 5-2 below. These are estimates only because project scopes can change during the course of a project, particularly in the preliminary stages of design.

Planned New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	2	7	14	23
Number of New Station Bays[34]	29	67	243	339
New Circuit[35] (km)	492	20	279	791
Number of New Reactive Devices	0	2	3	5
Total New Reactive Power (Mvar)	0	100	45	145
	400/220 kV	**400/110 kV**	**220/110 kV**	**Total**
Number of New Transformers	8	3	12	23
Total New Transformer Capacity (MVA)	4,000	1,000	3,000	8,000

Table 5-2a Summary of Planned New Assets by Voltage and Equipment

Planned Uprates/Refurbishments/Upgrades	400 kV	220 kV	110 kV	Total
Circuit to be Uprated (km)	0	211	542	753
Circuit to be Refurbished (km)[36]	229	186	155	570
Number of Busbars to be Uprated	0	0	15	15
Number of Stations to be Refurbished/Replaced/Redeveloped	1	7	7	15
Number of Protection Systems to be Upgraded	0	6	10	16

Table 5-2b Summary of Planned Uprates/Refurbishments/Upgrades of Assets by Voltage and Equipment

5.2 Summary of Phase of Projects

Table 5-3 below summarises the phase of development of each project, as described in section 2.4. Phase 2 covers the time after a project gets internal EirGrid capital approval through to the decision, where necessary, of the appropriate planning authority and up to Project Agreement with ESB Networks[37]. In this phase, work on the project involves outline design, environmental impact assessment, the public planning process and the Infrastructure Agreement process up to Project Agreement. Phase 3 covers the time after Project Agreement up to the commissioning and energisation of the new project. In this phase, work on the project involves detailed design and construction.

[34] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[35] It is not possible at this early stage to split estimated new build line lengths between overhead line and underground cable

[36] The lengths of line to be refurbished quoted in the table are the sum of the total lengths of the individual lines. However, due to the nature of refurbishment work the length of line to be refurbished may in fact be less.

[37] The appropriate planning authority is either a local authority (i.e. either a county or city council) or An Bord Pleanála.

No of Projects in Each Phase		
Phase 2 (In Outline Design & EIA or Planning Process)	Phase 3 (In Detailed Design & Construction)	Total
67	66	133

Table 5-3 No. of Projects in each Phase of Development

There are currently 66 projects in Phase 3 of project development illustrating that there is a considerable volume of projects in the detailed design or construction phase.

There are 67 projects that are in Phase 2 of project development representing a similar volume of projects in the pipeline that are at the outline design and/or environmental impact assessment or planning process stages.

Figure 5-1 illustrates the location of the larger network development projects in Phase 3, while Figure 5-2 shows those in Phase 2[38]. All new developments shown in Figure 5-2 are subject to existing/on-going Environmental Impact Assessment. For those projects not yet in the planning process, the lines shown on the map are indicative only and do not represent a preferred line route[39]. A full list of projects and their corresponding phase of development is given in Appendix C. EirGrid and the TAO are co-ordinating other capital projects in addition to the projects summarised in this chapter which are classified as minor capital works, line diversions and alterations. These projects are numerous and are more concerned with the day-to-day operation and maintenance of the network and so are not included in this chapter or itemised in Appendix C.

[38] Please note that planned projects in Phase 3 shown in Figure 5-1 are assumed to be completed, for illustration purposes, in Figure 5-2.

[39] Similarly it should be noted that line lengths for these projects are only indicative and estimates at this time.

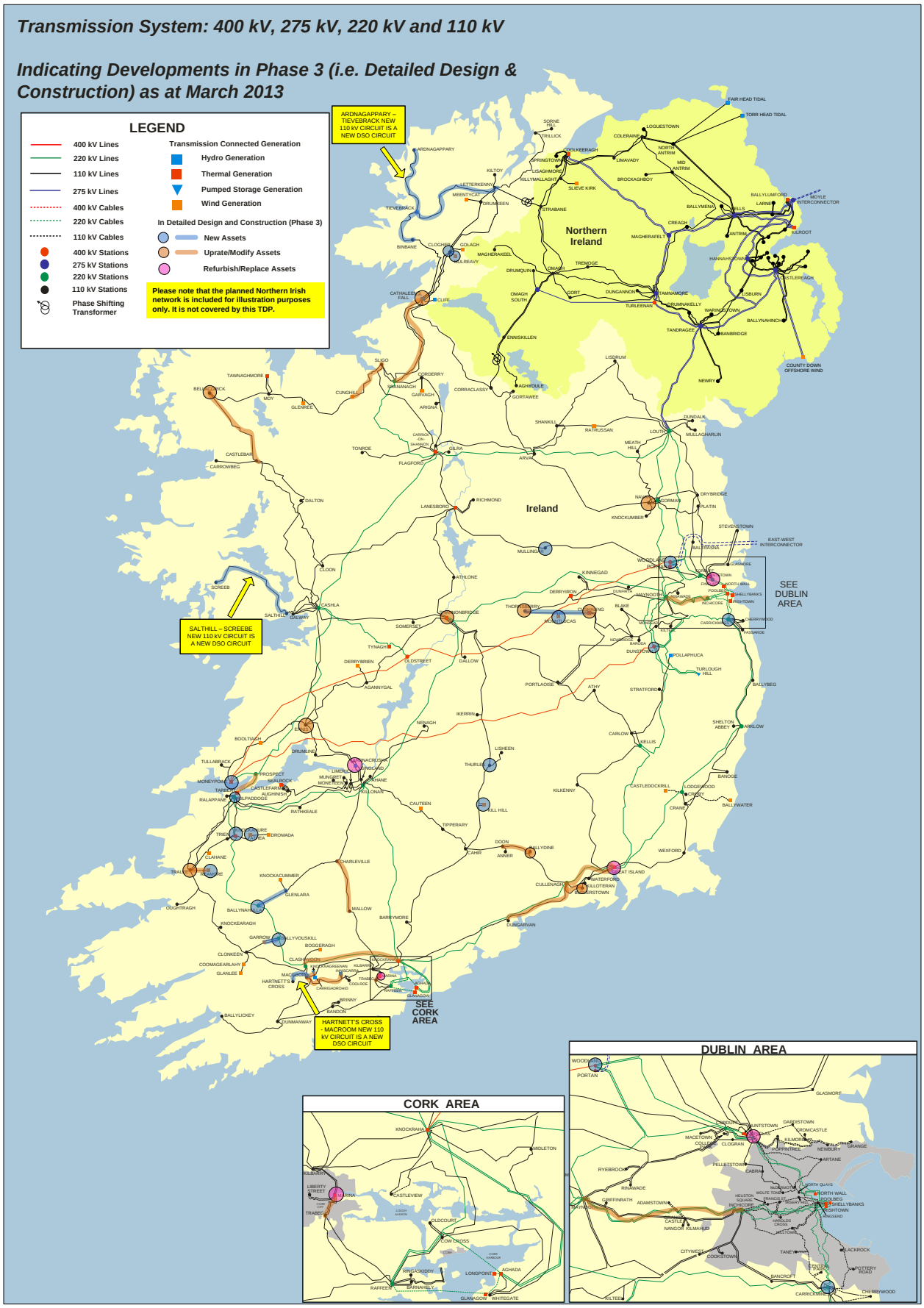


Figure 5-1 Planned Network Developments in Phase 3

Figure 5-2 Planned Network Developments in Phase 2

5.3 Project Delivery

By its very nature, development of the transmission system is subject to delivery risk. EirGrid's risk management plans and processes seek to identify, analyse, monitor and manage project and programme risks as part of the management and governance of the GRID25 programme. These plans and processes facilitate the management of project dependencies and critical path issues within the context of a changing environment.

Project estimated completion dates in the TDP are forecasts based on the best project information available at the time of the data freeze date. Certainty with regard to completion dates increases as a project moves through the various phases in its lifecycle, as represented below in Figure 5-3. The project schedule at the concept stage is developed based on standard lead times for generic project types. As a project moves forward from the concept phase a detailed schedule is developed, milestones are achieved and there is therefore greater certainty regarding the completion date.

Figure 5-3 Relationship Between Phases in Project Lifecycle and Completion Date Certainty

The level of certainty or risk in a project is also dependent on the project type as shown in Figure 5-4.

Figure 5-4 Project Certainty Depending on Project Type

EirGrid differentiates between moderate and high risk based on project type and project phase. Thus, line and station busbar uprate projects which are due to be completed by 2016 are considered to be within the moderate risk category while those large scale linear developments scheduled to be

completed post 2017 have a higher level of risk. Projects that are due for completion in the near-term are generally less risky than those that are due for completion in later years. It should be kept in mind that completion dates are subject to change and that the level of change typically depends on the type of project and the phase the project is at in its lifecycle.

6 REGIONAL PERSPECTIVE OF THE PLAN

6.1 Overview

As described in Chapter 1, planned projects are categorised on a planning area basis as per the following map.

Figure 6-1 Illustration of the Three Planning Areas and the underlying Statutory Regions

Table 6-1 below summarises the number of active projects by planning area with the more detailed project data listed in Appendix C[40].

[40] Prior to reviewing Appendix C consult Appendix A Project Details which explains some of the terms that are used to describe projects.

Planning Area	No of Active Projects
Border, Midlands & West (B-M-W)	29
South-West & Mid-West (SW-MW)	47
South-East, Mid-East & Dublin (SE-ME-D	37
Individual Projects spanning more than one Planning Area	9
Various Locations	11[41]
Total	**133**

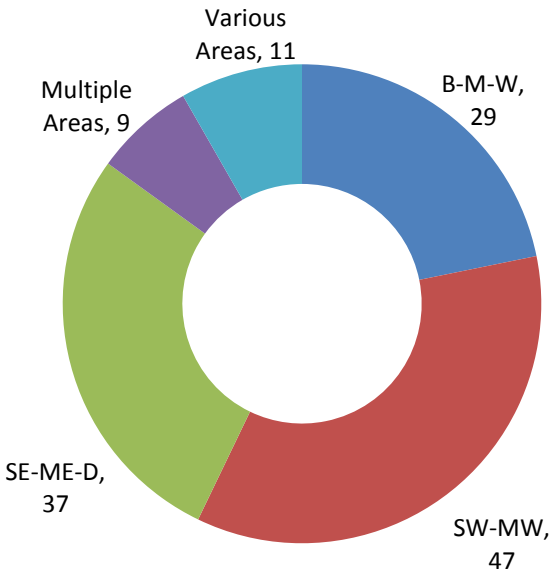


Table 6-1 Summary of Active Projects by Planning Area

It should be noted that there are nine individual projects that are in, or have the potential[42] to be in, multiple planning areas. These nine projects are listed in Table C-1 in Appendix C. However, for summarising and describing purposes these nine projects have been allocated to one of the three planning areas. These are noted below.

Two projects are included in the Border, Midlands and West planning area, another two projects are included in the South-West and Mid-West planning area and five projects are included in the South-East, Mid-East and Dublin planning area.

The two projects included in the Border, Midlands and West planning area are:

- Kinnegad - Mullingar 110 kV New Circuit (CP0596)
- North – South 400 kV Interconnection Development (CP0466)

This brings to 31 the number of projects summarised and described in the Border, Midlands and West planning area.

The two projects included in the South-West and Mid-West planning area are:

- Cashla – Prospect 220 kV Line Resagging (CP0748) and

[41] Each of the 13 projects categorised under 'various locations' involves works on the same type of equipment that is used in many parts of the transmission system around the country. The need for the projects arises due to the age and condition of the assets.

[42] Please note that the route for projects in Phase 2 has yet to be determined thus the planning areas these projects are in also has yet to be determined.

- Moneypoint – Oldstreet 400 kV Line Refurbishment (CP0824).

This brings to 49 the number of projects summarised and described in the South-West and Mid-West planning area.

The five projects included in the South-East, Mid-East and Dublin planning area are:

- Laois-Kilkenny Reinforcement Project (CP0585)
- The Grid Link Project (CP0732)
- Cauteen – Killonan 110 kV Line Uprate (CP0755)
- Cahir – Thurles 110 kV Line Uprate (CP0811)
- Oldstreet – Woodland 400 kV Line Refurbishment (CP0825)

This brings to 42 the number of projects summarised and described in the South-East, Mid-East and Dublin planning area.

In the following sections each planning area is discussed in turn.

6.2 The Border, Midlands & West Planning Area

Planning Area Overview

The Border, Midlands and West planning area is made up of the following counties categorised by statutory regions:

- The Border: Donegal, Sligo, Leitrim, Cavan, Monaghan and Louth
- The Midlands: Longford, Westmeath, Offaly and Laois
- The West: Mayo, Galway and Roscommon

For the period of this plan the development of the transmission system in the Border, Midlands and West planning area is characterised by the connection of high levels of wind generation to the relatively electrically remote 110 kV system that supplies a relatively low local demand. This excess of generation in the area is set to increase significantly in the coming years as generators, that currently have connection agreements and live connection offers, connect to the transmission system either directly or indirectly via the distribution system.

This is illustrated in Tables 6-2 and 6-3, and Figure 6-2 below. Tables 6-2 and 6-3 show, respectively, the forecast demand and generation for the period of the plan. Figure 6-2 illustrates the same information graphically. It should be noted that for illustration purposes in Figure 6-2 all contracted generation is assumed to connect by 2016 and all generators with live connection offers are assumed to connect by 2020. Currently there is 1,890 MW of installed generation capacity in the area compared with a peak area demand of 1,140 MW, representing a generation surplus of 750 MW (excluding transmission losses). The surplus in generation will increase to approximately 2,000 MW with only the connection of the contracted generators. If all the live offers were to mature to contracted connection agreements, the surplus has the potential to be as much as 3,900 MW at the time of peak demand and greater at other times.

Year	Winter Peak (MW)	Summer Peak (MW)	Summer Valley (MW)
2013	1,140	921	341
2014	1,155	933	346
2015	1,176	939	344
2016	1,175	963	353
2017	1,174	957	342
2018	1,188	956	343
2019	1,205	970	348
2020	1,230	990	357
2021	1,248	1,005	363
2022	1,265	1,019	368
2023	1,280	1,032	373

Table 6-2 Border, Midlands and West Planning Area Demand Forecasts

	Connected Generator Capacity (MW)	Contracted Generator Capacity (MW)	Generators with Live Offers (MW)	Total (MW)
Wind at Transmission	331	562	942	1,835
Wind at Distribution	391	163	578	1,132
Thermal at Transmission	980	601	297	1,878
Thermal at Distribution	108	50	0	158
Hydro[43]	78	1	0	79
Other[44]	2	54	1	57
TOTAL	1,890	1,431	1,818	5,139
Cumulative TOTAL	1,890	3,321	5,139	-

Table 6-3 Summary of Connected and Contracted Generators and Generators with Live Offers in the Border, Midlands and West Planning Area

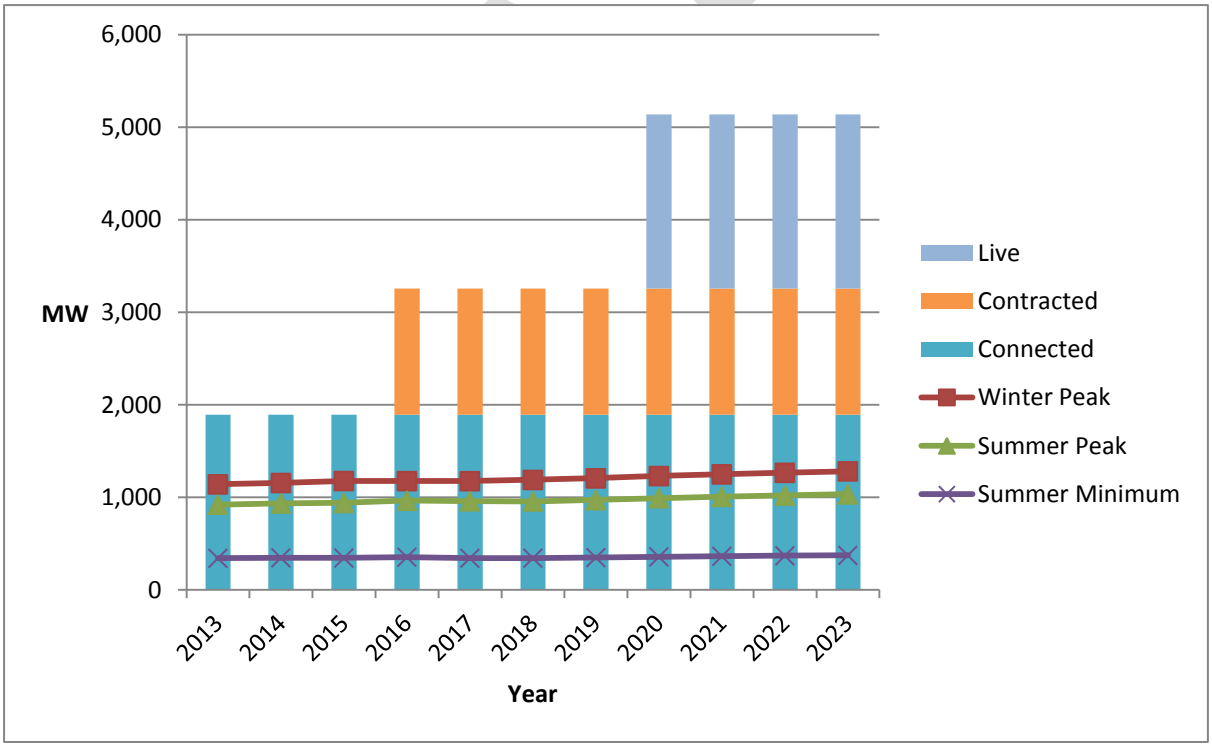


Figure 6-2 Summary of Forecast Demand and Generation in the Border, Midlands and West Planning Area

[43] Transmission and distribution.

[44] Consists of biogas, biomass, hybrid, land fill gas and wave projects.

There are a number of reinforcement needs that have to be addressed in the long-term strategic development of the electricity transmission system in the Border, Midlands and West planning area. To cater for the high levels of generation described above there is a requirement for additional network reinforcement to enable the efficient export of generation from this area to areas with high load, such as the eastern seaboard. In addition, there are also reinforcement needs due to localised security of supply concerns (i.e. local constraints related to a shortage of transmission capacity, asset condition and reactive power requirements) and to accommodate further market integration with Northern Ireland.

Currently there are 29 planned projects entirely within the Border, Midlands and West planning area. As noted in section 6-1 for summarising and describing purposes a further two projects that span multiple planning areas are included in this planning area; hence, 31 projects are described here. These are listed in Table C-2 in Appendix C.

Although these projects address specific network development needs, due to the nature of the transmission system (i.e. usually involving incremental increases of large capacity), the reinforcements will have a broader impact by increasing the capacity of the transmission network to safely accommodate greater load growth and more diverse power flows for many years to come. These projects will provide benefits to existing and future users of the transmission system in the planning area.

The 31 projects can be categorised as either New Build, Uprate/Modify or Refurbish/Replace. Table 6-4 shows the number of projects in each category.

Project Category	No of Projects
New Build	11
Uprate/Modify	17
Refurbish/Replace	3
Total	**31**

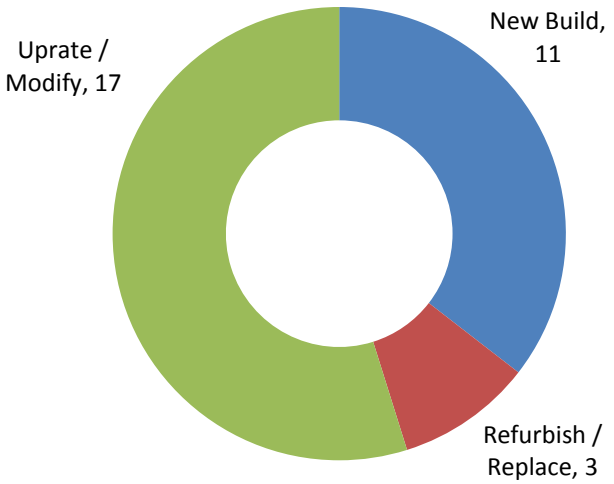


Table 6-4 Summary of Projects by Category in the Border, Midlands and West Planning Area

The statistics associated with the 31 projects in the Border, Midlands and West planning area are presented in Table 6-5 below. These statistics may change as the individual projects' scopes may be adjusted during the course of the project particularly for those in the preliminary stages of design.

Planned New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	1	0	7	8
Number of New Station Bays[45]	3	1	46	50
New Circuit[46] (km)	236	0	175	411
Number of New Reactive Devices	0	0	2	2
Total New Reactive Power (Mvar)	0	0	30	30
	400/220 kV	**400/110 kV**	**220/110 kV**	**Total**
Number of New Transformers	1	1	0	2
Total New Transformer Capacity (MVA)	500	500	0	1,000

Table 6-5a Summary of Planned New Assets by Voltage and Equipment for the Border, Midlands and West Planning Area

Planned Uprates/Refurbishments/Upgrades	400 kV	220 kV	110 kV	Total
Circuit to be Uprated (km)	0	0	184	184
Circuit to be Refurbished (km)[47]	0	0	41	41
Number of Busbars to be Uprated	0	0	6	6
Number of Stations to be Refurbished/Replaced/Redeveloped	0	0	0	0
Number of Protection Systems to be Upgraded	0	0	5	5

Table 6-5b Summary of Planned Uprates/Refurbishments/Upgrades of Assets by Voltage and Equipment for the Border, Midlands and West Planning Area

The 31 projects in the Border, Midlands and West planning area are discussed in more detail below in the context of the need they serve and the local area or county they are located in. In order to aid the understanding of the projects and where they are located, the larger network development projects in phase 2 and 3 are illustrated in Figure 6-3 below. The status of the larger network development

[45] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[46] It is not possible at this early stage to split estimated new build line lengths between overhead line and underground cable.

[47] The lengths of line to be refurbished quoted in the table are the sum of the lengths of the individual lines. However, due to the nature of refurbishment work the length of line to be refurbished may in fact be less.

projects is noted below; the status of the remaining projects is noted in Appendix C. Projects of European Significance in, or partly in, Ireland are identified in the ENTSO-E's most recent TYNDP that covers the period 2012 to 2022. These projects are identified in this Plan using the following label: " TYNDP/TYNDP_Project_No".

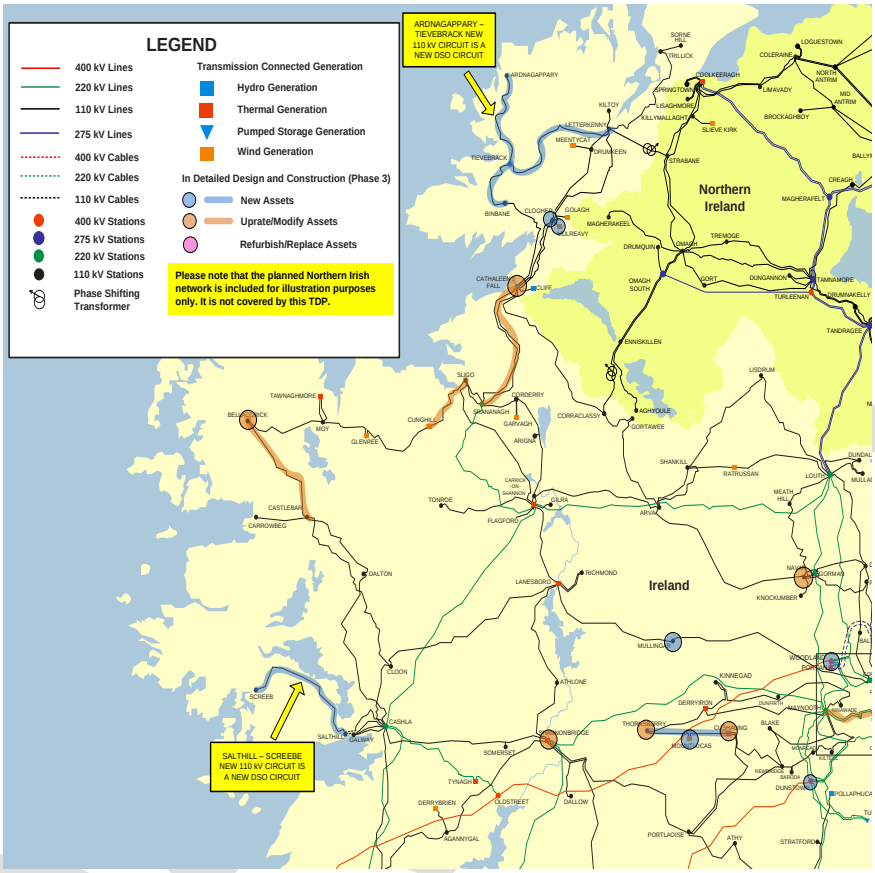


Figure 6-3a Planned Network Developments in the Border, Midlands, West Planning Area in Phase 3

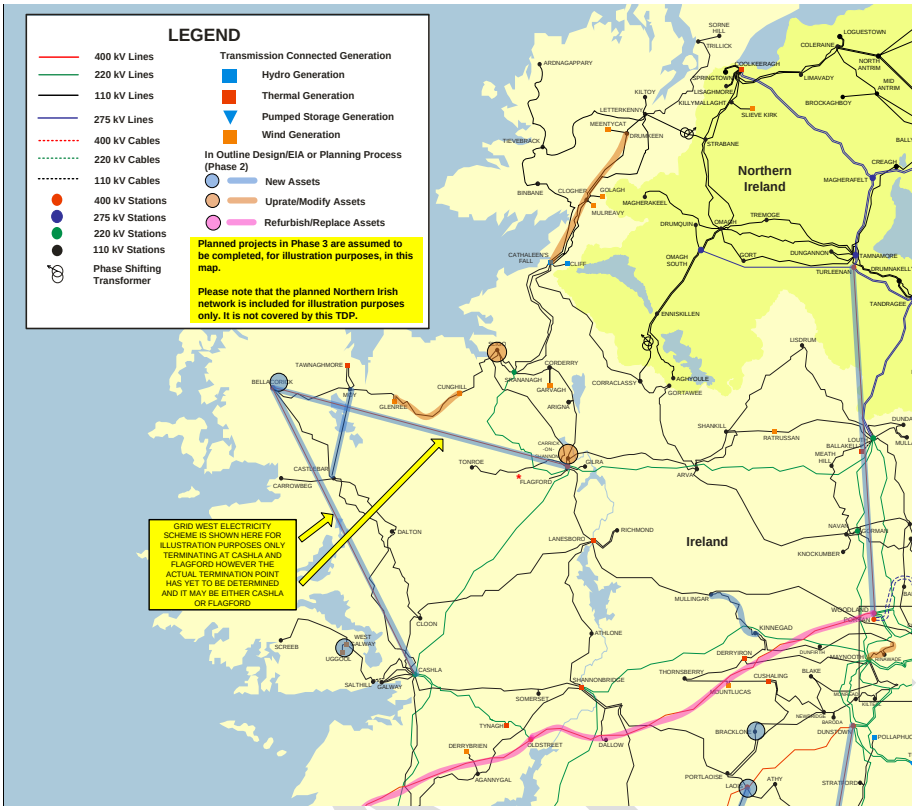


Figure 6-3b Planned Network Developments in the Border, Midlands, West Planning Area in Phase 2

Reinforcement of the Transmission Network between Ireland and Northern Ireland

Project: North - South Interconnection Development (CP0466) (TYNDP/81) – 400 kV Line from Woodland Transmission Station in Co. Meath to Turleenan Transmission Station in Northern Ireland[48]

Description: The drivers for this project are market integration, security of supply and RES integration. This need for interconnection is best described by the benefits that will be derived from the reinforcement. This new circuit will:

- Improve competition and economic operation by removing constraints;
- Improve security of supply by allowing sharing of generation across the island and removing the scenario where a single event could lead to system separation of Ireland and Northern Ireland;
- Provide required flexibility for renewable generation; and
- Ensure security of supply for the North East of Ireland.

[48] http://www.eirgridprojects.com/projects/northsouth400kvinterconnectiondevelopment/

This is a joint EirGrid and Northern Ireland Electricity project.

Status: In Phase 2 i.e. preparing to submit for planning permission

Reinforcement of the Transmission Network in Donegal

Project: Binbane - Letterkenny 110 kV New Line (CP0421)[49,50]

Description: The drivers for this project are security of supply and RES integration. The need for reinforcement arises due to local constraints on the transmission and distribution networks i.e. there is a need to provide additional thermal capacity and to address reactive compensation needs in Donegal. Studies have indicated violations of voltage limits in the north Donegal area under maintenance-trip conditions. The DSO has also requested that west Donegal (the Binbane/Killbegs area) and North West Donegal (the Derrybeg/Gweedore area) be reinforced with 110 kV infrastructure. The project will also contribute to facilitating the growing number of renewable generators in Donegal.

Status: In Phase 3 i.e. in construction

Reinforcement of the Transmission Network in and out of Donegal

The projects listed below relate to evacuating power out of Donegal. Consequently, some of the projects are within Donegal and are necessary to enable the export of power from Donegal.

Projects: Cathaleen's Fall - Srananagh No. 2 110 kV Line Uprate (CP0745)

Cathaleen's Fall 110 kV Station - Busbar Uprate (CP0734)

Cathaleen's Fall - Drumkeen 110 kV Line Uprate (CP0764)

Description: The driver for these projects is RES integration and security of supply. The need for these reinforcements arises due to local constraints on the transmission system i.e. the thermal capacity limit (i.e. rating) of the existing infrastructure is close to being exceeded primarily as a result of the connection of new wind farms. Studies have indicated potential violations of thermal capacity limits in the area under single contingency and maintenance-trip conditions. These uprates are part of an overall strategy to increase the capacity for the potentially large power flows out of Donegal to other areas at times when generation is in excess of local demand. In addition, the two line uprate projects above also involve refurbishment works due to the condition of the assets; these works will be undertaken at the same time as the uprating works.

[49] http://www.eirgridprojects.com/projects/donegal110kv/

[50] As part of this project there is also a new 110 kV DSO circuit to north west Donegal (the Derrybeg/Gweedore area)

Future Projects: In addition to the approved projects listed above, EirGrid, SONI and NIE are completing a joint network planning study called Renewable Integration Development Project (RIDP) (TYNDP/82). The objective is to identify the most optimal solution for the network to cater for renewable generation in the north west of the island i.e. Donegal and the west of Northern Ireland. This joint network planning study and the agreed working arrangements are governed by the System Operator Agreement. The driver of this transmission development project is RES integration.

Reinforcement of the Transmission Network in the Border, Midlands and West Planning Area for New and Modified Demand Connections

Projects: Bracklone 110 kV New Station & Loop in – New DSO Demand Connection (CP0644)

Mullagharlin 110 kV Station – New 110 kV Bay for DSO Transformer (CP0404)

Portlaoise 110 kV Station – 2 New 110 kV Bays for DSO Transformers (CP0645)

Castlebar 110 kV Station – Uprate 110 kV Bay for DSO Transformer (CP0680)

Cloon 110 kV Station – New 110 kV Bay for DSO Transformer (CP0706)

Letterkenny 110 kV Station – Relocation of 110 kV Bay & 2 New Couplers (CP0740)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to the requirement for new and modified demand connections. These projects are the shallow connections for a number of DSO demand connections.

Reinforcement of the Transmission Network in the Border, Midlands and West Planning Area for New Generation Connections

Projects: The Grid West Project (CP0721) (TYNDP/82) – 400 kV Circuit from the Bellacorick area to either Flagford or Cashla Transmission Stations[51]

West Galway, Uggool/Seacon New 110 kV Stations – New Wind Farm Connections (CP0737)[52]

Clogher and Mulreavy 110 kV New Stations – New Wind Farm Connections (CP0603)

Mount Lucas 110 kV New Station – New Wind Farm Connection (CP0739)

[51] http://www.eirgridprojects.com/projects/gridwest/overview/

[52] http://www.eirgridprojects.com/projects/westgalway/overview/

Description: The driver for these projects is RES integration. The need for reinforcement arises due to the requirement for new generation connections. These projects are the shallow connections for a number of wind farms. The most significant of these projects is the Grid West Project. There is approximately 650 MW of renewable generation seeking to connect to the transmission system in the Bellacorick area of Co. Mayo. This is significantly in excess of the local demand and the local 110 kV network is not capable of supporting such a level of generation. The Grid West Project which comprises a 400 kV circuit from the Bellacorick area to either Flagford or Cashla transmission stations will contribute to facilitating the connection of approximately 650 MW of renewable generation in the Bellacorick area.

Status: The Grid West Project is in Phase 2 i.e. in the public consultation, outline design and EIA stage

Reinforcement of the Transmission Network in the vicinity of Mayo and Sligo

Projects: Bellacorick 110 kV Station - Busbar Uprate (CP0773)

Bellacorick - Castlebar 110 kV Line Uprate (CP0731)

Cunghill - Sligo 110 kV Line Uprate (CP0736)

Cunghill – Glenree 110 kV Line Uprate (CP0791)

Sligo 110 kV Station – Busbar Uprate, New Coupler & Refurbishment Works (CP0772)

Castlebar – Moy 110 kV New Circuit (CP0816)

Description: The driver for the Castlebar – Moy 110 kV new circuit project is RES integration. The need for reinforcement arises due to local constraints on the transmission network. This is as a result of the planned connection of new generation in the area that leads to potential violations of thermal capacity limits in the area under intact network and single contingency conditions. Studies have also indicated violations of voltage limits in the area under single contingency conditions.

The drivers for all the uprate projects above are RES integration and security of supply. The need for these reinforcements arises due to local constraints on the transmission system, i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded. This is primarily as a result of the planned connection of new generation. A further driver is the expected increase in demand in the area. Studies have indicated potential violations of thermal capacity limits in the area under single contingency and maintenance-trip conditions. In addition, the three line uprate projects and the Sligo station works above also involve refurbishment works due to the condition of the assets; these works will be undertaken at the same time as the uprating works.

All these projects are part of an overall strategy, in conjunction with the Grid West Project mentioned above, to increase the capacity for the potentially large power flows out of Mayo to other areas at times of excess local generation.

Status: Castlebar – Moy 110 kV New Circuit is in Phase 2

Reinforcement of the Transmission Network in Roscommon and Leitrim

Project: Carrick-on-Shannon 110 kV Station - Busbar Uprate, New Coupler & Refurbishment Works (CP0697)

Description: The driver for this project is RES integration. The need for reinforcement arises due to local constraints on the transmission network i.e. the thermal capacity limit of the existing Carrick-on-Shannon 110 kV busbar may be exceeded. The recent uprating of 110 kV circuits in the area to accommodate the connection of renewable generation facilitates higher flows on the 110 kV network. These higher flows may result in higher loading of the Carrick-on-Shannon 110 kV busbar. The existing rating of the busbar is inadequate for the future needs of the station; therefore, Carrick-on-Shannon 110 kV busbar needs to be uprated.

Reinforcement of the Transmission Network in the Mullingar Area

Projects: Mullingar 110 kV Station – New Capacitors (CP0594)

Kinnegad - Mullingar 110 kV New Circuit (CP0596)[53]

Description: The driver for these projects is security of supply. The need for reinforcement arises due to local constraints on the transmission network i.e. there is a need to address reactive compensation needs in the Mullingar area. This need was identified through network studies which indicated violations of voltage limits in the Mullingar area under maintenance-trip conditions. The installation of capacitors is an interim solution until the long term solution of a new circuit between Kinnegad and Mullingar 110 kV stations is in place.

Status: Kinnegad – Mullingar 110 kV New Circuit has been granted planning permission; it is in Phase 2

[53] http://www.eirgridprojects.com/projects/mullingarreinforcement/

Reinforcement of the Transmission Network in the Offaly Area

Projects: Cushaling – Thornsberry 110 kV New Circuit (CP0197)

Cushaling 110 kV Station - Busbar Uprate (CP0723)

Thornsberry 110 kV Station - Busbar Uprate (CP0724)

Shannonbridge 220/110 kV Station – Uprate 2 x 110 kV Circuit Breakers (CP0759)

Description: The driver for CP0759 is RES integration while the driver for the remaining projects is security of supply. The DSO has requested a 2nd connection to the existing Thornsberry 110 kV station; this is provided by the new Cushaling – Thornsberry 110 kV circuit (CP0197). Planning studies indicate that the connection of new generation and the building of new infrastructure increases the power flowing through the area, potentially exceeding the rated capacity of existing equipment.

Status: Cushaling – Thornsberry 110 kV New Circuit is in Phase 3 i.e. in construction

In addition to the network reinforcement projects described above, there are also other approved projects in the Border, Midlands and West planning area; namely:

- Lisdrum - Louth 110 kV Line Refurbishment (CP0384);
- Mullingar 110 kV Station – Transmission Works Associated with Installation of New 38 kV GIS (CP0777); and
- Castlebar 110 kV Station – Transmission Works Associated with Installation of New 38 kV GIS (CP0778).

Future Potential Projects

In addition to the approved projects listed above, the DSO is considering, in conjunction with EirGrid, a new 110 kV station in the vicinity of Athenry, Co. Galway. EirGrid is also investigating the development requirements (including refurbishment, uprating and/or installation of new equipment) at a number of 110 kV stations to ensure the stations continue to comply with both DSO and TSO standards, particularly Castlebar and Moy 110 kV stations.

Outstanding Needs in the Planning Area For the Period of the Plan

EirGrid is, on an on-going basis, performing technical studies to monitor the future behaviour of the transmission system to ensure that network development needs and solutions to those needs are identified in a timely manner. Currently there are a number of ongoing studies in the Border, Midlands and West planning area that may result in some new projects achieving capital approval while for other projects the decision may be made not to proceed. New projects which get capital approval will be included in future years' Transmission Development Plans. Taking the approved projects that are

progressing at the moment and the future potential projects into account there are no outstanding needs in the Border, Midlands and West planning area for the period of this plan.

6.3 The South-West & Mid-West Planning Area

Planning Area Overview

The South-West and Mid-West planning area is made up of the following counties categorised by statutory region:

- The South-West: Kerry and Cork
- The Mid-West: Clare, Limerick and North Tipperary

For the period of this plan the development of the transmission system in the South-West and Mid-West planning area is characterised by the connection of high levels of wind generation in the Co. Cork and Co. Kerry areas resulting in transmission network constraints as power is exported out of the area towards the Moneypoint and Knockraha transmission stations.

Similar to the Border, Midlands and West planning area the South-West and Mid-West planning area has an excess of generation relative to the load in the area. This excess of generation in the area is set to increase in the coming years as generators, that currently have connection agreements and live connection offers, connect to the transmission system either directly or indirectly via the distribution system.

This is illustrated in Tables 6-6 and 6-7, and Figure 6-4 below. Tables 6-6 and 6-7 show, respectively, the forecast demand and generation for the period of the plan. Figure 6-4 illustrates the same information graphically. It should be noted that for illustration purposes only, in Figure 6-4 all contracted generation is assumed to connect by 2016, all generators with live connection offers are assumed to connect by 2020 and those generators that plan to close[54] do so by 2020. Currently there is 4,013 MW of installed generation capacity in the area compared with a peak area demand of 1,112 MW, representing a generation surplus of 2,901 MW (excluding transmission losses). The surplus in generation will increase to approximately 3,500 MW with only the connection of the contracted generators. If all the live offers were to mature to contracted connection agreements and the generator units that plan to close do close, the surplus has the potential to be as much as 4,100 MW at the time of peak demand and greater at other times.

[54] Tarbert 1, 2, 3 & 4 (590 MW) plan to close. Tarbert is located in the South-West and Mid-West planning area.

Year	Winter Peak (MW)	Summer Peak (MW)	Summer Valley (MW)
2013	1,112	959	415
2014	1,126	971	420
2015	1,134	976	418
2016	1,195	988	424
2017	1,207	1,045	474
2018	1,220	1,056	479
2019	1,235	1,069	485
2020	1,258	1,089	494
2021	1,275	1,104	500
2022	1,290	1,117	506
2023	1,306	1,131	512

Table 6-6 South-West and Mid-West Planning Area Demand Forecasts

	Connected Generator Capacity (MW)	Contracted Generator Capacity (MW)	Generators with Live Offers (MW)	Total (MW)
Wind at Transmission	372	186	278	836
Wind at Distribution	376	474	765	1,615
Thermal at Transmission	3,098	0	141	3,239
Thermal at Distribution	38	0	25	63
Hydro[55]	119	2	1	122
Pumped Storage	0	70	0	70
Other[56]	10	0	7	17
TOTAL	4,013	732	1,217	5,962
Cumulative TOTAL	4,013	4,745	5,962	-

Table 6-7 Summary of Connected and Contracted Generators and Generators with Live Offers in the South-West and Mid-West Planning Area

[55] Transmission and distribution.

[56] Consists of biogas, biomass, hybrid, land fill gas and wave projects.

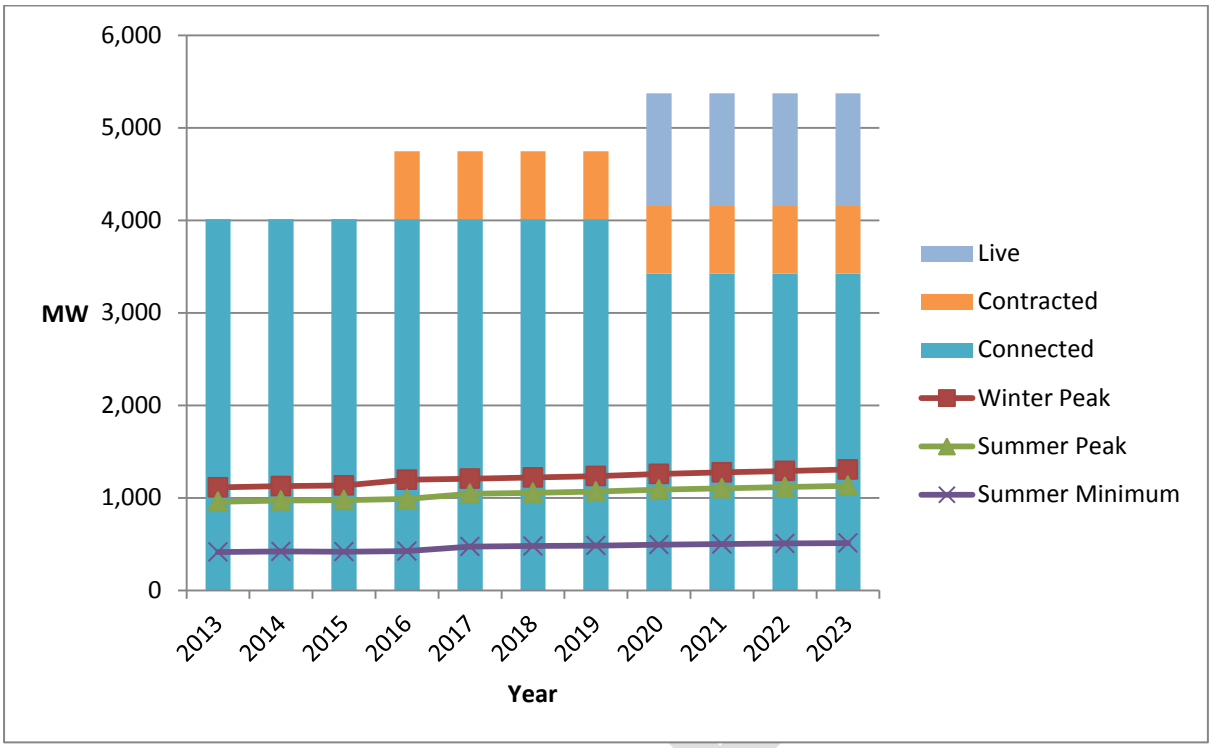


Figure 6-4 Summary of Forecast Demand and Generation in the South-West and Mid-West Planning Area

There are a number of reinforcement needs that have to be addressed in the long-term strategic development of the electricity transmission system in the South-West and Mid-West planning area. To cater for the high levels of generation relative to local demand described above there is a requirement for additional network reinforcement to enable the efficient export of generation from this area. Furthermore it is also necessary to reinforce the transmission network to address local security of supply concerns i.e. local constraints related to a shortage of transmission capacity, asset condition and reactive power requirements.

Currently there are 47 planned projects entirely within the South-West and Mid-West planning area. As noted in section 6-1 for summarising and describing purposes two additional projects that span multiple planning areas are included in this planning area; hence, 49 projects are described here. These are listed in Table C-3 in Appendix C.

Although these projects address specific network development needs, due to the nature of the transmission system (i.e. usually involving incremental increases of large capacity), the reinforcements will have a broader impact by increasing the capacity of the transmission network to safely accommodate greater load growth and more diverse power flows for many years to come. These projects will provide benefits to existing and future users of the transmission system in the planning area.

The 49 projects can be categorised as either New Build, Uprate/Modify or Refurbish/Replace. Table 6-8 shows the number of projects in each category.

Project Category	No of Projects
New Build	13
Uprate/Modify	27
Refurbish/Replace	9
Total	**49**

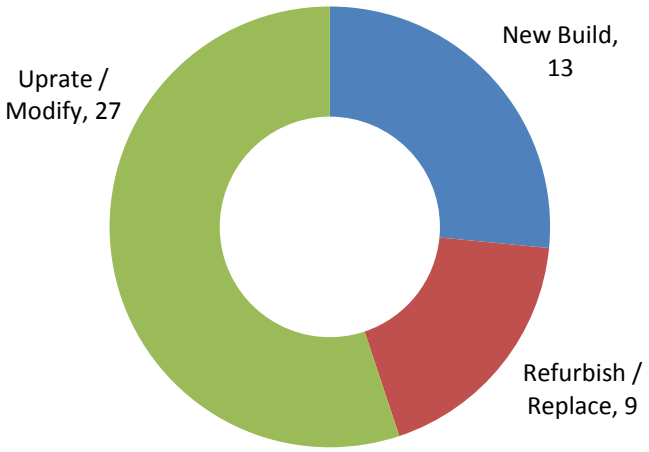


Table 6-8 Summary of Projects by Category in the South-West and Mid-West Planning Area

The statistics associated with the 49 projects in the South-West and Mid-West planning area are presented in Table 6-9 below. These statistics may change as the individual projects' scopes may be adjusted during the course of the project particularly for those in the preliminary stages of design.

Planned New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	0	5	4	9
Number of New Station Bays[57]	14	44	94	152
New Circuit[58] (km)	26	10	74	110
Number of New Reactive Devices	0	0	1	1
Total New Reactive Power (Mvar)	0	0	15	15
	400/220 kV	**400/110 kV**	**220/110 kV**	**Total**
Number of New Transformers	3	0	7	10
Total New Transformer Capacity (MVA)	1,500	0	1,750	3,250

Table 6-9a Summary of Planned New Assets by Voltage and Equipment for the South-West and Mid-West Planning Area

[57] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[58] It is not possible at this early stage to split estimated new build line lengths between overhead line and underground cable

Planned Uprates/Refurbishments/Upgrades	400 kV	220 kV	110 kV	Total
Circuit to be Uprated (km)	0	150	161	311
Circuit to be Refurbished (km)[59]	103	102	26	231
Number of Busbars to be Uprated	0	0	4	4
Number of Stations to be Refurbished/Replaced/Redeveloped	1	4	4	9
Number of Protection Systems to be Upgraded	0	1	0	1

Table 6-9b Summary of Planned Uprates/Refurbishments/Upgrades of Assets by Voltage and Equipment for the South-West and Mid-West planning area

The 49 projects in the South-West and Mid-West planning area are discussed in more detail below in the context of the need they serve and the local area or county they are located in. In order to aid the understanding of the projects and where they are located, the larger network development projects in phase 2 and 3 are illustrated in Figure 6-5 below. The status of the larger network development projects is noted below; the status of the remaining projects is noted in Appendix C. Projects of European Significance in, or partly in, Ireland are identified in the ENTSO-E's most recent TYNDP that covers the period 2012 to 2022. These projects are identified in this Plan using the following label: " TYNDP/TYNDP_Project_No".

[59] The lengths of line to be refurbished quoted in the table are the sum of the lengths of the individual lines. However, due to the nature of refurbishment work the length of line to be refurbished may in fact be less.

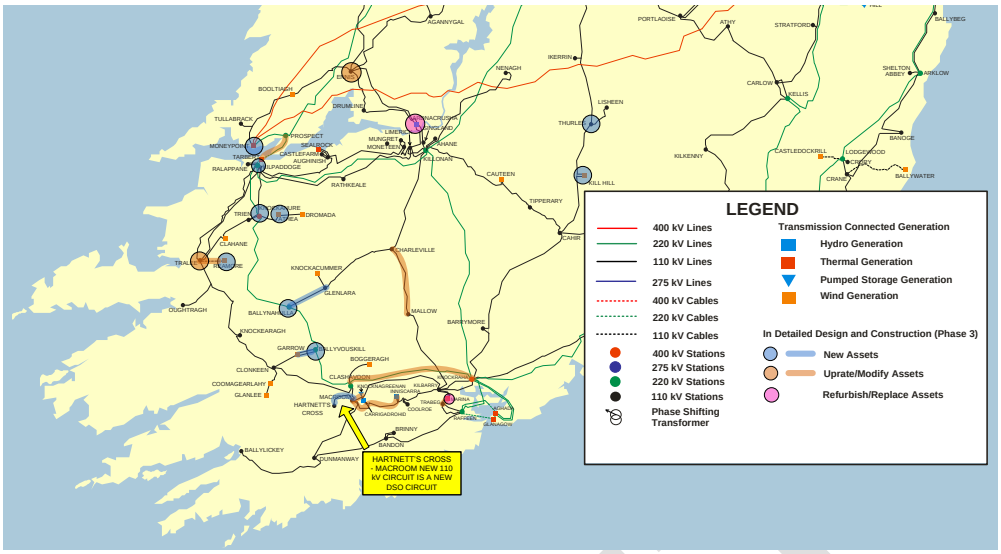


Figure 6-5a Planned Network Developments in the South-West, Mid-West Planning Area in Phase 3

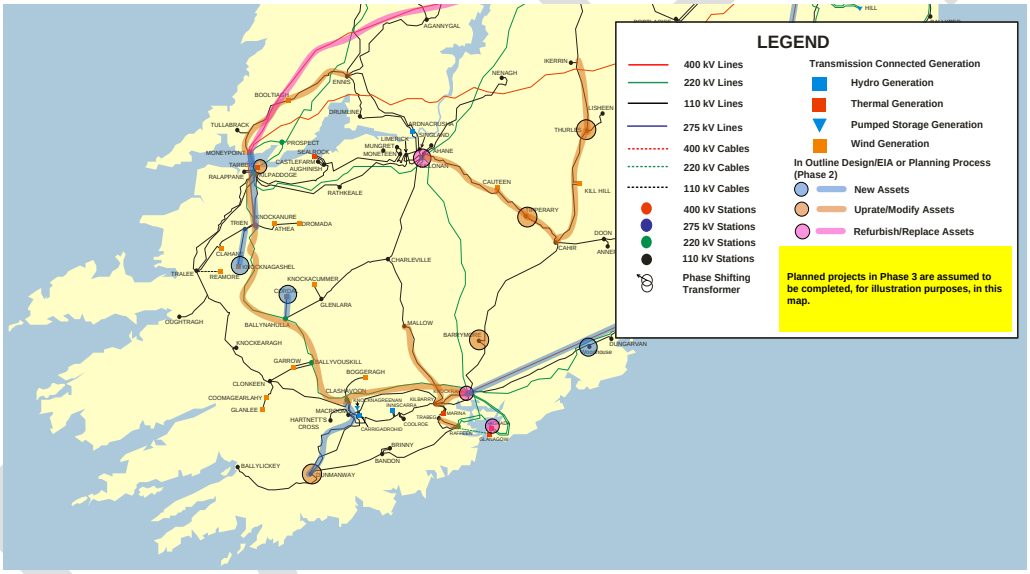


Figure 6-5b Planned Network Developments in the South-West, Mid-West Planning Area in Phase 2

Reinforcement of the Transmission Network in West Cork

Project: Clashavoon – Dunmanway 110 kV New Line (CP0501)[60]

Dunmanway 110 kV Station – Busbar Uprate & New Coupler (CP0709)

[60] http://www.eirgridprojects.com/projects/clashavoondunmanway/overview/

Description: The drivers for these projects are security of supply and RES integration. The need for the new Clashavoon – Dunmanway 110 kV circuit arises due to local constraints on the transmission network, i.e. the thermal capacity limit (i.e. rating) of the existing infrastructure is close to being exceeded. Studies have indicated violations of thermal capacity limits (i.e. overloading) of circuits in the west Cork area under maintenance-trip conditions. The new line will provide a third 110 kV line into the west Cork area thus securing supplies to the area and enabling export of excess generation. In addition, the thermal capacity of the existing Dunmanway 110 kV busbar is inadequate for the future potential power flows through the station; therefore, Dunmanway 110 kV busbar needs to be uprated. To improve security of supply in the area and to increase operational flexibility, especially in the outage season, a new coupler is also being installed in Dunmanway 110 kV station. These projects will also contribute to facilitating the growing number of renewable generators in west Cork.

Status: Clashavoon – Dunmanway 110 kV New Line has been granted planning permission; it is in Phase 2

Future Projects: In addition to the approved projects listed above, there is also a future potential project to reinforce the corridor between Clashavoon and Macroom transmission stations. The main driver for this project is RES integration.

Reinforcement of the Transmission Network in Tipperary

Project: Thurles 110 kV Station – New Capacitor (CP0529)

Ikerrin Tee - Thurles 110 kV Line Uprate & Thurles 110 kV Station - Busbar Uprate & New Coupler (CP0657)

Description: The drivers for these projects are security of supply and RES integration. The need for the new capacitor at Thurles arises due to local constraints on the transmission network i.e. there is a need to address reactive compensation needs in the Tipperary area. This need was identified through network studies which indicated potential violations of voltage limits in the Tipperary area under maintenance-trip conditions. The need to uprate the Ikerrin Tee – Thurles 110 kV line arises due to local constraints on the transmission network i.e. there is a requirement for additional thermal capacity in the area as a result of the connection and planned connection of new wind farms. Studies have indicated violation of thermal capacity limits (i.e. overloading) of the circuit under single contingency conditions. The thermal capacity limit of the existing Thurles 110 kV busbar may be exceeded by expected higher flows on the 110 kV network therefore, Thurles 110 kV busbar needs to be uprated. To improve security of supply in the area and to increase operational flexibility, especially in the outage season, a new coupler is also being installed in Thurles 110 kV station.

Reinforcement of the Transmission Network in Clare

Projects: Moneypoint 400/220/110 kV GIS Development (CP0688)

Ennis – Booltiagh - Tullabrack Tee - Moneypoint 110kV Line Uprate (CP0597)

Ennis 110 kV Station - Busbar Uprate & New Coupler (CP0689)

Ardnacrusha 110 kV Station Redevelopment (CP0054)

Description: The drivers for these projects are security of supply and RES integration. The need for reinforcement arises due to local constraints on the transmission network i.e. there is a need to provide additional thermal capacity and to address reactive compensation needs in the area. These needs were identified through network studies which indicated potential violations of voltage and thermal capacity limits in the Clare area under maintenance-trip and single contingency conditions. The preferred solution to address voltage violations in the area is a new 220/110 kV transformer in Moneypoint 400 kV station[61]. The solution to address the thermal capacity needs in the area is to uprate the Ennis – Booltiagh – Tullabrack Tee – Moneypoint 110 kV circuit. The thermal capacity limit of the existing Ennis 110 kV busbar may be exceeded by anticipated higher flows on the 110 kV network, therefore, Ennis 110 kV busbar needs to be uprated. To improve security of supply in the area and to increase operational flexibility, especially in the outage season, a new coupler is also being installed in Ennis 110 kV station. The need for the replacement of the 400 kV transmission equipment in Moneypoint and the redevelopment of the entire Ardnacrusha 110 kV transmission station arises due to the age and condition of the assets. These projects will also contribute to facilitating the growing number of renewable generators in west Clare.

Reinforcement of the Transmission Network in Limerick City

Project: Killonan 220/110 kV Station Redevelopment (CP0624)

Description: The driver for the Killonan 220/110 kV project is security of supply. Due to the condition and age of the transmission equipment in Killonan 220/110 kV station, which is the main bulk supply point for the Mid-West region, a major project involving the redevelopment of the entire station is progressing.

[61] The recent installation of capacitors at Ardnacrusha and Drumline 110 kV stations are interim solutions to the voltage needs in the area.

Reinforcement of the Transmission Network in the Cork City area

Projects: Marina 110 kV Station Redevelopment (CP0228)

Raffeen – Trabeg 110 kV No. 1 Line Uprate (CP0754)

Marina - Trabeg 110 kV No. 1 & No. 2 Cable Uprates (CP0696)

Charleville - Mallow 110 kV Line Uprate (CP0762)

Kilbarry – Mallow 110 kV Partial Line Uprate (CP0776)

Kilbarry – Knockraha 110 kV No. 1 Line Uprate (CP0783)

Aghada 220/110 kV Station Upgrade (CP0794)

Knockraha 220 kV Station Upgrade (CP0796)

Description: The driver for these projects is security of supply. Due to the condition and age of the transmission equipment in Marina 110 kV station which is the main bulk supply point for Cork city a major project involving the redevelopment of the entire Marina 110 kV transmission station is progressing. In addition, the need for multiple line and cable uprates is due to local constraints on the transmission network, i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded. Studies have indicated violations of thermal capacity limits (i.e. overloading) of these circuits under maintenance-trip conditions at times of both high thermal and high renewable generation dispatches.

The need for the Aghada and Knockraha 220/110 kV station upgrade projects arises due to a number of local constraints on the transmission network. Network planning contingency studies have indicated the potential loss of generation and voltage violations in the absence of these projects. Potential for the thermal capacity of equipment within Aghada station and of circuits in the Cork and Waterford area to be violated have also been identified in the absence of these projects. In addition, the Aghada project involves refurbishment works due to the condition and age of assets in the station. These upgrade projects will create and maintain the requisite levels of reliability and flexibility in the transmission network.

Reinforcement of the Transmission Network in North Kerry

Projects: Kilpaddoge 220/110 kV New Station – New Station to the West of Tarbert 220/110 kV Station (CP0647)[62]

[62] http://www.eirgridprojects.com/projects/tarbertredevelopment/

Tralee 110 kV Station – New Coupler (CP0674)

Tarbert 220/110 kV Station Refurbishment (CP0622)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to local constraints on the transmission network, i.e. the physical capacity of Tarbert 220/110 kV station is close to being reached. The new Kilpaddoge station will replace many of the functions of the existing Tarbert station. The new Kilpaddoge station is necessary to allow for the essential expansion of transmission connections in north Kerry. The existing Tarbert transmission station is being retained; due to the age and condition of the assets in Tarbert station a project involving the refurbishment of the 220 kV assets is progressing. In addition, to improve security of supply in the area and to increase operational flexibility, especially in the outage season, a new coupler is also being installed in Tralee 110 kV station.

Status: Kilpaddoge 220/110 kV New Station is in Phase 3 i.e. in the detailed design and construction stage

Reinforcement of the Transmission Network in the South-West and Mid-West Planning Area for New and Modified Demand Connections

Projects: Macroom 110 kV Station – New 110 kV Bay for DSO Connection to Hartnett's Cross 110 kV New Station (CP0041)

Bandon 110 kV Station – Uprate 110 kV Bay for DSO Transformer (CP0627)

Barrymore 110 kV Station Extension & Loop in to Cahir – Knockraha 110 kV Circuit (CP0707)

Kilbarry 110 kV Station – New 110 kV Bay for DSO Connection to Blackpool 110 kV New Station (CP0713)

Trabeg 110 kV Station – Uprate 2 110 kV Bays for DSO Transformers (CP0741)

Cow Cross 110 kV Station – New 110 kV Bay for DSO Transformer (CP0743)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to the requirement for new and modified demand connections. These projects are the shallow connections for a number of DSO demand connections.

Reinforcement of the Transmission Network in the South-West and Mid-West Planning Area for New Generation Connections

Projects: Athea 110 kV New Station & Loop in to Dromada – Trien 110 kV Circuit – New Wind Farm Connections (CP0479)

Reamore 110 kV New Station & Connection to Tralee 110 kV Station – New Wind Farm Connections (CP0710)

Cloghboola 110 kV New Station & Connection to Trien 110 kV Station– New Wind Farm Connections (CP0608)

Lisheen 110 kV Station – New 110 kV Bay for New DSO Wind Farm Connection (CP0761)

Cordal 110 kV New Station & Connection to East Kerry North West Cork 220/110 kV New Station- New Wind Farm Connections (CP0818)

Boggeragh 110 kV Station - New 110 kV Bay for New TSO Wind Farm Connection (CP0828)

Description: The driver for these projects is RES integration. The need for reinforcement arises due to the requirement for new generation connections. These are the shallow connections for a number of wind farms.

Reinforcement of the 220 kV Transmission Network in Kerry and West Cork for New Connections

Projects: Millstreet 220/110 kV New Station (CP0650)[63]

East Kerry North West Cork 220/110 kV New Station (CP0651)[64]

North Kerry 220/110 kV New Station (CP0500)[65]

Description: The driver for these projects is RES integration. The need for reinforcement arises as the existing 110 kV network will not be able to accommodate the amount of wind generation planned for the area i.e. a number of Gate 2 and Gate 3 wind farms. The new North Kerry (CP0500), East Kerry/North West Cork (CP0651) and Millstreet (CP0650) 220/110 kV stations, looped into the existing Tarbert - Clashavoon 220 kV circuit, are necessary to facilitate the connection of large amounts of wind generation in the area.

Status: Millstreet, East Kerry & North West Cork and North Kerry 220/110 kV New Stations are all in Phase 3 i.e. in the detailed design and construction stage

[63] http://www.eirgridprojects.com/projects/millstreet/overview/

[64] http://www.eirgridprojects.com/projects/eastkerrynorthwestcorkproject/overview/

[65] http://www.eirgridprojects.com/projects/northkerryproject/

Reinforcement of the 220 kV Transmission Network out of Kerry and West Cork North Towards Moneypoint Transmission Station in Clare and East Towards Knockraha Transmission Station Close to Cork City

Projects: Clashavoon - Knockraha 220 kV Line Uprate (CP0717)

Clashavoon - Tarbert 220 kV Line Uprate (CP0763)

Description: The driver for these projects is RES integration. The need for reinforcement arises due to the connection of large amounts of wind generation in Kerry, west Cork and west Limerick and the resulting power flows constraining the transmission network i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded. Studies have indicated violations of thermal capacity limits (i.e. overloading) of these circuits under single contingency and maintenance-trip conditions. These projects are part of an overall strategy to increase the capacity for the potentially large power flows out the area north towards Moneypoint and east towards Knockraha transmission stations and onwards to the large demand centres of Cork and Dublin.

Reinforcement of the 220 kV and 400 kV Transmission Network across the Shannon Estuary Between North Kerry and Clare

Projects: Moneypoint - Kilpadogge 220 kV New Cable (CP0399) (TYNDP/83)

Moneypoint - North Kerry Project (CP0726) (TYNDP/83)

Prospect - Tarbert 220 kV Line Uprate (CP0698)

Description: The drivers for these projects are RES integration and security of supply. The need for reinforcement arises due to the connection of large amounts of wind generation in Kerry, west Cork and west Limerick and the resulting power flows constraining the transmission network i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded. Studies have indicated violations of thermal capacity limits (i.e. overloading) of circuits in the area under single contingency and maintenance-trip conditions. Studies have also indicated potential violations of voltage limits in the area under intact network and single contingency conditions. In addition, the Moneypoint - Kilpadogge 220 kV new cable reinforcement is required to relieve constraints and facilitate power flows in the Mid-West and South-West of the country that present from the connection of renewable and conventional generation. The Prospect – Tarbert line uprate project also involves refurbishment works due to the condition of the assets; these works will be undertaken at the same time as the uprating works. These projects are part of an overall strategy to increase the capacity for the potentially large power flows out of the area north towards Moneypoint (thus allowing better utilisation of the

more efficient 400 kV network) and east towards Knockraha transmission stations and onwards to the large demand centres of Cork and Dublin.

Status: Moneypoint – Kilpadogge 220 kV New Cable is in Phase 2 i.e. in the public consultation, outline design and EIA stage

Moneypoint – North Kerry Project is in Phase 2

Reinforcement of the 110 kV Transmission Network out of Kerry and West Cork East Towards Knockraha Transmission Station Close to Cork City

Projects: Carrigadrohid - Macroom 110 kV Line Uprate (CP0716)

Inniscarra - Macroom 110 kV Line Uprate (CP0719)

Description: The drivers for these projects are RES integration. These uprates are necessary to facilitate the connection of large amounts of wind generation in Kerry and west Cork. The need for reinforcement arises due to local constraints on the transmission network, i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded. Studies have indicated violations of thermal capacity limits (i.e. overloading) of these circuits under single contingency and maintenance-trip conditions. These uprates are part of an overall strategy to increase the capacity for the potentially large power flows out of the area east towards Knockraha transmission station[66].

In addition to the network reinforcement projects described above, there are also other approved projects in the South-West and Mid-West planning area, namely:

- Moneypoint – Prospect 220 kV Line Refurbishment (CP0746);
- Bandon – Dunmanway 110 kV Line Refurbishment (CP0640);
- Cashla – Prospect 220 kV Line Resagging (CP0748);
- Clonkeen 110 kV Station Reconfiguration (CP0714);
- Booltiagh 110 kV Station – Modification for Booltiagh Wind Farm Phases 2 & 3 (CP0605);
- Knockraha 220 kV Station Refurbishment – Part 2 (CP0213); and
- Moneypoint – Oldstreet 400 kV Line Refurbishment (CP0824).

[66] The uprates of Carrigadrohid – Kilbarry (CP0379), Coolroe – Inniscarra (CP0518) and Coolroe – Kilbarry (CP0517) 110 kV lines were completed in December 2010, August 2011 and November 2012 respectively.

Future Potential Projects

In addition to the approved projects listed above, EirGrid is currently working with the French TSO RTE on a joint project investigating the business case for an interconnector between Ireland and France ( TYNDP/107). The potential connection points are expected to be in the south of the country including this planning area. The main drivers of this future potential project are market integration and RES integration.

Outstanding Needs in the Planning Area For the Period of the Plan

EirGrid is continuously performing technical studies to monitor the future behaviour of the transmission system to ensure that network development needs and solutions to those needs are identified in a timely manner. Currently there are a number of ongoing studies in the South-West and Mid-West planning area that may result in some new projects achieving capital approval while for other projects the decision may be made not to proceed. New projects which get capital approval will be included in future years' Transmission Development Plans. Taking the approved projects that are progressing at the moment and the future potential projects into account there are no outstanding needs in the South-West and Mid-West planning area for the period of this plan.

6.4 The South-East, Mid-East & Dublin Planning Area

Planning Area Overview

The South-East, Mid-East and Dublin planning area is made up of the following counties categorised by statutory region:

- The South-East: South Tipperary, Waterford, Wexford, Kilkenny and Carlow
- The Mid-East: Wicklow, Kildare and Meath
- Dublin

For the period of this plan the transmission system in the South-East, Mid-East and Dublin planning area is characterised by the displacement of thermal generation in Dublin and the increase in power flows through the South-East caused by increased levels of wind generation throughout the West and South-West in particular.

In contrast to the Border, Midlands and West and the South-West and Mid-West planning areas the South-East, Mid-East and Dublin planning area does not have a substantial excess of generation relative to demand. This is illustrated in Tables 6-10 and 6-11, and Figure 6-6 below. Tables 6-10 and 6-11 show, respectively, the forecast demand and generation for the period of the plan. Figure 6-6 illustrates the same information graphically. It should be noted that for illustration purposes only, in Figure 6-6 all contracted generation is assumed to connect by 2016, all generators with live connection offers are assumed to connect by 2020 and those generators that plan to close[67] do so by 2020. Currently there is 3,252 MW of installed generation and interconnection capacity in the area compared with a peak area demand of 2,516 MW (excluding transmission losses), this represents a surplus of 736 MW if the East West Interconnector (EWIC) is importing 500 MW and a deficit of 294 MW if EWIC is exporting 530 MW. The surplus in generation will increase and range from approximately 600 MW to 1,600 MW with only the connection of the contracted generators. If all the live offers were to mature to contracted connection agreements and the generator units that plan to close do close, the surplus has the potential to range from approximately 1,000 MW to 2,000 MW at peak and greater at other times.

[67] Great Island 1, 2 & 3 (216 MW) plan to close. Great Island is located in the South-East, Mid-East and Dublin planning area.

Year	Winter Peak (MW)	Summer Peak (MW)	Summer Valley (MW)
2013	2,516	1,934	913
2014	2,544	1,956	922
2015	2,578	1,995	948
2016	2,576	2,005	954
2017	2,614	1,995	933
2018	2,641	2,027	945
2019	2,674	2,052	957
2020	2,722	2,088	973
2021	2,758	2,115	985
2022	2,791	2,140	996
2023	2,825	2,166	1,009

Table 6-10 South-East, Mid-East and Dublin Planning Area Demand Forecasts

	Connected Generator / Interconnection Capacity (MW)	Contracted Generator / Interconnection Capacity (MW)	Generators / Interconnectors with Live Offers (MW)	Total (MW)
Wind at Transmission	83	62	387	532
Wind at Distribution	132	153	266	551
Thermal at Transmission	2,127	627	0	2,754
Thermal at Distribution	27	76	117	220
Hydro[68]	41	0	1	42
Pumped Storage	292	0	0	292
Interconnector	500	0	0	500
Other[69]	50	26	0	76
TOTAL	3,252	944	771	4,967
Cumulative TOTAL	3,252	4,196	4,967	-

Table 6-11 Summary of Connected Generators, Contracted Generators and Interconnection, and Generators with Live Offers in the South-East, Mid-East and Dublin Planning Area

[68] Transmission and distribution.

[69] Consists of biogas, biomass, hybrid, land fill gas and wave projects.

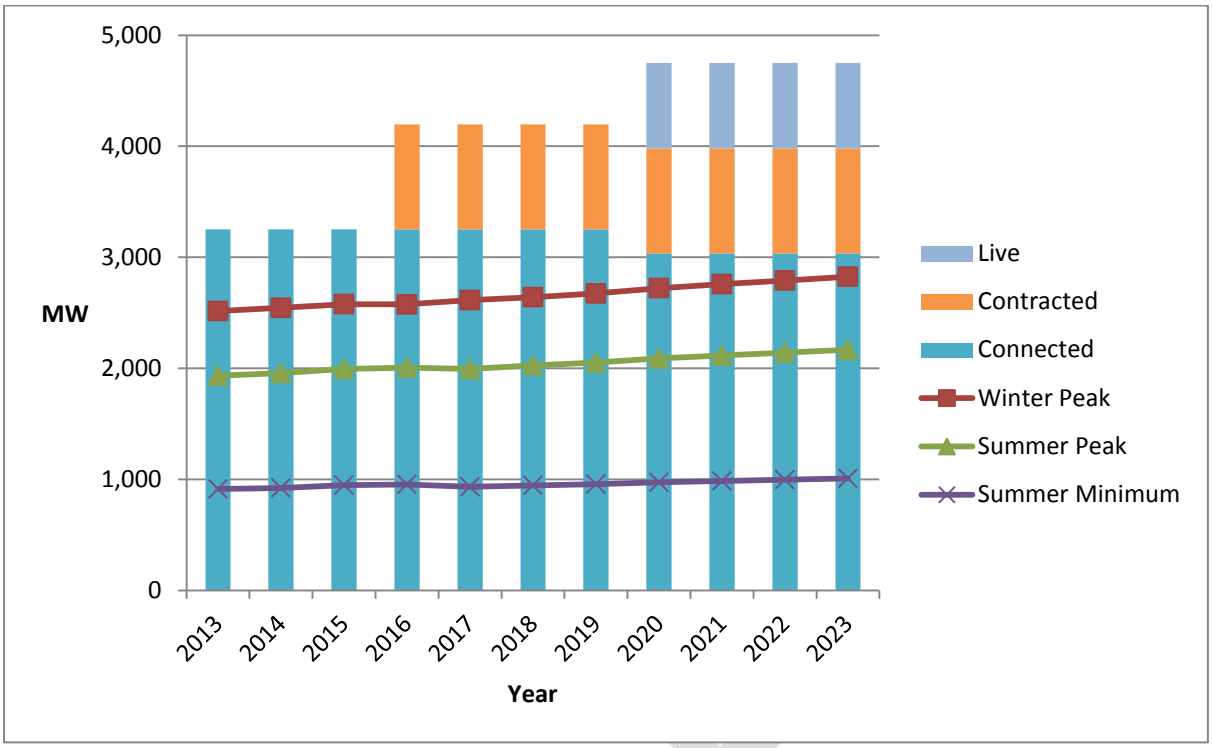


Figure 6-6 Summary of Forecast Demand and Generation in the South-East, Mid-East and Dublin Planning Area

There are a number of reinforcement needs that have to be addressed in the long-term strategic development of the electricity transmission system in the South-East, Mid-East and Dublin planning area. To cater for the power flows due to additional generation and interconnection there is a requirement for additional network reinforcement to enable the efficient transfer of power to the load centres of the eastern seaboard and the Dublin area. In addition, there are also reinforcement needs due to security of supply concerns (i.e. local constraints related to a shortage of transmission capacity, asset condition and reactive power requirements) and to accommodate market integration.

Currently there are 37 planned projects entirely within the South-East, Mid-East and Dublin planning area. As noted in section 6-1 for summarising and describing purposes five projects that span multiple planning areas are included in the South-East, Mid-East and Dublin planning area; hence, 42 projects are described here. These are listed in Table C-4 in Appendix C.

Although these projects address specific network development needs, due to the nature of the transmission system (i.e. usually involving incremental increases of large capacity), the reinforcements will have a broader impact by increasing the capacity of the transmission network to safely accommodate greater load growth and more diverse power flows for many years to come. These projects will provide benefits to existing and future users of the transmission system in the planning area.

The 42 projects can be categorised as either New Build, Uprate/Modify, Refurbish/Replace or Other. Table 6-12 shows the number of projects in each category.

Project Category	No of Projects
New Build	9
Uprate / Modify	21
Refurbish / Replace	11
Other[70]	1
Total	**42**

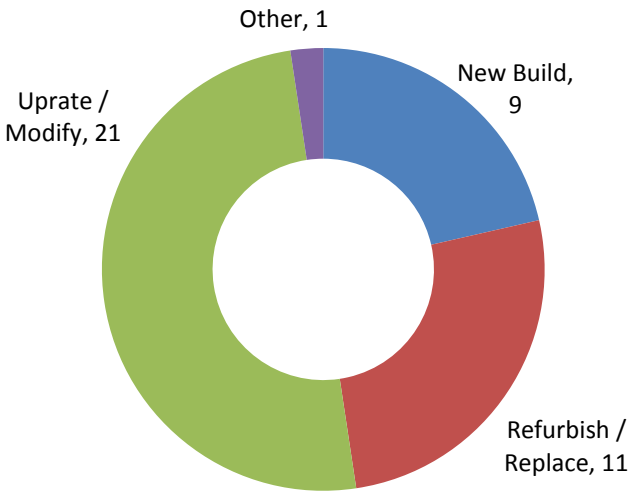


Table 6-12 Summary of Projects by Category for the South-East, Mid-East and Dublin Planning Area

The statistics associated with the 42 projects in the South-East, Mid-East and Dublin planning area are presented in Table 6-13 below. These statistics may change as the individual projects' scopes may be adjusted during the course of the project particularly for those in the preliminary stages of design.

Planned New Assets	400 kV	220 kV	110 kV	Total
Number of New Stations	1	2	3	6
Number of New Station Bays[71]	12	22	103	137
New Circuit[72] (km)	230	10	30	270
Number of New Reactive Devices	0	2	0	2
Total New Reactive Power (Mvar)	0	100	0	100
Planned New Assets	**400/220 kV**	**400/110 kV**	**220/110 kV**	**Total**
Number of New Transformers	4	2	5	11
Total New Transformer Capacity (MVA)	2,000	500	1,250	3,750

Table 6-13a Summary of Planned New Assets by Voltage and Equipment for the South-East, Mid-East and Dublin Planning Area

[70] Projects that cannot readily be categorised under the three main categories are classified as Other.

[71] The numbers for new station bays are the sum of new bays in both new stations and existing stations.

[72] It is not possible at this early stage to split estimated new build line lengths between overhead line and underground cable

Planned Uprates/Refurbishments/Upgrades	400 kV	220 kV	110 kV	Total
Circuit to be Uprated (km)	0	61	197	258
Circuit to be Refurbished (km)[73]	126	85	88	299
Number of Busbars to be Uprated	0	0	5	5
Number of Stations to be Refurbished/Replaced/Redeveloped	0	3	3	6
Number of Protection Systems to be Upgraded	0	3	3	6

Table 6-13b Summary of Planned Uprates/Refurbishments/Upgrades of Assets by Voltage and Equipment for the South-East, Mid-East and Dublin Planning Area

The 42 projects in the South-East, Mid-East and Dublin planning area are discussed in more detail below in the context of the need they serve and the local area or county they are located in. In order to aid the understanding of the projects and where they are located, the larger network development projects in phase 2 and 3 are illustrated in Figure 6-7 below. The status of the larger network development projects is noted below; the status of the remaining projects is noted in Appendix C. Projects of European Significance in, or partly in, Ireland are identified in the ENTSO-E's most recent TYNDP that covers the period 2012 to 2022. These projects are identified in this Plan using the following label: " TYNDP/TYNDP_Project_No".

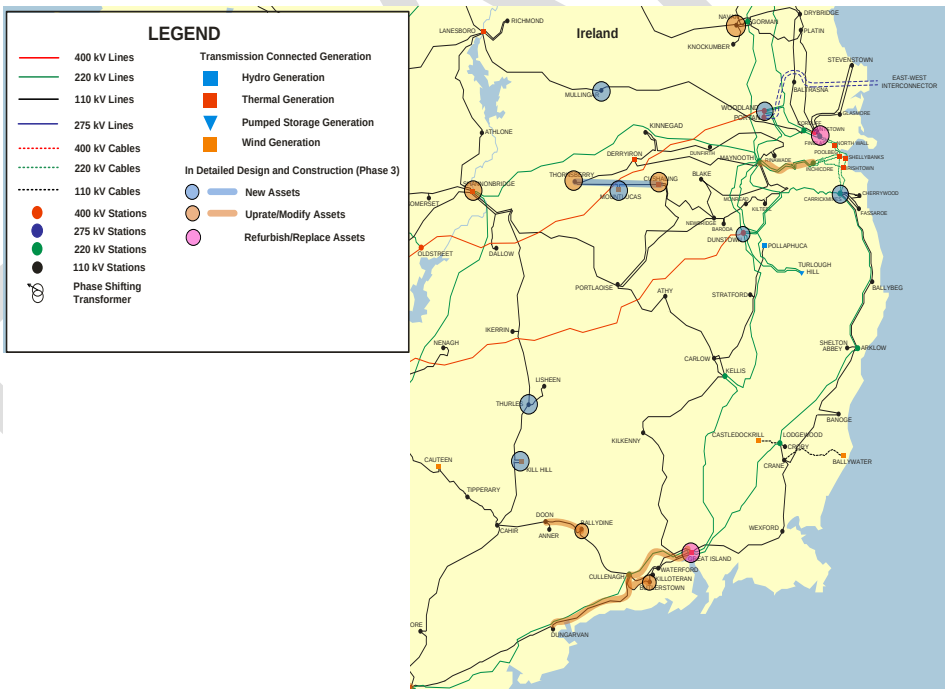


Figure 6-7a Planned Network Developments in South-East, Mid-East, Dublin in Phase 3

[73] The lengths of line to be refurbished quoted in the table are the sum of the lengths of the individual lines. However, due to the nature of refurbishment work the length of line to be refurbished may in fact be less.

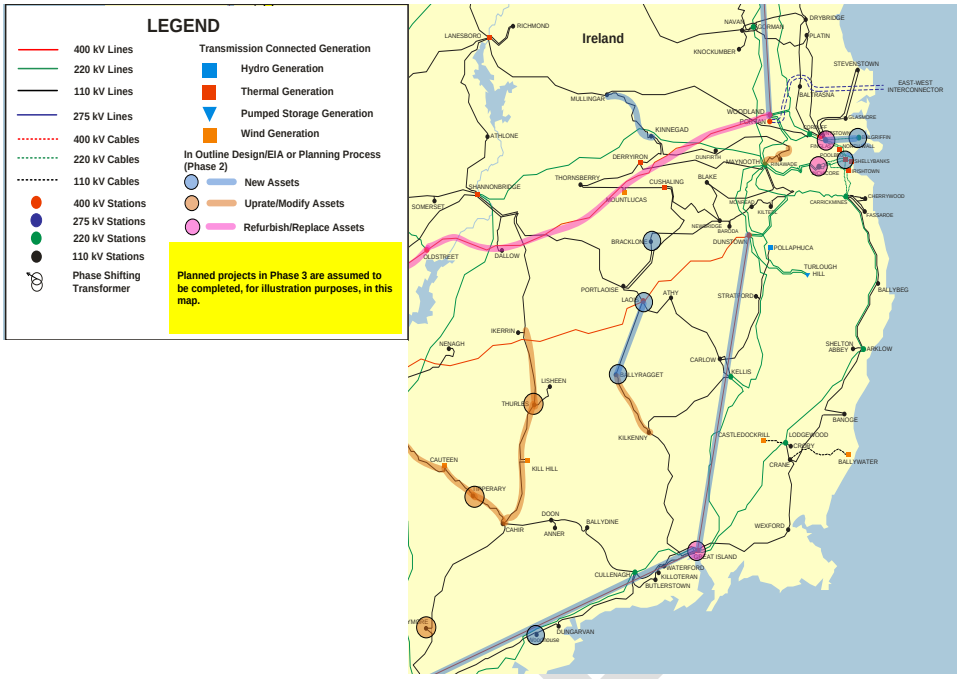


Figure 6-7a Planned Network Developments in the South-East, Mid-East, Dublin Planning Area in Phase 2

Reinforcement of the Transmission Network Relating to Interconnection between Ireland and Great Britain

Projects: Woodland 400/220 kV Station - New 400/220 kV 500 MVA Transformer (CP0682)

Dunstown 400/220 kV Station - New 400/220 kV 500 MVA Transformer (CP0683)

Description: These projects are required to support the connection of the East West Interconnector. The need for reinforcement arises due to local constraints on the transmission network, i.e. there is a need to provide additional thermal capacity in the two stations. These needs were identified through network planning studies which indicated the violation of thermal capacity limits on the existing transformers in the stations under single and maintenance-trip contingency conditions.

Reinforcement of the Transmission Network in the Midlands and South East Regions including Kildare

Project: Laois-Kilkenny Reinforcement Project (CP0585) – Comprises a New 400/110 kV Station near Portlaoise (Looped into the Existing Dunstown - Moneypoint 400 kV and Athy – Portlaoise 110 kV Lines), a New 110 kV Circuit From This Station to a New 110

kV Station at Ballyragget, Co. Kilkenny and a 110 kV Uprate to the Existing Ballyragget - Kilkenny Line Which is Currently Operated at 38 kV[74]

Description: This project is required to address quality of supply issues and provide security of supply in the area. The need for reinforcement arises due to local constraints on the transmission network, i.e. there is a need to provide voltage support (reactive compensation) across the planning area as well as ensure security of supply in the area through the provision of additional thermal capacity. These needs were identified through network studies which indicated potential violations of voltage limits throughout the area under single contingency conditions and loss of load violations in Kilkenny under maintenance-trip conditions. It should be noted that the recent installation of a capacitor in Kilkenny 110 kV station (in 2010) is a short term measure to maintain supply standards to the area while the Laois - Kilkenny reinforcement addresses the medium to long term quality and security of supply concerns.

Status: In Phase 2 i.e. the planning application was lodged in January 2013

Reinforcement of the Transmission Network Between Munster and Leinster

Project: The Grid Link Project (CP0732) (TYNDP/83) – 400 kV Circuit from Knockraha Transmission Station near Cork City to Dunstown Transmission Station in Co. Kildare via Great Island Transmission Station in Co. Wexford[75]

Description: The drivers for this project are security of supply, RES integration and market integration. The need for reinforcement arises due to high inter-regional power flows on the transmission system between Cork, the south east and Dublin and local constraints in the Cahir area, the south midlands and the south east. These needs were identified through network studies which indicated the widespread violation of thermal capacity limits (i.e. ratings) on transmission circuits across the planning area and potential voltage violations and voltage collapse in the area for numerous contingency scenarios.

Status: In Phase 2 i.e. in the public consultation, outline design and EIA stage

Reinforcement of the Transmission & Distribution[76] Networks in the Greater Dublin Area

[74] http://www.eirgridprojects.com/projects/laoiskilkenny/overview/

[75] http://www.eirgridprojects.com/projects/gridlink/overview/

[76] The DSO operates the 110 kV network in Dublin.

Projects: Dublin North Fringe 220/110 kV Project (CP0437) – New 220/110 kV Station to the East of Finglas 220/110 kV Station[77]

Carrickmines 220/110 kV Station - New 4th 220/110 kV 250 MVA Transformer & GIS Development (CP0580)

Finglas 110 kV Station Redevelopment (CP0646)

Inchicore 220 kV Station Upgrade (CP0692)

Finglas 220 kV Station Upgrade (CP0792)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to local constraints on the transmission and distribution networks, i.e. there is a requirement for additional thermal capacity at a number of locations in the Greater Dublin area. This additional thermal capacity is required at the existing Carrickmines 220/110 kV station and at a new 220/110 kV station in North Dublin to the east of the existing Finglas 220/110 kV station. These needs were identified through co-ordinated TSO and DSO network planning studies which indicated the violation of thermal capacity limits on a number of circuits and transformers under single contingency conditions. In addition, and also in conjunction with the DSO, in Carrickmines and Finglas 220/110 kV stations which are major bulk supply points for South and North Dublin respectively projects are progressing to replace Carrickmines 220 kV and Finglas 110 kV substations due to the condition and age of the assets.

Inchicore and Finglas 220 kV stations also have their own specific needs. The need for these stations' upgrade projects arises due to a number of local constraints on the transmission network. In the case of Inchicore, network planning contingency studies have indicated that the current carrying capacity limit of some of the existing switchgear is close to being exceeded. While in Finglas 220 kV station, studies have indicated the potential loss of load in the absence of this project. In addition, both these projects involve refurbishment works due to the condition and age of assets in the stations.

Status: Dublin North Fringe 220/110 kV Project has been granted planning permission; it is in Phase 2

Reinforcement of the Transmission Network in the Greater Dublin Area

Projects: Inchicore - Maynooth 1 & 2 220 kV Line Uprate (CP0667)

[77] http://www.eirgridprojects.com/projects/dublinnorthfringe/

Corduff - Ryebrook 110 kV Line Uprate & Ryebrook 110 kV Station Busbar Uprate (CP0668)

Maynooth - Ryebrook 110 kV Line Uprate (CP0747)

Installation of 100 MVar Reactive Support in the Dublin Region (CP0760)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to local constraints on the transmission network, i.e. there is a requirement for additional thermal capacity and reactive power compensation in Dublin. The thermal capacity needs were identified through network planning studies which indicated the violation of thermal capacity limits on a number of circuits under single and maintenance-trip contingency conditions. The reactive power compensation need was also identified through network planning studies which indicated the violation of upper voltage limits at a number of transmission stations under single and double contingency conditions. In addition, the Inchicore – Maynooth line uprate project also involves refurbishment works due to the condition of the assets; these works will be undertaken at the same time as the uprating works.

Future Projects: In addition to the approved projects listed above, there is also a future potential project to reinforce the transmission network in the Greater Dublin area (TYNDP/84). The main driver for this project is security of supply. The existing 400 kV network provides a high capacity link between Moneypoint generation station and Galway on the west coast and Dublin on the east. EirGrid is currently investigating the expansion of the 400 kV network into Greater Dublin. This reinforcement could be by the alteration of existing routes and equipment or with new overhead line or cable routes entirely.

Reinforcement of the Transmission Network in the South East

Projects: Great Island 220 kV Station Redevelopment (CP0623)

Great Island 110 kV Station Redevelopment (CP0729)

Description: The driver for these projects is security of supply. Due to the condition and age of the assets in Great Island 220/110 kV transmission station, which is one of the main bulk supply points in the South-East region, a major redevelopment involving the replacement of the entire station is progressing.

Reinforcement of the Transmission Network in the North East

Projects: Navan 110 kV Station - Busbar Uprate & New Coupler (CP0708)

Description: The driver for these projects is security of supply. The need for reinforcement in Navan 110 kV station arises due to local constraints in the station i.e. the thermal capacity limit of the existing Navan 110 kV busbar may be exceeded. The recent uprating of 110 kV circuits in the area facilitates higher flows on the 110 kV network. These higher flows may result in higher loading of the Navan 110 kV busbar. The existing rating of the busbar is inadequate for the future needs of the station; therefore, Navan 110 kV busbar needs to be uprated. In addition, to improve security of supply in the area and to increase operational flexibility, especially in the outage season, a new coupler is also being installed in Navan 110 kV station. Finally, the Navan station project also involves refurbishment works due to the condition of some assets in the station; these works will be undertaken at the same time as the busbar uprate and coupler works.

Reinforcement of the Transmission Network in the South-East, Mid-East and Dublin Planning Area for New and Modified Demand Connections

Projects: Arklow 220/110 kV Station – New 110 kV Bay for DSO Transformer (CP0507)

Great Island 220/110 kV Station – New 110 kV Bay for DSO Connection to Knockmullen (New Ross) (CP0490)

Wexford 110 kV Station – New 110 kV Bay for DSO Transformer & New Coupler (CP0486)

Baroda 110 kV Station – 2 New 110 kV Bays for DSO Transformers (CP0693)

Waterford 110 kV Station – Uprate 110 kV Bay for DSO Transformer (CP0753[78])

Ryebrook 110 kV Station Redevelopment (CP0789)

Description: The driver for these projects is security of supply. The need for reinforcement arises due to the requirement for new and modified demand connections. These are the shallow connections for a number of DSO connections and a modified transmission demand connection.

Reinforcement of the Transmission Network in the South-East, Mid-East and Dublin Planning Area for New Generation Connections

Projects: Kill Hill 110 kV New Station – New Wind Farm Connection (CP0728)

Great Island 220/110 kV Station – New Thermal Plant Connection (CP0715)

[78] In TDP 2012 the CP Number for this project was CP0631. The CP Number has been updated to CP0753 in TDP 2013. It is the same project.

Woodhouse 110 kV New Station - New Wind Farm Connection (CP0705)

Description: The driver for these projects is RES integration and thermal generation connection. The need for reinforcement arises due to the requirement for new generation connections. These are the shallow connections for 2 wind farms and a thermal plant.

Reinforcement of the Transmission Network Between Limerick and the South Midlands

Projects: Cauteen – Killonan 110 kV Line Uprate (CP0755)

Cauteen - Tipperary 110 kV Line Uprate (CP0756)

Cahir - Tipperary 110 kV Line Uprate & Tipperary 110 kV Station Busbar Uprate (CP0744)

Description: The driver for these projects is RES integration. The need for these reinforcements arises due to local constraints on the transmission system i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded primarily as a result of the connection of new wind farms. These needs were identified through network planning studies which indicated the violation of thermal capacity limits on a number of circuits and busbars under single contingency conditions.

Reinforcement of the Transmission Network Between the Midlands/Tipperary South and the South East and Cork and the South East

Projects: Cullenagh - Great Island 220 kV Line Uprate (CP0265)

Ballydine - Doon 110 kV Line Uprate & Ballydine Busbar Uprate (CP0371)

Butlerstown – Killoteran 110 kV Line Uprate & Butlerstown 110 kV Station Busbar Uprate (CP0559)

Cullenagh - Dungarvan 110 kV Line Uprate (CP0701)

Butlerstown - Cullenagh 110 kV Line Uprate (CP0702)

Cahir – Thurles 110 kV Line Uprate (CP0811)

Description: The driver for these projects (excluding CP0811) is security of supply. The need for these reinforcements arises due to local constraints on the transmission system (i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded) together with the poor condition of assets that may accelerate the timing of the uprates. The need for additional thermal capacity was identified through network planning studies which indicated the violation of thermal capacity limits on the circuits and busbars under contingency conditions. The need for refurbishment was established by condition assessments undertaken by ESB. The initial short term need for three

(CP0265, CP0371 and CP0559) of the above projects is for refurbishment with uprating required further in the future. For these three projects it was assessed to be economically prudent to uprate and address the refurbishment aspects now rather than refurbish first and delay the uprating.

The driver for the Cahir – Thurles 110 kV line uprate project is RES integration. The need for this reinforcement arises due to local constraints on the transmission system i.e. the thermal capacity limit of the existing infrastructure is close to being exceeded primarily as a result of the connection of new wind farms in the Midlands and Tipperary. The need for additional thermal capacity was identified through network planning studies incorporating various generation scenarios which indicated the violation of thermal capacity limits on the circuit under contingency conditions.

In addition to the network reinforcement projects described above, there are also other approved projects in the South-East, Mid-East and Dublin planning area, namely:

- Dunstown - Kellis 220 kV Line Refurbishment (CP0769);
- Kellis - Kilkenny 110 kV Line Refurbishment (CP0768);
- Shelton Abbey 110 kV Station- Protection Upgrade (CP0508);
- Dunfirth – Kinnegad – Rinawade 110 kV Line Refurbishment (CP0797);
- Dunstown – Turlough Hill 220 kV Line Refurbishment (CP0798);
- Oldstreet – Woodland 400 kV Line Refurbishment (CP0825);
- Poolbeg 220 kV Station – Fencing; and
- Dungarvan 110 kV Station – Transmission Works Associated with Installation of New 38 kV GIS (CP0779).

Future Potential Projects

In addition to the approved projects listed above, EirGrid is currently working with RTE and National Grid, the French and British TSOs respectively, on joint projects investigating the business cases for interconnectors between Ireland and France (TYNDP/107) and Ireland and Great Britain (TYNDP/106). The potential connection points are expected to be in the south and east of the country including this planning area. The main drivers of these future potential projects are market integration and RES integration. EirGrid is also currently planning connections for offshore wind farms off the east coast (TYNDP/109). The DSO is considering, in conjunction with EirGrid, a new 110 kV station in the vicinity of Trim (Fosterstown), Co. Meath. EirGrid and the DSO are evaluating a requirement to revert the existing 220 kV circuit between Carrickmines and Arklow that currently operates at 110 kV to 220 kV operation and the resultant impact of providing an alternative 110 kV connection to Ballybeg 110 kV station. In addition, a DSO led feasibility study is on-going at present to determine if a sectionalising circuit breaker can be installed in Macetown 110 kV station.

Outstanding Needs in the Planning Area For the Period of the Plan

EirGrid is continuously performing technical studies to monitor the future behaviour of the transmission system to ensure that network development needs and solutions to those needs are identified in a timely manner. Currently there are a number of ongoing studies in the South-East, Mid-East and Dublin planning area that may result in some new projects achieving capital approval while for other projects the decision may be made not to proceed. New projects which get capital approval will be included in future years' Transmission Development Plans. Taking the approved projects that are progressing at the moment and the future potential projects into account there are no outstanding needs in the South-East, Mid-East and Dublin planning area for the period of this plan.

7 SUMMARY OF ENVIRONMENTAL APPRAISAL REPORT

An Environmental Appraisal Report, an accompanying document to this TDP, has been prepared to assess whether EirGrid's TDP 2013-2023 is in accordance with the provisions of the Grid25 Implementation Programme (IP) and its Strategic Environmental Assessment (SEA). The IP is a practical overview of how the early stages of Grid25 are to be implemented and identifies those parts of the transmission system that are envisaged as likely to be developed over the period 2011-2016. The IP was based on information contained in the TDP 2010-2015.

An outcome of the SEA of the Grid25 IP was to conduct an environmental appraisal of each subsequent TDP, to identify any updates to these documents since the publication of the Grid25 IP and to assess ongoing mitigation measures and targets as set out in the SEA.

The TDP 2013-2023 includes 144 reinforcement projects that have been approved internally by EirGrid; of these, 133 are in progress, three are cancelled or deferred and there are eight projects whose expected energisation dates have yet to be confirmed by the customer. Of the active 133 projects, 100 were presented in the TDP 2012, while the other 33 projects are new to the TDP 2013-2023.

These 33 projects consist of new builds, refurbishment/replacement projects, uprates/modification projects and other projects. These four categories of projects have been assessed against the Strategic Environmental Objectives from the SEA and it has been determined that following the implementation of mitigation measures the SEOs will generally be achieved.

Therefore, the TDP 2013-2023 is considered to be in accordance with the provisions of the Grid25 IP and its SEA.

APPENDIX A: PROJECT TERMS

Appendices B and C include information on specific projects. This appendix explains terms that are used to describe projects in the following appendices:

- *Capital Project Number (CP No.)* - each project is referenced with a Capital Project number for coordination between EirGrid and TAO;
- *Estimated Completion Date (ECD)* - the estimates provided are subject to the planning process where applicable, the construction progress, availability of transmission outages and commissioning and may be liable to change; and
- *Phase* – the stage the project has progressed to at the data freeze date i.e. the 31st of March 2013:
    - Phase 3: Developments in the Detailed Design and Construction Phase - projects that have received public planning permission, where appropriate, or are:
        - At the post-project agreement stage;
        - At the initial stage of procurement and engineering design;
        - Presently under construction.
    - Phase 2: Developments in the Public Planning Process - projects or developments that have been approved at the appropriate level internally in EirGrid and have entered the public planning process; and Developments in the Outline Design and EIA Phase - projects or developments that have been approved at the appropriate level internally in EirGrid and are at the Outline Design or Environmental Impact Assessment (EIA) stage.

APPENDIX B: CHANGES SINCE TDP 2012

This appendix details the projects that have been completed, those that are cancelled or deferred and those for which expected energisation dates have yet to be confirmed by the customer.

Projects Completed since TDP 2012 (37 Projects)

Thirty seven projects were completed between the 31st March 2012 and the 31st of March 2013, the data freeze dates for TDP 2012 and TDP 2013. These projects are listed in Table B.1 below. In addition, it should be noted that the East West Interconnector is fully commercially operational since the 1st of May 2013.

CP No	Project Title	Date Completed[79]
CP0173	Banoge 110 kV New Station - New DSO Connection	Q2-12
CP0648	Garrow 110 kV Station Extension	Q2-12
CP0551	Cahir - Doon 110 kV Line Uprate & Cahir & Doon 110 kV Busbar Uprates	Q2-12
CP0138	Killonan 220/110 kV Station - New Bay for New DSO Demand Connection at Nenagh 110 kV Station	Q2-12
CP0254	Cashla loop-in of the Dalton - Galway 110 kV Line	Q2-12
CP0543	Salthill 110 kV New Station - New DSO Demand Connection	Q2-12
CP0571	Limerick - Rathkeale 110 kV Line Refurbishment	Q2-12
CP0751	Aughinish - Tarbert 110 kV Line Resagging	Q2-12
CP0203	Cahir 110 kV Station Refurbishment – Part 2	Q2-12
CP0523	Inchicore 220/110 kV Station - New 4th 220/110 kV 250 MVA Transformer	Q2-12
CP0661	Cashla - Tynagh 220 kV Line Uprate	Q2-12
CP0720	Cahir - Thurles 110 kV Line Resagging	Q2-12
CP0652	East West Interconnector - Shallow Connection	Q3-12
CP0637	Portlaoise 110 kV Station - Busbar Uprate	Q3-12
CP0774 (NEW)	Rathkeale - Tarbert 110 kV Line Refurbishment	Q3-12
CP0558	Ballydine - Cullenagh 110 kV Line Uprate	Q3-12
CP0497	Power Line Carrier & Coupling Capacitor Replacement at Various Stations	Q3-12

[79] Project energisation date.

CP0695	Killonan - Tarbert 220 kV Line Refurbishment	Q3-12
CP0765	Aughinish - Moneteen 110 kV Line Resagging	Q3-12
CP0383	Lisdrum - Shankill 110 kV Line Refurbishment	Q3-12
CP0635	Corderry 110 kV Station - Busbar Uprate	Q4-12
CP0656	Arklow - Crane 110 kV Line Uprate & Arklow & Crane 110 kV Busbar Uprates	Q4-12
CP0211	Srananagh 220 kV Station & Flagford - Srananagh 220 kV New Circuit	Q4-12
CP0704	Cathaleen's Fall - Golagh T 110 kV Line Uprate & Golagh - Golagh Tee 110 kV Line Refurbishment	Q4-12
CP0665	Dunstown - Maynooth 220 kV Part Line Refurbishment	Q4-12
CP0675	Clashavoon 220/110 kV Station - New 220/110 kV 250 MVA Transformer	Q4-12
CP0699	Cathaleen's Fall - Srananagh No. 1 110 kV Line Uprate	Q4-12
CP0775 (NEW)	Cloon - Lanesboro 110 kV Line Refurbishment	Q4-12
CP0511	Killonan 220/110 kV Station - New 4th 220/110 kV 250 MVA Transformer (only BZP outstanding)	Q4-12
CP0374	Arva - Shankill No. 2 110 kV New Line	Q4-12
CP0517	Coolroe - Kilbarry 110 kV Line Uprate	Q4-12
CP0536	Installation of Surge Arrestors at Various Stations	Q4-12
CP0664	Cullenagh - Knockraha 220 kV Line Uprate	Q1-13
CP0560	Cullenagh - Waterford 110 kV Line Uprate	Q1-13
CP0292	Gorman - Meath Hill 110 kV New Line	Q1-13
CP0122	Moneteen 110 kV & Tarbert 220/110 kV Stations – 110 kV Busbar Protection	Q1-13
CP0733	Cloghran 110 kV New Station - New Demand Connection	Q1-13

Table B-1 Projects Completed since TDP 2012 (37 Projects)

Projects Cancelled or Deferred (3 Projects)

Three projects that were listed in TDP 2012 are either cancelled or deferred as at the 31st of March 2013; they are listed in Table B.2 below.

CP No.	Project Title	Originator	Status
CP0506	Finnstown 220/110 kV Project[80]	DSO	Deferred
CP0619	Shankill 110 kV Station - New Capacitors	TSO	Deferred
CP0649	Drumline 110 kV Station – 2 New 110 kV Bays	DSO	Cancelled

Table B-2 TDP 2012 Projects Cancelled or Deferred (3 Projects)

Projects Whose Expected Energisation Dates Have Yet to be Confirmed (8 Projects)

There are eight projects, listed in Table B-3 below, whose expected energisation dates have yet to be confirmed by the customer and which will be managed by EirGrid in accordance with their long-stop dates as per their connection agreements. All of these projects were included in TDP 2012.

CP No.	Project Title
CP0641	Nore Power 110 kV Connection
CP0669	Cuilleen Power 110 kV Connection
CP0670	Suir Power 110 kV Connection
CP0602	Keelderry Windfarm 110 kV Connection
CP0676	Ballakelly 220 kV Connection
CP0677	Caulstown 110 kV Connection
CP0673	Knocknagreenan 110 kV Connection
CP0609	Glanlee Wind Farm Phase 2

Table B-3 Projects Whose Expected Energisation Dates Have Yet to be Confirmed by the Customer (8 Projects)

[80] Post data freeze update: currently, TSO and DSO are jointly reviewing the needs in the area and the potential next steps.

APPENDIX C: PLANNED NETWORK DEVELOPMENTS

This appendix details live TDP 2012 projects and additional new projects that have been approved since TDP 2012. The driver/s, need/s, location, phase[81] and Estimated Completion Date[82] for individual projects are included in the tables in this appendix. Tables of projects are categorised by planning area; it should be noted that some projects are in multiple planning areas

When reviewing the data in this appendix it is important to note the logic applied to describing the location of projects. If the project involves a circuit then both the "from" and "to" stations are noted; thus, all circuits will have 2 counties listed. If the counties are in the same Planning Area then the Planning Area is listed only once. If the project crosses Planning Areas then the multiple Planning Areas are included. If the project refers to a station then only one county and one Planning Area is listed for that project.

Also please note the following labels:

- "(NEW)" included with a project's CP No. signifies that it is an additional new project that has been approved since TDP 2012;
- "  TYNDP/TYNDP_Project_No" included with a project's title signifies that it is in the ENTSO-E's most recent Ten Year Network Development Plan that covers the period 2012 to 2022 and is a Project of European Significance (PES); and
- "*" included with a project's length signifies that the line length is an estimate at this time.

[81] As at the data freeze date of the 31st of March 2013

[82] As at the data freeze date of the 31st of March 2013

Data Management

It should be noted that the ECDs for some transmission projects are available and updated on an on-going basis at the following 2 websites:

- On the EirGrid website, Associated Transmission Reinforcements:

  http://www.eirgrid.com/customers/gridconnections/generatorconnections/associatedtransmissionreinforcements/

- On the CER website, PR3 Transmission Capital Expenditure Monitoring:

  http://www.cer.ie/en/electricity-transmission-network-reports-and-publications.aspx?article=7e5e12b2-8502-4735-80b0-ba1ec3d973eb

Projects in Multiple Planning Areas

There are nine projects that are in multiple Planning Areas; these projects are listed in Table C-1 below.

CP No	Project Title	Type	km	DRIVERS			NEEDS					Location		Phase	ECD
				Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition	County/Counties	Planning Area/s		
CP0748	Cashla - Prospect 220 kV Line Resagging	Refurbish / Replace	88.6	1	0	0	0	0	0	0	1	Galway, Clare	SW-MW, B-M-W	3	2013
CP0811 (NEW)	Cahir - Thurles 110 kV Line Uprate	Uprate / Modify	39.0	1	1	0	0	1	0	0	0	Tipperary South, Tipperary North	SE-ME-D, SW-MW	2	2014
CP0755	Cauteen - Killonan 110 kV Line Uprate	Uprate / Modify	27.9	0	1	0	0	1	0	0	0	Tipperary South, Limerick	SE-ME-D, SW-MW	2	2015
CP0596	Kinnegad - Mullingar 110 kV New Circuit	New Build	27.0*	1	0	0	0	1	0	0	0	Meath, Westmeath	B-M-W, SE-ME-D	2	2015
CP0825 (NEW)	Oldstreet - Woodland 400 kV Line Refurbishment	Refurbish / Replace	126.4	1	0	0	0	0	0	0	1	Galway, Meath	SE-ME-D, B-M-W	2	2017
CP0824 (NEW)	Moneypoint - Oldstreet 400 kV Line Refurbishment	Refurbish / Replace	102.5	1	0	0	0	0	0	0	1	Clare, Galway	SW-MW, B-M-W	2	2017
CP0585	Laois-Kilkenny Reinforcement Project	New Build	30* + 22[83]	1	0	0	0	1	0	0	0	Laois, Kilkenny	SE-ME-D, B-M-W	2	2017
CP0466	North South 400 kV Interconnection Development - TYNDP/81	New Build	106.0*	1	0	1	1	0	0	1	0	Meath, Tyrone	B-M-W, SE-ME-D	2	2017
CP0732	The Grid Link Project - TYNDP/83	New Build	230.0*	1	1	1	1	1	0	1	0	Cork, Wexford, Kildare	SE-ME-D, SW-MW	2	2020

Table C-1 Planned Projects that are in Multiple Planning Areas (9 Projects)

[83] 30 km accounts for the proposed new 110 kV circuit between the proposed new 400/110 kV station near Portlaoise and the proposed new 110 kV station at Ballyragget, while 22 km accounts for the proposed 110 kV uprate to the existing Ballyragget – Kilkenny line which is currently operated at 38 kV.

Projects in the Border, Midlands and West Planning Area

There are 31 projects in the Border, Midlands and West Planning Area; these projects are listed in Table C-2 below.

CP No	Project Title	Type	km	DRIVERS			NEEDS					Location	Phase	ECD
				Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition	County/Counties		
CP0594	Mullingar 110 kV Station - New Capacitors	New Build	0.0	1	0	0	0	1	0	0	0	Westmeath	3	2013
CP0723	Cushaling 110 kV Station - Busbar Uprate	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	Offaly	3	2013
CP0739	Mount Lucas 110 kV New Station - New Wind Farm Connection	New Build	1.2*	0	1	0	0	0	1	0	0	Offaly	3	2013
CP0421	Binbane - Letterkenny 110 kV New Line	New Build	65.0	1	0	0	0	1	0	0	0	Donegal, Donegal	3	2013
CP0197	Cushaling - Thornsberry 110 kV New Line	New Build	30.0	1	0	0	0	1	0	0	0	Offaly, Offaly	3	2013
CP0759 (NEW)	Shannonbridge 220/110 kV Station - Uprate 2 110 kV Circuit Breakers	Uprate / Modify	0.0	0	1	0	0	1	0	0	0	Offaly	3	2013
CP0773	Bellacorick 110 kV Station - Busbar Uprate	Uprate / Modify	0.0	0	1	0	0	1	0	0	0	Mayo	3	2013
CP0384	Lisdrum - Louth 110 kV Line Refurbishment	Refurbish / Replace	40.9	1	0	0	0	0	0	0	1	Monaghan, Louth	3	2013
CP0772 (NEW)	Sligo 110 kV Station - Busbar Uprate, New Coupler & Refurbishment Works	Uprate / Modify	0.0	1	1	0	0	1	0	0	1	Sligo	2	2014
CP0745	Cathaleen's Fall - Srananagh No. 2 110 kV Line Uprate	Uprate / Modify	49.7	0	1	0	0	1	0	0	0	Donegal, Sligo	3	2014
CP0697 (NEW)	Carrick-on-Shannon 110 kV Station - Busbar Uprate & Other Works	Uprate / Modify	0.0	0	1	0	0	1	0	0	1	Roscommon	2	2014
CP0724	Thornsberry 110 kV Station - Busbar Uprate	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	Offaly	3	2014
CP0734	Cathaleen's Fall 110 kV Station - Busbar Uprate	Uprate / Modify	0.0	0	1	0	0	1	0	0	0	Donegal	3	2014

CP0736	Cunghill - Sligo 110 kV Line Uprate	Uprate / Modify	24.0	0	1	0	0	1	0	0	0	Sligo, Sligo	3	2014
CP0777 (NEW)	Mullingar 110 kV Station - Transmission Works Associated with Installation of New 38 kV GIS	Refurbish / Replace	0.0	1	0	0	0	0	1	0	0	Westmeath	3	2014
CP0778 (NEW)	Castlebar 110 kV Station - Transmission Works Associated with Installation of New 38 kV GIS	Refurbish / Replace	0.0	1	0	0	0	0	1	0	0	Mayo	3	2014
CP0791 (NEW)	Cunghill - Glenree 110 kV Line Uprate & Refurbishment	Uprate / Modify	21.5	1	1	0	0	1	0	0	1	Sligo, Mayo	2	2014
CP0737	West Galway, Uggool/Seacon New 110 kV Stations - New Wind Farm Connections	New Build	4.2*	0	1	0	0	0	1	0	0	Galway	2	2015
CP0603	Clogher & Mulreavy 110 kV New Stations - New Wind Farm Connections	New Build	7.7*	0	1	0	0	0	1	0	0	Donegal, Donegal	3	2015
CP0596	Kinnegad - Mullingar 110 kV New Circuit	New Build	27.0*	1	0	0	0	1	0	0	0	Meath, Westmeath,	2	2015
CP0644	Bracklone 110 kV New Station & Loop in	New Build	0.0	1	0	0	0	0	1	0	0	Laois	2	2015
CP0706	Cloon 110 kV Station - New 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Galway	2	2015
CP0731	Bellacorick - Castlebar 110 kV Line Uprate	Uprate / Modify	38.0	0	1	0	0	1	0	0	0	Mayo, Mayo	3	2015
CP0740	Letterkenny 110 kV Station – Relocation of 110 kV Bay & 2 New Couplers	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Donegal	2	2015
CP0764	Cathaleen's Fall - Drumkeen 110 kV Line Uprate & Refurbishment	Uprate / Modify	51.0	1	1	0	0	1	0	0	1	Donegal, Donegal	2	2015
CP0404	Mullagharlin 110 kV Station – New 110 kV Transformer Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Louth	2	2017
CP0680	Castlebar 110 kV Station - Uprate 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Mayo	2	2017
CP0466	North South 400 kV Interconnection Development  - TYNDP/81	New Build	106.0*	1	0	1	1	0	0	1	0	Monaghan, Cavan, Meath	2	2017
CP0645	Portlaoise 110 kV Station - 2 New 110 kV Bays	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Laois	2	2018
CP0816 (NEW)	Castlebar - Moy 110 kV New Circuit	New Build	40.0*	0	1	0	0	1	0	0	0	Mayo, Mayo	2	2018

CP0721	The Grid West Project - TYNDP/82	New Build	130.0*	0	1	0	0	1	0	0	0	Mayo, Roscommon, Sligo, Galway	2	2019

Table C-2 Planned Projects in the Border, Midlands and West Planning Area (31 Projects)

Projects in the South-West and Mid-West Planning Area

There are 49 projects in the South-West and Mid-West Planning Area; these projects are listed in Table C-3 below.

CP No	Project Title	Type	km	DRIVERS			NEEDS					Location	Phase	ECD
				Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition	County/Counties		
CP0605	Booltiagh 110 kV Station - Modification for Booltiagh Wind Farm Phase 2 & 3	Uprate / Modify	0.0	0	1	0	0	0	1	0	0	Clare	3	2013
CP0710	Reamore 110 kV New Station - New Wind Farm Connections	New Build	12.0*[84]	0	1	0	0	0	1	0	0	Kerry	3	2013
CP0714	Clonkeen 110 kV Station Reconfiguration	Uprate / Modify	0.0	0	1	0	0	1	0	0	0	Kerry	3	2013
CP0748	Cashla - Prospect 220 kV Line Resagging	Refurbish / Replace	88.6	1	0	0	0	0	0	0	1	Galway, Clare	3	2013
CP0689	Ennis 110 kV Station - Busbar Uprate & New Coupler	Uprate / Modify	0.0	1	1	0	0	1	0	0	0	Clare	3	2013
CP0717	Clashavoon - Knockraha 220 kV Line Uprate	Uprate / Modify	45.0	0	1	0	1	1	0	0	0	Cork, Cork	3	2013
CP0719	Inniscarra - Macroom 110 kV Line Uprate	Uprate / Modify	18.1	0	1	0	0	1	0	0	0	Cork, Cork	3	2013
CP0674	Tralee 110 kV Station - New Coupler	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	Kerry	3	2013
CP0746	Moneypoint - Prospect 220 kV Line Refurbishment	Refurbish / Replace	13.0	1	0	0	0	0	0	0	1	Clare, Clare	3	2013
CP0696	Marina - Trabeg No. 1 & No. 2 110 kV Cable Uprates	Uprate / Modify	6.2	1	0	0	0	1	0	0	0	Cork, Cork	3	2013

[84] There is an existing 38 kV circuit between the location of the proposed Reamore 110 kV station and the existing Tralee 110 kV station; it is built to 110 kV standards. It will be upgraded to 110 kV operation.

CP0762	Charleville - Mallow 110 kV Line Uprate	Uprate / Modify	22.5	1	0	0	0	1	0	0	0	Cork, Cork	3	2013
CP0640	Bandon - Dunmanway 110 kV Line Refurbishment	Refurbish / Replace	26.0	1	0	0	0	0	0	0	1	Cork, Cork	3	2013
CP0479	Athea 110 kV New Station - New Wind Farm Connections	New Build	0.0	0	1	0	0	0	1	0	0	Limerick	3	2013
CP0213	Knockraha 220 kV Station Refurbishment – Part 2	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Cork	3	2013
CP0761	Lisheen 110 kV Station - New Bay for New DSO Wind Farm Connection	Uprate / Modify	0.0	0	1	0	0	0	1	0	0	Tipperary North	2	2014
CP0828 (NEW)	Boggeragh 110 kV Station - New 110 kV Bay	Uprate / Modify	0.0	0	1	0	0	0	1	0	0	Cork	2	2014
CP0228	Marina 110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Cork	3	2014
CP0709	Dunmanway 110 kV Station - Busbar Uprate & New Coupler	Uprate / Modify	0.0	1	0	0	0	1	0	0	1	Cork	2	2014
CP0657	Ikerrin T - Thurles 110 kV Line Uprate & Thurles 110 kV Station - Busbar Uprate & New Coupler	Uprate / Modify	25.9	0	1	0	0	1	0	0	0	Tipperary North, Tipperary North	2	2014
CP0608	Cloghboola 110 kV New Station - New Wind Farm Connections	New Build	13.5*	0	1	0	0	0	1	0	0	Kerry	2	2014
CP0529	Thurles 110 kV Station - New Capacitor	New Build	0.0	1	0	0	0	1	0	0	0	Tipperary North	3	2014
CP0776 (NEW)	Kilbarry - Mallow 110 kV Partial Line Uprate	Uprate / Modify	1.0	1	0	0	0	1	0	0	0	Cork, Cork	2	2014
CP0716	Carrigadrohid - Macroom 110 kV Line Uprate	Uprate / Modify	2.4	0	1	0	0	1	0	0	0	Cork, Cork	3	2014
CP0783 (NEW)	Kilbarry - Knockraha No. 1 110 kV Line Uprate	Uprate / Modify	11.9	1	0	0	0	1	0	0	0	Cork, Cork	2	2014
CP0754	Raffeen – Trabeg 110 kV No. 1 Line Uprate	Uprate / Modify	10.4	1	0	0	0	1	0	0	0	Cork, Cork	2	2014
CP0698	Prospect - Tarbert 220 kV Line Uprate	Uprate / Modify	7.7	1	1	0	1	1	0	0	1	Clare, Kerry	3	2014

CP0818 (NEW)	Cordal 110 kV New Station	New Build	0.0	0	1	0	0	0	1	0	0	Kerry	2	2015
CP0399	Moneypoint - Kilpadogge 220 kV New Cable - TYNDP/83	New Build	10.0*	1	1	0	1	1	0	0	0	Clare, Kerry	2	2015
CP0500	North Kerry 220/110 kV New Station	New Build	1.0*	0	1	0	0	1	0	0	0	Kerry, Limerick	3	2015
CP0501	Clashavoon - Dunmanway 110 kV New Line	New Build	35.0*	1	1	0	0	1	0	0	0	Cork, Cork	2	2015
CP0622 (NEW)	Tarbert 220/110 kV Station Refurbishment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Kerry	2	2015
CP0763	Clashavoon - Tarbert 220 kV Line Uprate	Uprate / Modify	97.3	0	1	0	1	1	0	0	0	Cork, Kerry	2	2015
CP0647	Kilpaddoge 220/110 kV New Station	New Build	0.0	1	0	0	0	1	0	0	1	Kerry	3	2015
CP0650	Millstreet 220/110 kV New Station	New Build	14.0*	0	1	0	0	1	0	0	0	Cork, Cork	3	2015
CP0651	East Kerry & North West Cork 220/110 kV New Station	New Build	10.0*	0	1	0	0	1	0	0	0	Cork	3	2015
CP0627	Bandon 110 kV Station - Uprate 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Cork	2	2015
CP0041	Macroom 110 kV Station - New 110 kV Bay for Hartnett's Cross 110 kV New Station	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Cork	3	2015
CP0743	Cow Cross 110 kV Station - New 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Cork	2	2015
CP0597	Ennis - Booltiagh - Tullabrack T - Moneypoint 110 kV Line Uprate	Uprate / Modify	50.2	0	1	0	0	1	0	0	0	Clare, Clare	2	2016
CP0688	Moneypoint 400/220/110 kV GIS Development	New Build	0.0	1	0	0	0	1	0	0	1	Clare	3	2016
CP0054	Ardnacrusha 110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Clare	3	2016
CP0707	Barrymore 110 kV Station Extension & Loop in	Uprate / Modify	0.3	1	0	0	0	0	1	0	0	Cork	2	2016

CP0824 (NEW)	Moneypoint - Oldstreet 400 kV Line Refurbishment	Refurbish / Replace	102.5	1	0	0	0	0	0	0	1	Clare, Galway	2	2017
CP0713	Kilbarry 110 kV Station - New 110 kV Bay for Blackpool 110 kV New Station	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Cork	2	2018
CP0794 (NEW)	Aghada 220/110 kV Station Upgrade	Uprate / Modify	0.0	1	0	0	0	1	0	0	1	Cork	2	2018
CP0796 (NEW)	Knockraha 220 kV Station Upgrade	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	Cork	2	2018
CP0624	Killonan 220/110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Limerick	2	2018
CP0726	Moneypoint to North Kerry Project - TYNDP/83	New Build	26.0*	0	1	0	0	1	0	0	0	Clare, Kerry	2	2019
CP0741	Trabeg 110 kV Station – Uprate 2 110 kV Transformer Bays	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Cork	2	2019

Table C-3 Planned Projects in the South-West and Mid-West Planning Area (49 Projects)

Projects in the South-East, Mid-East and Dublin Planning Area

There are 42 projects in the South-East, Mid-East and Dublin Planning Area; these projects are listed in Table C-4 below.

CP No	Project Title	Type	km	DRIVERS			NEEDS					Location	Phase	ECD
				Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition	County/Counties		
CP0682	Woodland 400/220 kV Station - New 400/220 kV 500 MVA Transformer	New Build	0.0	0	0	1	0	1	0	1	0	Meath	3	2013
CP0508	Shelton Abbey 110 kV Station - Protection Upgrade	Refurbish / Replace	0.0	1	0	0	0	1	0	0	0	Wicklow	3	2013
CP0702	Butlerstown - Cullenagh 110 kV Line Uprate	Uprate / Modify	11.6	1	0	0	0	1	0	0	0	Waterford, Waterford	3	2013
CP0559	Butlerstown - Killoteran 110 kV Line Uprate & Butlerstown 110 kV Station Busbar Uprate	Uprate / Modify	2.7	1	0	0	0	1	0	0	0	Waterford, Waterford	3	2013
CP0708	Navan 110 kV Station - Busbar Uprate & New Coupler	Uprate / Modify	0.0	1	0	0	0	1	0	0	1	Meath	3	2013
CP0715	Great Island 220 kV Station - New Thermal Plant Connection	Uprate / Modify	0.0	0	0	1	0	0	1	0	0	Wexford	3	2013
CP0701	Cullenagh - Dungarvan 110 kV Line Uprate	Uprate / Modify	34.3	1	0	0	0	1	0	0	0	Waterford, Waterford	3	2013
CP0371	Ballydine - Doon 110 kV Line Uprate & Ballydine Busbar Uprate	Uprate / Modify	11.4	1	0	0	0	1	0	0	1	Tipperary South, Tipperary South	3	2013
CP0507	Arklow 220/110 kV Station - New 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	Wicklow	2	2013
CP0623	Great Island 220 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Wexford	3	2013
CP0667	Inchicore - Maynooth No. 1 & No. 2 220 kV Line Uprate	Uprate / Modify	38.0	1	0	0	0	1	0	0	1	Dublin, Kildare	3	2013
CP0683	Dunstown 400/220 kV Station - New 400/220 kV 500 MVA Transformer	New Build	0.0	0	0	1	0	1	0	1	0	Kildare	3	2013
CP0747	Maynooth - Ryebrook 110 kV Line Uprate	Uprate / Modify	9.0	1	0	0	0	1	0	0	0	Kildare, Kildare	2	2013

CP0768	Kellis - Kilkenny 110 kV Line Refurbishment	Refurbish / Replace	34.3	1	0	0	0	0	0	0	1	Carlow, Kilkenny	3	2013
CP0668	Corduff - Ryebrook 110 kV Line Uprate & Ryebrook 110 kV Station Busbar Uprate	Uprate / Modify	8.0	1	0	0	0	1	0	0	0	Dublin, Kildare	2	2014
CP0769	Dunstown - Kellis 220 kV Line Refurbishment	Refurbish / Replace	59.3	1	0	0	0	0	0	0	1	Kildare, Carlow	3	2014
CP0811 (NEW)	Cahir - Thurles 110 kV Line Uprate	Uprate / Modify	39.0	1	1	0	0	1	0	0	0	Tipperary South, Tipperary North	2	2014
CP0728	Kill Hill 110 kV New Station - New Wind Farm Connection	New Build	0.0	0	1	0	0	0	1	0	0	Tipperary South	3	2014
CP0798 (NEW)	Dunstown - Turlough Hill 220 kV Line Refurbishment	Refurbish / Replace	25.2	1	0	0	0	0	0	0	1	Kildare, Wicklow	2	2014
CP0265	Cullenagh - Great Island 220 kV Line Uprate	Uprate / Modify	23.0	1	0	0	0	1	0	0	1	Waterford, Wexford	3	2014
CP0770 (NEW)	Poolbeg 220 kV Station - Fencing	Other	0.0	1	0	0	0	0	0	0	1	Dublin	2	2014
CP0779 (NEW)	Dungarvan 110 kV Station - Transmission Works Associated with Installation of New 38 kV GIS	Refurbish / Replace	0.0	1	0	0	0	0	1	0	0	Waterford	3	2014
CP0705 (NEW)	Woodhouse 110 kV New Station	New Build	0.0	0	1	0	0	0	1	0	0	Waterford	2	2014
CP0797 (NEW)	Dunfirth - Kinnegad - Rinawade 110 kV Line Refurbishment	Refurbish / Replace	53.9	1	0	0	0	0	0	0	1	Kildare, Meath	2	2014
CP0486	Wexford 110 kV Station - New 110 kV Transformer Bay & New Coupler	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Wexford	2	2015
CP0753	Waterford 110 kV Station - Uprate 110 kV Bay	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Waterford	2	2015
CP0756	Cauteen - Tipperary 110 kV Line Uprate	Uprate / Modify	13.0	0	1	0	0	1	0	0	0	Tipperary South, Tipperary South	2	2015
CP0744	Cahir - Tipperary 110 kV Line Uprate & Tipperary 110 kV Station Busbar Uprate	Uprate / Modify	18.1	0	1	0	0	1	0	0	0	Tipperary South, Tipperary South	2	2015
CP0755	Cauteen - Killonan 110 kV Line Uprate	Uprate / Modify	27.9	0	1	0	0	1	0	0	0	Tipperary South, Limerick	2	2015
CP0729	Great Island 110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	Wexford	2	2015

CP0789 (NEW)	Ryebrook 110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	0	1	0	0	Kildare	2	2015
CP0490	Great Island 220/110 kV Station - New 110 kV Bay for DSO Connection to Knockmullen (New Ross)	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Wexford	2	2016
CP0646	Finglas 110 kV Station Redevelopment	Refurbish / Replace	0.0	1	0	0	0	1	0	0	0	Dublin	3	2016
CP0760	Installation of 100 MVar Reactive Support in Dublin Region	New Build	0.0	1	0	0	0	1	0	0	0	Dublin	2	2016
CP0580	Carrickmines 220/110 kV Station - New 4th 220/110 kV 250 MVA Transformer & GIS Development	New Build	0.0	1	0	0	0	1	0	0	0	Dublin	3	2016
CP0792 (NEW)	Finglas 220 kV Station Upgrade	Uprate / Modify	0.0	1	0	0	0	1	0	0	1	Dublin	2	2016
CP0585	Laois-Kilkenny Reinforcement Project	New Build	30* + 22[85]	1	0	0	0	1	0	0	0	Laois, Kilkenny	2	2017
CP0825 (NEW)	Oldstreet - Woodland 400 kV Line Refurbishment	Refurbish / Replace	126.4	1	0	0	0	0	0	0	1	Galway, Meath	2	2017
CP0437	Dublin North Fringe 220/110 kV Project - New 220/110 kV Station to the East of Finglas 220/110 kV Station	New Build	10.0*	1	0	0	0	1	0	0	0	Dublin	2	2017
CP0693	Baroda 110 kV Station - 2 New 110 kV Bays	Uprate / Modify	0.0	1	0	0	0	0	1	0	0	Kildare	2	2017
CP0692 (NEW)	Inchicore 220 kV Station Upgrade	Uprate / Modify	0.0	1	0	0	0	1	0	0	1	Dublin	2	2018
CP0732	The Grid Link Project - TYNDP/83	New Build	230.0*	1	1	1	1	1	0	1	0	Cork, Wexford, Kildare	2	2020

Table C-4 Planned Projects in the South-East, Mid-East and Dublin Planning Area (42 Projects)

[85] 30 km accounts for the proposed new 110 kV circuit between the proposed new 400/110 kV station near Portlaoise and the proposed new 110 kV station at Ballyragget, while 22 km accounts for the proposed 110 kV uprate to the existing Ballyragget – Kilkenny line which is currently operated at 38 kV.

Projects in various locations

There are 11 projects each with elements at various locations around the country; these projects are listed in Table C-5 below.

CP No	Project Title	Type	km	DRIVERS			NEEDS					Phase	ECD
				Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition		
CP0722 (NEW)	Transmission Station Flood Alleviation Measures	Other	0.0	1	0	0	0	0	0	0	1	3	2013
CP0322	Protection Upgrades at Various Stations	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	3	2013
CP0752 (NEW)	HV Line Tower Painting - South	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	3	2013
CP0757 (NEW)	Remote Control for NCC Phase 3	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	2	2013
CP0703 (NEW)	Remote Control for NCC Phase 2	Uprate / Modify	0.0	1	0	0	0	1	0	0	0	3	2013
CP0481 (NEW)	Strategic Spare - 220 kV Mobile Bay	Other	0.0	1	0	0	0	1	0	0	0	3	2014
CP0727	Balteau CT Replacement 110 kV	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	3	2014
CP0727	Balteau CT Replacement 220 kV	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	3	2014
CP0788 (NEW)	Micafil Bushings Replacement	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	2	2014
CP0786 (NEW)	Surge Arrestor Replacement - North	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	2	2018
CP0787 (New)	Surge Arrestor Replacement - South	Refurbish / Replace	0.0	1	0	0	0	0	0	0	1	2	2018

Table C-5 Planned Projects that are at various locations (11 Projects)

APPENDIX D: IRISH PROJECTS IN EUROPEAN TYNDP

Table D.1 below lists the 11 Irish projects in the ENTSO-E's most recent Ten Year Network Development Plan covering the period 2012 to 2022.

It should be noted that in the TYNDP individual projects can be clustered together to form a larger project where clustering is governed by predetermined criteria.

Projects which have a CP No. in the table below have achieved internal EirGrid capital approval and are also listed in Appendix C above. Projects which are labelled "n/a" are currently conceptual and are under investigation.

TYNDP No.	CP No.	Project Title
80	-[86]	East – West Interconnector[87]
81	CP0466	North South 400 kV Interconnection Development
82	CP0721	The Grid West Project
	n/a	Renewable Integration Development Project (RIDP)
83	CP0399	Moneypoint - Kilpaddoge 220 kV New Cable
	CP0726	Moneypoint - North Kerry Project
	CP0732	The Grid Link Project
84	n/a	Project to Reinforce the Greater Dublin Area/'Dublin Ring' Project
106	n/a	2nd Ireland – Great Britain Interconnector
107	n/a	Ireland – France Interconnector
109	n/a	Connections for Offshore Wind Farms off the East Coast

Table D-1 Irish Projects in European TYNDP

[86] East West Interconnector was not subject to a Project Agreement with ESB Networks; thus, it does not have a CP No.

[87] The East West Interconnector is fully commercially operational since the 1st of May 2013.

APPENDIX E: ABBREVIATIONS & GLOSSARY OF TERMS

AA	Appropriate Assessment
ABP	An Bord Pleanála
AIS	Air Insulated Switchgear
BZP	Buszone Protection
CER	Commission for Energy Regulation
CCGT	Combined Cycle Gas Turbine
CP No.	Capital Project Identification Number
DSO	Distribution System Operator
EAR	Environmental Appraisal Report
ECD	Estimated Completion Date
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ENTSO-E	European Network of Transmission System Operators for Electricity
ER	Environmental Report
ESB	Electricity Supply Board
EU	European Union
GIS	Gas Insulated Switchgear
GW	Gigawatt
HV	High Voltage
HVDC	High Voltage Direct Current
IP	Implementation Programme
IROPI	Imperative Reasons of Over-riding Public Interest
MEC	Maximum Export Capacity

MIC	Maximum Import Capacity
MW	Megawatt
NIE	Northern Ireland Electricity
NIS	Natura Impact Statement
NSS	National Spatial Strategy
NWPS	National Parks and Wildlife Service
RegIP	Regional Investment Plan
RES	Renewable Energy Sources
RGNS	Regional Group North Sea
RIDP	Renewable Integration Development Project
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEM	Single Energy Market
SID	Strategic Infrastructure Development
SID	Strategic Infrastructure Division
SI60	Statutory Instrument No. 60 of 2005
SI147	Statutory Instrument No. 147 of 2011
SI445	Statutory Instrument No. 445 of 2000
SONI	System Operator Northern Ireland
SPA	Special Protection Areas
TAO	Transmission Asset Owner
TDP	Transmission Development Plan
TPC	Transmission Planning Criteria
TSO	Transmission System Operator
TYNDP	Ten Year Network Development Plan

Bay	A bay is a connection point to a busbar, and comprises switchgear and measurement equipment.
Busbar	An electrical conductor located in a station that makes a common connection between several circuits.
Capacitor	An item of plant normally utilised on the electrical network to supply reactive power to loads (generally locally) and thereby supporting the local area voltage.
Circuit	A line or cable, including associated switchgear, which carries electrical power.
Circuit Breaker	A device used to open a circuit that may be carrying electrical current.
Combined Cycle Gas Turbine (CCGT)	A type of thermal generator that typically uses natural gas as a fuel source. It is a collection of gas turbines and steam units; where 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.
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 export or import capacity respectively.
Demand	The amount of electrical power that is consumed by a customer and

	is measured in MegaWatts (MW). In a general sense, the amount of power that must be transported from grid connected generation stations to meet all customers' electricity requirements.
Demand-Side Management	The modification of normal demand patterns usually through the use of financial incentives.
Distribution System Operator	In electrical power business, a distribution system operator is an operator that transmits electrical power from the transmission system and small generation plants connected to the distribution system to the consumer.
EirGrid	The independent statutory electricity Transmission System Operator in Ireland.
Embedded Generation	Refers to generation that is connected to the distribution system or at a customer's site.
Gas Insulated Switchgear (GIS)	A compact form of switchgear where the conductors and circuit breakers are insulated by an inert gas (i.e. SF_6).
Gate	An approach to considering applications for connections of new generation. It involves a staggered system that facilitates the group processing approach which allows the TSO and DSO to process a pre-defined number of connection offers concurrently rather than having to treat each application on an individual independent basis.
Generation Dispatch	The configuration of outputs from the connected generation units.
Grid	A meshed network of high voltage lines and cables (400 kV, 275 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 EU member state to another.
Maximum Export Capacity (MEC)	The maximum export value (MW) provided in accordance with a generator's connection agreement. The MEC is a contract value 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.
Maximum Import Capacity (MIC)	The maximum import value (MW) provided in accordance with a demand customer's connection agreement. The MIC is a contract value which a demand customer chooses to cater for maximum demand at their site.
Network Development Driver	A factor, based on national and European energy policy objectives, that influences or "drives" the investment in the transmission system.
Network Development Need	A problem on the transmission network which requires a network reinforcement or network project to be installed to solve the need.
Power Flow	The physical flow of electrical power. It is typically measured in megavolt-amperes (MVA) which is the product of both 'active' and 'reactive' electrical power. The flow of 'active' power is measured in megawatts (MW); the flow of ' reactive power', which is measured in megavars (Mvar)
Phase Shifting Transformer (PST)	An item of plant employed on the electrical network to control the flow of active power.

Reactive Compensation	The process of supplying reactive power to the network.
Reactive Power	Reactive power is that portion of electricity that establishes and sustains the electric and magnetic fields of alternating current equipment. It is utilised to control voltage on the transmission network
Reactor	An item of plant employed on the electrical network to either limit short circuit levels or prevent voltage rise depending on its installation and configuration.
Shallow Connection	Shallow Connection means the local connection assets required to connect a customer, or customers, to the transmission system and which are typically for the specific benefit of that particular customer or group of customers.
Summer Valley	The annual minimum electrical demand that usually occurs in August. Annual minimum demand is typically 35 % of the winter peak.
Summer Peak	The average week-day peak electrical demand value between March and September, inclusive, which is typically 80 % of the winter peak.
Switchgear	A combination of electrical equipment such as disconnects and/or circuit breakers used to isolate equipment in or near an electrical station.
Transformer	An item of electrical equipment that allows electrical power to flow between typically two different voltage levels in an alternating current (AC) power system..

Transmission Losses	A small proportion of energy is lost as heat whilst transporting electricity on the transmission system. These losses are known as transmission losses. As the amount of energy transmitted increases, losses also increase.
Transmission Peak	The peak demand that is transported on the grid. The transmission peak includes an estimate of transmission losses.
Transmission Planning Criteria	The set of standards that the transmission system is designed to meet. The criteria are deterministic as is the norm throughout the world. They set out objective standards which have been found to deliver an acceptable compromise between the cost of development and the transmission service provided.
Transmission System Operator	In the electrical power business, a transmission system operator is the licensed entity that is responsible for transmitting electrical power from generation plants to regional or local electricity distribution operators.
Uprating	To increase the rating of a circuit or busbar. This is achieved by increasing ground clearances and/or replacing conductor, together with any changes to terminal equipment and support structures.
Winter Peak	This is the maximum annual system demand. It occurs in the period October to February, of the following year, inclusive. Thus, for transmission planning purposes the winter peak in 2013, the first year of this plan, may occur in early 2014. 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 2010, July 2012

II. Transmission Development Plan 2012, July 2013

III. Transmission Planning Criteria, October 1998

IV. Grid25 - Grid Development Strategy, October 2008

V. All Island Generation Capacity Statement 2012-2021, December 2011

VI. All Island Generation Capacity Statement 2013-2022, December 2012

VII. All Island Transmission Forecast Statement 2012-2018, May 2012

VIII. Grid25 Implementation Programme, May 2012

IX. Strategic Environmental Assessment, May 2012

European Network of Transmission System Operators for Electricity published documents:

X. Ten Year Network Development Plan 2012, July 2012

National Legislation:

XI. Electricity Regulation Act, 1999

XII. Planning and Development Acts, 2000 to 2011

XIII. Strategic Infrastructure Act, 2006

XIV. Statutory Instrument No. 445 of 2000, European Communities (Internal Market in Electricity) Regulations

XV. Statutory Instrument No. 60 of 2005, European Communities (Internal Market in Electricity) Regulations

XVI. Statutory Instrument No. 147 of 2011, European Communities (Renewable Energy) Regulations

European Legislation:

XVII. Birds and Natural Habitats Regulations, 2011

XVIII. Cross-border Exchanges in Electricity Regulation (EC) No 714/2009

XIX. Environmental Impact Assessment Directive

XX. Habitats Directive

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