Transmission Development Plan Northern Ireland 2018-2027

SONI

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Table of Contents

Document Structure

The structure of the document is as follows:

The **Abbreviations and Glossary of Terms** provides a glossary of terms used in the document.

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

Section 1: Introduction: our statutory and legal obligations are introduced. The purpose and context of the Transmission Development Plan Northern Ireland (TDPNI) is outlined.

Section 2: Strategy for Developing the Grid: describes the overall strategy followed when developing the grid and the key strategic considerations when identifying reinforcements.

Section 3: General Approach to Developing the Grid: describes our approach to the network planning process and how we plan the development of the transmission network.

Section 4: Implementation: describes how the strategy for developing the grid will be implemented. This section is based on policies and objectives derived from Section 3.

Section 5: Investment Needs: the drivers of network development are introduced and discussed, as are the needs of the network which result from these drivers. The needs are identified through the application of the transmission development approach discussed in Section 2.

Section 6: 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 7: Project Description: summarises and categorises the development projects that are currently in progress by location.

Section 8: Summary of Strategic Environmental Assessment -Mitigation Measures: summarises the mitigation measures from the Strategic Environmental Assessment SEA and Habitats Regulation Assessment of the TDPNI 2018-2027.

Appendix A: Project Terms

Appendix B: Planned Network Developments

Appendix C: Northern Ireland Projects in European Plans

Appendix E: References

Abbreviations and Glossary of Terms

Abbreviation	Explanation
AA	Appropriate Assessment
DSO	Distribution System Operator
EAR	Environmental Appraisal Report
EC	European Commission
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
EU	European Union
GCS	Generation Capacity Statement
GIS	Gas Insulated Switchgear
GW	Gigawatt
HV	High Voltage
HVDC	High Voltage Direct Current
MW	Megawatt
NIE Networks	Northern Ireland Electricity Networks
NIS	Natura Impact Statement
PA	Project Agreement

Abbreviation	Explanation
RegIP	Regional Investment Plan
RES	Renewable Energy Sources
RGNS	Regional Group North Sea
RIDP	Renewable Integration Development Project
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SONI	System Operator Northern Ireland
SPA	Special Protection Areas
TAO	Transmission Asset Owner
TDP	Transmission Development Plan
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards
TYNDP	Ten-Year Network Development Plan
TYTFS	Ten Year Transmission Forecast Statement
Utility Regulator	Utility Regulator for Northern Ireland

Glossary of Terms	Explanation
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 used on the electrical network to supply reactive power to loads (generally locally) and thereby support 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 is carrying electrical current.
Constraint	A change in the output of generators from the market schedule due to transmission network limitations - specifically the overloading of transmission lines, cables and transformers.
Contingency	An unexpected failure or outage of a network component, such as a generation unit, transmission line, transformer or other electrical element.
Coupler	This is a device which can be used to either connect or disconnect sections of busbars. A coupler increases security of supply and flexibility under both fault and maintenance conditions. A coupler can also be known as a Sectionalising Circuit Breaker.
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 transmission network 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.
Deterministic	The deterministic methodology is often referred to as the N-1 criterion. This means that the system must have sufficient capacity so that in the eventuality of a probable system outage, there are no resulting system problems such as overloading, under-voltage, over-voltage or instability.
Distribution System Operator (DSO)	In the electrical power business, a distribution system operator is the licensed entity responsible for: • operating and ensuring the maintenance and development of the distribution system in a given area (and its interconnections), if necessary and where applicable; and • ensuring the long term ability of the system to meet reasonable demands for electrical power. The DSO in Northern Ireland is Northern Ireland Electricity Networks (NIE Networks). NIE Networks is also the asset owner of the Northern Ireland distribution system.

Glossary of Terms	Explanation
EirGrid	The independent statutory electricity Transmission System Operator in Ireland.
Embedded Generation	Refers to generation that is connected to the distribution network 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 (that is, SF6).
Generation Dispatch	The configuration of outputs from the connected generation units.
Grid	A network of high voltage lines and cables (275 kV and 110 kV, and in future 400 kV) used to transmit bulk electricity supplies around Northern Ireland. The terms grid, electricity transmission network, and transmission system are used interchangeably in this Development Plan.
Interconnector	The electrical link, facilities and equipment that connect the transmission network of one EU member state to another.
Network Development Driver	A factor, based on national and European energy policy objectives, that influences or "drives" the investment in the transmission network.
Network Development Need	A deficiency or problem on the network which arises as a result of one or a number of network development drivers. Network reinforcement is required to solve a network development 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' is measured in Megavars (Mvar).
Phase Shifting Transformer (PST)	A type 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 to compensate for reactive power usage at a point in time.
Reactive Power	Reactive power is that portion of electricity that establishes and sustains the electric and magnetic fields of alternating current equipment. Reactive power is measured in Megavars (Mvar).
Reactor	An item of plant comprising a coil of electrical wire. Depending on its installation and configuration, it is typically employed on the electrical network to either: • limit short circuit levels; or • prevent voltage rise.
Shallow Connection	Shallow Connection means the local connection assets required to connect a customer, or customers, to the transmission network. These types of connections are typically for the specific benefit of that particular customer or group of customers.

Glossary of Terms	Explanation
SONI	The independent statutory electricity Transmission System Operator in Northern Ireland.
Summer Valley	The annual minimum electrical demand that usually occurs in August. Annual minimum demand is typically 30% of the winter peak.
Summer Peak	The week-day peak electrical demand value between March and September, inclusive, which is typically 79 % 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 or light whilst transporting electricity on the transmission network. These losses are known as transmission losses.
Transmission Peak	The peak demand that is transported on the transmission network. The transmission peak includes an estimate of transmission losses.
Transmission System Security and Planning Standards (TSSPS)	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 Asset Owner (TAO)	In the electrical power business, a transmission asset owner is the entity which owns all of the assets associated with the transmission system, including substations, cables, overhead lines and associated structures. The TAO is responsible for the condition of transmission assets and thus all asset replacement projects. The TAO in Northern Ireland is Northern Ireland Electricity Networks.
Transmission System Operator (TSO)	A transmission system operator is the licensed entity that is responsible for: • operating and ensuring the maintenance and development of the transmission system in a given area (and its interconnections), if necessary and where applicable; and • ensuring the long term ability of the system to transmit electrical power from generation plants to transmission connected demand and regional or local electricity distribution operators. SONI is the TSO for Northern Ireland.
Uprate	To increase the capacity or rating of electrical equipment.
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 reference to winter 18 covers the period from October 2018 to February 2019. The winter peak figures take account of the impact of projected Demand-Side Management initiatives.

Executive Summary

Executive Summary

SONI, as Transmission System Operator (TSO), plays an important role in the economy of Northern Ireland. Through the provision of a secure electricity supply, SONI is responsible for ensuring that the lights stay on for homes and businesses across the region. Sustaining a reliable supply of electricity is not just important for existing consumers, it is also crucial to attracting investment[1]. In order to ensure continued secure, reliable, economic and sustainable electricity supply SONI must continue to plan investment in the Northern Ireland transmission network.

The Transmission Development Plan Northern Ireland (TDPNI) 2018-2027 is the plan for the development of the Northern Ireland transmission network and interconnection over the ten years from 2018. This ten-year plan presents projects that are expected to be needed for the operation of the transmission network. In addition, future needs that may drive future potential projects are also discussed.

This report has been prepared in accordance with Article 22 of European Directive 72/2009 and Condition 40 of the SONI TSO Licence.

Drivers of Transmission Network Development

The development of the Northern Ireland electricity sector is guided by a number of national and European Union (EU) rules and strategic objectives. These objectives guide investment in the Northern Ireland transmission network and are summarised as follows:

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

In order to achieve these strategic objectives, we must invest in the development and maintenance of the electricity transmission network. Drivers of investment include:

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

As demand or generation changes, or as the transmission network becomes more interconnected with neighbouring transmission networks[2], the flow of electrical energy throughout the transmission network changes. To accommodate these changes in power flows it is often necessary to modify or strengthen the transmission network to ensure performance and reliability levels are upheld. SONI and NIE Networks are obliged to develop an economic, efficient and coordinated transmission system[3].

In addition, the condition of transmission network assets is a factor. The timely maintenance or replacement of assets is required to provide the necessary level of security of supply.

1 Grant Thornton: "Powering Northern Ireland A report exploring SONI's role in the economy", October 2016.
Available here: http://www.grantthorntonni.com/globalassets/1.-member-firms/ireland/insights/publications/powering-northern-ireland_grant-thornton.pdf
2 The European electric power transmission networks are interconnected, so as to be able to transmit energy from one country to the other.
3 The Electricity (Northern Ireland) Order 1992, Article 12

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

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

Transmission Network Reinforcements

This development plan considers the 46 projects that are planned.

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

Projects by Planning Area				
Project Category	**North and West**	**South-East**	**Projects in Both Areas**	**Total**
New Build	9	9	0	**18**
Uprate/Modify	3	9	2	**12**
Refurbish/Replace	5	9	0	**14**
Other	0	0	0	**0**
Total	**17**	**27**	**2**	**46**

Capital Expenditure

SONI's expenditure on transmission development projects is estimated at £28.23 million for the period 2018 – 2027. This figure is the amount required to bring projects to the point of handover to NIE Networks. The projects are subject to SONI's governance procedures. Estimated TAO costs associated with these projects are £450 million. The Utility Regulator will determine the amount that can eventually be recovered from customer and generator tariffs for these projects.

The Utility Regulator has already approved expenditure for asset replacement projects of £48.8 million for the period 2017-2024[4]. There are three further asset replacement projects sitting outside this mechanism with indicative costs estimated at £56.9 million[5].

Data Management

Transmission network development is ever evolving. To allow for comparison of network development projects on a year-on-year basis, data is represented at a fixed point in time – the data freeze date. The data freeze date of TDPNI 2018 is 1 January 2018.

Strategic Environmental Assessment

This TDPNI 2018-2028 is subject to Strategic Environmental Assessment[6] (SEA) and Appropriate Assessment[7] (AA). An environmental report and shadow Habitats Regulation Regulations report accompany the TDPNI and the main findings of these assessments have influenced and are incorporated into the Plan.

4 See the NIE Networks RP6 final determination: https://www.uregni.gov.uk/nie-networks-rp6. Please note that the costs reported in the RP6 final determination are from 2015-16 have been adjusted for inflation in this TDPNI for 2018.
5 Coolkeeragh – Magherafelt 275 kV refurbishment, Ballylumford 110 kV switchboard replacement and Ballylumford – Castlereagh 110 kV refurbishment
6 EU Directive (2001/42/EC) Strategic Environmental Assessment is a requirement for certain plans and programmes.
7 EU Habitats Directive: Council Directive 92/43/EEC of 21st May 1992 on the conservation of natural habitats and of wild fauna and flora

1. Introduction

1. Introduction

The Northern Ireland transmission system is a network of 275 kV and 110 kV (and in future 400 kV) high voltage lines and cables. It is the backbone of the power system; efficiently delivering large amounts of power from where it is generated to where it is needed, safely and reliably.

Electricity supply is essential to everyday life and to the local economy, and a reliable electricity network is the means by which we move electricity around Northern Ireland. The development of transmission network infrastructure is, therefore, of strategic importance.

This TDPNI outlines the:

- Drivers of network development;
- Network investment needs; and
- Projects required to address these needs.

1.1. Statutory and Legal Requirements

Regulations that are relevant to planning the transmission network include:

1.1.1. National Statutory and Licence Requirements

- The Electricity Order (Northern Ireland) 1992:
  - Article 12.
- The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012.
- The Construction (Design and Management) Regulations (NI) 2016.
- SONI's TSO Licence:
  - Condition 18 – Transmission Interface Arrangements
  - Condition 20 – Operation of the Transmission System and the System Security and Planning Standards
  - Condition 40 – Transmission Development Plan NI
- NIE Networks Transmission Licence:
  - Condition 19 – Developing and Maintaining the Transmission System

1.1.2. European Statutory Requirements

- Regulation (EC) No 714/2009 on conditions for access to the network for cross-border exchanges in electricity:
  - Article 4; Article 8 paragraph 3(b); Article 12.
- Directive 2009/72/EC concerning common rules for the internal market in electricity:
  - Paragraphs 1 and 4 of Article 22.
- Directive 2009/28/EC on the promotion of the use of energy from renewable sources:
  - Paragraph 2 of Article 16.

- Directive 2012/27/EC on energy efficiency:
    - Paragraph 5 of Article 15.

SONI are responsible for the planning and operation of the transmission network within Northern Ireland. We have both a licence obligation to produce a TDP annually and contribute to a European Ten-Year Network Development Plan (TYNDP) every two years.

NIE Networks is responsible for the development and maintenance of the transmission system[8], including asset replacement projects, in accordance with the Transmission Interface Arrangements (TIA). SONI reviews all asset replacement proposals and these are incorporated in this Plan.

1.2. Context of the Plan

This TDPNI covers a period of ten years which, as well as being a statutory requirement under our licence, is in line with the European Network of Transmission System Operators for Electricity's (ENTSO-E) TYNDP. As part of the preparation of the TDPNI, we consult with EirGrid as TSO in Ireland and with NIE Networks in compliance with the license condition. SONI is obliged to undertake a public consultation on the draft TDPNI. Following feedback received from the public consultation we update the TDP, as required, and provide a report to the Utility Regulator on feedback received. We prepare the final version of the TDPNI and submit it to the Utility Regulator for approval. A public consultation on the TDPNI is held by the Utility Regulator for Northern Ireland before approval[9].

In advance of the submission to The Utility Regulator, a Strategic Environmental Assessment (SEA) is being undertaken under the provisions of the European Communities Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (SEA Directive) as transposed through the Environmental Assessment of Plans and Programmes Regulations (Northern Ireland) 2004 (S.R. 280/2004). A Habitat Regulations Assessment is also being prepared (Council Directive 92/43/EEC, and Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995) This process is being undertaken in advance of consultation and approval by The Utility Regulator to ensure that environmental considerations are integrated into the TDPNI 2018-2027 before its completion. SEA aims to provide a high level of protection for the environment and to promote sustainable development.

The Transmission Asset Owner (TAO), NIE Networks, is responsible for the detailed design and construction of projects. NIE Networks are also responsible for delivering asset replacement projects. This document allows them to consider future financing and resourcing requirements.

The development of the transmission network involves forecasting future needs. Solutions chosen to address these needs must maintain security and quality of supply within standards, while balancing costs and environmental impacts. The process is flexible to enable the long-term development of the network, and derogations against standards can be obtained in exceptional circumstances.

Considerations that shape the medium and long-term development of the transmission network are outlined below.

1.2.1. All-Island and European Context

Our TSO licence obliges us to carry out transmission planning on a coordinated all-island basis in conjunction with EirGrid. This requirement is met by the System Operator Agreement in place between EirGrid and SONI. Together we now publish All-Island Generation Capacity and Transmission Forecast Statements. The aim of coordinated planning is to ensure, as far as possible, that projects developed, particularly in border areas, will benefit the entire island.

8 NIE Networks Transmission Licence, Condition 19. Available here: https://www.uregni.gov.uk/sites/uregni/files/media-files/NIE%20Transmission%20Licence%20effective%202%20October%202017.pdf
9 Directive 2009/28/EC, Article 22, Paragraph 4: *"The regulatory authority shall consult all actual or potential system users on the ten-year network development plan in an open and transparent manner. Persons or undertakings claiming to be potential system users may be required to substantiate such claims. The regulatory authority shall publish the result of the consultation process, in particular possible needs for investments."*

European legislation requires all European TSOs to cooperate through ENTSO-E. ENTSO-E has six regional groups that co-ordinate network planning and development at regional level. We are members of the Regional Group North Sea (RGNS), which also includes EirGrid and 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. This RegIP together with the other five RegIPs feed into ENTSO-E's TYNDP.

Projects of pan-European and regional significance[10] are identified in this TDP, using the following labels: "TYNDP/TYNDP_Project_No" or "RegIP/RegIP_Project_No". The most recent final versions of TYNDP[11] and RGNS RegIP[12] were issued in 2016 and 2015 respectively. Northern Ireland projects in European plans are listed in Appendix C.

1.2.2. United Kingdom's Referendum on EU Membership

The United Kingdom's June 2016 referendum on EU membership has presented uncertainties for the energy market on the island of Ireland.

Regardless of the UK leaving the EU, there will always be many shared benefits of working closely with our nearest neighbours. We aim to maintain a strong relationship between Northern Ireland, Great Britain and Ireland on energy matters. This TDPNI is based on the most up-to-date information available at the freeze date of 01 January 2018. Future TDPNIs will reflect any change in Northern Ireland's relationship with the EU.

1.3. TDPNI 2018

TDPNI 2018 presents our view of future transmission needs and our plan to develop the network through specific projects, to meet these needs over the next ten years. It also includes NIE Networks' view of asset replacement needs on the transmission system, including that provided for through its price control.

It is possible that changes will occur in the need for, scope of, and timing of the listed 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 TDPs. As such, the long-term development of the network is under review on an on-going basis.

This TDPNI presents the projects which are currently being advanced to solve the needs of the transmission network. In addition, future needs that drive future potential projects are also discussed.

1.4. Data Management

Transmission network development is continuously evolving. To help the comparison of network development projects year-on-year, and in the interest of routine reporting, data is represented at a fixed point in time – the data freeze date.

The TDPNI summarises transmission projects applicable as at the data freeze date, 1 January 2018. Future TDPNIs will highlight the changes that have happened since the previous Plan.

10 Please see Appendix C for information on what qualifies a project to be of pan-European significance.
11 TYNDP 2016 can be found here: https://www.entsoe.eu/major-projects/ten-year-network-development-plan/ten%20year%20network%20development%20plan%202016/Pages/default.aspx
12 https://www.entsoe.eu/Documents/TYNDP%20documents/TYNDP%202016/rgips/Regional%20Investment%20Plan%202015%20-%20RG%20NS%20-%20Final.pdf

1.5. Planning Area Categorisation

Power flows on the transmission network are not contained within specific localities. Therefore, from a transmission planning viewpoint, it is more appropriate to represent planning areas that best reflect the conditions and power flows on the transmission network. For this purpose we refer to two planning areas in Northern Ireland:

- The North and West; and
- The South-East.

The regions and planning areas that best reflect the conditions and power flows on the transmission network are illustrated in Figure 1-1 below.

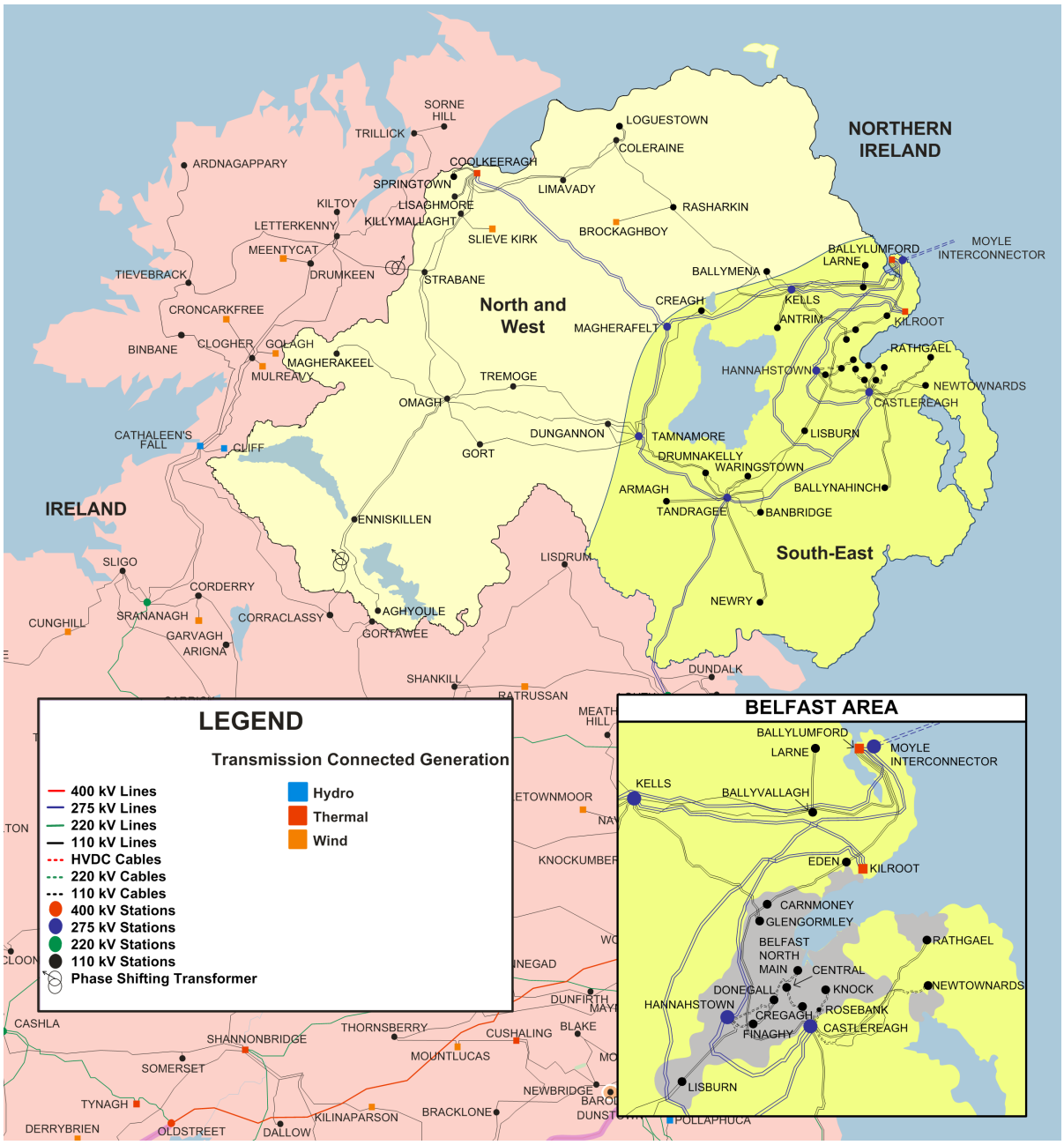


Figure 1-1 Illustration of the Northern Ireland planning areas

1.6. The TDPNI and Other SONI/EirGrid Publications

SONI and EirGrid are responsible for the publication of a number of statutory documents under their respective TSO licences. Two of these documents (the Generation Capacity Statement and the Ten Year Transmission Forecast Statement) are published on an all-island basis by both TSOs.

The other statutory documents published by both SONI and EirGrid are detailed below.

1.6.1. Generation Capacity Statement

The Generation Capacity Statement (GCS) is published annually by SONI and EirGrid. The GCS provides:

- A ten year forecast of electricity demand in Ireland and Northern Ireland;
- Contracted changes to conventional generation;
- Forecasted changes to renewable generation; and
- A ten-year forecast of the generation capacity required to meet demand.

The most recent version of the GCS is Generation Capacity Statement 2018-2027 and is available from the SONI website[13].

1.6.2. Ten Year Transmission Forecast Statement

The Ten Year Transmission Forecast Statement (TYTFS) is published annually by SONI and EirGrid. The TYTFS provides:

- Network models and data of the all-island transmission system;
- Forecast generation capacity and demand growth (taken from the GCS);
- Maximum and minimum fault levels at transmission system stations;
- Predicted transmission system power flows at different points in time; and
- Demand and generation opportunities on the transmission system.

The most recent version of the TYTFS is Ten Year Transmission Forecast Statement 2017 and is available from the SONI website[14].

1.6.3. Transmission Development Plan (Ireland)

The Transmission Development Plan (TDP) for Ireland is published annually by EirGrid. It is the equivalent document to the TDPNI for Ireland and is the plan for the development of the Irish transmission network and interconnection. It covers a ten year period. The TDP presents projects that are needed for the secure operation of the Irish transmission network.

The most recent version of the TDP (Ireland) is TDP 2017-2027 and is available from the EirGrid website[15].

13 http://www.soni.ltd.uk/media/documents/Generation_Capacity_Statement_2018.pdf
14 http://www.soni.ltd.uk/media/documents/TYTFS-2017-Final.pdf
15 http://www.eirgridgroup.com/site-files/library/EirGrid/TDP_2017_Final_for_Publication.pdf

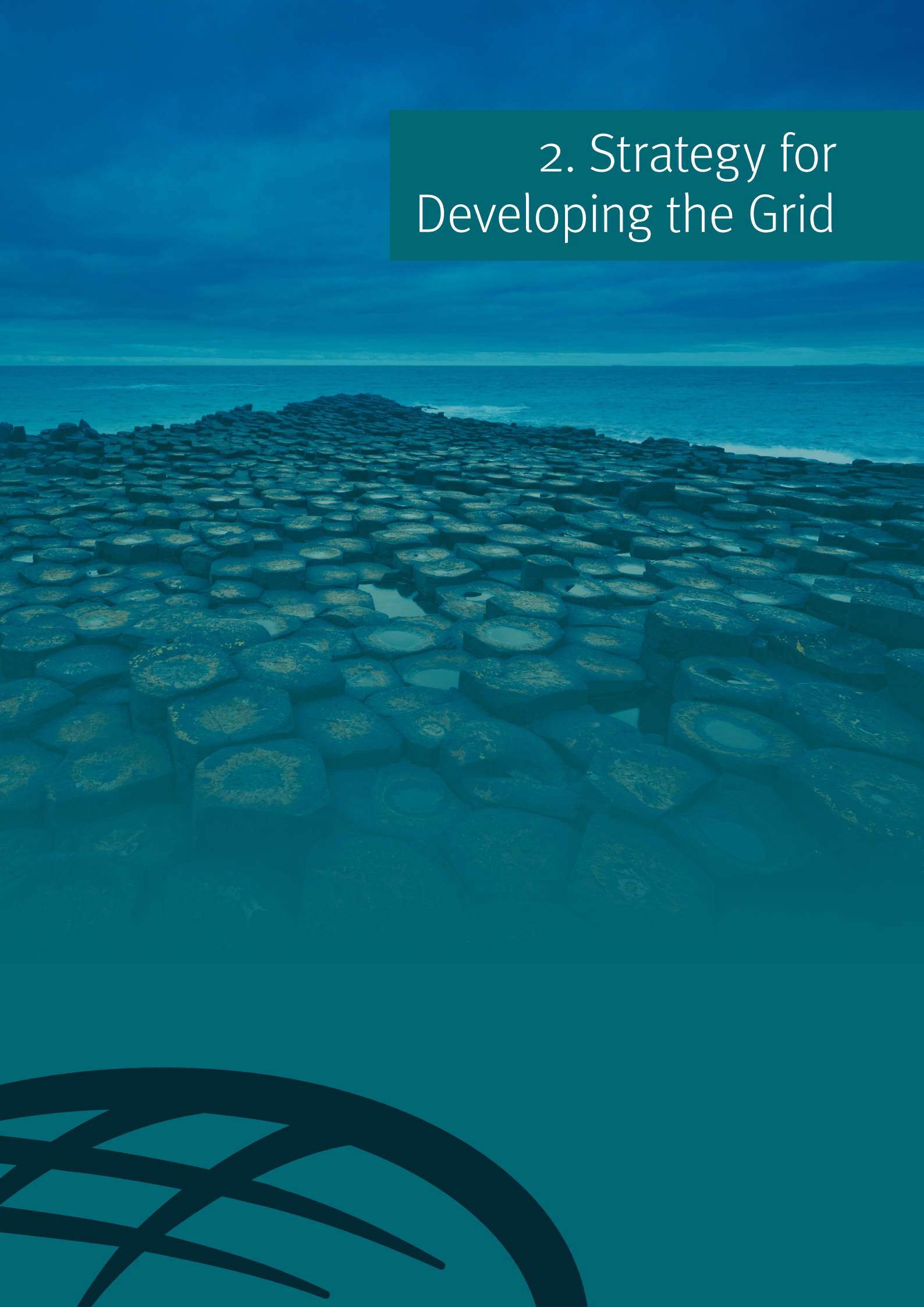
1.7. Changes Since the Freeze Date

Since the data freeze date of 1 January 2018, a number of project changes have emerged:

Table 1-1 Changes since data freeze date (1 January 2018)

Project	Change
Agivey 110/33 kV Cluster	ECD moved to Sep-2021
Coolkeeragh – Magherafelt 275 kV Uprate	ECD moved to Dec-2022
Curraghamulkin 110/33 kV Cluster	Connected Jul-2018
Omagh, Coleraine and Tamnamore Reactive Compensation	Cancelled (to be replaced by a project of a smaller scale)
Omagh Main – Omagh South Uprate	ECD moved to Aug-2022
Ballylumford-Castlereagh 110 kV Circuit Uprate	Scope changed, ECD now Dec-2021
Ballylumford Switchgear replacement	ECD moved to Dec-2023
Castlereagh inter-bus transformer 1 replacement	ECD moved to Dec-2020
Donegall Main (North) transformer replacement	ECD moved to Aug-2021
Kells 110/33 kV Cluster	ECD moved to Dec-2022
North-South 400 kV Interconnection Development	ECD moved to Dec-2023

2. Strategy for Developing the Grid



2. Strategy for Developing the Grid

As the TSO for Northern Ireland, we have a statutory duty to ensure the transmission network is able to support all reasonable demands for electricity. In addition, we are required to enter into agreement for connection with parties seeking to connect to the transmission network. This in turn supports economic development in Northern Ireland.

Changes to demand, generation merit order, or to interconnection with neighbouring transmission networks may alter the flow of electrical power throughout the Northern Ireland transmission network. 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, and that the cost of constraints is minimised.

The Northern Ireland electricity industry and its development take direction from a number of broad local[16] and European[17] strategic objectives. These objectives guide investment in the Northern Ireland transmission network and are summarised in the legislation[18] which, requires SONI to:

- ensure the development and maintenance of an efficient, co-ordinated and economical system of electricity transmission which has the long-term ability to meet reasonable demands for the transmission of electricity; and
- contribute to security of supply through adequate transmission capacity and system reliability; and
- facilitate competition in the supply and generation of electricity

To ensure these objectives are met we must provide on-going and timely reinforcement of the Northern Ireland transmission network.

In the development of the network reinforcements we are led by the following strategy statements:

- Inclusive consultation with local communities and landowners will inform how we plan the development the network;
- All practical technology options will be considered for network development; and
- The network will be optimised to minimise the requirement for new infrastructure to be built.

16 The Strategic Energy Framework can be found here:
https://www.economy-ni.gov.uk/sites/default/files/publications/deti/sef%202010.pdf
Note that the SEF expires in 2020 and there is currently nothing in place beyond this date.
17 http://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy
18 Article 12, The Electricity (Northern Ireland) Order 1992

3. General Approach to Developing the Grid

3. General Approach to Developing the Grid

3.1. Scenario Planning

As TSO, we are obliged to plan the development of a safe, secure, reliable, economical, efficient, and coordinated transmission network that is able to meet all reasonable demands for electricity, in accordance with the activities permitted by our licence.

We plan the development of the transmission network taking account of the long-term needs and the economics of various development options. The need for development is determined by assessing long-term future network performance against technical standards. These technical standards are embodied in the Transmission System Security and Planning Standards[19] (TSSPS), which are approved by the Utility Regulator. When it is established that expected changes across the network cannot be accommodated without violating the performance criteria outlined in the TSSPS, a range of issues are considered when selecting a transmission reinforcement strategy.

When assessing development options to address future potential network needs, we consider the impacts of each possible option on other potential development needs. Sometimes by making more effective use of the existing network, we can delay large investment or avoid the need for additional circuits. In some cases, a proposed project may meet more than one development requirement and prove more economic and have less impact on the environment than multiple projects. Where possible, we seek to find single development projects to meet multiple network requirements.

3.2. Planning Standards

To ensure transmission system reliability and security, predicted power flows of the network are compared with the requirements of the Transmission System Security and Planning Standards (TSSPS).

The TSSPS establishes a set of design criteria for the transmission system. This includes setting the minimum level of redundancy that should be incorporated into the design to deal with credible faults and outages. The standard includes checking for any circuits that would be overloaded or where voltages would fall below statutory levels.

SONI assesses the present and future transmission system against these standards and, when breaches are forecast, establishes plans to address those breaches. However in some circumstances it may be more appropriate to seek derogation in the particular case (such as economic reasons). This derogation would be directed by The Utility Regulator following consultation with SONI and materially affected electricity undertakings, including the TAO and the TSO of Ireland.

3.3. Roles and Responsibilities

There are three parties licensed to participate in the transmission of electricity in Northern Ireland. Northern Ireland Electricity Networks (NIE Networks) is responsible for the development and maintenance of the transmission system in accordance with the Transmission Interface Arrangements (TIA). SONI holds the Transmission System Operator license and is responsible for the operation and planning of the transmission system. Moyle Interconnector Limited also holds a transmission licence as the owner of the interconnector to Scotland.

19 http://www.soni.ltd.uk/media/Northern-Ireland-TSSPS-September-2015.pdf

The arrangements between NIE Networks and SONI are governed by the Transmission Interface Arrangements (TIA). The TIA arrangements include responsibilities regarding the preparation of draft asset replacement plans by NIE Networks and the system development plans prepared by SONI. The TIA allows for the ongoing development of an asset replacement and system development investment plan. SONI is responsible for ensuring that asset replacement and system development are integrated into an investment plan.

Some projects included in the investment plan will be well developed whereas others will be conceptual or indicative and therefore more likely to be changed from year to year. The plan is modified regularly as planning assumptions and scenarios are changed.

The investment plan is then circulated between SONI and NIE Networks before becoming a draft Transmission Development Plan Northern Ireland (TDPNI) and is subject to a Strategic Environmental Assessment (SEA). After the SEA process is complete, the plan is finalised as the annual TDPNI. TDPNI is subject to public consultation[20] by SONI and consultation and approval by the Utility Regulator.

3.4. SONI's Grid Development Process

The planning of grid development projects by SONI is done under a three part process (See Fig. 3-1). Asset replacement projects are progressed separately by NIE Networks. The process includes for stakeholder and public participation in the development of projects.

Part 1: Planning: Identifying the optimum solution and what area may be affected

When a potential breach of the standards is identified, SONI will study the potential breach in detail including any other related issues. Consistent with good practice, as set out in the TSSPS, SONI may seek ways that would allow the potential breach to be managed operationally and put into place any changes to operational practice as may be required. However, in certain cases where that operational mitigation would lead to unacceptable cost or risk for customers, SONI will prepare plans to develop the transmission system.

When we identify the need to develop a transmission project we then have to consider how it is best delivered. This means looking at a number of solutions and narrowing these down based on their technical viability, deliverability, cost, potential impact on the environment and on those living and working in the general area where the project may be located.

The steps in planning are to first identify a long list of options across a range of different technologies. Such options will include the need for any new substations or overhead line and underground cables. In some cases where appropriate the use of flexible AC transmission systems (FACTS) and HVDC will also be considered depending on the need identified. The long list of options will be assessed against multi-criteria analysis including at a high level, environmental and cost benefit assessments to identify a shorter list of potential options.

SONI will then consider the short list in greater detail and in some cases engage expert consultants to assist. These studies may include sensitivity studies to assess the performance of the options against different generation and demand assumptions. The process culminates with a recommendation for a preferred solution and tiering to establish the level of stakeholder engagement and consultation required.

At this stage SONI will engage with the Utility Regulator in regard to cost recovery.

Depending on the nature of the project, SONI will seek to engage with key stakeholders before progressing the recommendation further. SONI will consider the stakeholder engagement findings and amend any plans accordingly before progressing further. It will also publicise the results of the stakeholder engagement process and its decision.

20 In parallel with the SEA process

In parallel with the stakeholder engagement phase, and recognizing that the Utility Regulator is also a key stakeholder, SONI will seek approval for cost recovery through The Utility Regulator and progress the project to the outline design stage. This stage will identify any study areas for identification of new substations or corridors for overhead line and/or cable routes.

Part 2: Outline Design: Identifying where the project will be built

SONI manages the pre-construction outline design of transmission projects once the need has been identified (part 1). This also includes consultation with the TAO, NIE Networks. The projects can involve the development of new substations, overhead lines or cable circuits operating at 110 kV and above.

SONI is responsible for preparing documentation required to apply for planning consent for the development of the projects - this entails developing the design to the level required for obtaining planning consent including any necessary environmental reports or assessments, and consultations with stakeholders and landowners to obtain the right to gain access and install transmission equipment on their lands.

Part 3: Consents: Planning application to project handover to NIE Networks

SONI submits planning applications with the relevant planning authority. SONI is also responsible for submitting any other consent applications that may be required, e.g. Marine License with the relevant consenting authority. The planning authority will make a legally binding decision on the project. It may grant full planning permission, grant permission on the basis that we make changes, or refuse permission. SONI is also responsible for the acquisition of any wayleaves, easements, access rights, land options, leases and any other legal rights required for the installation of the new infrastructure.

Following receipt of planning and landowner consents the project is handed over to NIE Networks for detail design. This includes a review of the SONI functional specification (outline design and consents) and preparation of a design specification. Separate preconstruction work for NIE Networks will include tendering and procurement. Following receipt and review of the design specification from NIE Networks, SONI issues a Transmission Project Instruction and enters into a Project Agreement with NIE Networks. NIE Networks then deliver the project.

Figure 3-1: SONI's Grid Development Process

3.5 Public Planning and Environmental Considerations

Planning and environmental considerations integrated into the three part process for grid development. This section details SONIs public planning and environmental responsibilities and how these issues are considered in grid development (See also Section 4).

3.5.1. Public Planning Considerations

SONI is supported by experienced professional planning and ecological consultants. These consultants assist in the development of transmission infrastructure projects, and in other aspects of network development, from a planning and environmental perspective.

3.5.2. Environmental Considerations

Environmental considerations are integrated into the functioning of grid development at both the strategic (i.e. Plan level) and at the project level.

The requirements for Environmental Impact Assessment (EIA- for projects) and Appropriate Assessment (AA) (see below) are transposed into Northern Ireland law in Statutory Rules of Northern Ireland **2017 No. 83**, The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017 and Conservation (Natural Habitats) Regulations 1995 (as amended).

Where necessary, applications for statutory consent are accompanied by an Environmental Statement (ES) or an Environmental Report (ER) the need for a statutory ES is informed by way of an EIA Screening report.

Similarly, screening for the need for AA for impacts on sites specifically designated for nature conservation is routinely undertaken for all our grid projects.

3.5.3. Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is a systematic process of predicting and evaluating the environmental effects of a proposed plan or programme, in order to ensure that these effects are adequately addressed as early as possible. A SEA is prepared in respect of this transmission development plan. The purpose of the SEA is to ensure that environmental considerations are integrated into the development plan and that to anticipate and avoid, where possible, potential adverse environmental impacts arising from the TDP.

It is envisaged that the SEA will have a five year lifespan, with review and drafting processes for the next SEA beginning in the final year. However, as the preparation of a TDP is an annual rolling process, each TDP prepared will be accompanied by an Environmental Appraisal Report (EAR) which will assess the plan against the provisions of the adopted SEA statement. This process will ensure consistency of approach in environmental issues of each TDP across the lifespan of the SEA.

A summary of the environmental assessment and mitigation measures of this SEA is presented in Section 8 of this report. The relationship between the TDP, SEA and EAR is set out graphically in Figure 3-2 below.

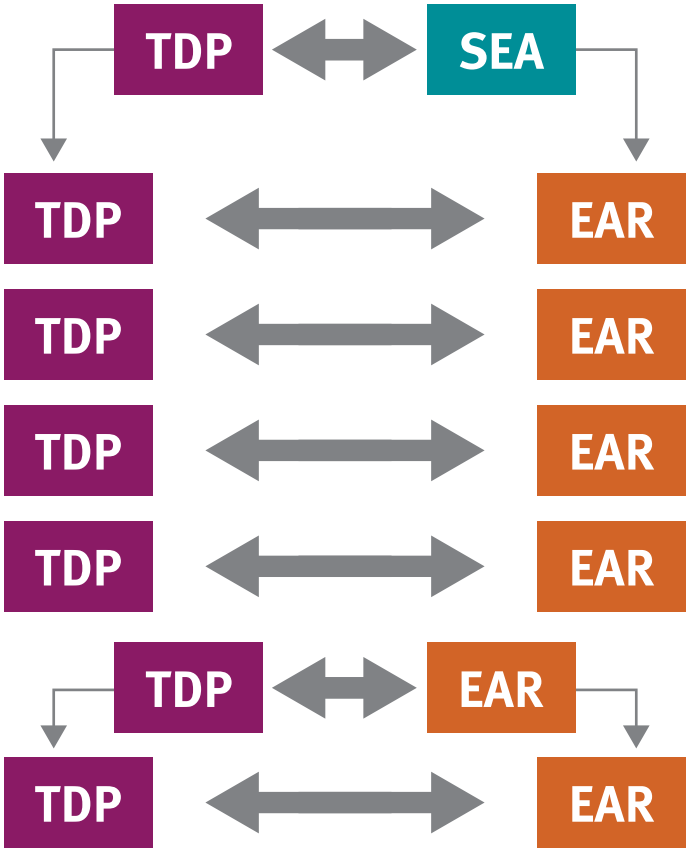


Figure 3-2 Structure for TDP, SEA, and associated EARs

Environmental Impact Assessment (EIA)

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, through to preparation of an Environmental Statement ES. Projects where an ES is mandatory are identified in Annex I of the EIA Directive. This includes transmission of electricity by overhead lines where:

- The voltage is 220 kV or more; and
- The cable length is more than 15 km.

An ES may be required for sub-threshold development where likely significant impacts on the environment are identified by the relevant planning authority.

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

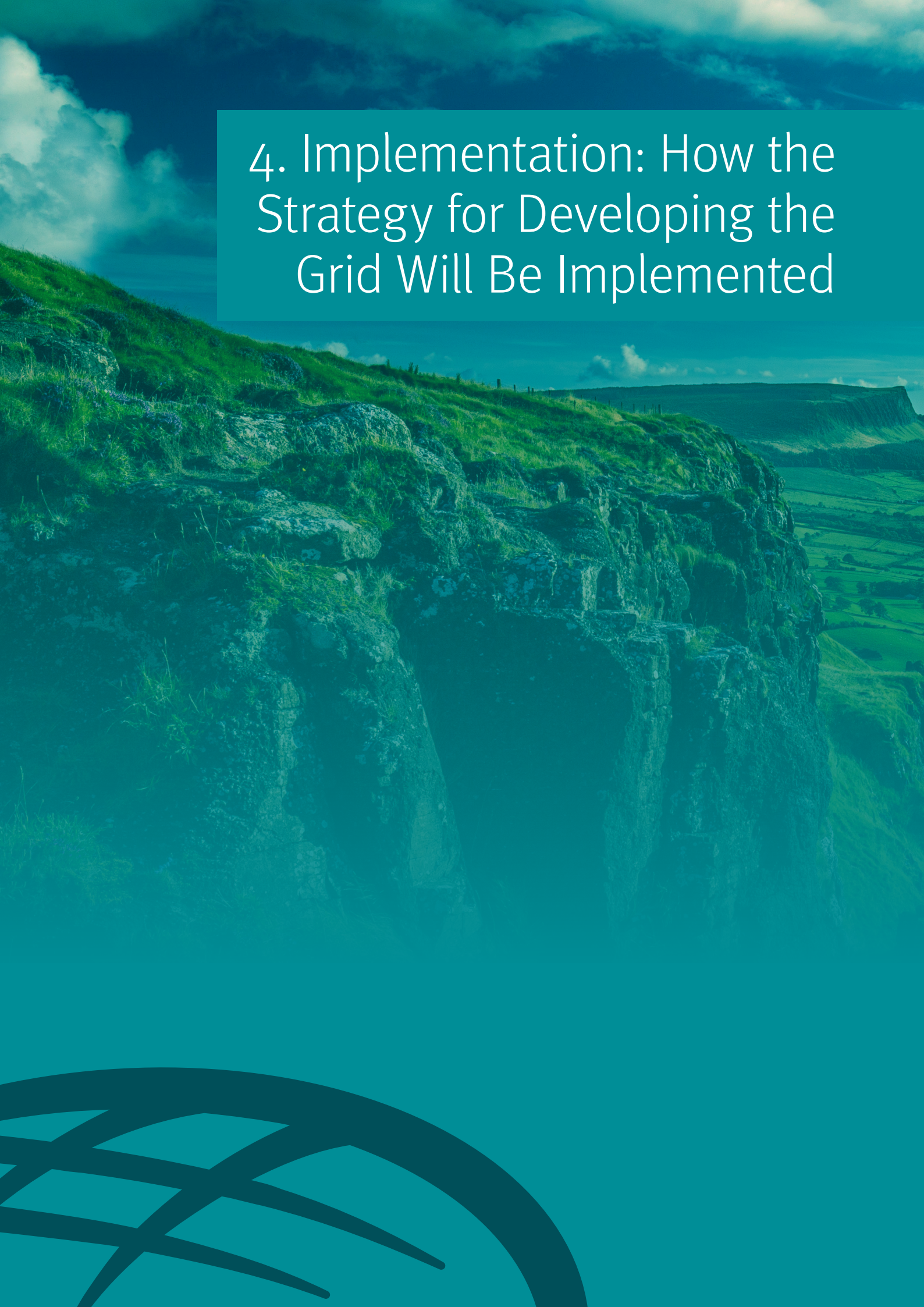
Appropriate Assessment (AA)

In accordance with the provisions of the EU Habitats Directive (92/43/EEC), any plan or project not directly connected to a Natura 2000 site (Special Area of Conservation (SAC) or Special Protection Area (SPA)), that is likely to have a significant effect on the site is subject to Appropriate Assessment (AA) of its implications on the site.

The Habitats Directive is implemented via the Conservation (Natural Habitats) Regulations 1995 (as amended) in Northern Ireland.

The Appropriate Assessment process in Northern Ireland is generally referred to as a Habitats Regulations Assessment (HRA). A Screening for Appropriate Assessment is referred to as a Test of Likely Significance (ToLS), with the resultant report being referred to as a ToLS Report.

In Northern Ireland, the HRA process is undertaken by Shared Environmental Services (SES), a centralised body comprising specialist staff that provide expert environmental advice and support to Councils. SONI as project proponent will usually submit a ToLS Report or a HRA Report as part of a bundle of environmental information when seeking planning permission.



4. Implementation: How the Strategy for Developing the Grid Will Be Implemented

4. Implementation: How the Strategy for Developing the Grid Will Be Implemented

In this chapter we set out how our strategy for developing the grid will be implemented. SONI is responsible for the inclusion of asset replacement projects in the investment plan and TDPNI but the delivery of these asset replacement projects including planning, consents and all detailed assessments are the responsibility of the TAO, NIE Networks.

SONI's strategy for planning the development of the grid is discussed under the following headings:

- Our approach to the environment;
- Our approach to technology;
- Our approach to project development;
- Our approach to planning and consenting of projects; and
- Our approach to consultation and engagement.

These topics build upon the previous chapter which detailed our general approach to developing the grid. Policies and objectives are set out to assist in delivery of the grid strategy objectives in a sustainable manner.

4.1. Our Approach to the Environment

4.1.1. Introduction

SONI has a legal responsibility to comply with planning law, including all relevant environmental legislation. In practice, this means that environmental issues inform the decision making process when it comes to developing the grid in Northern Ireland.

This TDPNI is subject to Strategic Environmental Assessment as outlined in previous sections. (See Chapter 8 for a detailed description of the process.)

Planning and environmental considerations are embedded into every grid development project that SONI undertakes in order to ensure that environmental issues are at the forefront of decision-making. Early involvement in projects allows potential environmental issues to be identified and avoided or managed in the course of project development.

4.1.2. Policies and Objectives

The following environmental policies (ENVP) have been compiled to ensure that SONI has due regard for existing environmental protection legislation and environmental best practice when developing projects.

Environmental objectives (ENVO) have also been developed for a number of environmental topics.

4.1.3. General

It is the policy of SONI:

ENVP1: To promote best environmental practice in the design and appraisal of transmission development projects.

4.1.4. Biodiversity

It is the policy of SONI:

ENVP2: To exercise its functions as a TSO in line with the Wildlife and Natural Environment Act (Northern Ireland) 2011 and the Northern Ireland Biodiversity Strategy (2015) to further the conservation of biodiversity so far as is consistent with the proper exercise of those functions.

ENVP3: To avoid adverse effects on sites designated for nature conservation including, Special Conservation Areas, Special Protection Areas, RAMSAR Sites, Areas of Special Scientific Interest and National Nature Reserves.

ENVP4: To protect NI priority species and habitats and other species protected under legislation in the development of any transmission infrastructure and to preserve key ecological linkage features

It is the objective of SONI:

ENVO1: To prepare and utilise industry specific Ecology Guidelines for the development of Transmission projects. This will ensure a standard approach to ecological impact assessment for transmission projects.

4.1.5. Climate Change

It is the policy of SONI:

ENVP5: To integrate measures related to climate change into grid development, by way of both effective mitigation and adaptation responses, in accordance with available guidance and best practice.

4.1.6. Noise

It is the policy of SONI:

ENVP6: To employ methods on transmission infrastructure which minimise noise emissions in line with best industry practice.

It is the objective of SONI:

ENVO2: To give careful consideration to the siting of transmission infrastructure so as to ensure that noise-sensitive receptors are protected from potential noise emissions.

ENVO3: To seek to preserve and maintain noise quality in accordance with good practice and relevant legislation.

4.1.7. Landscape

It is the policy of SONI:

ENVP7: To have regard to the Northern Ireland Landscape Character Assessment 2000, and the Northern Ireland Seascape Character Assessment in the design and appraisal of its transmission development projects.

It is the objective of SONI:

ENVO4: To protect landscapes through the sustainable planning and design of transmission infrastructure and to have regard to important landscape designations including AONBs and the World Heritage Site.

4.1.8. Cultural Heritage

It is the policy of SONI:

ENVP8: To take reasonable measures to ensure that the special interest of protected structures, including their curtilages and settings, are protected when considering site or route options for the planning of transmission infrastructure.

ENVP9: To protect archaeological material when planning transmission infrastructure, by avoidance or by best practice mitigation measures.

4.1.9. Water

It is the policy of SONI:

ENVP10: That there is no increase in flood risk as a result of transmission development, and to ensure any flood risk to the development is appropriately managed.

ENVP11: To promote the use of sustainable urban drainage systems in any new developments where it is appropriate.

ENVP12: To have regard to Planning Policy Statements and Supplementary Planning Guidance: PPS 15 Planning and Flood Risk Development Control Considerations in the preparation of grid development strategies and plans.

It is the objective of SONI:

ENVO5: That all grid development proposals, and in particular, transmission substation developments, shall carry out, to an appropriate level of detail, a site-specific Flood Risk Assessment that shall demonstrate compliance with all current Guidelines, standards and best practice. The Flood Risk Assessment shall pay particular emphasis to residual flood risks, site-specific mitigation measures, flood-resilient design and construction, and any necessary management measures.

4.1.10. Air Quality

It is the policy of SONI:

ENVP13: To preserve and maintain air quality in accordance with good practice and relevant legislation in the proposed construction of its transmission projects.

ENVP14: To ensure appropriate dust suppression during construction works.

4.1.11. Tourism

It is the policy of SONI:

ENVP15: To consider the potential impact upon tourism in the planning of transmission projects.

It is the objective of SONI:

ENVO6: To identify the nature of tourism in a project area; to consider the cumulative/in combination impact on tourism of a project and to consider short term and long term impacts of grid development projects on tourism as appropriate.

4.1.12. Conclusion

All of the environmental policies and objectives detailed above are assessed against Strategic Environmental Objectives. This is provided in the SEA Environmental Report.

4.2. Our Approach to Technology

4.2.1. Introduction

As outlined in Chapter 2 of this document, the SONI Strategy sets out three strategy statements, two of which directly relate to technology in transmission infrastructure development:

- We will consider all practical technology options; and
- We will optimise the existing grid to minimise the need for new infrastructure.

The use of new technologies can bring a number of advantages, including enhanced operational performance, improved system reliability, shortened construction times and reduced impact on the environment. All of these have the potential to reduce system costs.

We have developed a world-leading initiative "*Delivering a Secure, Sustainable Electricity System*" (DS3 programme). The aim of the programme is to meet the challenges of operating the electricity system in a secure manner while achieving the 2020 renewable electricity targets. The programme is designed to ensure that we can securely operate the power system with increasing amounts of variable renewable generation over the coming years. We continued to examine the performance of underground cables and their technical impact on the network, noting their advantage in terms of the potential for reduced visual impact compared with overhead lines. However, this must be balanced against costs as well as the potential impacts on sensitive environmental and ecological areas from what can be significant civil engineering works. We will continue to assess technological developments in this area to ensure the full capability of this technology is available for use on the NI grid.

The transmission grid in Northern Ireland, similar to other European and international grids, uses high voltage alternating current (HVAC). Where power is to be transferred over long distances it may be cost effective and technically possible to do so using high voltage direct current (HVDC). Over the last number of years we have continued to examine the performance of HVDC and its technical impact on the network.

Demand Side Management and Response has been used in Northern Ireland for many years, primarily at industrial level. It works by customers reducing their electricity consumption on request. This helps us to operate the grid more securely.

We are also investigating the use of modular power flow control technologies that may enable us to make better use of the existing transmission network.

In most cases overhead line technology remains the most reliable and least expensive option for developing new circuits. We are actively considering new structure designs in order to minimise adverse landscape and visual impacts. The goal is to use less visually intrusive pylons, particularly in sensitive areas.

Over the last number of years, we have learned that the level of uncertainty over the future usage of the grid is increasing. To cater for this, we are changing how we plan the grid. Our new approach involves developing a range of energy scenarios (possible situations or events that impact on energy).

In the process of developing the range of energy scenarios, key policy makers, industry experts, and stakeholders are asked how they see the energy landscape changing over time. The final scenarios will be published and reviewed every two years. We will use these scenarios throughout our planning analysis to assess the future needs of the electricity system, and to test the practicality and merits of different options for grid development.

4.2.2. Policies and Objectives

It is the policy of SONI:

TP1: To promote and facilitate the sustainable development of a high-quality transmission grid to serve the existing and future needs of NI

TP2: To consider all practical technology options in the development of projects, including maximising use of existing transmission grid.

4.3. Our Approach to Project Development

4.3.1. Introduction

SONI undertakes a number of grid development projects as part of its statutory role in maintaining, planning the development of and operating the transmission grid.

A focus in the development of our projects is on matters of proper planning and sustainable development. This requires a careful balancing of the technical need and solutions for a project with appropriate and adequate opportunities for public participation in the project development process.

SONI has established a new approach to developing grid projects in Northern Ireland. This is a three part process, from the identification of a need to develop the grid to the eventual hand over to NIE Networks for construction and operation of a project by SONI. This approach integrates the technical development of a project with increased and enhanced engagement with stakeholders, communities and landowners. We are now progressing with a managed transition to full implementation of this approach across our grid development projects.

4.3.2. Policies and Objectives

The following policies and objectives have been adopted by SONI in order to ensure an appropriate and sustainable approach to the development of our transmission projects.

It is the policy of SONI:

PDP1: To develop projects in accordance with SONI's Process for Developing the Grid in Northern Ireland.

PDP2: To promote sustainable grid development by balancing complex and/or competing technical, economic, environmental, social and deliverability goals and priorities in decision-making.

PDP3: To ensure that grid development is carried out in an economically efficient manner, and seek derogation from the Utility Regulator when this is not possible.

4.4. Our Approach to Planning and Consenting of Projects

4.4.1. Introduction

The TIA requires SONI to develop the design of projects to the point where consents are obtained. Our grid developments occur within a planning and environmental context, where the focus is on matters of proper planning and sustainable development, and where public participation is of key importance, as is the environmental and ecological impact of our projects, along with providing an economic solution for end-users of the network.

4.4.2. Policies and Objectives

The following policies and objectives have been adopted by SONI in order to ensure an appropriate and sustainable approach to the planning and consenting of our transmission projects.

It is the policy of SONI:

PCP1: To have regard to relevant legislation and guidelines in respect of planning and consenting of transmission infrastructure development projects, and make provision for any policies for the provision of transmission infrastructure set out in these documents.

PCP2: To have regard to precedent arising from decisions of the Competent Authorities, and of the High Court in Judicial Review of decisions, relating to the planning and consenting of transmission infrastructure development projects.

PCP3: To promote sustainable grid development by balancing complex and/or competing technical, economic and environmental goals and priorities in decision-making.

4.5. Our Approach to Consultation and Engagement

4.5.1. Policies and Objectives

The following policies and objectives have been adopted by SONI in order to ensure an appropriate and sustainable approach to consultation and engagement in the development of our transmission projects.

It is the policy of SONI:

CEP1: To consult and engage with statutory and non-statutory stakeholders, including communities, landowners and the general public, at the earliest appropriate stage of a project's development.

CEP2: To recognise and develop the essential role that communities, landowners and other stakeholders play in transmission infrastructure development, and to engage with different stakeholders as appropriate during the life of a grid development project.

CEP3: To ensure consultation and engagement feedback is appropriately considered in decision making.

5. Investment Needs

5. Investment Needs

SONI is central to maintaining an economic, efficient and coordinated electricity transmission network in Northern Ireland. Reliable and high-quality electricity infrastructure powers the NI economy and supports investment in the region[21].

The Strategic Energy Framework (SEF)[22] released in 2010 sets out Northern Ireland's energy future. Investment in the transmission system is necessary to enable Northern Ireland's transition to a low carbon energy future. In this regard, the TDP is developed to support local government objectives and enable this energy transition. The SEF expires in 2020 and there is currently nothing in place beyond this date, however it is assumed that decarbonisation targets will continue to increase beyond 2020.

By facilitating new connections onto the network, reviewing maintenance plans and identifying the future electrical needs of Northern Ireland, SONI can direct and plan investment in the transmission system. This investment will, in turn, secure the electricity supply into the future.

5.1. Policy Drivers of Transmission Network Investment

In order to achieve the identified strategic objectives laid out by national and EU policies, we must continue to produce investment plans and progress individual projects to develop the electricity transmission network. Specific drivers of investment in transmission network infrastructure are identified, and described in the following sections.

5.1.1. Security of Transmission Network

Security of supply generally addresses two separate issues:

- The availability of primary energy resources and ability to generate sufficient electricity to meet demand (which is the responsibility of the UR and the Department for the Economy); 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, as set out in the TSSPS.

The TDP is aimed at addressing the security of supply issues that relate to the transmission network.

Therefore, for this document, security of supply means the ability of the transmission network to reliably and securely transport electrical energy from where it is generated to the demand centres where it is consumed.

5.1.2. Market Integration

With increased market integration, electrical power can flow from areas where it is cheap to produce to areas where it is more highly valued. Therefore, the aim is to make the EU electricity markets more integrated.

The integration of RES and other forms of low carbon generation significantly increases the power exchange opportunities across the region. Differences in national targets combined with varying availabilities of renewable sources across Europe will lead to greater penetration of RES in certain areas compared to others. Therefore, there is a need to reinforce the transmission networks between and within EU countries to obtain these economic benefits.

21 Grant Thornton: "Powering Northern Ireland A report exploring SONI's role in the economy", October 2016. Available here: http://www.grantthorntonni.com/globalassets/1.-member-firms/ireland/insights/publications/powering-northern-ireland_grant-thornton.pdf
22 https://www.economy-ni.gov.uk/sites/default/files/publications/deti/sef%202010.pdf
Note that the SEF expires in 2020 and there is currently nothing in place beyond this date.

5.1.3. Renewable Energy Sources Integration

Developing renewable energy is an integral part of Northern Ireland's sustainable energy objectives and climate change strategy. In comparison to fossil fuels, RES has lower or no net emissions when compared to fossil fuels. RES contribute to 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 volatile energy costs RES can also contribute to cost competitiveness by reducing dependence on imported fossil fuels. At the moment windfarms are the main sources of renewable electricity generation in Northern Ireland. However, as Europe moves to further decarbonise its energy system, it is expected that additional forms of renewable energy will be further developed e.g. solar, biomass, wave and tidal.

In order to fulfil both European and local renewable targets[23], many RES-related projects are expected to be initiated throughout the period of this TDP. Many of these projects are located in rural areas where the transmission network is less developed. This places pressure on the electricity transmission network in these rural areas. Significant challenges will arise in extending and reinforcing the network to connect new RES.

5.2. Technical Drivers for Transmission Network Investment

Technical drivers of transmission network investment include changes in demand, generation and interconnection, inter-regional power flows and changes in asset conditions.

5.2.1. Demand, Generation and Interconnection

Changes in Demand and Generation

Demand growth and the connection of new demand can give rise to higher power flows which may trigger the need to reinforce the network as a result. 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.

Our All-Island Generation Capacity Statement 2018 (GCS)[24], available here[25], details the forecast of electricity demand for the years 2018 to 2027. The peak demand in Table 4-1 corresponds to the forecast median transmission system peak demand published in GCS 2018.

Table 4-1 Forecast Demand and Generation growth over the period 2017 to 2026[26]

Year	Peak Demand (GW)	Generation Capacity (GW)
2018	1.76	3.66
2019	1.77	3.66
2020	1.77	3.66
2021	1.78	3.76
2022	1.80	3.76
2023	1.82	3.76
2024	1.82	3.76
2025	1.84	3.25
2026	1.84	3.25
2027	1.84	3.25

23 Northern Ireland currently has a non-binding target of 40% electricity consumption to be met by renewable sources by 2020. SONI expects this to be reviewed in due course.
24 It is important to note that the information in the GCS 2018 is based on the best information available at the freeze date, October 2017.
25 http://www.soni.ltd.uk/media/documents/Generation_Capacity_Statement_2018.pdf
26 This forecast is based on information presented in GCS 2018 and TYTFS 2017. The Moyle interconnector is not included in the figures above.

Our All-Island Ten Year Transmission Forecast Statement 2017 (TYTFS)[27], available here[28], includes information on how the GCS demand forecast relates to each individual demand centre node over the period covered by this TDP.

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.

The addition of new generation capacity requires network development to connect the new generator to the network. This provides a path for electric power flow between the new generator and the transmission network. This is known as the shallow connection. The new generation capacity will inevitably alter the power flows across the network, which has the potential to create overload problems deep into the network. To resolve these overloads we need further reinforcements (known as deep reinforcements) to allow full network access.

The connection of large generators, or groups of generators, combined with the increasingly meshed nature of the transmission network results in lower network impedance and consequently increased short circuit levels. This is a safety issue, as under fault conditions such high short circuit levels may cause catastrophic failure of high voltage equipment. We monitor fault levels on the network and take measures to prevent such conditions occurring. The areas where the network is close to the fault rating of installed equipment are highlighted on the map in Figure 4-2.

Table 4-1 highlights the level of existing generation and projected levels of generation expected to connect over the period of this TDP, as detailed in the TYTFS 2017. It is important to note that this figure does not include additional generation that is in the applications queue, but is not contracted as of the freeze date of January 2018.

The projected increased levels of generation are accommodated by the reinforcements included in this TDP. This includes the identified future potential projects discussed in Chapter 6.

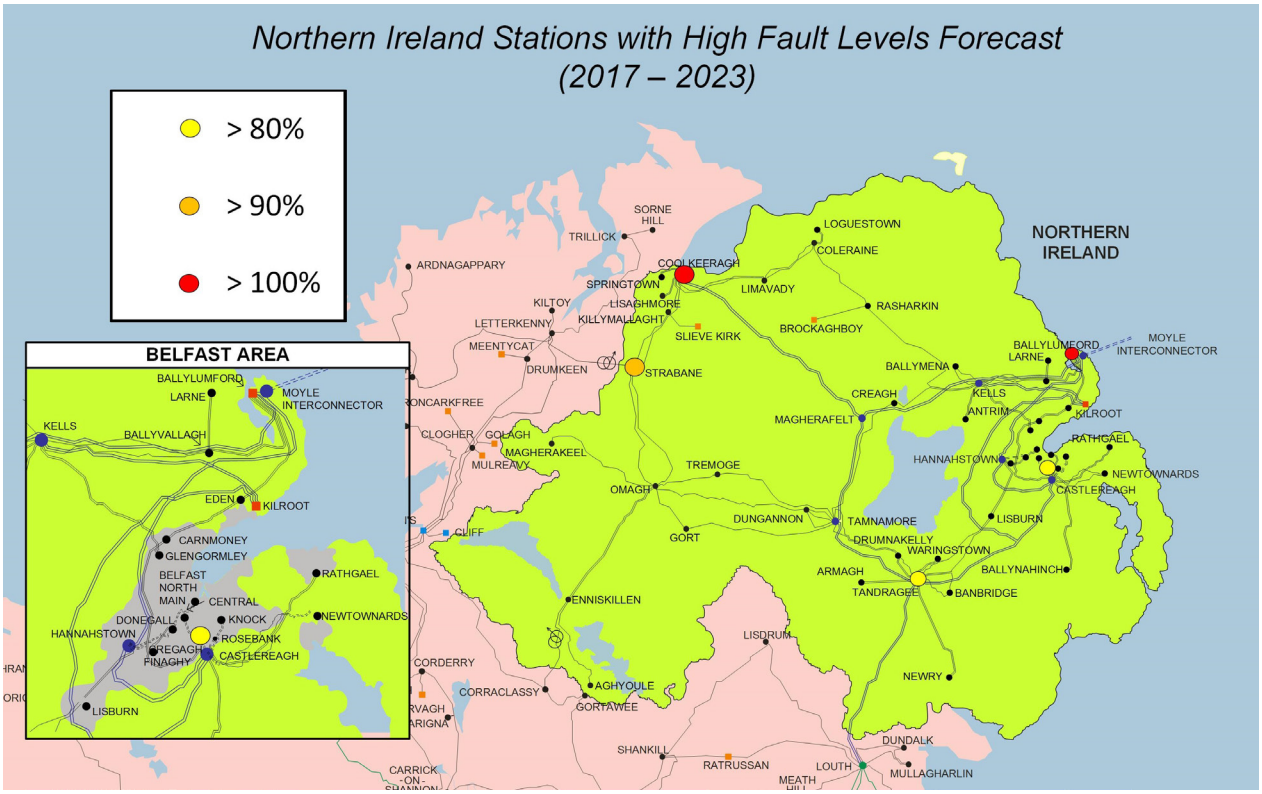


Figure 4-2 Stations with forecast high fault levels, 2017 – 2023 (from TYTFS 2017)

27 It is important to note that the information in the TYTFS 2017 is based on the best information available at the freeze date, July 2017.
28 http://www.soni.ltd.uk/media/documents/TYTFS-2017-Final.pdf

Changes in Northern Ireland's Interconnection

EU Policy recognises the economic and technical benefits associated with increased interconnection and therefore seeks to promote interconnection between European transmission systems. Increased interconnection between transmission networks results in a larger energy market. With increased market integration there is greater competition and the potential for prices to be reduced. With increased interconnection there is also access to a broader generation base, which enhances the networks' security of supply. This can potentially defer the need for additional generation to be constructed to meet security of supply standards or requirements.

The planned second North South Interconnector between Northern Ireland and Ireland is addressed in this TDP.

5.2.2. Changes in Inter-Regional Power Flows

The following factors have the potential to significantly change the flow of electrical power throughout the transmission network. They can drive the need for network reinforcements over the next ten years and beyond:

- Changes in demand;
- Further integration with neighbouring countries; and
- Integration of significant levels of new generation (both conventional and renewable).

There is now a growing need to accommodate a much broader range of plausible, credible flow patterns across the network. This is due to the extent of the likely changes that are envisaged for Northern Ireland, particularly in respect of RES integration. To cater for a broader range of flow patterns, greater transmission network flexibility is required.

5.2.3. Changes in Asset Condition

Transmission network assets have a finite lifespan. The useful life of transmission assets are impacted by a number of factors. These include:

- The age of the asset;
- Technology type and its propensity for obsolescence;
- Maintenance adequacy and effectiveness;
- Environmental conditions; and
- Utilisation

In order to ensure that security of supply is not compromised, routine condition assessments are carried out by the TAO. These assess the condition of the assets and estimate remaining useful life.

Typically, where asset condition is poor and they continue to be required, assets are:

- Refurbished;
- Replaced on a like-for-like basis; or
- Replaced with higher rated equipment to cater for future needs.

6. Planned Network Developments

6. Planned Network Developments

6.1. Overview of the Plan

This chapter summarises the network development projects that are a result of the transmission network development planning process (outlined in Section 2.4). Projects are described in greater detail in Chapter 6 and Appendix B.

The TDP includes a total of 47 projects that are currently in progress. These projects are categorised as either New Build; Uprate/Modify; Refurbish/Replace related projects or Other.

New Build projects: are projects that involve the construction of new stations or new circuits. This category also includes projects that involve the installation of new equipment in existing stations.

An example of a new build project is the installation of new transformers or new reactive support devices within existing stations.

Uprate/Modify projects: are projects that involve the uprating of existing assets. An example of an uprate project is changing equipment to increase the capacity rating of circuits or busbars.

This category also includes projects that involve the modification of existing assets.

An example of a modification project is the installation of new couplers or new bays in existing stations. Reconfiguration of existing stations is also included in this category.

Refurbish/Replace projects: are projects that involve the refurbishment of existing stations or existing circuits. This category also includes projects that involve the replacement of existing assets. For example the replacement of stations at or close to the end of their useful life or replacement and upgrading of protection in existing stations.

Other: are projects that do not fall naturally into any of the three categories above.

Table 5-1 below summarises the active 47 projects into their respective categories.

Table 5-1 Summary of Projects by Category

Project Category	No. of Projects
New Build	18
Uprate/Modify	13
Refurbish/Replace	15
Other	0
Total	47

6.2. Summary of Stage of Projects

Table 5-2 below summarises the number of projects in each phase of network development[29].

Table 5-2 No. of Projects in each stage of development

No. of Projects in Each Stage					
Part 1 Planning	**Part 2 Outline Design**	**Part 3 Consents**	**Asset Replacement**	**Under Construction**	**Total**
18	11	1	15	2	47

Figure 5-1 illustrates the location of the larger network development projects in parts 1-3, excluding the NW of NI Reinforcement, which is detailed in Figure 5-2. Figure 5-3 shows NIE Networks asset replacement projects.

For those projects in the early stages of the planning process, indicative corridors are shown on the map as a specific solution or line route has not yet been decided on. A full list of projects and their corresponding stage of development is given in Appendix B.

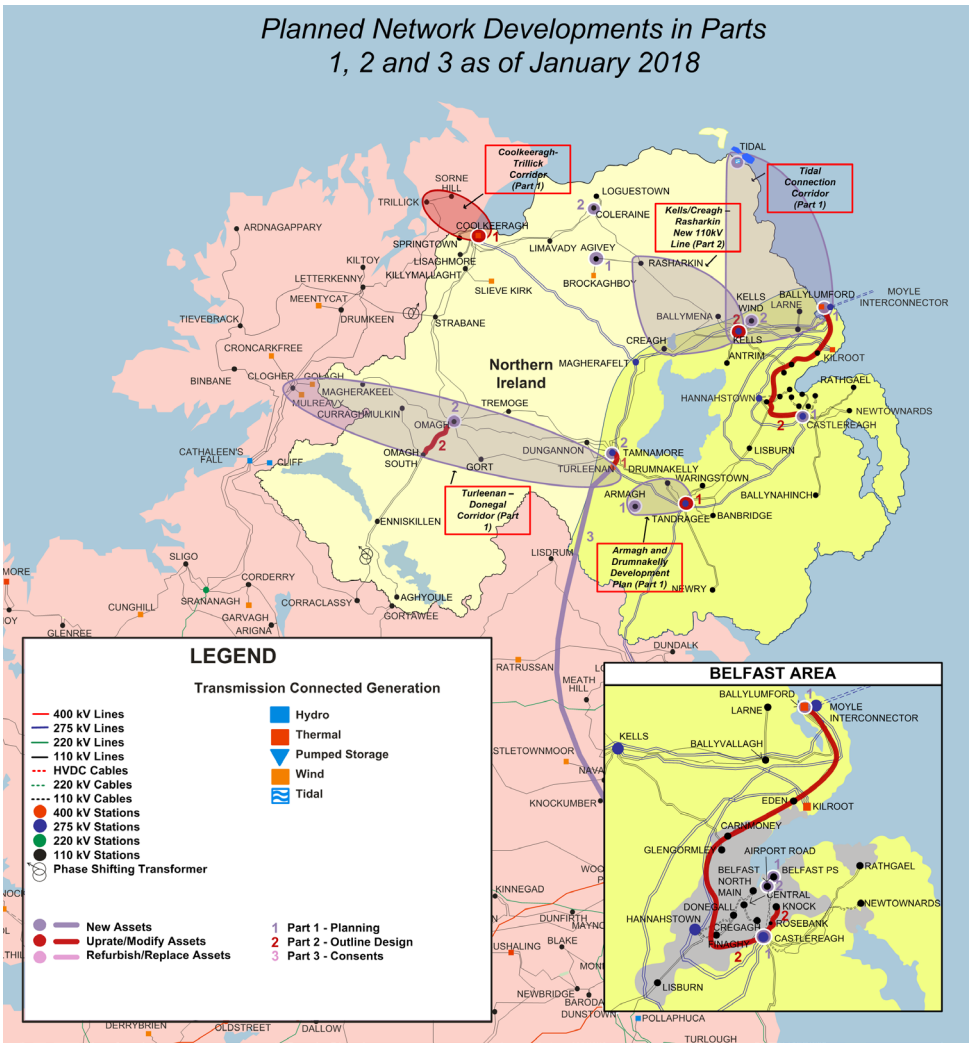


Figure 5-1 Planned Network Developments in Parts 1, 2 and 3 (not including NW of NI Reinforcement)

29 The process of network development is described in section 2. Further information on the stage of the project is available in Appendix A

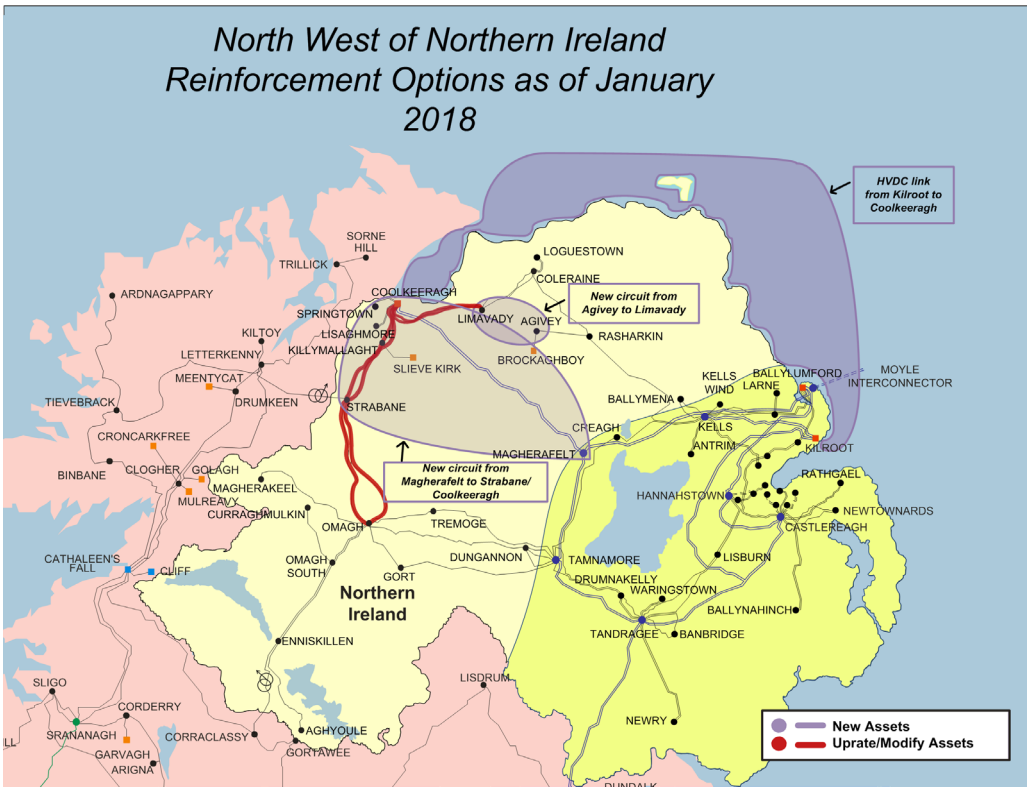


Figure 5-2 North West of NI reinforcement – potential options

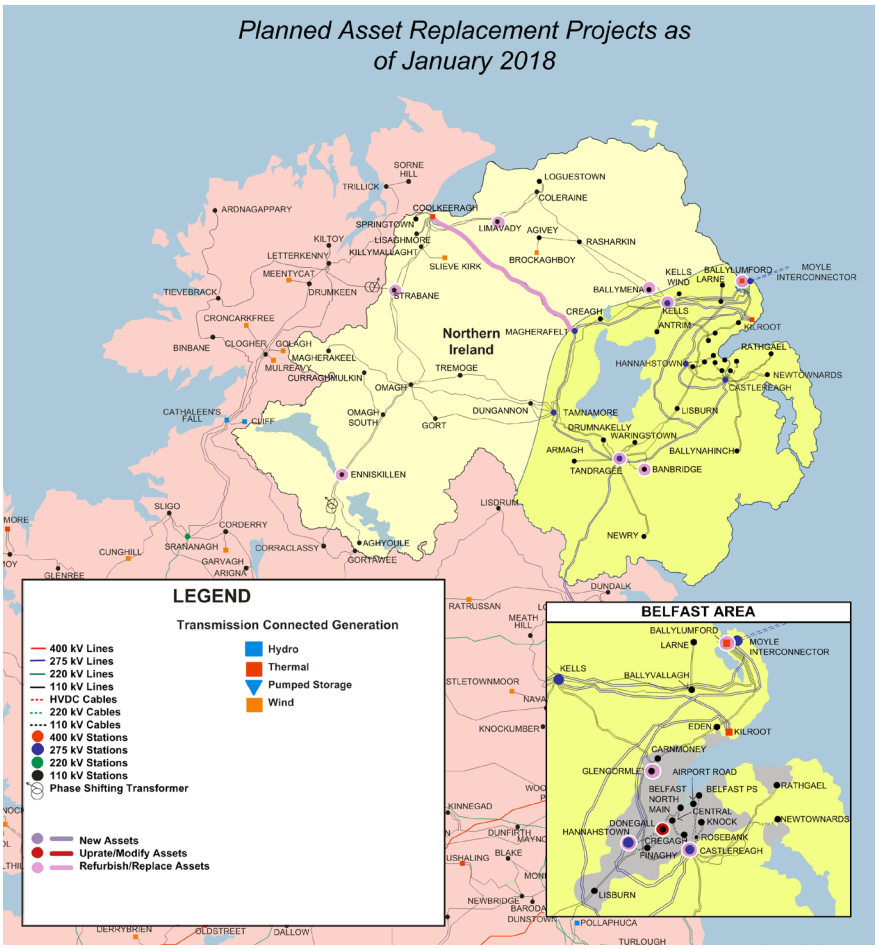


Figure 5-3 Planned NIE Networks asset replacement projects

7. Project Description

7. Project Description

7.1. Overview

As described in Chapter 1, planned projects are categorised on a planning area basis, as per Figure 1-1.

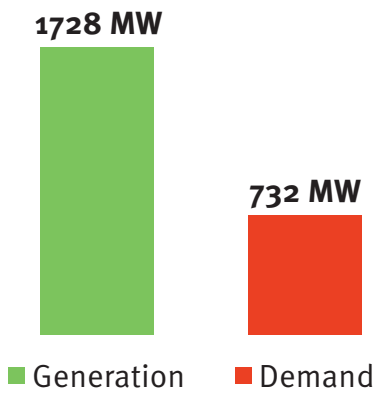
There are 2 individual projects that are in, or have the potential to be in, both planning areas. These projects are listed in Table B-1 in Appendix B.

Projects of pan-European and regional significance in, or partly in, Northern Ireland are identified in ENTSO-E's most recent TYNDP and RegIP documents. Such projects are identified in this TDP using the following labels: "TYNDP/TYNDP_Project_No" or "RegIP/RegIP_Project_No" and are listed in Appendix C.

7.2. The North and West Planning Area

The North and West Planning Area Overview
The North and West planning area comprises all areas connected to the transmission system north and west of the 275 kV double circuit ring around Lough Neagh, and the 275 kV connection with Louth station in Ireland.

2026 Forecast Regional Generation and Demand Balance



Summary of TDP Projects

TDP project category	No. of Projects
New Build	9
Uprate/Modify	3
Refurbish/Replace	5
Total	**17**

Regional Description
This area is characterised by a significant amount of wind generation connected to the 110 kV network and has more generation than demand. Conventional generation in this area is provided by Coolkeeragh Power Station, connected to the main 275 kV ring by a double circuit spur line which crosses the Sperrin mountains from Magherafelt. There are two cross-border connections on the 110 kV system, connecting Strabane with Letterkenny in County Donegal and Enniskillen with Corraclassy in County Cavan. Cross-border power flows are managed by power flow controllers (PFCs). There is limited high capacity 275 kV infrastructure in this area, and currently little or no spare capacity for generation on the 110 kV system. The planning area has considerably more generation than demand. The excess of generation in the area is set to increase in the coming years. This is due to generators that currently have live connection offers connecting to the transmission and distribution networks. To cater for the high levels of generation described above, network reinforcement is necessary. This will enable the efficient export of generation from this area towards areas with high load, such as the South-East. There are also reinforcement needs due to local constraints related to a shortage of transmission capacity and voltage support. The projects described in this section will enable the transmission network to safely accommodate the more diverse power flows which are a result of excess regional generation. This project list is not definitive and will be updated in future TDPs to reflect the changing nature and understanding of the needs of the power system. They will also provide benefits to existing and future users of the transmission network in the planning area and facilitate broad future regional load growth.

The 17 projects in the North and West planning area are discussed in more detail below. The status of the network development projects is noted in Appendix B.

Please refer to Figures 5-1 and 5-2 for locational information of planned Network Developments in the North and West Planning Area.

7.2.1. Asset Replacement Projects

Coolkeeragh - Magherafelt 275 kV Circuits Refurbishment

The need for this project arises from the condition and rating of the existing conductor on the double circuit tower line, originally installed in the 1960s. Under certain scenarios there is a risk of overloading the existing conductor. The rating of the replacement conductor will be increased to cater for increased generation and will be defined as part of the redesign of the circuit. **Completion date: Winter 2021**.

Ballymena Transformer 3 and 4 Replacement

The 110/33kV transformers TX 3 and 4 at Ballymena Main are to be replaced due to the condition of the assets. **Completion date: 2024**.

Enniskillen Main Transformer 1 and 2 Replacement

The 110/33kV transformers TX 1 and 1 at Enniskillen are to be replaced due to the condition of the assets. **Completion date: 2024**.

Strabane Main 110kV Refurbishment

The 110 kV mesh at Strabane Main is to be refurbished due to the condition of the existing assets. Consideration will also be given to the installation of a GIS switchboard. **Completion date: 2024**.

Limavady Main 110kV Refurbishment

The 110 kV mesh at Limavady Main is to be refurbished due to the condition and rating of the existing assets. Consideration will also be given to the installation of a GIS switchboard. **Completion date: 2024**.

7.2.2. Renewable Generation Cluster Substations and New Connections

Curraghamulkin 110/33 kV Cluster (Formerly Drumquin)[30]

The driver of this project is RES integration. It is planned to establish a new 110/33 kV cluster substation close to Drumquin village to allow connection of new wind generation. The Curraghamulkin cluster is to be connected to the existing Enniskillen - Omagh 110 kV circuits by means of a new switching station (Omagh South) north of Dromore village. A single portal overhead line will be built from the new station to the cluster site. **Completion date: Summer 2018**.

Agivey 110/33 kV Cluster

The driver of this project is RES integration. It is planned to establish a 110/33 kV cluster substation near Garvagh to allow connection of new wind generation. This will be connected to the existing 110kV Brockaghboy to Rasharkin overhead line. **Completion date: Winter 2020**.

Fair Head/Torr Head Tidal Scheme Connection (on hold)[31]

The driver of this project is RES integration. Developers are planning to establish two 100MW tidal generation schemes off the County Antrim coast close to Torr Head and Fair Head. A connection has not yet been formally offered but the proposed scale of the scheme will likely require connection into Kells Main and construction of either a 275 kV circuit or 110 kV single or double circuit line. **Completion date: after 2025**.

7.2.3. Renewable Integration Developments

Omagh Main – Omagh South Uprate

The drivers of this project are facilitation of a new connection and RES integration. With the connection of Curraghamulkin cluster substation to Omagh South it will be necessary to restring the Omagh Main – Omagh South tower line with higher capacity conductor. **Completion date: Summer 2019**.

Omagh Reactive Compensation

The drivers of this project are security of supply and RES integration. The continued development of wind generation in the North and West of Northern Ireland has resulted in a need for voltage support at several locations. Reactive support will be installed at Omagh Main, connected to the 110 kV busbar. **Completion date: Winter 2021**.

30 Curraghamulkin cluster was energised in June 2018.
31 The connection application for these schemes was withdrawn after the data freeze date.

Coleraine Reactive Compensation

The drivers of this project are security of supply and RES integration. The continued development of wind generation in the North and West of Northern Ireland has resulted in a need for voltage support at several locations. Reactive support will be installed at Coleraine, connected to the 110 kV busbar. The existing 36 Mvar Capacitor is to be recovered with consideration being given to its deployment elsewhere. **Completion date: Winter 2021**.

Creagh/Kells-Rasharkin New 110 kV Circuit

The drivers of this project are security of supply and RES integration. As a result of increasing growth in renewable generation there will be a need to construct a second 110 kV circuit between either Creagh or Kells and Rasharkin 110/33 kV cluster substation. **Completion date: Winter 2024**.

Coolkeeragh – Trillick New 110 kV Line (on hold)

The drivers for this project are security of supply, RES integration and market integration. A need has been identified to strengthen the electricity network on both sides of the border in the north-west to assist in the integration of renewable power sources. This project is on hold at present. If the project is progressed it will interact with the North West of NI Reinforcement (see below) and the scope of the solution required to be delivered through that project. **Completion date: after 2025**.

Turleenan - Omagh South – Co. Donegal New 275 kV Line (on hold)

The drivers for this project are security of supply, RES integration and market integration. A need has been identified to strengthen the electricity network on both sides of the border in the north-west to assist in the integration of renewable power sources. This project is on hold and may be replaced by the North West Reinforcement (see below) but still has Project of Common interest (PCI) status. **Completion date: after 2025**.

North West of NI Reinforcement

The drivers for this project are security of supply and RES integration. As a result of increasing growth in renewable generation in the west there will be a need to construct a new circuit between the 275kV system and the 110kV system electrically close to Coolkeeragh.

A long list of options shall be narrowed down to a short list. A combination of these may be required. The long list of main and supporting options will include the following:

- HVDC link from Kilroot to Coolkeeragh;
- 275kV or 110kV circuit from Magherafelt to Coolkeeragh;
- 275kV or 110kV circuit from Magherafelt to Strabane (new s/s);
- 110kV circuit from Agivey cluster – Limavady;
- Strabane – Omagh 110 kV Uprate;
- Coolkeeragh – Strabane 110 kV Uprate;
- Coolkeeragh – Killymallaght 110 kV Uprate;
- Coolkeeragh – Limavady 110 kV Uprate; and
- Killymallaght – Strabane 110 kV Uprate.

These can be seen in Figure 5-2. **Completion expected after 2025**.

7.2.4. Load Related and Security of Supply

North West Special Protection Scheme Upgrade

The drivers of this project are security of supply and RES integration. This scheme was installed to protect the network in the north-west in the event of faults on the 275 kV network before the large-scale installation of wind generation in the north and west of NI. As wind generation capacity has increased, a need has been identified to replace and upgrade the existing special protection scheme. **Completion date: Winter 2019**.

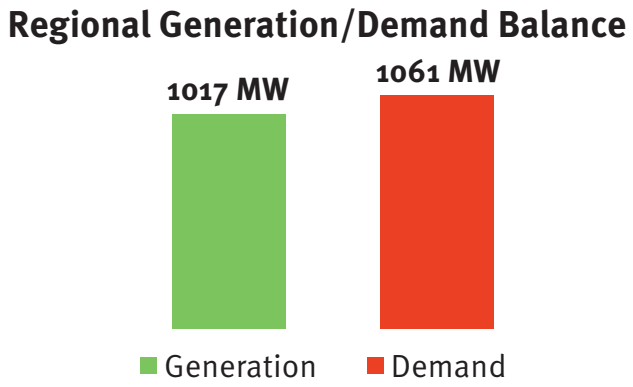
Coolkeeragh T1 Transformer Cabling Uprate

The driver for this project is security of supply. The increase in wind generation in the north-west of NI has resulted in an increase in power flows at Coolkeeragh. The project is to uprate the 110 kV cabling associated with Transformer 1 in order to accommodate these flows. **Completion date: Winter 2020**.

7.3. The South-East Planning Area

The South-East Planning Area Overview
The South-East planning area comprises all areas within the 275 kV double circuit ring around Lough Neagh, as well as Greater Belfast, South Antrim and County Down.

2026 Forecast Regional Generation and Demand Balance



Summary of TDP Projects

TDP project category	No. of Projects
New Build	9
Uprate/Modify	8
Refurbish/Replace	10
Total	**27**

Regional Description
This area is characterised by its relatively high demand, particularly in the Greater Belfast area. There are two large conventional power stations; Ballylumford near Larne and Kilroot near Carrickfergus. Wind generation makes up a small proportion of installed capacity. There is one cross-border connection on the 275 kV system, connecting Tandragee with Louth. The Moyle HVDC interconnector provides a connection between the 275 kV system near Ballylumford with the power system of Great Britain, via Scotland. There is strong 275 kV infrastructure in this area, with significant spare capacity for generation and demand. In contrast to the North and West area, demand is greater than generation in the South-East. The development of the transmission network in the area is characterised by the need to meet increasing demand and improve system resilience and flexibility. Investment is required to increase transmission of wind power from the North and West as well as cross-border interconnection. There are also reinforcement needs due to: • Local constraints related to a shortage of transmission capacity and voltage support; • Accommodate further market integration with Ireland. The projects described in this section will enable the transmission network to safely accommodate the more diverse power flows which are a result of excess regional generation. This project list is not definitive and will be updated in future TDPs to reflect the changing nature and understanding of the needs of the power system. They will also provide benefits to existing and future users of the transmission network in the planning area and facilitate broad future regional load growth.

The 27 projects in the South-East planning area are discussed in more detail below. The status of the network development projects is noted in Appendix B.

Please refer to Figures 5-1 and 5-2 for locational information of planned Network Developments in the South-East Area in Parts 2 & 3.

7.3.1. Asset Replacement Projects

Donegall Main (North) Transformer Replacement

The 60 MVA transformer Tx B at Donegall North is to be replaced by a new 90 MVA unit. The need for this arises because of the condition of the asset. The rating of 90 MVA is the standard rating now procured for 110/33kV transformer applications. **Completion date: Summer 2018**.

Castlereagh Inter-Bus Transformer 1 Replacement

The 275/110kV 240MVA interbus transformer IBTX 1 at Castlereagh is to be replaced due to the age and condition of the existing transformer. **Completion date: Winter 2018**.

Ballylumford Switchgear Replacement

The existing 110 kV switchgear at Ballylumford is to be replaced with a new 110 kV GIS double busbar and the 110 kV circuits diverted accordingly. The need for this project arises from the age, condition and obsolescence of the existing equipment as well as the potential for high short circuit currents in the event of a fault. **Completion date: Winter 2020**.

Ballylumford-Castlereagh 110 kV Circuit Refurbishment

The conductor on the existing tower line as well as a number of towers and foundations will be replaced due to the condition and age of the existing assets. Note that this project will occur in tandem the Ballylumford – Castlereagh Uprate. **Completion date: Winter 2022**.

Banbridge Main Transformer 1, 2, 3 and 4 Replacement

The 110/33kV transformers TX 1-4 at Banbridge Main are to be replaced due to the age and condition of the existing transformers. **Completion date: 2024**.

Ballylumford Inter-Bus Transformer 1 and 2 Cooler Replacement

The transformer coolers of 275/110 kV interbus transformers IBTX 1 and 2 are to be replaced due to the age and condition of the existing assets. **Completion date: 2024**.

Glengormley Main Transformer Tx B Replacement

The 110/33 kV transformer Tx B is to be replaced due to the age of the existing transformer. **Completion date: 2024**.

Hannahstown Inter-Bus Transformer 1 or 2 Replacement

The 275/110kV 240MVA interbus transformers IBTX 1 and 2 at Hannahstown are to be replaced due to the age and condition of the existing transformers. **Completion date: TBA**.

Tandragee Inter-Bus Transformer 1 or 2 Replacement

The 275/110kV 240MVA interbus transformers IBTX 1 and 2 at Tandragee are to be replaced due to the age and condition of the existing transformers. **Completion date: TBA**.

Kells Inter-Bus Transformer 1 and 2 Replacement

The 275/110kV 240MVA interbus transformers IBTX 1 and 2 at Kells are to be replaced due to the age and condition of the existing transformers. **Completion date: TBA**.

Kells and Tandragee Shunt Reactor Replacement

The TR1 and TR2 reactors at Kells and Tandragee 275kV substations (respectively) are to be **replaced by 2027** due to the age and condition of the existing assets.

7.3.2. Renewable Generation Cluster Substations and New Connections

Kells 110/33 kV Cluster

The driver of this project is RES integration. It is planned to establish a 110/33 kV cluster substation near to the existing Kells 275/110kV substation to connect new renewable generation to the transmission system. This will be connected to the existing Kells 110kV station via an underground cable. **Completion date: Winter 2020**.

Belfast Power Station

The driver of this project is connecting new generation. Belfast Power Station Ltd. are proposing a new 480 MW CCGT, to be located in Belfast Harbour Estate. The project is in the early stages of development, and at the freeze date, no connection application had been received. It is assumed that this power station will connect to the transmission network via underground cable at Castlereagh substation. This project will encompass the connection of the power station to the network **Completion date: TBA**.

32 A connection application was received in 2018 but at the time of publication no offer had yet been issued.

Compressed Air Energy Storage Scheme Connection (on hold)

The drivers for this project are RES and market integration. A developer has planned the construction of a Compressed Air Energy Storage facility close to Ballylumford Power station in Islandmagee. An offer had been made for a connection into Ballylumford at 275 kV but this offer has expired. It does, however, continue to have PCI status. This project encompasses the connection of the scheme to the network. **If it progresses, this project is expected to be completed after 2025**.

7.3.3. Renewable Integration Developments

Tamnamore Reactive Compensation

The drivers of this project are security of supply and RES integration. The continued development of wind generation in the North and West of Northern Ireland has resulted in a need for voltage support at several locations. Reactive support will be installed at Tamnamore, connected to the 110 kV bus. **Completion date: Winter 2021**.

Tamnamore – Turleenan 275 kV Uprate

The drivers of this project are security of supply and RES integration. Pending the establishment of Turleenan substation it is planned to uprate the conductors between Turleenan and Tamnamore 275kV substation in order to improve inter-region power flow. **Completion date: Winter 2022**.

7.3.4. Load Related and Security of Supply

Kells Remote Control

The driver for this project is security of supply. This project is to enable the remote control of the existing line end disconnectors. This project is required to ensure sufficient resilience and redundancy of the 275 kV mesh, particularly under adverse weather conditions. **Completion date: Winter 2020**.

Tandragee 110 kV 275 kV Second Bus Coupling Circuit Breaker

The driver of this project is security of supply. This project is to install a second busbar coupler onto the existing 275 kV double busbar. This project will improve resilience and redundancy of the protection at Tandragee. **Completion date: Winter 2021**.

Ballylumford-Castlereagh 110 kV Circuit Uprate

The driver for this project is security of supply. The conductor on the existing tower line will be uprated to cater for increased demand. Note that this project will occur in tandem the Ballylumford – Castlereagh Refurbishment. **Completion date: Winter 2022**.

Airport Road 110/33kV substation

The driver of this project is security of supply. It is planned to construct a new 110/33 kV substation in the Belfast Harbour Estate, close to the existing Airport Road 33/6.6kV substation. The substation will be connected to the existing Rosebank substation via the existing 110 kV tower line (currently operated at 33kV) from Rosebank to Sydenham Road. The need for this project arises from the increasing load in the Belfast Harbour and city centre area. **Completion date: Winter 2022**.

Castlereagh 275 kV New no. 4 Inter-Bus Transformer

The driver of this project is security of supply. There is a need to provide additional capacity at Castlereagh to meet expected demand growth. **Completion date: Winter 2022**.

Castlereagh Reactors

The driver of this project is security of supply. Further shunt reactors are planned to be installed at Castlereagh substation in order to improve voltage regulation when the network is lightly loaded. **Completion date: 2024**.

Drumnakelly and Armagh Development Plan

The driver of this project is security of supply. There is a need to reinforce the distribution system supplying Armagh city and the surrounding area due to increasing demand. It is also forecast that demand will exceed capacity at the existing Drumnakelly 110/33kV substation. Options being considered include:

- Establishing a new 110/33kV substation adjacent to the existing Drumnakelly Main along with associated 33kV reinforcements to the Armagh area; and
- Establishing a new 110/33kV substation at Armagh with new 110kV circuits from Tandragee or Drumnakelly.

Completion date: 2027.

7.3.5. Fault Level Replacements

Castlereagh and Tandragee 110 kV Switchgear Replacement

The driver for this project is safety. Due to increasing fault levels it is planned, subject to detailed study, to replace 110 kV circuit breakers and current transformers at Castlereagh and Tandragee. **Completion date: Winter 2021**.

Castlereagh – Knock 110 kV Cables Uprate

The driver for this project is safety. The protection on this circuit will be replaced and uprated as well as the cable sealing ends and a section of cabling. This project is necessary due to the fault level exceeding the short circuit rating of the cable under certain conditions. **Completion date: Winter 2021**.

Cregagh Transformer B Switchgear Replacement

The driver for this project is security of supply. The fault levels at Creagh are approaching the rating of existing switchgear. It is planned to replace a set of disconnectors and earth switches. **Completion date: Winter 2022**.

7.3.6. Interconnection

North-South Interconnector[33]

The drivers for this project are market integration, security of supply and RES integration. This project involves construction of a new 400 kV circuit from existing Woodland 400 kV station in County Meath (Ireland) to a proposed 400/275 kV station at Turleenan in County Tyrone (Northern Ireland). This project is needed to remove constraints within the single electricity market (and future ISEM), improve security of supply and facilitate safe and secure operation of renewables. **Completion date: Winter 2021**.

33 Since the freeze date, the estimated completion date of this project has changed to winter 2023.

7.4. Projects in Both Planning Areas

Enhancement to the Low Frequency Load Disconnection Scheme

It is planned to modify existing under-frequency automatic load shedding schemes. **Completion date: Winter 2021**.

Augmentation of Capacity at Transmission/Distribution Interface

It is planned to increase 110/33 kV transformer capacity at four substations; Coleraine, Strabane, Limavady and Omagh. This capacity will be increased either by uprating transformers or by the installation of an additional transformer. **Completion date: Winter 2022**.

8. Strategic Environmental Assessment of TDPNI 2018-2027 (Project Options Assessment)

8. Strategic Environmental Assessment of TDPNI 2018-2027 (Project Options Assessment)

An examination of the possible environmental impacts of grid development project options within TDPNI 2018-2027 is part of the Strategic Environmental Assessment (SEA) as detailed in Chapter 8 of the Environmental Report.

All projects are developed with a range of inherent mitigation derived from statutory and in-house processes (SONI) and procedures that work to try to avoid the potential for significant environmental impacts in the first instance. These measures are set out Chapter 4 Implementation of this TDPNI. The applicability of these policies and objectives will be dependent on the nature and scale of each project.

The assessment of likely significant environmental effects (Chapter 8 of the SEA Environmental Report) has been undertaken with the assumption that these policies and objectives will be implemented for projects detailed in this TDPNI and also for projects included in future TDPNIs.

The SEA Environmental Report has been produced to assess the environmental impacts of the various project development options (alternatives) within the TDPNI and to provide the environmental guidance to help create a more sustainable TDPNI. In parallel to this, a Habitats Regulation Assessment (HRA) has been prepared to inform the decision making process, in terms of the potential for the development options to impact the integrity of any European sites in view of that sites conservation objectives. Both environmental assessments have been central to the development of the draft TDPNI.

It is important to note that while SONI is the competent authority for the purpose of preparing the TDPNI and associated SEA, all projects will likely require statutory consent under the provisions of the Planning Act (Northern Ireland) 2011, implemented by the relevant planning authority.

The TDPNI has been assessed via a Baseline Led Assessment. This method involves the assessment of each option available in the potential project developments listed in the TDPNI against each of the following topics:

- Biodiversity, Flora & Fauna (BFF);
- Population & Human Health (PHH);
- Soils, Geology and Land use (S);
- Water (W);
- Air (A);
- Climatic Factors (C);
- Material Assets & Infrastructure (MA);
- Cultural, Architectural & Archaeological Heritage (H); and
- Landscape & Visual Amenity (L).

Each potential development option/project in the TDPNI has been assessed in the short, medium and long term for likely effects, the significance of the effects, and whether they are positive or negative effects. Other impacts that have been assessed for significance are secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the inter-relationship of effects. The scenario of "The Evolution of the Environment without the Plan" has also been assessed in the same format.

The TDPNI provides a list of the potential project options and alternatives that could be developed within the Plan period up to 2027. These are all the development "alternatives" available to the Plan. A number of these potential projects were screened out of requiring assessment as the works are of such a scale as not to be considered significant and/or are localised to within existing electrical transmission sites/substations, or as the proposals have gone beyond strategic planning to the detailed planning stage and so will only be considered for cumulative and in-combination impacts. The projects that were screened in and to be assessed in the SEA are presented in Table 8-1 below.

Project ID	Project Name	Development Type
1	Coolkeeragh – Magherafelt 275 kV Circuits Restring	Transmission Line Restring/Uprate
2	Agivey 110/33 kV Cluster	New Substation and Transmission Line
3	Kells110/33 kV Cluster	New Substation and Transmission Line
4	Fair Head/Torr Head Tidal Scheme connection	New Transmission Line
5	Belfast Power Station	New Transmission Line
6	Compressed Air Energy Storage Scheme connection	New Transmission Line
7	Omagh Main – Omagh South Uprate	Transmission Line Restring
8	Omagh Reactive Compensation	Substation Extension or Upgrade
9	Tamnamore Reactive Compensation	Substation Extension or Upgrade
10	Coleraine Reactive Compensation	Substation Extension or Upgrade
11	Kells/Creagh – Rasharkin New 110 kV Circuit	New Transmission Line
12	Tamnamore – Turleenan Uprate	Transmission Line Restring
13	Coolkeeragh – Trillick new 110 kV Line	New Transmission Line
14	Turleenan – Omagh South – Co. Donegal new 275 kV Line	New Transmission Line
15	*North West of Northern Ireland Reinforcement* Kilroot – Coolkeeragh HVDC Link	New Transmission Line (Subsea)
16	*North West of Northern Ireland Reinforcement* Magherafelt – Coolkeeragh new 275 kV or 110 kV Circuit	New Transmission Line
17	*North West of Northern Ireland Reinforcement* Magherafelt – Strabane (new substation) new 275 kV or 110 kV Circuit	New Transmission Line

Project ID	Project Name	Development Type
18	*North West of Northern Ireland Reinforcement* Agivey Cluster – Limavady new 110 kV Circuit	New Transmission Line and New Substation
19	*North West of Northern Ireland Reinforcement* Strabane – Omagh 110 kV Uprate	Transmission Line Restring/Uprate
20	*North West of Northern Ireland Reinforcement* Coolkeeragh – Strabane 110 kV Uprate	Transmission Line Restring/Uprate
21	*North West of Northern Ireland Reinforcement* Coolkeeragh – Killymallaght 110 kV Uprate	Transmission Line Restring/Uprate
22	*North West of Northern Ireland Reinforcement* Coolkeeragh – Limavady 110 kV Uprate	Transmission Line Restring/Uprate
23	North West of Northern Ireland Reinforcement – Killymallaght – Strabane 110 kV Uprate	Transmission Line Restring/Uprate
24	Sydenham Road Main (new station)	New Substation
25	Ballylumford – Castlereagh 110 kV Circuit Restring	Transmission Line Restring
26	Drumnakelly and Armagh Development Plan – new 110/33 kV substation adjacent to Drumnakelly Main and 33 kV reinforcements to Armagh area	New Substation and Transmission Line
27	Drumnakelly and Armagh Development Plan – 110/33 kV substation at Armagh and 110 kV circuits from Tandragee or Drumnakelly	New Substation and Transmission Line
28	Castlereagh – Knock 110 kV Cables Uprate	Transmission Line Restring/Uprate

Each project option available to the TDPNI has been assessed against the Strategic Environmental Objectives (SEOs). All potential positive and negative impacts are presented individually, with a text description, and then a summary graphic. In addition, a summary of the overall balanced potential effect has been presented for each environmental issue area. The scores assigned to impacts are from +3 to -3. If a development proposal is thought to have the potential for unacceptable impacts a score of -999 has been assigned. The purpose of adding numerical scores is to assist in the ranking of options and for potential incorporation of the environmental and social criteria into future decision making by the Plan team, as this can easily be tied into a multi-criteria analysis of alternatives if desired.

Each option available in the Plan has been assessed in the short, medium and long term for likely effects, the significance of the effects, and whether they are positive or negative effects. Other impacts that have been assessed for significance are secondary effects, cumulative effects, synergistic effects, temporary and permanent effects, and the inter-relationship of effects. The scenario of "The Evolution of the Environment without the Plan" has also been assessed in the same format. This was considered as the Do-Nothing Scenario.

No significant negative impacts are being anticipated from development and operation of the transmission developments, yet several slight to moderate, negative impacts have been identified. However many of these can be avoided or mitigated for in the next detailed design and construction/ environmental management planning stages. For transmission infrastructure upgrade developments, the negative impacts identified are mainly restricted to the construction phase, leaving no significant medium or long term footprint on the wider environment. However new transmission infrastructure developments have the potential for short, medium and long term, slight to moderate negative impacts due to their permanent physical and visual disturbance, during and following construction. Mitigation measures have been proposed that can minimise the potential for these negative impacts, if adopted in the detailed planning and design stage. Areas that may be more sensitive to these transmission developments have also been highlighted, to help inform SONI of the areas that should be avoided to minimise potential environmental impacts.

In the medium and long term the development of these transmission projects has the potential for slight to significant positive impacts, including the improved reliability of the grid network, support of economic growth, and facilitating the connection and supply of more renewable energy. These positive impacts in turn will help ensure that electricity supply is able to meet future demand, and that there is less reliance on fossil fuels into the future, resulting in better air quality and less GHG emissions. Furthermore, the projects in the TDPNI could play a key role in shaping a reliable and sustainable energy future for Northern Ireland and help achieve the 2020 renewable electricity target.

9. Habitats Regulation Assessment

9. Habitats Regulation Assessment

The Habitats Directive (Council Directive 92/43/EEC) on the conservation of natural habitats and of wild fauna and flora obliges member states to designate, protect and conserve habitats and species of importance in a European Union context. Article 6(3) of the Habitats Directive requires that "Any plan or project not directly connected with or necessary to the conservation of a site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives." The Directive was transposed into Northern Ireland legislation through the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995.

Any proposed plan or project that has potential to result in a significant effect on a designated European site will require an AA. Case law has determined that the likelihood need not be great, merely possible, and that the precautionary principle must apply as set out in European Commission Guidance and as required by CJEU case law (i.e. C 127/02 'Waddenzee').

AA for the TDPNI is being carried out in parallel with the SEA process. This is done through the preparation of Habitats Regulation Assessment (HRA). The findings of the AA will be used to guide the development of the alternatives to be considered as part of the SEA. The first stage of the AA process is Screening, which is to determine whether implementation of the TDPNI has the potential to have a significant effect on designated European sites.

The HRA Screening of the 44 potential projects within the TDPNI identified that there is the potential for significant habitat loss, water quality and habitat deterioration, and disturbance and displacement impacts on European sites, in the development of 19 of the potential projects that could come forward during the Plan period.

- The possibility of likely significant Habitat Loss effects cannot be discounted for forty five European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites.
- The possibility of likely significant Water Quality and Habitat Deterioration effects cannot be discounted for forty four European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites.
- The possibility of likely significant Disturbance and Displacement effects cannot be discounted for twenty nine European sites without further evaluation and analysis, or the application of measures intended to avoid or reduce the harmful effects of the potential projects on European sites.

Having conducted further investigation and analysis; and having applied measures appropriate at a plan level intended to avoid or reduce the harmful effects of the implementation of the plan on European sites; and taking into consideration the safeguarding regime of lower level screening for appropriate assessment or appropriate assessment as the case may be at a project level for each of the projects brought forward from the TDPNI prior to those projects being consented under the planning code; it is concluded that implementation of the TDPNI will not adversely affect the integrity of any European site.

10. Recommendations and Mitigation Arising from the Sea and HRA

10. Recommendations and Mitigation Arising from the Sea and HRA

Mitigation measures have been recommended where potential negative impacts on environmental topic areas have been identified from developing the alternative options (See chapter 9 of the Environmental Report). These mitigation measures aim to prevent, reduce and as fully as possible offset any significant adverse effects on the environment due to implementation of the projects within the TDPNI.

10.1. General Mitigation

The principal mitigation recommendation is that the predicted negative effects should be considered further during the next stage of detailed planning and design, when the specifics of the development infrastructure options can be optimised through detailed feasibility studies and design in order to limit the potential impacts on sensitive receptors.

Further environmental studies based on the more detailed designs and construction methodologies should be undertaken as appropriate. These studies may involve, but are not limited to, marine, aquatic and terrestrial ecology surveys, ornithological and bat surveys, fish surveys, landscape and visual assessments, WFD assessments, geotechnical investigations and heritage surveys. Further Appropriate Assessment, to meet the requirements of the Habitats Directive, of the detailed designs and construction methodologies will be required at the project level, where potential impacts have been identified in this SEA and accompanying HRA for the TDPNI.

Before any works are carried out, detailed method statements and management plans (construction and environmental) should be prepared, including timing of works, information on the specific mitigation measures to be employed for each works area, and mechanisms for ensuring compliance with environmental legislation and statutory consents.

The timing of construction and maintenance works should be planned to avoid any potential for negative cumulative impacts or inter-relationships with other schemes, plans or projects, yet look to optimise any potential positive cumulative impacts or inter-relationships.

Contractors should be required to prepare Construction Environmental Management Plans (CEMPs), which would include a requirement for related plans to be prepared, as appropriate, for project implementation, such as Erosion and Sediment Control, Invasive Species Management, Emergency Response, Traffic and Safety Management, Dust and Noise Minimisation, and Stakeholder Communication Plans.

Works should only be carried out once the method statements have been consulted on with competent authorities, such as the NIEA. At the project level it will not be sufficient to defer the production of construction method statements. These should be completed in the detailed design stage and may be subject to further Appropriate Assessment where potential impacts have been identified in this SEA and accompanying HRA for the TDPNI. Where there may be unavoidable impacts on protected habitats and/or species the necessary derogation licences should be applied for prior to seeking planning permission or approval for a scheme.

Marine construction and in stream works have the greatest potential for negative impacts during spawning/breeding and early nursery periods for aquatic and marine protected species. No marine or instream works should occur during restricted periods for relevant species and consultation should be undertaken with the appropriate authorities in this regard.

Monitoring of project-level mitigation measures should be undertaken during and after works, to ensure effectiveness.

All works and planning of works should be undertaken with regard to all relevant legislation, licensing and consent requirements, and recommended best practice guidelines. An ecological clerk of works should be appointed for environmental management of each infrastructure development, and where specific sensitive species may be impacted, an appropriate expert should also be appointed.

10.2. Specific Mitigation

Table 9-1 of the Environmental Report demonstrates environmental impact specific mitigation measures that should be adopted within the TDPNI to minimise the potential for any negative effects on the wider environment of developing any of the proposals assessed. These mitigation measures should be implemented and further developed at the next detailed design stage and project level study stage.

Potential Impact	Proposed Mitigation
1 - Construction phase disturbance, such as noise and habitat degradation, to International, National or locally designated sites and species that are within close proximity to developments.	Good planning and timing of works, and good construction and management practices to keep impacts to a minimum. Environmental Management Plan (EMP) and Construction Management Plan (CMP) to be developed and agreed with relevant authorities and consultees prior to commencement of works. Adhere to SONI/EirGrid/best practice guidelines. Scoping of relevant specialist ecological surveys during the detailed planning stage and prior to any construction works. Where applicable, prior to any vegetation clearance an ecologist should be contracted to undertake a 'pre-vegetation clearance' survey for signs of nesting birds and important species. Should important species be found during surveys the sequential approach of avoid, reduce or mitigate should be adopted to prevent significant impacts. Vegetation clearance should only occur outside the main breeding bird season - September to March. Following construction, replanting, landscaping, natural revegetating and habitat enhancement, should be undertaken in line with appropriate guidelines that aim to improve local biodiversity and wildlife. This is likely to provide for medium and long term benefits to the biodiversity, flora and fauna near the working areas. Where possible, original sediment/soil should be reinstated to original levels to facilitate natural restoration and recolonisation of habitat. Restricted working areas should be imposed to ensure minimal disturbance to sensitive habitats.

Potential Impact	Proposed Mitigation
2 - Construction phase sedimentation impacts on International, National or locally designated sites and species that are within close proximity to developments and where pathways are evident, as constructions works may mobilise sediments into watercourses.	Consultation with environmental bodies on construction methodology and appropriate timing of works to provide the least potential for sediment mobilisation to watercourses. Good planning and timing of works, and good construction and management practices to keep the potential for impacts to a minimum. Minimise requirement for near or in-stream works through good planning. During construction and site establishment operations, silt fencing should be used to prevent disturbed soil reaching the aquatic zone. Any in-stream works should be carried out during low flow conditions and should cease during heavy rainfall and flood conditions, to reduce suspended solids in the river. Buffer zones along waterways can provide mitigation during construction activities. Buffer zones must be of adequate dimensions and impede all free flow to waterways. Heavy machinery and site traffic should be excluded from these areas.
3 - Increased risk of direct physical disturbance to International, National or locally designated sites and species that are within close proximity to developments, including hazards to birds through collision and electrocution.	To avoid or minimise the potential for bird collision with overhead conductors, bird flight deflectors or bird warning spheres should be installed in areas identified as being of high risk, or having bird species vulnerable to such impacts. Ornithological surveys should be undertaken during the detailed design stage to identify these sensitive areas and species. Any mitigation measures require monitoring programmes to ensure that they are effective,
4 - Increased rate of spread of invasive species during restring or line development works. Mobile construction equipment traversing through areas of invasive species, potentially carrying these species into new areas.	Cleaning of equipment and machinery along with strict management protocols to combat the spread of invasive species. Pre and post construction surveys for invasive species may be recommended in areas of known invasive species risk. If invasive species are found to be present, an Invasive Species Management Plan should be prepared to outline control and or removal measures to ensure such species are not spread during construction or operation of any future projects.
5 - Creation of a new vector for mobile invasive species in the development of new transmission lines. Corridor clearing may act as a pathway for invasive species.	Cleaning of equipment and machinery along with strict management protocols to combat the spread of invasive species. Pre and post construction surveys for invasive species may be recommended in areas of known invasive species risk. If invasive species are found to be present, an Invasive Species Management Plan should be prepared to outline control and or removal measures to ensure such species are not spread during construction or operation of any future projects.

Potential Impact	Proposed Mitigation
6 - Electromagnetic disturbances to mobile/migratory, marine and aquatic species, e.g. Atlantic salmon, from the development of underwater/subsea transmission lines.	Some studies suggest that marine and aquatic species that use magnetic fields for navigation can be affected by EMF and thus mitigation measures may need to be adopted in some underwater/subsea transmission lines. The Fair Head/Torr Head Tidal Scheme Connection and the Kilroot – Coolkeeragh HVDC Link projects both encompass areas where Salmonid Rivers flow into the sea and therefore significant salmon migration activity is likely to occur. The extent and magnitude of the EMF produced by subsea transmission lines in these areas, and the potential for these aquatic species to come into close contact with the lines, may need to be further studied for potential impacts at a more detailed level on a case by case basis.
7 - Construction phase disturbance impacts to marine or aquatic nursery and spawning grounds, such as noise/vibration pollution and physical habitat disturbance.	Consultation with DAERA Inland Fisheries and DAERA Marine Environment Division at the detailed feasibility stage. Known marine spawning and nursery grounds should be avoided where possible, or invasive works minimised in these areas. All works involving open cut crossings should be carried out during the period May to September to avoid interruption of salmonid spawning runs, spawning, incubation of eggs and the early developmental stages.
8 - Construction phase sedimentation impacts to marine or aquatic nursery and spawning grounds, as construction works may cause sediment displacement and blanketing/ smothering.	The planning of developments should aim to avoid known marine or aquatic nursery or spawning grounds. Where this cannot be avoided, construction timing should be well planned and works duration and invasive workings should be kept to a minimum in these areas.
9 - Construction phase disturbance impacts, such as noise pollution (e.g. cable laying or excavation), to mobile marine and aquatic species (e.g. cetaceans) that are known to frequent the study area.	The planning of developments should aim to avoid known hotspot areas for mobile marine and aquatic species. Where this cannot be avoided, construction times should be kept to a minimum in these areas. Employing Marine Mammal Observers (MMOs) on board construction works vessels can help ensure that impacts of coastal works are minimised. Consultation with DAERA Inland Fisheries and DAERA Marine Environment Division at the detailed feasibility stage. Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010) should be followed for marine based cable laying activities.
10 - Construction phase noise pollution disturbance impacts to people in close proximity to developments.	Disturbances can be kept to a minimum with good working practices, planning and timing. Adoption of Construction Best Practice. Noise-producing activities such as excavation and piling should only take place during daylight hours and monitoring of these activities should be ongoing. Continued liaison with local communities is advised with regard to complaints concerning noise and vibration emissions resulting from construction works.

Potential Impact	Proposed Mitigation
11 - Construction phase dust and sediment releases in close proximity to the developments, causing disturbance and negative health impacts to local people.	Disturbances can be kept to a minimum with good working practices, planning and timing. Adoption of Construction Best Practice. Development of dust minimisation plans in advance of works. Dust suppression measures in place during construction, for example establishing appropriate speed limits over unmade surfaces and establishing wheel washing facilities on construction sites. Continued liaison with local communities is advised with regard to complaints concerning dust releases resulting from construction works.
12 - Construction/maintenance phase compaction or destabilisation of peat and other sensitive soils, from heavy equipment traversing an area.	The development of transmission infrastructure across areas of significant soil sensitivity should be avoided where possible at the design stage (e.g. areas of deep and active peat should be avoided where possible). Where areas of sensitive habitat need to be crossed during construction/maintenance works, measures to reduce the impact of vehicles on wetland or bog should be considered including the use, for example, of low pressure vehicles, wide wheel/tracks and the laying of protective geotextile on the vegetation to be crossed. Construction machinery should also be restricted to site roads and designated access routes. Machinery should not be allowed to access, park or travel over areas outside development construction zones. Where impacts cannot be avoided or reduced, further works should be carried out to compensate for these impacts, or to restore some aspect of the natural environment to an approximation of its previous condition (e.g. where disturbance of peat soils cannot be avoided, there should be some consideration given to possible re-seeding with native species to stabilise the peat and accelerate recovery of the vegetation).
13 - Temporary or permanent loss of crops and/or agricultural land due to the disturbance of construction works required for the uprating of existing or development of new transmission infrastructure over agricultural areas.	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Consultation with landowners and/or tenants to identify speciality agricultural crops or lands that may require protection during construction. Consultation with landowners to develop compensation for lost crop value caused by construction works. Land within the working area should be reinstated as near as practical to its former condition.

Potential Impact	Proposed Mitigation
14 - Construction phase disruption to current land uses, such as noise pollution and dust release from construction works.	Good site management practices and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice. Noise and vibration producing activities such as piling and excavation should only take place during daylight hours and monitoring of these activities should be ongoing in sensitive areas. Development of dust minimisation plans. Dust suppression measures in place during construction, for example establishing appropriate speed limits over unmade surfaces and establishing wheel washing facilities on larger construction sites. Continued liaison with local communities is advised with regard to complaints concerning noise pollutions and dust release resulting from construction works.
15 - Construction phase potential for contaminated materials to be mobilised and tracked through the study area from historically contaminated sites or hazardous soils and activities, impacting on nearby soils and land uses.	Identification of historically contaminated areas and sites and careful route planning during the design stage to avoid these sites where possible, to prevent further contamination. Good management, planning and working practices to minimise contamination of nearby soils and land uses if works crossing historically contaminated sites or hazardous soils cannot be avoided. Good working practices may include installation of wheel wash and plant washing facilities. Strict management and regulation of construction activities. Sampling and analysis of sites prior to construction works in potentially hazardous areas, to establish potential risk.
16 - Access difficulties in topographically unsuitable areas, such as upland and steep slope areas or historic mine sites, and where transport of construction equipment across these areas may be problematic.	Careful route planning during the design stage to avoid topographically unsuitable areas where possible. In some cases, where access for machinery is particularly difficult due to the sensitive nature of habitats or difficult terrain, the aerial transport of materials and machinery by helicopter may be considered.
17 - Construction phase sedimentation impacts to water bodies e.g. construction works may destabilise soil materials, river banks and shorelines.	Good management and planning to keep water quality disturbance to a minimum. Precautions should be put into place to avoid or minimise the generation and release of sediments into any watercourses. Any potential water quality issues from construction should be contained and treated to ensure no damage to natural waterbodies. Construction will have to be planned appropriately, using Best Available Techniques/ Technology (BAT) at all times, to ensure water quality issues are kept to a minimum, with no significant adverse effects. Develop, implement and enforce an Erosion and Sedimentation Control Plan (ESCP) where risks are identified to downstream European sites.

Potential Impact	Proposed Mitigation
18 - Construction phase pollution impacts to water bodies, e.g. construction works may accidentally release pollutants, such as fuels, oils and lubricants.	Pollution prevention guidance notes (PPGs) should be consulted, which provide detailed guidance and appropriate mitigation measures to avoid or reduce the impact on the water environment. Develop, implement and enforce a Water Pollution Prevention and Environmental Emergency Response Plan for all work sites. This should include good site practices as described in the Good Practice Guidance notes proposed by EA/SEPA/NIEA. All protective coatings used would be suitable for use in the aquatic environment and used in accordance with best environmental practice. Storage facilities would contain and prevent the release of fuels, oils and chemicals associated with plant, refuelling and construction equipment into the environment. Emergency and spill response equipment should be kept on hand during construction.
19 - Difficult working conditions during construction and maintenance works due to interactions with coastal, pluvial or fluvial flood extents.	Individual developments to be subject to detailed Flood Risk Assessment at the detailed planning stage, where risk has been identified. Avoid flood extents where possible, or provide infrastructure that is both resilient to the potential flood risk and provides no transfer of flood risk once developed. Critical infrastructure should not be placed in floodplains where it may be impacted, or where it may be inaccessible during flood events.
20 - Increases in local air emissions and reductions in local air quality from construction plant emissions, in areas of the proposed developments.	Development of dust minimisation plans. Dust suppression measures in place during construction to include regular dampening down of stock piles, establishing appropriate speed limits over unmade surfaces and establishing wheel washing facilities on construction sites. Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
21 - Increases in local GHG emissions from construction plant emissions, in areas of the proposed developments.	Plan construction scheduling to minimise vehicle trips. Limit idling of heavy equipment unless needed for the safe operation of the equipment and verify through unscheduled inspections.
22 - Difficult working conditions during construction and maintenance works due to interactions with climate change exacerbated coastal, pluvial or fluvial flood extents.	Individual developments to be subject to detailed Flood Risk Assessment at the detailed planning stage, where risk has been identified, including for climate change scenarios. Avoid climate change flood extents where possible, or provide infrastructure that is both resilient to the potential flood risk and provides no transfer of flood risk once developed. Critical infrastructure should not be placed in floodplains where it may be impacted, or where it may be inaccessible during flood events.

Potential Impact	Proposed Mitigation
23 - Temporary loss of GHG sequestering vegetation in clearance of development area, during and following the construction of new transmission lines, prior to re-establishment.	Good planning and timing of works to minimise construction footprint impacts. Following construction, replanting, landscaping, and natural revegetating, should be undertaken in line with appropriate guidelines that aim to improve local GHG sequestering vegetation cover.
24 - Construction phase disturbance impacts to existing material assets and infrastructure such as transport networks, agricultural, aquaculture, fisheries, and recreation and amenity areas as construction works may interfere with the functioning of these assets, e.g. road closure or temporary loss of agricultural lands.	Development of good site management practices, traffic and construction management plans and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Minimise the frequency and duration of road closures. Adoption of Construction Best Practice.
25 - Planning and construction constraints due to the presence of existing infrastructure or other planned developments.	Constraints should be identified, and described in as much detail as possible during the early stages of a project, so that awareness of them and their potential impact can be managed. Incorporation of potential impacts and risks associated with other planned developments at the detailed planning stage. Consultation with other asset owners to establish the best possible working arrangements with the least disturbance.
26 - Permanent, direct loss of existing material assets, such as agricultural land, in the development footprint of new transmission infrastructure, e.g. new substations.	Good spatial planning to minimise the potential for such impacts. Consultation with landowners to develop compensation for loss of assets, such as agricultural land, caused by development of new infrastructure. Good site management practices and construction management plans, and consultation with the competent and statutory authorities prior to any works should enable all impacts to be kept to a minimum over a short timescale. Adoption of Construction Best Practice.
27 - Construction phase impacts on the setting of heritage sites and features in close proximity transmission infrastructure, during uprating and construction works.	Where necessary a heritage impact assessment should be prepared in respect of any works to architectural or archaeological features in advance of any works being carried out to feed into detailed design. Consultation and agreement with the Department for Communities, Historic Environment Division, in advance of any works taking place in respect of protected archaeological or architectural features. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration to minimise potential for damages, in potentially sensitive areas. Heritage features damaged could be restored/preserved. Statutory consents and notices may be required prior to works taking place.

Potential Impact	Proposed Mitigation
28 - Permanent impacts on the setting of heritage sites and features in close proximity transmission infrastructure.	Impacts could be kept to a minimum through sensitive design and planning. Planning and design advice from qualified archaeologists. Statutory consents may be required prior to works.
29 - Potential for loss of or damage to known and unknown heritage features in the development of transmission infrastructure.	Impacts could be kept to a minimum through sensitive design and planning. Planning and design advice from qualified archaeologists. Construction supervision by qualified project archaeologists, combined with sensitive construction methods and restoration to minimise potential for damages, in potentially sensitive areas. Statutory consents may be required prior to works.
30 - Construction phase impacts on the local landscape and local visual amenity from construction equipment and works.	Impacts could be kept to a minimum through good site practice and planning (e.g. screened laydown areas and traffic management). Adoption of Construction Best Practice. Landscape and Visual Assessment of options at the detailed feasibility and detailed planning stages to minimise the potential for impacts and provide site specific mitigation measures.
31 - Permanent impacts on landscape and visual amenity from the development of new transmission infrastructure.	Impacts could be kept to a minimum through sensitive design and planning (e.g. vegetative screening and landscape management planning). Landscape and visual assessment and advice during detailed design. Public consultation on draft designs. Landscape and Visual Assessment of options at the detailed feasibility and detailed planning stages to minimise the potential for impacts and provide site specific mitigation measures.

10.3. HRA Mitigation

In addition to the proposed SEA mitigation Table 9-2 demonstrates the HRA mitigation measures that will be adopted within the TDPNI to minimise the potential for any negative impacts on the European sites as arising from any of the potential projects.

Where avoidance is not possible adverse effects on site integrity will be avoided through project specific mitigation measures, either through the design of the project or subsequent measures that can be guaranteed – for example, through a condition or planning obligation. Mitigation measures shall aim to ensure that no adverse effect on the integrity of a European site.

Where impacts are identified at project level, appropriate mitigation will be developed to ensure the resulting impacts of the construction and operation of a project do not adversely affect the integrity of a European site in view of the site's conservation objectives. Best practice measures identified in EirGrid's benchmarking Evidence-Based Environmental Studies .

The following measures will be incorporated into future project specific HRAs and EcIAs, where appropriate. This list of mitigation measures is not designed to be exhaustive and shall be supplemented by project and site specific mitigation developed by project level Appropriate Assessment and Environmental Impact Assessment.

Habitat loss

Any and all works in or in proximity to a European site will be supervised by an experienced ecologist acting as an Ecological Clerk of Works (ECoW).

Direct habitat loss within European sites will be avoided for new-build infrastructure and avoided where reasonably practicable for refurbishment of infrastructure within European sites.

When construction occurs within a designated site, sensitive construction techniques will be used such as the use of bog mats for machinery access, particularly if underground cables are proposed or in remote peatland areas.

Ecological monitoring will be undertaken at sensitive sites during construction as appropriate. Such sites will be identified on a case by case basis.

Restricted working areas will be imposed to ensure minimal disturbance to sensitive habitats.

Re-distribute vegetation and soil stripped from the construction areas to provide a seedbank and do not re-seed with Perennial Ryegrass.

Land within the working area will be reinstated to its former condition or as near as is reasonably practicable.

Invasive Species

There is the potential for non-native invasive species to be present in proximity to a future project. The introduction of invasive species into a European site can affect the conservation objectives for qualifying habitats or species, potentially adversely affecting the integrity of the European site (e.g. affecting species distribution and abundance and/or out competing native species). Invasive species survey will be undertaken as part of the suite of ecology surveys for projects arising from the TDPNI if appropriate and in accordance with EirGrid (2012). If invasive species are found to be present an Invasive Species Management Plan will be prepared to outline control and or removal measures to ensure such species are not spread during construction or operation of any future projects.

Peatland sites

Areas of deep and active peat shall be avoided, where possible.

Detailed peat slip risk assessments shall be carried out as determined on a case by case basis for proposed developments in areas where peat substrates occur on sloped ground.

Construction machinery shall be restricted to site roads and designated access routes. Machinery shall not be allowed to access, park or travel over areas outside development construction zones.

Peat excavated during construction activity should not be stored (temporarily or otherwise) on areas of adjacent mire habitats or near flushes or drains. Temporary storage of spoil material excavated during the construction phase developments should be stored at suitable locations away from surface watercourses.

All spoil material excavated during the construction phase should be reinstated following the completion of the construction phase of a proposed development.

Where disturbance of peat soils cannot be avoided, there should be some consideration given to possible re-seeding with native species to stabilise the peat and accelerate recovery of vegetation.

Water Quality and Habitat Deterioration

In all cases where works have the potential to impact on protected surface water or riparian habitats within or upstream of a European site, measures must be put in place to manage and minimise the risk of escape of elevated levels of suspended solids or polluting substances into watercourses.

Develop, implement and enforce an Erosion and Sedimentation Control Plan (ESCP) where risks are identified to downstream European sites.

The ESCP must include sufficient pollution control measures to prevent run-off, silt, hydrocarbons or any other harmful substances or substrates from entering any surrounding surface waters.

Storage facilities would contain and prevent the release of fuels, oils and chemicals associated with plant, refuelling and construction equipment into the environment.

All protective coatings used would be suitable for use in the aquatic environment and used in accordance with best environmental practice.

Develop, implement and enforce a Water Pollution Prevention and Environmental Emergency Response Plan for all work sites. This should include good site practices as described in NIEA Pollution Prevention Guidance (DAERA, 2016) and applicable CIRIA Technical Guidance (CIRIA, 2001; CIRIA, 2006) including methods and procedures to deal with any spills and the timely reporting of incidents.

- There shall be no in-stream crossing by machinery.
- Silty water will be collected in settlement ponds prior to discharge to watercourses.
- Buffering strips will be provided near watercourses.
- All works involving open cut crossings shall be carried out during the period May to September to avoid interruption of salmonid spawning runs, spawning, incubation of eggs and the early developmental stages.
- Where appropriate and practical, bank vegetation and bed material which has been removed shall be stored to facilitate its replacement when channel works in the vicinity of a watercourse have been completed.
- Works in the vicinity of a watercourse shall be carried out with reference to a water quality protection or surface water management plan for each site which shall ensure that:
- All necessary measures shall be taken to minimise the generation and release of sediments into all watercourses.
- Levels of suspended solids in the river shall be monitored during the course of the works.
- Precautions shall be put in place to avoid spillages of diesel, oil or other polluting substances.

Disturbance and Displacement

Birds

Where feasible, site clearance involving the cutting or destruction of vegetation and hedgerows shall not take place in the bird breeding season between March 1st and August 31st inclusive.

Mitigation measures to reduce disturbance effects on feature species birds may include but not be limited to:

Timing of works (e.g. avoiding works in or close to SPAs during the bird breeding season [March to August inclusive] or avoiding works in the vicinity of SPAs with over wintering birds between the months of November and March inclusive)

Avoid working simultaneously with other projects which could also cause disturbance.

Screening of works to reduced disturbance impacts.

On the advice of relevant ornithological experts and agencies, conduct surveys where the risk of collision on migratory routes cannot be excluded at screening stage. Bird warning devices shall be put in place where crossings of sensitive flight corridors cannot be avoided and where a collision risk occurs.

Surveys focusing on feature species which can move outside the confines of a European site shall be conducted to ensure any significant areas of supporting habitat (e.g. foraging areas for feature species birds in close proximity to, but outwith an SPA; or otter holts out with an SAC, etc.) would be identified and avoided or appropriate mitigation measure put in place.

Otters

Works shall avoid active otter holts. In the event that an otter holt cannot be avoided by the works, it will be necessary to seek a derogation licence from NIEA to exclude otters from the holt. No works shall be undertaken within 150mof any holts at which breeding females or cubs are present.

No wheeled or tracked vehicles (of any kind) shall be used within 30m of non-breeding otter holts. Light work, such as digging by hand or scrub clearance shall also not take place within 30m of such holts, except as agreed with NIEA under licence.

Marine Mammals

Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise (JNCC, 2010) will be followed for marine based cable laying activities.

10.4. Monitoring

The SEA Directive requires that the significant environmental effects of the implementation of the TDPNI are monitored in order to identify, at an early stage, unforeseen adverse effects and in order to undertake appropriate remedial action. The proposed monitoring programme in Table 9-3 is based on the Targets and Indicators established in the SEOs. This monitoring plan will be adopted into TDPNI and should be undertaken in advance of development of the next cycle of the TDPNI, to enable the outcomes to influence the development of the Plan. Annual environmental review by SONI could also incorporate some or all of this monitoring.

Table 9.3 Proposed Environmental Monitoring of the TDPNI (From Environmental Report)

Environmental Topic	Objective		Sub-Objective		Indicators	Possible Data and Responsible Authority
Biodiversity, Flora & Fauna	**1**	Avoid damage to, and where possible enhance, biodiversity, flora and fauna.	**A**	Preserve, protect, maintain and where possible enhance internationally protected species and their key habitats.	Status, condition, area and number of internationally protected species and their key habitats. SACs, SPAs, Ramsar sites	NIEA/NPWS – Conservation Action Plans NIEA/NPWS reporting on Habitats and Species – Article 17 Reports, and Birds – Article 12 Reports
			B	Preserve, protect, maintain and where possible enhance national and local nature conservation sites and protected species, or other know species of conservation concern.	Status, condition, area and number of ASSI, NHA, pNHA, SLNCI and local conservation designations and their species.	NIEA/NPWS – Status of Protected Sites and Species in Northern Ireland/Ireland Reporting Local Authority – Local Area Plans
Population & Human Health	**2**	Minimise the risk to and provide benefit for the community and human health.	**A**	Minimise disruption and displacement to the local population, while providing robust transmission infrastructure.	Population density within proximity to potential transmission system developments.	NISRA – Census data
			B	Minimise risks to human health and social deprivation, while providing robust transmission infrastructure.	Perceived health of the local population within proximity to potential transmission system developments. Socially sensitive areas within proximity to potential transmission system developments.	NISRA – Census data NIO data on NI Peace Lines DSD data on Neighbourhood Renewal Areas

Table 9.3 Proposed Environmental Monitoring of the TDPNI (From Environmental Report)

Environmental Topic	Objective		Sub-Objective		Indicators	Possible Data and Responsible Authority
Soils, Geology and Landuse	**3**	Minimise damage to the function and quality of the soil resource in the study area in construction and operation of transmission infrastructure.	**A**	Minimise damage to the function and quality of the soil resource in the study area in construction and operation of transmission infrastructure.	Loss or damage to sensitive soils and land uses, e.g. peatlands, ancient woodland, commercial forestry, cultivated lands Interactions with potentially hazardous soils and activities, e.g. PPC sites, mines, quarries, historically contaminated sites Interactions with topographically difficult sites, e.g. steep slopes and uplands.	GSNI/NIEA data Woodland Trust, LPSNI, NIEA, GSNI, and Forest Service data Local Area Plans
Water	**4**	Avoid impacts and interaction with water quality, quantity and resource.	**A**	Avoid damage to or deterioration of water status, quality and resource.	WFD water status of surface, coastal, transitional and groundwater's within proximity to potential transmission system developments. Sensitive waterbodies, e.g. drinking and bathing waters within proximity to potential transmission system developments.	NIEA and WFD data
			B	Avoid interactions with coastal, pluvial or fluvial flood extents.	Medium probability flood extents - Pluvial and fluvial 100 year and coastal 200 year flood extents.	DfI Rivers data – flood extents/risk – Flood Risk Management Plans

Table 9.3 Proposed Environmental Monitoring of the TDPNI (From Environmental Report)

Environmental Topic	Objective		Sub-Objective		Indicators	Possible Data and Responsible Authority
Air	5	Minimise risk to local air quality and contribute to improving regional emissions	A	Minimise risk to local air quality and contribute to improving regional emissions	Development in air quality sensitive areas. Enable increased renewable energy connection to reduce requirements for fossil fuel burning.	Local Authorities, DAERA , DEFRA data – Annual air quality monitoring summaries and Continuous air quality monitoring
Climatic Factors	6	Adaption of infrastructure to potential climatic change and reduced GHG emissions	A	Adaption of infrastructure to potential climatic change and reduced GHG emissions	Medium probability climate change (cc) influenced flood extents - Pluvial and fluvial 100 year + cc and coastal 200 year +cc flood extents. Enable increased renewable energy connection to reduce requirements for fossil fuel burning.	DfI Rivers data – flood extents/risk – Flood Risk Management Plans Met Office regional information SONI/NIE – Annual Reporting and Plans
Material Assets & Infrastructure	7	Provide new, robust electrical transmission infrastructure with minimal disruption to other assets and infrastructure.	A	Provide new, robust electrical transmission infrastructure with minimal disruption to other assets and infrastructure.	Transmission infrastructure developed or upgraded. Potential for impacts on transport (road, rail, air) and energy infrastructure (gas). Potential for loss of or impacts to agricultural land assets.	SONI and NIE– Annual Reporting and Plans SGN data Transport NI and Translink data LPSNI data EEA - CORINE Landcover

Table 9.3 Proposed Environmental Monitoring of the TDPNI (From Environmental Report)

Environmental Topic	Objective		Sub-Objective		Indicators	Possible Data and Responsible Authority
Cultural, Architectural & Archaeological Heritage	**8**	Protect the historic environment and cultural heritage.	**A**	Protect the historic environment and cultural heritage.	Potential for impacts on, or the setting of, known archaeological heritage features. Potential for impacts on, or the setting of, known architectural heritage features.	NIEA, DfC Heritage and UNESCO data
Landscape & Visual Amenity	**9**	Minimise the potential for negative impacts on landscape and visual amenity.	**A**	Minimise the potential for negative impacts on landscape and visual amenity.	Landscape sensitivity to infrastructure development. Potential for impacts on visually sensitive areas, such as AONBs and country parks.	Local Authority/NIEA – Landscape/Seascape Character Assessments Local Area Plans National Trust data EEA – CORINE Landcover

Appendix A: Project Terms

This appendix explains terms that are used to describe projects in the following appendices.

Estimated Completion Date (ECD): the estimates provided are subject to:

- The planning process where applicable;
- The construction progress; and
- Availability of transmission outages and commissioning; and
- May be liable to change.

Project Capex: The anticipated capital expenditure associated with a project, comprising the combined total of the TSO (SONI) and TAO (NIE Networks) costs.

Stage: the stage the project has progressed to on the data freeze date. The SONI approach to project development consists of three parts, namely:

Part 1 – Planning

Part 2 – Outline Design

Part 3 – Consents

Once projects have progressed beyond Part 3, they are handed over to NIE Networks for construction. These projects are marked as **NIE Networks** within the tables below.

Asset replacement projects are carried out by NIE Networks outside SONI's Grid Development Process. These are marked as **AR** in the tables below.

Appendix B: Planned Network Developments

This appendix details active TDP 2018 projects and their driver(s), need(s), location, stage and ECD, as at the data freeze date 01 January 2018. Projects are categorised by planning area[34].

Please note the following label:

- "TYNDP/TYNDP_Project_No" or "RegIP/RegIP_Project_No" included with a project's title signifies that it is in ENTSO-E's most recent TYNDP or RegIP North Sea. Projects included in the TYNDP are projects of pan-European significance. Projects included in the RegIP North Sea are projects of regional significance. These projects are listed in Appendix C; and
- "*" included with a project's length signifies that the circuit length is an estimate at this time.

Projects in Both Planning Areas:

There are 2 projects that are in multiple Planning Areas; these projects are listed in Table B-1 below.

Table B-1 Planned Projects that are in Both Planning Areas (2 Projects)

Project Title	Type	Km	Drivers			Needs					Stage (Part)	Project Capex	ECD
			Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition			
Enhancement to the low frequency load disconnection scheme	Uprate/ Modify	0	✓				✓				1	£0.45M	2021
Augmentation of capacity at Transmission/ Distribution interface	Uprate/ Modify	0		✓			✓				1	£13.6M	2022

Projects in the North and West Planning Area

There are 17 projects in the North and West Planning Area; these projects are listed in Table B-2 below.

34 Some projects are in, or have the potential to be in, both planning areas

Table B-2 Planned Projects in the North and West Planning Area (17 Projects)

Project Title	Type	Km	Drivers				Needs					Stage (Part)	Project Capex	ECD
			New Connection	Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition			
Coolkeeragh - Magherafelt 275 kV Circuits Refurbishment	Refurbish/ Replace	56		✓			✓				✓	AR	£27.4M	2021
Ballymena transformer 3 and 4 replacement	Refurbish/ Replace	0		✓							✓	AR	£1.89M	2024
Enniskillen Main transformer 1 and 2 replacement	Refurbish/ Replace	0		✓							✓	AR	£1.89M	2024
Strabane Main 110kV refurbishment	Refurbish/ Replace	0		✓							✓	AR	£2.49M	2024
Limavady Main 110kV refurbishment	Refurbish/ Replace	0		✓							✓	AR	£1.43M	2024
Curraghamulkin 110/33 kV Cluster	New Build	0	✓		✓				✓			NIE Networks	n/a	2018
Agivey 110/33 kV Cluster	New Build	0	✓		✓				✓			2	n/a[20]	2020
Fair Head/Torr Head Tidal Scheme connection	New Build	-	✓		✓		✓		✓			1	n/a	>2025
Omagh Main – Omagh South Uprate	Uprate/ Modify	9	✓		✓		✓	✓			✓	2	£3.25M	2019
Omagh Reactive Compensation	New Build	0		✓	✓		✓	✓				2	£23.3M	2021
Coleraine Reactive Compensation	New Build	0		✓	✓		✓	✓				2	£21.4M	2021
Creagh/Kells-Rasharkin New 110 kV Circuit	New Build	0		✓	✓			✓	✓			2	£23.07 M	2024
Coolkeeragh – Trillick new 110 kV	New Build	16		✓	✓	✓	✓	✓				1	£8.5M	>2025
Turleenan – Omagh South – Donegal new 275 kV line (TYNDP/82)	New Build	119		✓	✓		✓	✓				1	£170M	>2025
North West of NI Reinforcement	New Build	-		✓	✓		✓	✓				1	N/A	>2025
North West Special Protection Scheme upgrade	Uprate/ Modify	0		✓	✓			✓				NIE Networks	£0.34M	2019
Coolkeeragh T1 Transformer cabling uprate	Uprate/ Modify	0		✓				✓				1	£0.54M	2020

Projects in the South-East Planning Area

There are 27 projects in the South-East Planning Area; these projects are listed in Table C-3 below.

Table B-3 Planned Projects in the South-East Planning Area (27 Projects)

Project Title	Type	Km	Drivers				Needs					Stage (Part)	Project Capex	ECD
			New Connection	Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition			
Donegall Main (North) transformer replacement	Uprate/ Modify	0		✓				✓			✓	AR	TBA	2018
Castlereagh inter-bus transformer 1 replacement	Refurbish/ Replace	0		✓							✓	AR	£1.27M	2018
Ballylumford Switchgear replacement	Uprate/ Modify	0		✓				✓				AR	£17M	2020
Ballylumford – Castlereagh 110 kV Circuit Refurbishment	Refurbish/ Replace	52		✓							✓	AR	£12.5M	2022
Banbridge Main transformer 1, 2, 3 and 4 replacement	Refurbish/ Replace	0		✓							✓	AR	£1.89M	2024
Ballylumford inter-bus transformer 1 and 2 cooler replacement	Refurbish/ Replace	0		✓				✓			✓	AR	£0.27M	2024
Glengormley Main 110kV refurbishment	Refurbish/ Replace	0		✓							✓	AR	£0.94M	2024
Hannahstown inter-bus transformer 1 or 2 replacement	Refurbish/ Replace	0		✓							✓	AR	TBA	TBA
Tandragee inter-bus transformer 1 or 2 replacement	Refurbish/ Replace	0		✓							✓	AR	TBA	TBA
Kells inter-bus transformer 1 and 2 replacement	Refurbish/ Replace	0		✓							✓	AR	TBA	TBA
Kells and Tandragee shunt reactor replacement	Refurbish/ Replace	0		✓							✓	AR	£1.49M	2027

Table B-3 Planned Projects in the South-East Planning Area (27 Projects)

Project Title	Type	Km	Drivers				Needs					Stage (Part)	Project Capex	ECD
			New Connection	Security of Supply	RES Integration	Market Integration	Inter-Regional Power Flow	Local Constraints	Connection	Inter-connection	Asset Condition			
Kells 110/33 kV Cluster	New Build	0		✓			✓	✓				2	N/A	2020
Belfast Power Station Connection	New Build	~14	✓				✓	✓				1	N/A	›TBA
Compressed Air Energy Storage Scheme Connection	New Build	0	✓		✓	✓			✓			1 (on hold)	N/A	›2025
Tamnamore Reactive Compensation	New Build	0		✓	✓		✓	✓				2	£23.3M	2021
Tamnamore – Turleenan 275 kV Uprate	Uprate/ Modify	5		✓	✓		✓					1	£2.28M	2022
Kells Remote Control	Uprate/ Modify	0		✓			✓	✓				2	£0.37M	2020
Tandragee 110 kV 275 kV second bus coupling circuit breaker	Uprate/ Modify	0		✓			✓	✓				1	£2.14M	2021
Ballylumford-Castlereagh 110 kV Circuit Uprate	Uprate/ Modify	52		✓				✓				2	£12.5M	2022
Airport Road Main 110/33 kV substation	New Build	0		✓				✓	✓			2	£7.31M	2022
Castlereagh 275 kV new no. 4 inter-bus transformer	New Build	0		✓				✓	✓			1	£8.06M	2022
Castlereagh Reactors	New Build	0		✓				✓				1	£0.27M	2024
Drumnakelly and Armagh Development Plan	New Build	17		✓				✓	✓			1	£21.9M	2027
Castlereagh and Tandragee 110 kV Switchgear replacement	Uprate/ Modify	0		✓				✓				1	£7.42M	2021
Castlereagh – Knock 110 kV cables uprate	Uprate/ Modify	5		✓				✓			✓	2	£1.22M	2021
Cregagh Transformer B switchgear replacement	Uprate/ Modify	0		✓						✓		1	£0.29M	2022
North South 400 kV Interconnection Development (TYNDP/81)	New Build	137 (34)		✓	✓	✓	✓	✓		✓		3	£109.3M	2021

Appendix C: Northern Ireland Projects in European Plans[35]

How are Northern Ireland transmission projects included in ENTSO-E's TYNDP?

Licensed TSOs, who are members of ENTSO-E, and third party promoters propose transmission projects to ENTSO-E for inclusion in ENTSO-E's TYNDP. If these projects match the project of pan-European significance criteria below, they are included in the TYNDP.

Criteria for Inclusion in TYNDP

A project of pan-European significance is a set of Extra High Voltage assets, matching the following criteria:

- The main equipment is at least 220 kV if it is an AC overhead line or at least 150 kV otherwise and is, at least partially, located in one of the 34 countries represented within ENTSO-E;
- The project increases the grid transfer capability across a network boundary within the ENTSO-E interconnected network[36] or at its borders[37];
- The grid transfer capability increase (expressed in MW) meets at least one of the following minimums:
  - At least 500 MW of additional Net Transfer Capacity; or
  - Connecting or securing output of at least 1 GW/1000 km² of generation; or
  - Securing load growth for at least 10 years for an area representing consumption greater than 3 TWh/year.

SONI Projects in TYNDP 2016 and RegIP NS 2015

Table C-1 below lists the Northern Ireland projects we proposed, that are in ENTSO-E's most recent final versions of TYNDP and RegIP NS. These were issued in 2016 and 2015 respectively.

Table C-1 Our projects in European TYNDP 2016

TYNDP No.	Project Title
81	North South 400 kV Interconnection Development
82	Renewable Integration Development Project (RIDP)

Northern Ireland Projects of Common Interest (PCIs)[38]

The EC oversees the designation of Projects of Common Interest (PCI). To be eligible for PCI status, inclusion in the last available TYNDP is an explicit condition. Table C-2 below lists the Northern Ireland Projects of Common Interest. Renewable Integration Development Project (RIDP)

Table C-2 Northern Ireland Projects of Common Interest

PCI No.	TYNDP No.	Project Title
2.13.1	81	North South 400 kV Interconnection Development
2.13.2	82	Renewable Integration Development Project (RIDP)
1.12.1	1010	Compressed Air Energy Storage Scheme

35 For the avoidance of doubt, the term "Northern Ireland Projects in European Plans" refers to Northern Ireland projects in ENTSO-E's TYNDP and RegIP NS and Northern Ireland projects designated Projects of Common Interest.
36 For example, additional Net Transfer Capacity between two market areas.
37 That is, increasing the import and/or export capability of ENTSO-E countries in relation to others.
38 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R0540&from=EN

Northern Ireland e-Highway 2050 projects

The e-Highway2050 is a study project funded by the EC aimed at building a development plan for the European transmission network from 2020 to 2050. The development plan supports the EU's overall policy objectives with regard to energy and decarbonising the European economy. Table C-3 below lists the Northern Ireland projects included in the e-Highway 2050 plan.

Table C-3 Northern Ireland projects in e-Highway 2050 plan

TYNDP No.	Project Title
81	North South 400 kV Interconnection Development
82	Renewable Integration Development Project (RIDP)

How are Northern Ireland and European Plans related?

It is worth highlighting how the TDPNI and the European plans and designations are related. Figure D-1 below illustrates the relationship. All our capital projects, irrespective of size, are described in the TDPNI.

Only high voltage projects that involve a large increase in transmission capacity are included in European plans. Of those only a small number of large cross border projects which increase the import and/or export capability of ENTSO-E countries are designated Projects of Common Interest.

Figure C-1 Relationship between Northern Ireland and European Plans

Appendix D: References

Our Published Documents

I. SONI TSSPS, September 2015

II. All Island TYTFS 2017-2026

ENTSO-E Published Documents

III. TYNDP 2016

IV. RegIP North Sea, October 2015

Local Legislation

V. The Electricity Order (Northern Ireland) 1992 No. 231

VI. The Electricity Safety, Quality and Continuity Regulations (Northern Ireland) 2012

European Legislation

VII. Birds and Natural Habitats Regulations, 2011

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

IX. Environmental Impact Assessment Directive

X. Habitats Directive

XI. Internal Market in Electricity Directive 2009/72/EC

XII. Promotion of the Use of Energy from Renewable Resources Directive 2009/28/EC

XIII. Energy Efficiency Directive 2012/27/EC

Utility Regulator Published Documents

XIV. TSO Licence granted to SONI

XV. Transmission Licence granted to NIE Networks

XVI. NIE Networks RP6 Regulatory price Control, Utility Regulator, 2017

Government Published Documents

XVII. Strategic Energy Framework, 2010

Other Published Documents

XVIII. Grant Thornton: "Powering Northern Ireland A report exploring SONI's role in the economy", October 2016

Notes:

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Castlereagh House, 12 Manse Road, Belfast BT6 9RT • Telephone: 028 907 94336 • www.soni.ltd.uk

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