Draft Investment Planning and Delivery Report **2023**

EirGrid

ESB NETWORKS

DOC-150724-HZG

Contents

EirGrid and ESB Networks have clearly defined roles and responsibilities in relation to the transmission network, as set out in an Infrastructure Agreement.

EirGrid in its role as Transmission System Operator (TSO) is responsible for operating and ensuring the maintenance and development of a safe, secure and reliable electricity transmission system now and in the future. To achieve this, EirGrid continues to develop, manage and operate the electricity transmission grid. More recently, EirGrid has been mandated to operate, develop and own Ireland's offshore grid.

ESB is the Transmission Asset Owner (TAO) and its business unit ESB Networks carries out the licensed onshore TAO functions. ESB Networks is responsible for delivering the detailed design, construction and maintenance of the onshore transmission network, as identified by EirGrid.

We work closely together to ensure that all steps in the operation, development and construction of grid infrastructure are carried out as safely, securely, efficiently and cost effectively as possible.

1. Introduction

The Investment Planning and Delivery Report provides stakeholders with an overview of EirGrid and ESB Networks' annual infrastructure development and delivery progress across the portfolio of transmission projects.

EirGrid and ESB Networks share the Commission for Regulation of Utilities' (CRU's) strategic objectives for the PR5 period (2021-2025) and continue to develop our transmission infrastructure plans to deliver on the ambition of:

- Facilitating a secure low carbon future.
- Resolving local security of supply.
- Increasing efficiency and protecting customers.

This Investment Planning and Delivery (IPD) 2023 report will:

- Provide stakeholders with an overview of the unconstrained transmission Network Delivery Portfolio (NDP) as at the end of calendar year 2023, the third year of the Price Review Five (PR5) period; and
- Advise stakeholders on how the development and delivery of grid infrastructure is progressing relative to expectations.

The IPD 2023 report includes an overview of the infrastructure development highlights and benefits delivered in 2023 (Section 2) and the progress in each of the six steps relative to previous years and with reference to what was expected to be delivered (Sections 5-10). The report contains information on how we prioritise projects (Section 11), Climate Change Adaptation activities (Section 12) and an overview of stakeholder engagement activities (Section 13).

This report forms part of the enhanced PR5 reporting and monitoring requirements outlined in CRU/20/154. We recommend that it is read in conjunction with our Annual Electricity Transmission Performance Report 2023, which contains an overview as to how the transmission system was operated, developed and maintained in 2023 by EirGrid and ESB Networks. We look forward to engaging with our stakeholders further as we continue to deliver on our ambitious 2030 targets.

1.1 Strategy for planning and delivering the grid

EirGrid Group's Strategy[1] is shaped by climate change and the need for a secure, reliable and sustainable transition of the electricity sector to low-carbon, renewable energy. The Shaping Our Electricity Future (SOEF)[2] initiative takes a whole of system approach and considers transmission network development, public and stakeholder engagement, evolution of system operations and appropriately incentivising electricity markets.

The updated Shaping Our Electricity Future (SOEF) Version 1.1[3] captures the changes to electricity policy set out in the Government's Climate Action Plan 2023[4] and sets out a pathway for an electricity system that can deliver 80% of electricity demand from renewable energy by 2030. This is supported by the Shaping Our Electricity Future Roadmap V1.1 which details the dynamic plan for achieving these goals, reflecting the best available information, including changes in climate and energy policy and reports on progress against specific actions within the roadmap.

80%

of electricity demand from renewable energy by 2030

1 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Group-Strategy-2025-DOWNLOAD.pdf
2 https://cms.eirgrid.ie/sites/default/files/publications/Shaping_Our_Electricity_Future_Roadmap.pdf
3 https://cms.eirgrid.ie/sites/default/files/publications/Shaping-Our-Electricity-Future-Roadmap_Version-1.1_07.23.pdf
4 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

Central to EirGrid's strategy for infrastructure delivery is our six-step approach for grid development.

This framework sets out how the general public and stakeholders can influence the decisions that EirGrid makes on grid development projects. It is an agile and flexible framework which includes transmission infrastructure projects and programmes of different types and scales. Projects enter the framework once they are sufficiently developed whilst also taking account of the applicable project need and the project driver. The framework is flexible and enables EirGrid and ESB Networks teams to appropriately combine steps and activities to deliver transmission infrastructure in a timely manner, in accordance with best practice, environmental, social, regulatory and technical requirements.

Progress during 2023 on each of the steps in the Framework for Grid Development is outlined in Section 4 of this report.

Figure 1: EirGrid six-step framework for grid development

2. Transmission development highlights 2023

EirGrid manages a complex programme of transmission capital projects at various stages of development. ESB Networks has the responsibility for efficiently and safely managing the delivery of these projects, including aspects such as procurement and construction.

Projects are planned and delivered in line with the needs identified by EirGrid and the jointly agreed work programmes. The successful rollout of an upgraded electricity network is a key requirement in achieving the ambitious Climate Action Plan 2023[5] targets and maintaining a safe and secure transmission system.

Summarised below are the highlights in Transmission Development for 2023.

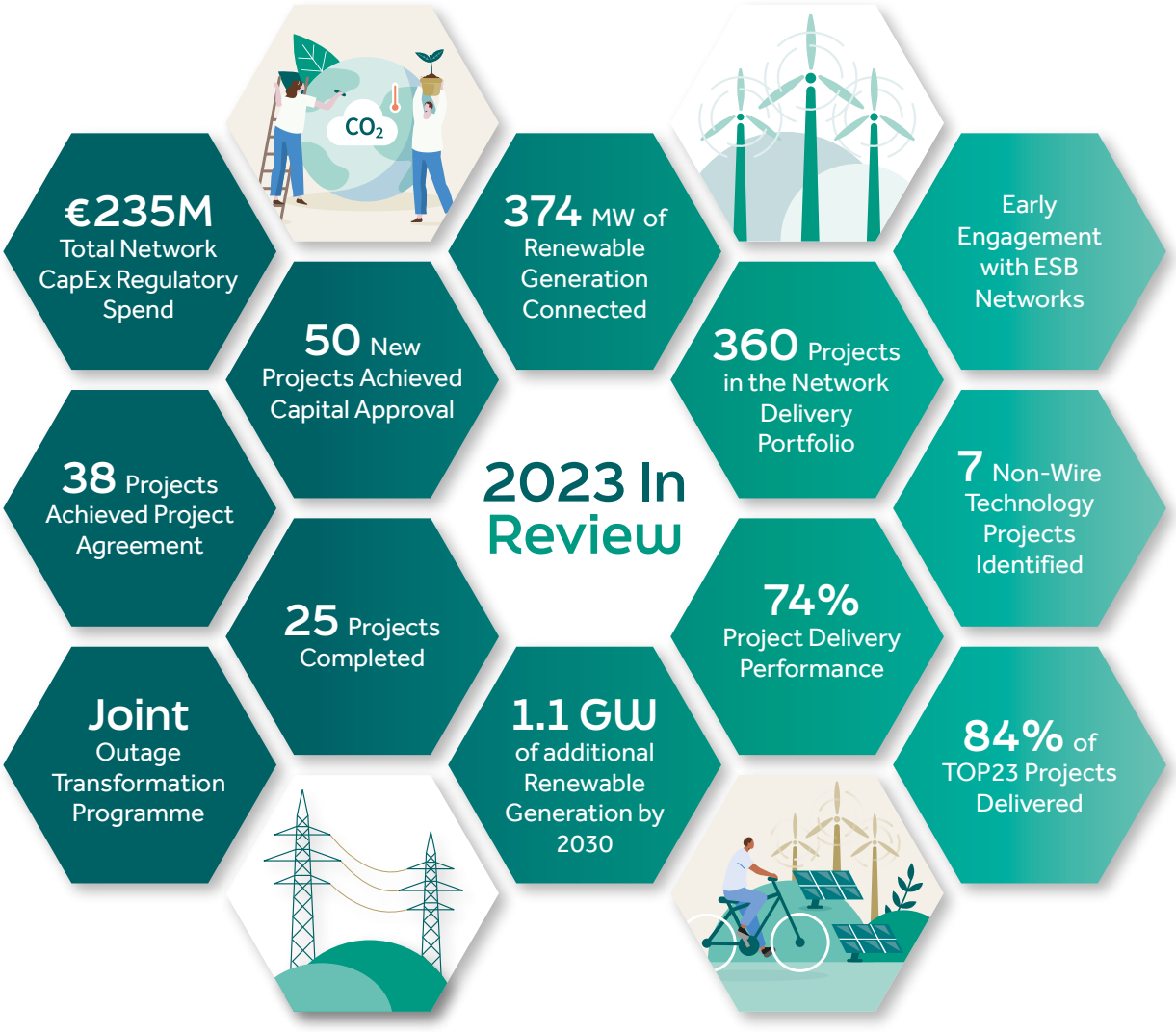


Figure 2: Transmission development highlights 2023

5 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/

In 2023, strong progress was made by EirGrid and ESB Networks in terms of project development and delivery across the six steps of the Framework for Grid Development (Figure 2), with 50 projects achieving capital approval and 38 projects achieving project agreement and thus moving into the detailed design and construction stages. Capital investment in the transmission network increased further in 2023 to €235M. Project completions also increased further in 2023 with twenty-five projects to the value of €196M being energised and/or completed.

EirGrid's average project delivery outturn performance in 2023 is an acceptable performance, achieving 74% of key project milestones delivered in line or ahead of plan. This is an assessment of the quantity of capital approvals and project agreements achieved within the calendar year and the quantity of energisations achieved within PR5 to date, against the quantity of these milestones planned.

EirGrid publishes a quarterly report called the Network Delivery Portfolio (NDP)[6] which gives stakeholders and industry a regular status update on the progress of approximately 360 projects through the six-step process towards completion. Further details on the NDP are included in Section 4 of this report.

The major challenges impacting the completion of works within the outage programme include issues such as forced outages on the transmission system, low generation capacity margins, project scoping, outage availability, outage utilisation and outage complexity challenges. The outage related challenges are a key contributor to a lower-than-expected project completions delivered in 2023. The reasons for this and the contributing factors are outlined in greater detail in Section 4 of this report.

We also introduce details regarding the ongoing Outage Transformation Programme which commenced in 2023 and which, when concluded, will propose solutions to address how the outage process can be updated to increase outage availability and maximise utilisation and effectiveness of existing outages and project delivery. Further details on the Outage Transformation Programme are included in Section 11.

6 https://www.eirgrid.ie/grid/grid-reports-and-planning/network-delivery-portfolio

2.1 Renewable connections and battery energy storage

The connection and completion of new renewable generation projects to the transmission network is vital to achieving the 2030 climate action plan targets. In 2023, EirGrid progressed a diverse set of renewable and Battery Energy Storage Systems (BESS) projects through the Six-Step Framework. BESS technologies facilitate renewable energy on the grid by supporting system reserve provision, generation adequacy and congestion management.

The battery technology captures the electrical energy at one time for it to be used at times of higher demand.

The following section outlines major developments in the connection of renewable energy and BESS projects to the grid. Notably, significant capacity has been added to the grid this year, with additional capacity planned over the next couple of years (Figure 3).

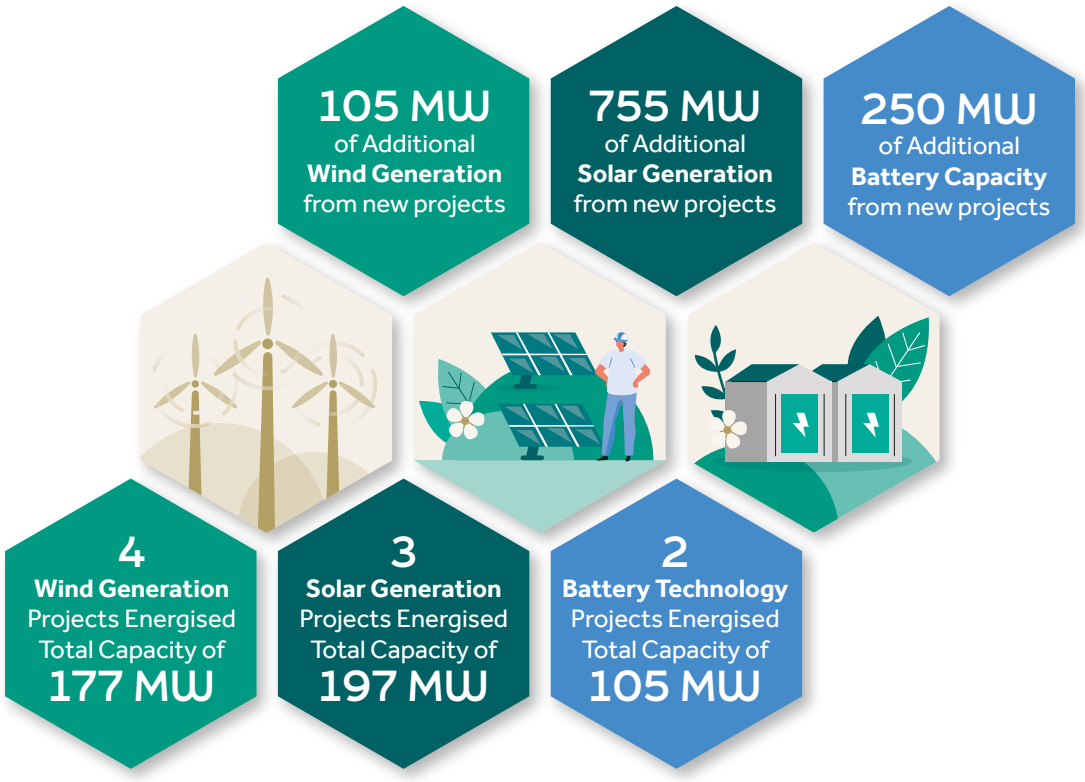


Figure 3: Renewable connections and battery energy storage highlights

Renewable Projects which achieved capital approval

Twelve renewable projects and three Battery Energy Storage System (BESS) projects received Capital Approval and progressed through Step 3. More information on these projects can be found in Section 7. These projects are expected to provide significant benefits to the grid by 2030, including:

- Approx. 105 MW of Wind Generation.
- Approx. 755 MW of Solar Generation.
- Approx. 250 MW of Battery Energy Storage Systems.

Renewable projects which achieved project agreement

In 2023, six renewable project and two BESS projects received Project Agreement. More information on these projects can be found in Section 10. These projects are expected to provide:

- Approx 191 MW of Wind Generation.
- Approx 99 MW of Solar Generation.
- Approx. 118 MW of Battery Energy Storage Systems.

Energised renewable projects

The following Wind Farm and Solar Farm projects were completed in 2023 and are expected to deliver over 370 MW of new renewable generation:

- Buffy 110 kV Station (Ardderoo wind farm), Lislea 110 kV Station (Drumlins Wind Farm), Lenalea Windfarm and Oweninny Power 2 will provide an additional 177 MW of renewable generation.
- Blundelstown 110 kV Station (South Meath Solar Farm), Tullabeg Solar 110 kV Station and Lysaghtstown 110 kV Station (Lysaghtstown Solar Farm) will provide an additional 197 MW of renewable generation.

During 2023, two new BESS technology projects totalling 105 MW were completed. The following BESS connections were energised in 2023:

- The Poolbeg BESS project was energised in June 2023 and will provide 75 MW of additional capacity.
- The Irishtown BESS project was energised in December 2023 and will provide 30 MW of additional capacity.

2.2 Powering Up Dublin programme

In May 2022, EirGrid launched the 'Powering Up Dublin' programme which involves replacing and upgrading older underground cable infrastructure that is reaching the end of its life and facilitate future renewable electricity, specifically offshore capability being 'offshore ready'. This programme will help ensure the security of supply in the Dublin region and improve the overall resilience of the power system.

Since the launch of the Powering Up Dublin Programme, EirGrid has completed the programme masterplan and developed proposals for five major cable circuit replacement and upgrade projects. The emerging best performing options were presented to the public as part of one of EirGrid's largest ever public consultation events which ran from March to May 2023. Following consideration of the public and stakeholder feedback, EirGrid confirmed the best performing route options for three of the routes in Quarter 4 of 2023 (Carrickmines to Poolbeg, Finglas to North Wall, North Wall to Poolbeg).

Extension and development of new substations are a key aspect of the programme and significant progress was made during 2023. EirGrid confirmed the best performing options and submitted planning applications for the Belcamp 220 kV substation extension and the new Poolbeg 220 kV substation in February and June 2023 respectively and are continuing engagement in anticipation of planning permission being granted. The works undertaken to date have been underpinned by extensive public consultation carried out in the latter stages of 2022 on the options long list. Please refer to Section 13.3 of this document which discusses the Dublin Infrastructure Forum. When complete, the projects will provide capacity to meet growing demand from residential and commercial property development and the electrification of heat and transport across the northern, southern, central and western regions of the greater Dublin area. More information on the Programme can be found on the EirGrid Website[7].

7 https://www.eirgrid.ie/dublin

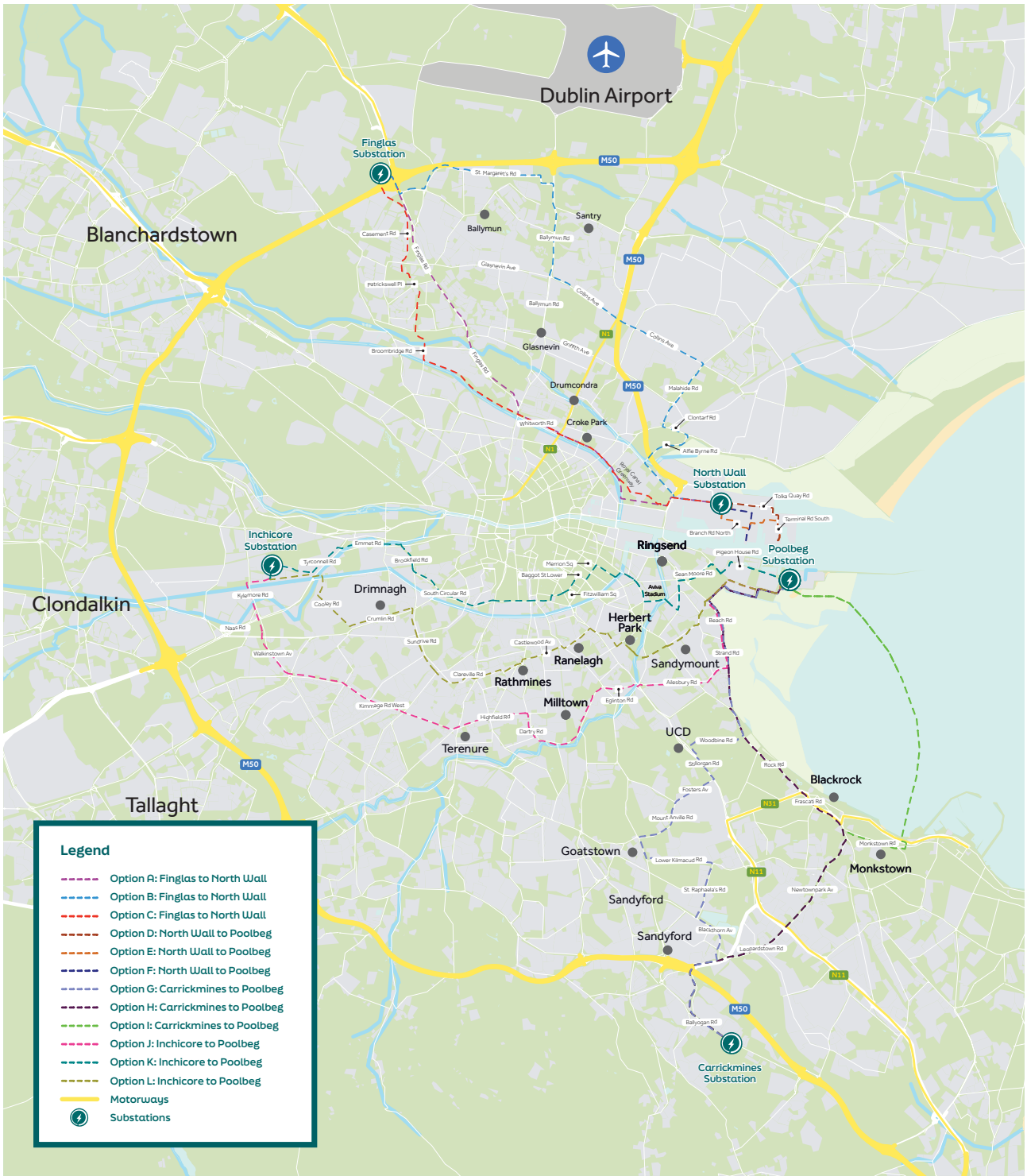


Figure 4: Dublin programme – emerging best performing options

2.3 Security of supply

Security of supply continued to be an important area of focus for EirGrid in 2023 with several workstreams in operation across the company. This includes the development and implementation of operational measures, fast-tracking certain infrastructure delivery and market innovations to advance security of supply solutions. EirGrid has been tasked by the CRU to deliver on elements of the CRU's Security of Supply Programme of Actions as set out in CRU21115[8].
In addition, the CRU's PR5 Local Security of Supply TSO Incentive, as set out in CRU/20/154[9], obliges EirGrid to develop Local Security of Supply specific plans for the PR5 period. Further information on the outturn performance for the Local Security of Supply incentive can be found in the Annual Electricity Performance Report 2023. The CRU published its most recent update on the Electricity Security of Supply Programme of Work in October 2023[10].

2.4 Demand connections and data centres

During 2023, the following projects which facilitate demand connections were energised and/or completed:

- The Rathmullan 110 kV Station, was energised in October 2023, which facilitated a connection from a new data centre in Oldbridge Co. Meath to the existing Drybridge Platin 110 kV overhead line.
- The Aungierstown 110 kV Station was energised in May 2023 facilitating a connection between a data centre to the new station and the existing Castlebagot 220/110 kV Station.
- An additional transformer was energised at the Kellystown 220 kV Station, connecting the Maynooth-Woodland 220 kV OHL and the Kellystown 220 kV GIS station to the existing demand connection.
- The Bracetown 220 kV station includes two new transformer bays, two underground cable connections from Bracetown 220 kV Station to Clonee 220 kV Station and a new feeder bay in Clonee 220 kV station to facilitate the double circuit to Bracetown.

8 https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU21115-Security-of-Electricity-Supply--Programme-of-Actions.pdf
9 https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU20154-PR5-Regulatory-Framework-Incentives-and-Reporting-1.pdf
10 https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/Electricity_Security_of_Supply_Programme_of_Work_Update_October_2023.pdf

2.5 New technology

In 2023, EirGrid and ESB Networks progressed several transmission projects utilising new technologies, with significant progress made in the application and consideration of new non-wire technology solutions.

The introduction of new technology into the electricity grid, such as Dynamic Line Rating (DLR), Power Flow Controllers (PFC), Static Synchronous Compensator (STATCOM) and Distributed Temperature Sensing (DTS) are providing significant benefits for the electricity grid in Ireland and contribute to a more resilient and sustainable energy future. They will enhance the efficiency, reliability and stability of the power system. These technologies allow for better utilisation of existing infrastructure, facilitate the integration of more renewable energy sources and ensure a more stable supply of power even under high demand.

EirGrid's network analyses performed as part of SOEF v1.0[11] identified a total of 21 candidate reinforcements, which involve non-wire solutions and technologies. These non-wire technologies are Dynamic Line Rating and Power flow controllers.

Dynamic line rating

The installation of Dynamic Line Rating (DLR) allows existing lines to operate at a higher load rating based on ambient conditions and can eliminate the need for the line to be uprated whilst also facilitating a new connection. Non-wire solutions were considered for all investment planning decisions made in 2023.

The following progress was made in 2023 on the 5 DLR candidate reinforcements in SOEF v1.0:

- Cashla Dalton 110 kV Circuit Dynamic Line Rating & Cathaleen's Fall Corraclassy 110 kV Circuit Dynamic Line Rating are being progressed as DLR projects and both achieved Gateway 3 approval in 2023.
- Grangecastle South is being progressed as a thermal uprate and is therefore no longer a candidate project for DLR. This project achieved Gateway 3 approval in 2023.
- Baroda – Newbridge 110 kV circuit 1 (DLR) will undergo further assessment due to an underground cable section in the circuit.
- The needs associated to Bellacorrick – Castlebar 110 kV circuit 1 (DLR) will be addressed by a planned special protection scheme.

The nine DLR candidate reinforcements in SOEF v1.1[12] are expected to be progressed in 2024 and 2025.

11 https://cms.eirgrid.ie/sites/default/files/publications/Shaping_Our_Electricity_Future_Roadmap.pdf
12 https://cms.eirgrid.ie/sites/default/files/publications/Shaping-Our-Electricity-Future-Roadmap_Version-1.1_07.23.pdf

Power Flow Controllers (PFC)

PFCs are devices which when installed on a transmission circuit allow control over how power is directed along that circuit and neighbouring circuits. PFCs have been identified as an option in 7 candidate reinforcements across SOEF. The use of PFCs will be evaluated as part of the options evaluation, with selection and approval of the best performing option at Gateway 3. The needs associated with the PFC candidate reinforcements in SOEF will continue to be assessed and progressed in the coming years, particularly once more information is gathered on the power flow controller trial project. These projects achieved GW5 approval in 2023 and are discussed in more detail with the Binbane – Tievebrack 110 kV line project in Section 9.

Static Synchronous Compensator (STATCOM)

At the end of 2023, two 220-110 kV stations using Static Synchronous Compensator (STATCOM) technology were energised in Ballynahulla, Co. Kerry and Ballyvouskill, Co. Cork. A STATCOM is a device that stabilises voltage in power grids. STATCOMs help to enhance grid stability and maintain voltage levels, improving the overall reliability and efficiency of the grid. They are especially useful when power demand is high or new power sources are being connected to the grid.

Distributed Temperature Sensing (DTS)

Distributed Temperature Sensing (DTS) uses fibre optic sensor cables embedded in the power cable, typically over lengths of several kilometres, that function as linear temperature sensors. The result is a continuous temperature profile along the entire length of the sensor cable. In 2023, a DTS scheme was ordered and delivered to Kilpaddoge Substation, in Co. Kerry, where it has been installed and is now in service. This new technology now monitors the Kilpaddoge – Knockanure 220 kV cable and the two Kilpaddoge – Moneypoint 220 kV cables.

Further detail on the Joint TSO/TAO Incentive performance for 2023, which includes additional information on new technology aspects of portfolio delivery, is included in the Annual Performance Report 2023.

3. Capital expenditure

Every five years the CRU determines the revenue price control for the TSO (EirGrid) and the TAO (ESB Networks). The CRU sets a revenue envelope to cover the development of the national transmission grid.

This is referred to as network CapEx, under which EirGrid and ESB Networks carry out their capital works programme over a five-year period. This envelope can be adjusted, if necessary, during the five years to allow for changing needs. The costs associated with development of the national transmission grid are recovered over a 50-year period consistent with the expected network asset life.

The total TSO and TAO network CapEx allowance for the PR5 period was determined by CRU in the PR5 Final Determination, CRU/20/152, as €1,048M (2019 Prices), of which €244M was allocated to 2023. Further information on the PR5 final determination can be found in the determination paper on CRU's website[13].

The PR5 programme evolved in 2023 as projects were completed, progressed, added, rescheduled or removed. At the end of 2023, the total network CapEx regulatory spend for 2023 was €235M. Regulatory spend increased in 2023 by €59M when compared with 2022 but was €9m lower than the PR5 2023 CapEx allowance of €244M.

Table 1: Actual total regulatory spend PR5 2023 vs PR5 allowance for 2023

	PR5 TSO & TAO network CapEx determination allowance 2023	PR5 programme 2023 TSO & TAO outturn	Variance PR5 outturn 2023 vs PR5 allowance
Total network CapEx regulatory spend	€244M[14]	€235M*	-€9M (-4%)

13 https://cruie-live-96ca64acab2247eca8a850a7e54b-5b34f62.divio-media.com/documents/CRU20152-TSO-and-TAO-Transmission-Revenue-2021-20252.pdf
14 Expressed in nominal 2019 money.

The Network CapEx spend profile is heavily influenced by spending on major projects (such as East Meath – North Dublin, North Connacht, North South Interconnector, major stations and cable projects). The graph below shows the Network CapEx spending trend over the last five years across from 2019 to 2023.

It is anticipated that the Network CapEx delivery on major projects and therefore the spending trend will ramp up significantly in the period 2023-25. This aligns with EirGrid's Q4-23 Network Delivery Portfolio forecast for the remaining two years of PR5 as published in February 2024[15].

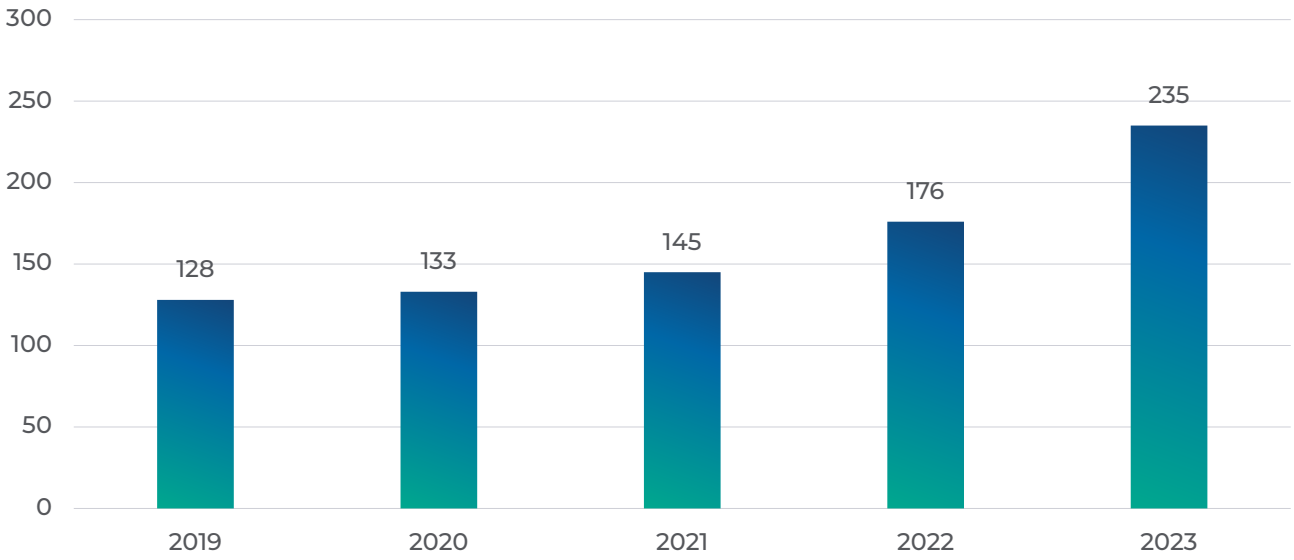


Figure 5: TSO/TAO total network CapEx regulatory spend by year (€M)

15 https://cms.eirgrid.ie/sites/default/files/publications/NDP-Publication-Q4-2023_0.pdf

4. Network delivery portfolio

EirGrid publishes a quarterly Network Delivery Portfolio (NDP) update for stakeholders and industry to meet CRU reporting requirements, as set out in CRU/20/154. The NDP contains an up-to-date programmatic view of the ongoing and pipeline transmission capital projects which span the period 2023-2030, covering the PR5 and PR6 periods.

The quarterly NDP publication is a dynamic and agile unconstrained[16] programme which contains the projects from the PR5 submission, newly added pipeline projects and additional requirements identified by the analysis carried out as part of the Shaping Our Electricity Future studies. The NDP provides a quarterly status update on the three major project milestones of EirGrid Capital Approval, Project Agreement with ESB Networks and Energisation for ca. 360 projects.

The objective of the NDP is to deliver on the EirGrid Group Strategy[17] to transform the power system by 2030, in accordance with the Climate Action Plan 2023[18]. EirGrid does this by providing a clear and transparent programme over multiple years which maximises the amount of project related work that can take place to reinforce the system, connect customers and ensure the required level of maintenance of the transmission system while ensuring a safe and secure system. The Q4-23 NDP project milestone data provides the status updates that form the basis for EirGrid's Transmission Development Plan 2023 and the information contained within this report.

The first edition of the NDP was published on the Customer and Industry section of EirGrid's website in October 2022 and quarterly updates continue to be published at this location[19].

16 Project dates and timelines provided in the NDP are based on an unconstrained scenario and are, therefore, indicative in nature and subject to change for a variety of reasons.
17 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Group-Strategy-2025-DOWNLOAD.pdf
18 https://www.gov.ie/en/publication/7bd8c-climate-action-plan-2023/
19 https://www.EirGrid.ie/grid/grid-reports-and-planning/network-delivery-portfolio

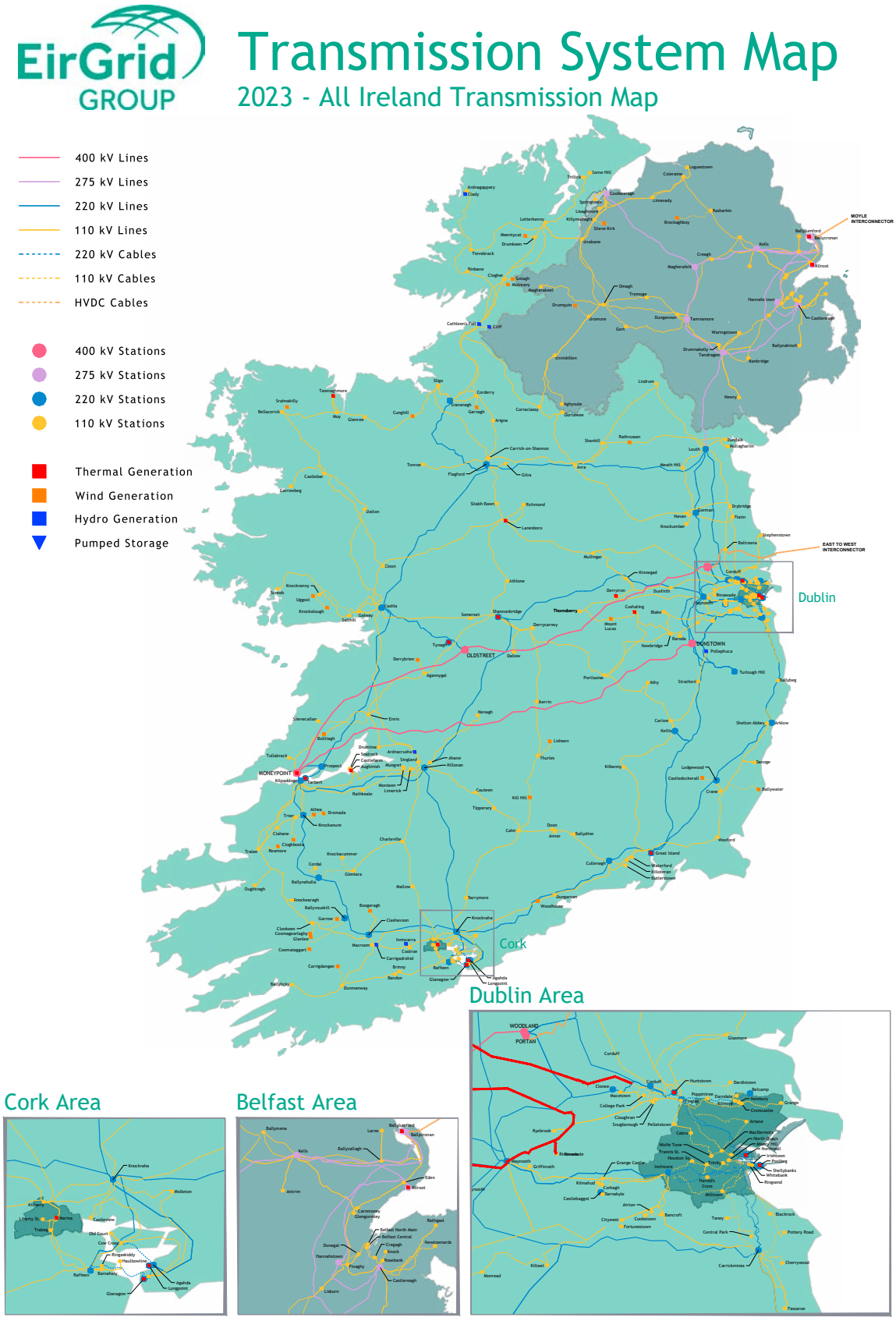


Figure 6: All Ireland transmission system map 2023

4.1 Network delivery portfolio trends in 2023

The third year of PR5 saw significant progress made by the EirGrid and ESB Networks in terms of project development and delivery. Notable trends in 2023 include the continued strong progression of pipeline projects to approved 'ongoing' capital projects in Step 3 of the Six-Step Framework and the strong completion of signed project agreements in Step 6.

These metrics are indicators of the volume of projects progressing through the Six-Step Process towards energisation and completion over the remainder of PR5, ultimately contributing towards the delivery of security of supply, 2030 climate change decarbonisation and customer connection targets.

Capital approvals

Fifty projects achieved Capital Approval in 2023. This volume of newly approved projects marks another year of strong performance and highlights the PR5 step change in the quantity of projects progressing through the Investment Planning process. Further details on the benefits associated with these projects is outlined in Section 7 of this report.

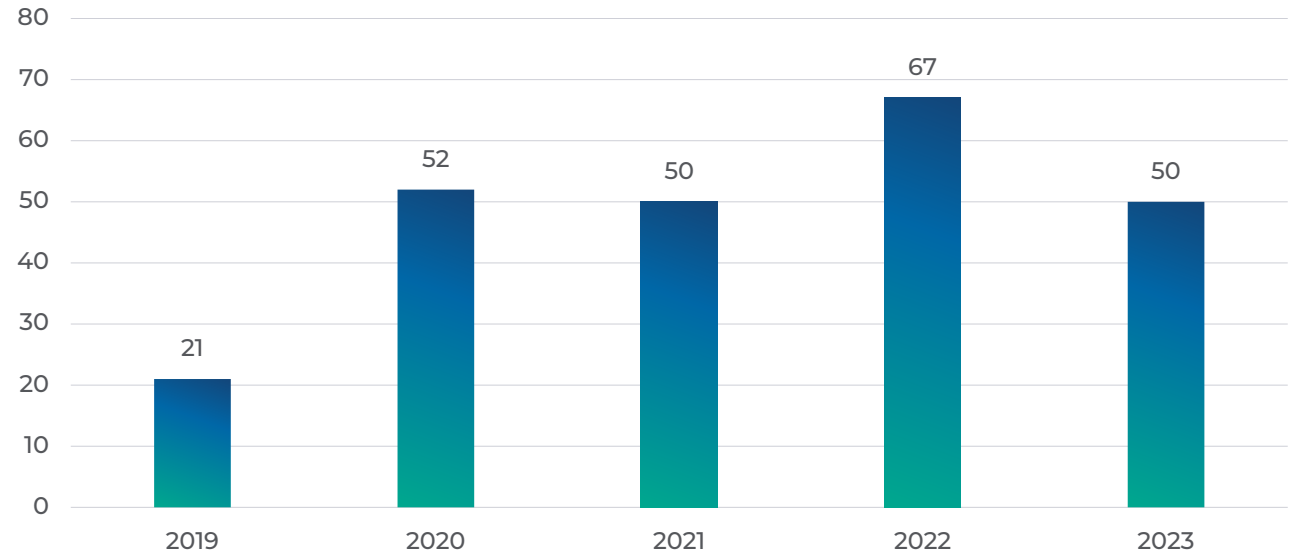


Figure 7: Number of new capital approvals – 5 year period

Project agreements

Thirty-eight Project Agreements (PA) were concluded between EirGrid and ESB Networks in 2023. The quantity of Project Agreements achieved is dependent on the pipeline of projects, which is subsequently reflected in the planned number of Project Agreements annually.

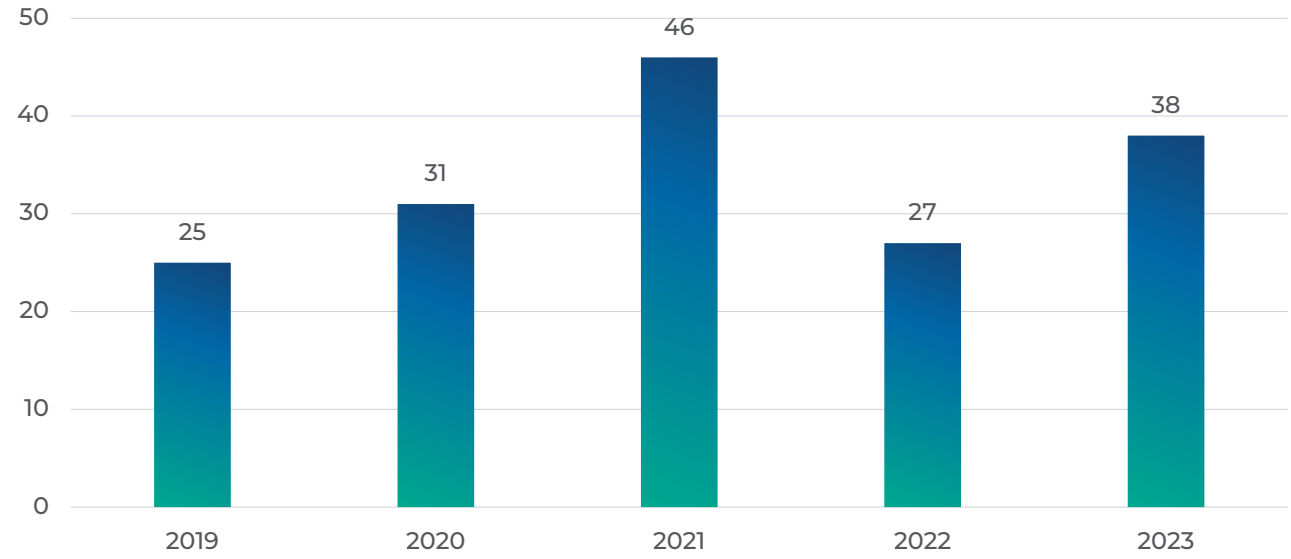


Figure 8: Number of new project agreements signed – 5 year period

Energisations and completions

Twenty-five projects were energised and/or completed in 2023, continuing a trend of a consistent growth in the number of completions in recent years.

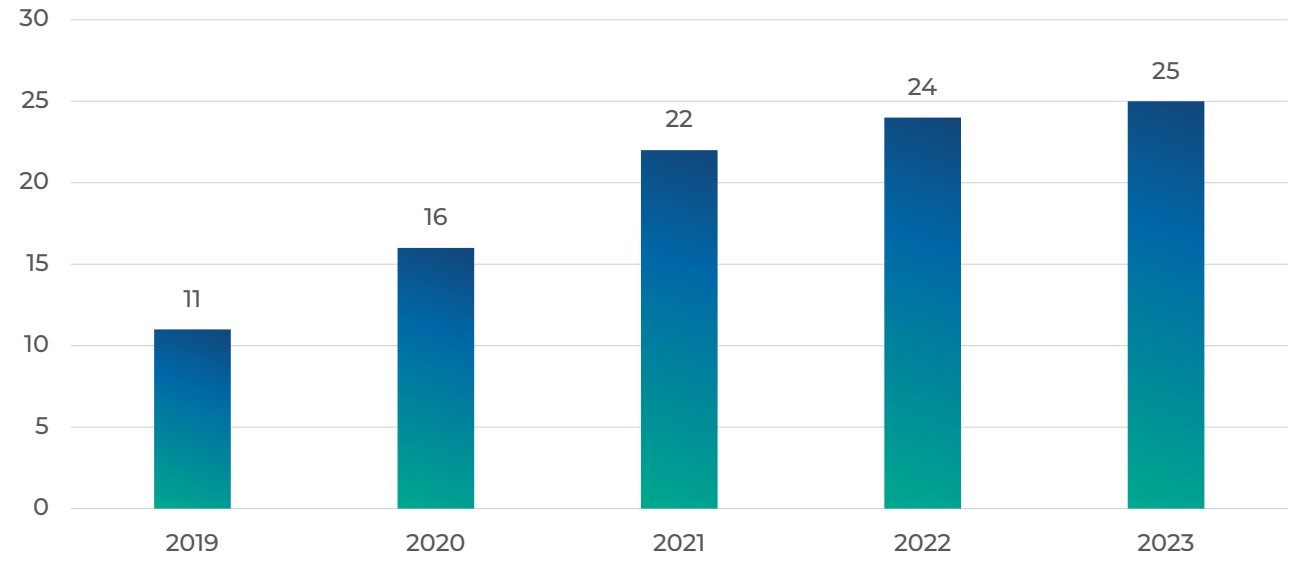


Figure 9: Number of projects energised/completed – 5 year period

4.2 Project delivery dependencies and challenges

Since EirGrid and ESB Networks' submission of the PR5 Programme to CRU in December 2019, a number of projects have experienced development and delivery challenges leading to revised energisation dates. Our ability to deliver grid infrastructure is dependent on a large number of external factors. Where there are changes to project energisation dates, these are communicated in quarterly and annual publications on EirGrid's website in our Customer and Industry[20] Section.

Some of the more common reasons for these changes are as follows:

- Outage availability.
- Outage scoping and complexity, particularly for existing brown field station projects, accommodating changes and the difficulty in achieving large volumes/durations of outages regionally.
- The efficient use by all parties of outage windows to maximise delivery.
- Security of Supply constraints or other system conditions restricting the ability to obtain sufficient outages.
- Delays on the part of customers – in making payments required, achieving consents and/or in changing programmes for contested builds.
- Difficulties in land acquisition, gaining access to land in a timely manner at various stages of project development and legal challenges.
- Discharge of extensive planning and environmental conditions on some projects.
- Issues with the quality of contested builds.
- Co-ordination and sequencing of multiple interdependent projects.
- Availability of materials from suppliers and/or manufacturers with the challenges caused through global supply chain shortages.

20 https://www.eirgrid.ie/industry/customer-information/operational-constraints

5. The six-step grid development process: Step 1

How do we identify the future needs of the electricity grid?

In Step 1, EirGrid confirms the need for a project by considering potential changes in the demand for electricity. These changes are influenced by factors such as how and where electricity is and will be generated and changes in electricity use.

EirGrid does this by identifying:

- Future system needs which are brought about by changes to demand, generation and storage, interconnection and asset condition.
- System reinforcement needs – application of technical planning standards.
- Asset management and maintenance needs – condition assessments and maintenance policies.

In 2019, EirGrid published Tomorrow's Energy Scenarios (TES) 2019 System Needs Assessment (SNA)[21]. The purpose of the SNA is to highlight the long-term needs of the grid in Ireland out to 2040.

The SNA report was the output of a process that started with the publication of and consultation on, TES in 2019[22]. We must adhere to technical standards when planning the network. These technical standards are detailed in EirGrid's Transmission System Security and Planning Standards (TSSPS)[23] as approved by the CRU. If it is established that the current grid cannot meet expected future needs under the TSSPS, the grid will need further investment.

In addition, in 2021, we published Shaping Our Electricity Future (SOEF) Roadmap[24]. SOEF sets out our planned approach – our roadmap in market operations, network development and system operations – to achieve our renewable ambition. The ambition, at the time of publication in 2021, was to have at least 70% of our electricity coming from renewable sources by 2030. This has since increased to 80% in SOEF Version 1.1 Roadmap[25] to reflect the Governments Climate Action Plan 2030 targets, as published in July 2023.

21 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-TES-2019-System-Needs-Assessment-Report_Final.pdf
22 The updated 2023 version of TES can be found at https://www.eirgrid.ie/industry/tomorrows-energy-scenarios-tes#tes-2023
23 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Transmission-System-Security-and-Planning-Standards-TSSPS-Final-May-2016-APPROVED.pdf
24 https://cms.eirgrid.ie/sites/default/files/publications/Shaping_Our_Electricity_Future_Roadmap.pdf
25 https://cms.eirgrid.ie/sites/default/files/publications/Shaping-Our-Electricity-Future-Roadmap_Version-1.1_07.23.pdf

The projects highlighted in SOEF and TES are in addition to projects that are already being undertaken by EirGrid. Most importantly, each individual project will follow the Six-Step Framework, ensuring the necessary assessments take place, relevant planning regulations are met and appropriate engagement takes place prior to moving forward. These projects will be incorporated into the NDP as and when they achieve an EirGrid Capital Approval.

When we have identified and confirmed a system need, a formal process of project development is initiated. At this point, the only decision that has been made is to confirm that there is a need for a grid development project and the details of the solution have not yet been considered.

Key to this process is considering a range of possible ways that energy usage may change in the future. We call this scenario planning. We test whether the grid of today can support a range of possible future energy scenarios or if the grid needs further investment.

5.1 What happened in Step 1 during 2023?

Network needs are identified through several different processes, including TES, SOEF and the connection offer process. In 2023, various needs located across the network were analysed, in line with the Six-Step Framework for developing the grid. This allowed EirGrid to better understand and define the network needs before preparing a list of solution options during Step 2. Following completion of Step 1, the needs progress to Step 2, where options to meet those network needs will be analysed.

In 2023, the following needs were confirmed:

- Confirmation of need to refurbish six 110 kV lines, particularly in the South-West and Midlands. These refurbishments are driven by improving the security of supply of the grid.
- Confirmation of need to refurbish four 220 kV lines, particularly in the South-West and Mid-West. These refurbishments are driven by improving the security of supply of the grid.
- Confirmation of need to increase the thermal capacity of five 110 kV circuits which will facilitate the integration of renewable energy sources in various regions across the country, namely in the Eastern and Western parts of Ireland.
- Confirmation of need to refurbish the existing Whitegate 110 kV station in Cork or the construction of the new 110 kV station, which will increase security of supply.

6. The six-step grid development process: Step 2

What technologies can meet these needs?

Step 2 involves the creation of a shortlist of options which meet the future needs as confirmed in Step 1. As part of this process, EirGrid seeks feedback from our stakeholders on the list of potential solutions.

In Step 2, we want to understand which options for our stakeholder's think are suitable and which are not. We will study stakeholders' feedback and produce a shortlist of options to consider in more detail in Step 3 of the Six-Step Framework.

When compiling the shortlist of options to consider in more detail, we try to balance stakeholder preferences with technical, cost and environmental suitability. This means we may include options that meet EirGrid's Transmission System Security and Planning Standards (TSSPS) and have a strong public preference but are technically less suitable than alternatives.

We will consider the issue of overall suitability in more detail when progressing to Step 3. If a major new line or linear development is shortlisted, an underground cable option will also be considered. Technologies that are available now can be considered as potential solution options straight away. New technologies that are ready for trial use may also be considered depending on their level of maturity.

We place new technologies into three broad categories:

- New technology at research and development stage.
- New technology ready for trial use.
- Technology available now.

6.1 What happened in Step 2 during 2023?

In 2023, EirGrid progressed four projects through Step 2 the Six-Step Framework, achieving four Gateway 2 approvals where various technological solutions were identified to meet the identified needs from Step 1.

These projects were:

Flagford Sligo Capacity Needs

Investigated the options to increase the network thermal capacity in the transmission corridor between Flagford and Sligo transmission stations, including the Srananagh 220 kV station. A Gateway 2 approval was previously achieved in 2022, however further analysis of the area indicated a greater capacity need, which required a revised Gateway 2 approval.

Donegal Srananagh Corridor

Investigated options to increase the thermal capacity of the Donegal to Srananagh network corridor, which will facilitate the integration of further Renewable Generation.

Athy – Carlow 110 kV Thermal Uprate

Investigated the options to increase the thermal capacity on the Athy – Carlow 110 kV circuit, which will support the integration of further Renewable Generation in the South-West and South-East of Ireland, along with accommodating large power flows from the Southern part of the network to the Midlands resulting from Celtic and Greenlink Interconnectors.

Wicklow North 220/110 kV Station

Investigated the options to increase capacity in the North Wicklow area in order to supply the projected demand growth in the area related to new residential, commercial loads as well as the electrification of the heat and transport sectors.

7. The six-step grid development process: Step 3

What's the best option and what area may be affected?

As part of EirGrid's Six-Step Framework for project development and delivery, needs are assessed in Step 1, solution options progressed in Step 2 and a best performing option is identified in Step 3. Step 3 also identifies the study area where this option could be placed. At the end of Step 3, projects progress through Gateway 3. Gateway 3 is crucial in EirGrid's Six-Step Framework as we confirm the investment decision for the project and the project progresses from a pipeline project to a Stage 1 ongoing project.

Within Step 3, EirGrid is tasked with confirming that the project need still remains, the complexity of the project and the area where the project can be built. Typically, this step is used to identify potential issues that may restrict options within the study area for the project. Stakeholders' views are sought on a specific technology option and on the study area where the project is planned for. This consultation helps us to understand what is important to stakeholders and to learn more about the local area.

When making our decision a multi-criteria decision-making process is employed, where we will populate the five main criteria and sub-criteria for each option. Our experts will then evaluate the options and develop justification for the best performing solution option. A decision is then based on a detailed analysis of stakeholder feedback and on economic, technical, social and environmental criteria.

7.1 Step 3 performance against plan

In 2023, EirGrid worked towards a target of forty-nine Capital Approvals which reflects projects that were in Step 3 and that progressed through Gateway 3. This target was achieved and surpassed with fifty Capital Approvals advanced in 2023. These fifty new projects, with a forecast total capital cost of €508m, were added to the PR5 programme having achieved Capital Approval in Step 3 of the Six-Step Framework.

The projects newly approved in 2023 are located right across the transmission network in the South, North-West, West, Midlands and North-East Regions.

These projects will help to maintain and enhance the security of supply and facilitate the integration of renewable energy onto the transmission system. A selection of the projects that achieved Capital Approval in 2023 includes:

- 25 customer connections;
- 12 asset refurbishments;
- 10 system reinforcements; and
- 3 conflict/diversion of existing circuit projects.

Table 2: Step 3 project progress

Milestone	Target	Delivered
Total Capital Approvals	49	50

€508m

forecast total capital cost for fifty new projects

7.2 Adding capacity

A notable highlight in 2023 was the progression of system reinforcement projects in the Midlands.

There is a significant amount of renewable generation planned in the Midlands region. SOEF v1.1 highlighted three large scale renewable hubs in the Midlands, in addition to network reinforcements. EirGrid is also investigating the feasibility of adding optic fibre to the uprated circuits. Fibre connection provides robust telecommunications for the fast tripping of protection, data collection and control purposes.

Newly approved system reinforcement projects in the Midlands include:

- Cushaling – Newbridge 110 kV Thermal Capacity.
- Maynooth – Rinawade 110 kV Line Uprate.
- Maynooth-Derryiron-Timahoe 110 kV Line Uprate.
- Rinawade – Dunfirth 110 kV Uprate.
- Corduff – Mullingar 110 kV Circuit Thermal Capacity.

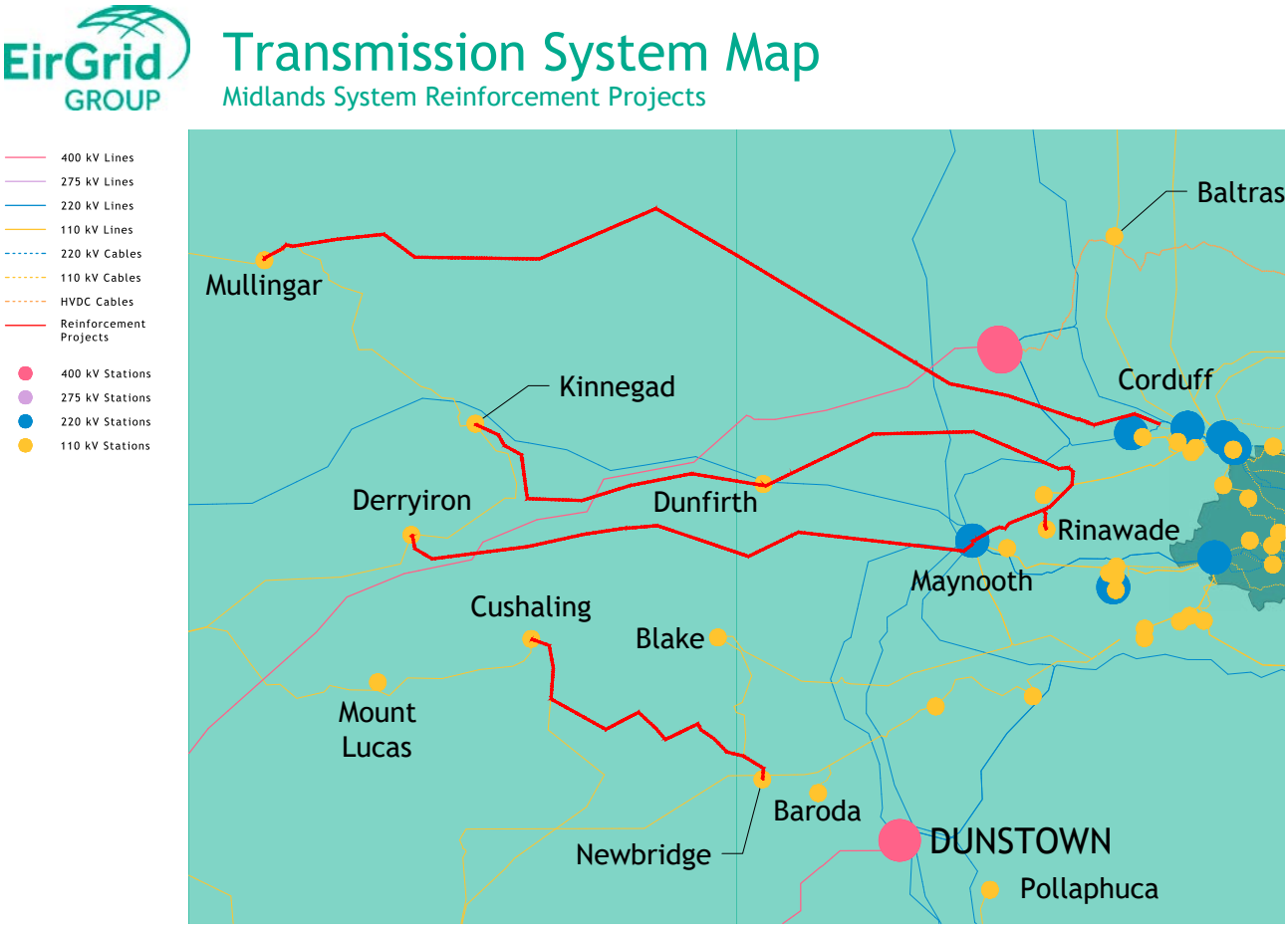


Figure 10: Transmission system map of the midlands reinforcement projects

7.3 New connections

The connection and completion of new renewable generation projects to the transmission network is vital to achieving the 2030 Climate Action Plan targets. Conversely, there has been continued growth of large energy users, known as Demand Connections, in Ireland over recent years. These demand connections include Information, Communications and Technology (ICT) industries and high-tech manufacturing companies and data centres. In recent years, new policies have been developed to manage the orderly connection and management of demand connections to and on the transmission system.

To meet the demands of bringing new connections onto the grid such as Demand or Renewable Customers, Steps 1, 2 and 3 are managed under the EirGrid Connections Process[26]. This process identifies the optimum connection method between the Customer and the transmission network. When the connection agreement is executed, a capital approval is progressed through Step 3 Governance and an EirGrid Project Manager manages the project through to its delivery in close collaboration with the customer.

7.4 Accelerating delivery in Steps 1, 2, & 3

EirGrid and ESB Networks combine and compress the grid development framework steps for eligible transmission projects to facilitate accelerated project delivery across the Network Delivery Portfolio, where possible and appropriate. This involves completing activities in parallel, particularly at the early investment planning stages, reducing the time between steps, engaging earlier with ESB Networks on scoping, the implementation of joint specialist teams and greater joint planning and coordination of outage activities. This agility and flexibility, mainly for smaller projects where the technology, option and/or route is clear, allows us to progress projects to completion in a timely manner to meet challenging targets.

In 2023, of the four projects progressed through Step 2, Step 1 and Step 2 were combined for one project which was the approval of a new 220/110 kV station in Wicklow North. For this project, ESB Networks identified capacity constraints in the existing 38 kV network feeding the north Wicklow area. The need for this project is driven by the load demand growth related to residential, commercial, electrification of the heat and transport sectors.

26 https://cms.eirgrid.ie/sites/default/files/publications/2018_19-Customer-Guide.pdf

Of the fifty Capital Approvals in 2023, Step 2 and Step 3 were combined for five projects. An example of a combined Step 2 and Step 3 project is the thermal uprate of the Rinawade – Dunfirth Tee – Kinnegad 110 kV circuit. For this project, EirGrid identified a need for transmission system capacity in the Midlands region which is driven by the integration of renewable generation in the Midlands.

Additionally, of the fifty Capital Approvals in 2023, Steps 1 – 3 were combined for eleven projects. An example of a project where Steps 1 – 3 were combined is the thermal uprate of the Athlone – Lanesboro 110 kV circuit. For this project, EirGrid identified that the circuit is likely to become increasingly at risk of large power flows, in excess of its thermal capacity. The need for this project is driven by the load connection growth related to connection of new renewable generation in the West and North-West. The SOEF and TES 2019 analysis confirmed the capacity issues associated with the Athlone – Lanesboro 110 kV circuit.

The diagram below illustrates the number of projects that achieved Gateway 1, Gateway 2, Gateway 3 and combined Gateway approvals.

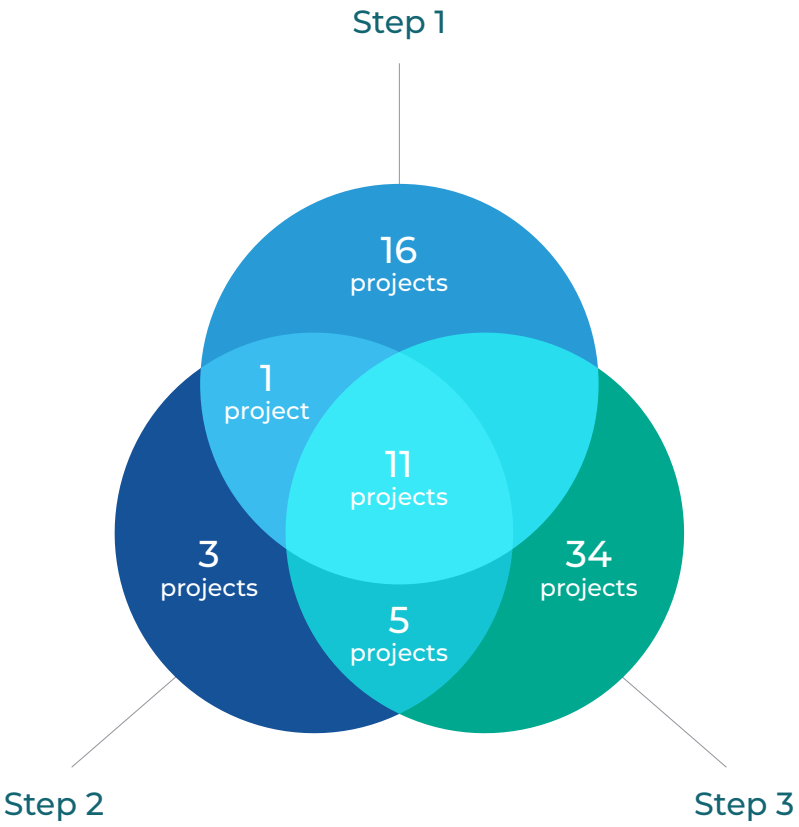


Figure 11: Projects with combined steps in 2023

7.5 Progression of 2022's Capital Approval projects

In 2022, EirGrid approved sixty-seven new projects in Step 3 with a total capital cost of €990M. By the end of 2023, 40% of the projects achieving capital approval in 2022 had progressed into Step 6 (detailed design/construction/ energisation), representing good progression of projects in the transmission capital programme.

Projects in Steps 4/5 are in the consenting and scoping stage and will be progressed to Step 6 in due course. Projects classified as on hold are not currently being progressed.

By the end of 2023, the status of all projects which achieved Capital Approval in 2022 was as follows:

- Projects completed – 2.
- Projects that achieved project agreement – 25.
- Projects progressing towards project agreement – 37.
- Projects on hold – 2.
- Projects cancelled – 1.

40%

of projects approved in 2022 progressed from Step 3 and into Step 6 in 2023

8. The six-step grid development process: Step 4

Where exactly should we build?

Following consultation and engagement in Steps 1, 2 and 3, EirGrid has made some key decisions and knows which technology is best for use on a project and roughly where the project will be built. We continue to examine and consider both an overhead line option and an underground cable option if a new circuit is needed.

In Step 4, we assess where exactly the most appropriate place to build the project is going to be. This could be either a circuit or station, or both. Some projects will not go through Step 4, primarily uprates or similar works where the pre-existing circuit and/or station is already built and therefore the location of the proposed project is already determined.

This step builds on the best performing technology solution and study area identified in Step 3, with detailed environmental and social analysis that explores feasible and best performing local siting and routing options for that technology solution.

The decision-making processes at this Step are informed by local, social and environmental 'on-the-ground' information; combined with the higher-level datasets used in Step 3. This approach enables us to map out potential sites for stations or circuit route corridors, ensuring alignment with the the best-performing technology solution identified for the area under study.

We continue to actively seek input from our stakeholders, adapting our engagement strategy to the size of the project. This adaption is evident in various formats, from public forums to interactive web platforms equipped with response forms. EirGrid is committed to fostering open dialogue, promoting these consultations via our website and through media channels, both local and national, tailored to the project's scope.

8.1 Step 4 performance against plan

In 2023, EirGrid targeted three major projects to progress through Step 4. This target was achieved with four major projects progressing through Step 4 in 2023. There are separate projects that progressed through Step 4, in addition to the major projects which progress through the Six-Step Framework from Steps 3 to 6 when their location is already known.

Table 3: Step 4 project progress

Milestone	Target	Delivered
Major Step 4 progressions	3	4

8.2 What happened in Step 4 in 2023?

In 2023, four projects progressed through Step 4 of the Six-Step Framework. These projects will help to maintain and enhance the security of supply and facilitate the integration of renewable energy and interconnectors onto the transmission system. The projects which progressed through Step 4 in 2023 are:

- Carrickmines to Poolbeg 220 kV Cable Replacement Project.
- East Meath North Dublin Grid Upgrade Project.
- Laois Moneypoint 400 kV Series Compensation.
- Bandon Busbar Uprate Need.

Carrickmines to Poolbeg 220 kV Cable Replacement Project

The Carrickmines to Poolbeg 220 kV project is part of a series of projects that make up the Dublin Programme as discussed in Section 2. The combined projects in the Dublin Programme will deliver significant benefits to the region such as transmission grid reinforcement, upgrade and security of supply as well facilitating integration of renewables and meeting growth in demand.

As part of Step 4, the study area from Step 3 was used to identify and map constraints that should be avoided due to environmental and social constraints. These included major hospitals, protected areas, designated sites and archaeological features. We evaluated various underground cable options and combined them to create four different cable route options.

After further analysis, we proposed three feasible routes for public consultation. Public Consultation and Stakeholder engagement was carried out from March – May 2023. Feedback from this process was incorporated into route decision making within Step 4. The final route was assessed through confirmation of engineering constraints, congestion and stakeholder input. More information on the Carrickmines to Poolbeg 220 kV Cable Replacement Project[27], the East Meath North Dublin Grid Upgrade Project[28] and the rest of Dublin Programme can be found on the EirGrid Website[29].

Laois Moneypoint 400 kV Series Compensation

The Laois Moneypoint series compensation project involves the requirement of a new series capacitor adjacent to the Moneypoint station. This project is part of the 'Regional Solution' suite of reinforcements that was initiated to provide more capacity on the transmission system. The 'Regional Solution' includes three series capacitor projects. The other two are to be installed adjacent to Dunstown Station and Oldstreet Station.

During Step 4, EirGrid identified potential sites for locating the series capacitor and evaluated the various options available. This process resulted in two best performing options being advanced, developed further and eventually the final option was chosen.

Following this, ESB Networks conducted procurement and tendering works following CRU approval. EirGrid developed a functional specification for the series capacitor device and issued project scope to ESB Networks which contained the project requirements. EirGrid then consulted with experts to undertake a preferred location study and to carry out a planning application.

Bandon Busbar Uprate Need

The uprate of the busbar at Bandon Station is driven by the need to increase the thermal capacity of the busbar to facilitate the connection of renewable generation in the South-West and integration of Interconnection. There are significant levels of new renewable generation that have connected or are in the process of connecting to the transmission and distribution system in the South-West.

In Step 4, a feasibility study was performed for the potential uprating of the existing AIS busbar along with its appropriate level of development and construction methodology. One single best performing option was identified and an assessment of planning requirements for the developed option was subsequently performed.

27 https://cms.eirgrid.ie/sites/default/files/publications/PUD-Carrickmines-to-Poolbeg-Brochure.pdf
28 https://www.eirgrid.ie/eastmeathnorthdublin#Updates
29 https://www.eirgrid.ie/dublin

9. The six-step grid development process: Step 5

The planning process

The objective of Step 5 is to achieve the necessary statutory consent for a project; if no statutory consent is required, the decision underpinning this is documented appropriately. This includes the preparation of plans and particulars in respect of the project proposal that will be used in the statutory consents process (or in obtaining a confirmation or Declaration of Exempted Development where no statutory consent is required).

For projects requiring planning permission, EirGrid will lodge a planning application with the appropriate planning authority, either An Bord Pleanála or the local planning authority. In certain cases, a project may receive an internal confirmation or a Declaration of Exempted Development (Section 5 Declaration) from the planning authority, negating the need for statutory consent. This also requires the preparation of plans and particulars for such projects.

Upon reaching Step 5 and the requirement for planning permission arises, EirGrid is legally obliged to publish the proposed project details through public notices in newspapers. These announcements provide guidance on how the public can present their submissions to the relevant planning authority. Additionally, we maintain and update this information on the EirGrid website[30].

The conclusion of this Step involves the receipt of a planning decision from the relevant authority or a confirmation or declaration of exempted development. When the planning application process ends, the planning authority will do one of the following:

- Grant permission; or
- Grant permission on the basis that EirGrid makes some changes to its application; or
- Refuse permission.

9.1 Step 5 performance against plan

In 2023, EirGrid targeted four major projects to progress through Step 5, of which all four were achieved.

Table 4: Step 5 project progress

Milestone	Target	Delivered
Major Gateway 5 approvals	4	4

30 https://www.eirgrid.ie/

9.2 What happened in Step 5 during 2023?

In addition to the four major projects that progressed through Step 5, EirGrid progressed a further 11 projects through Step 5 that would require planning consent in 2023 and 2024. The projects which progressed through Step 5 in 2023 include 11 system reinforcement projects, 3 asset refurbishment projects and 1 innovation project. The Kildare Meath project is a major project which moved through Step 5 and a planning application was lodged. In total 22 planning applications were lodged by EirGrid in 2023 and 17 Final Grants of Permission were confirmed.

Kildare Meath Grid Upgrade

Kildare-Meath Grid Upgrade Project will help transfer electricity to the east of the country and distribute electricity within the network in Counties Meath, Kildare and Dublin, which is essential in enabling enable further development of renewable energy generation. The project consists of a suite of transmission network reinforcements centred on strengthening the network between the existing Dunstown 400 kV substation in Co. Kildare and the Woodland 400 kV substation in Co. Meath via a high voltage (400 kV) underground cable.

This project achieved Gateway 5 approval in February 2023 and during Step 5, EirGrid met with multiple stakeholders such as An Bord Pleanála (ABP), Kildare County Council (KCC) and Meath County Council (MCC) to agree on the project design route and project specifications.

The planning design has incorporated many of the recommendations and comments that were received from the Stakeholders in these meetings. The planning application for the project was submitted to ABP in April 2023. During Step 5, EirGrid continued to engage with ESB Networks to progress and finalise the project requirements.

Power Flow Control Scheme

This innovation project represents the first trial project implementing a power flow controller on the grid which achieved Gateway 5 approval in 2023. This candidate line for the implementation of this new technology is the Binbane – Tievebrack 110 kV line with Binbane 110 kV Substation being the proposed site location.

Dunstown Moneypoint 400 kV Refurbishment

The Dunstown Moneypoint overhead is an integral connection for the electricity transmission system, connecting the Dunstown Station in Co. Kildare to the Moneypoint station in Co. Clare. During 2023, EirGrid engaged with both Clare and Tipperary County Councils for pre planning application meetings and following these engagements, Gateway 5 approval was achieved. A planning application is under preparation for lodgement to Clare and Tipperary County Councils.

10. The six-step grid development process: Step 6

Construction, energisation and benefit sharing

In Step 6, EirGrid and ESB Networks agree a construction programme. ESB Networks has the responsibility for efficiently and safely managing the delivery of these projects, including aspects such as procurement, construction works, testing, and commissioning. EirGrid has responsibilities in the areas of providing an outage plan based on information provided by ESB Networks and third-party developers, and to engage with EirGrid customers. Projects are jointly monitored and refined as the project progresses. During Step 6, post Project Agreement handover to ESB Networks, the project is under construction and depending on scope and complexity of the specific project this can take approximately 1 to 5 years.

Outages are a crucial component to the delivery and energisation of projects in Step 6. Outages are required to complete system reinforcement, refurbishment and customer connection projects. These outages are planned, prioritised and delivered through the Transmission Outage Programme (TOP) on an annual basis. Transmission outages are a valuable and scarce resource therefore outage planning is a core activity for EirGrid, in collaboration with ESB Networks. This is discussed in more detail in Section 11.

10.1 Step 6 performance against plan

The first priority of Step 6 is for EirGrid and ESB Networks to sign a Project Agreement (PA). For 2023, EirGrid targeted forty Project Agreements of which thirty-eight were achieved. This target of forty Project Agreements is informed by a constrained assessment of our portfolio.

Table 5: Step 6 project agreement progress

Milestone	Target	Delivered
Gateway 6 approvals	40	38

10.2 What happened in Step 6 in 2023?

In 2023, thirty-eight Project Agreements were concluded between EirGrid and ESB Networks. These Project Agreements represent a total forecast CapEx project cost of €788M to be achieved between 2023 and 2029. The projects reaching Project Agreement include fourteen customer connection projects, nineteen system reinforcement projects, four asset refurbishment projects and one conflict/diversion project.

The sections below include a summary of 2023's progress regarding Project Agreements signed by EirGrid and ESB Networks, projects that achieved energisation and an update on the progression of major projects in Step 6. Further updates on other major projects are available on EirGrid's website[31].

North South 400 kV Interconnector Project

EirGrid and SONI operate the electricity grid in the Republic of Ireland and Northern Ireland, respectively. Currently, there is only one interconnector between the two jurisdictions. The North South Interconnector project will see the addition of a new 400 kV overhead line to the network, connecting the electricity grids in the Republic of Ireland and Northern Ireland.

In March, the independent expert review on the North South Interconnector, was published by the Department for Energy and Climate Change (DECC) and found that the conclusions of the 2018 International Expert Commission on the decision to build the North South Interconnector above ground remain valid. Progress with the North South Interconnector project has been made with tendering by ESB Networks and NIE Networks for the main overhead line construction contract and for supply of materials in progress. In addition, we have recommenced our process for landowner engagement which will be critical in ensuring progress with this project.

This project will provide multiple benefits to the electricity grids in the Republic of Ireland and Northern Ireland such as:

- Eliminating the risk of a single event resulting in widespread power failures.
- Remove restrictions on cross-border flows of electricity.
- Bring more renewable energy onto the all-island grid.
- Operate a more efficient, cost-effective grid for inhabitants in the Republic of Ireland and Northern Ireland.

31 https://www.eirgrid.ie/community/projects-in-your-area

North Connacht 110 kV Project

The North Connacht project will create a new electricity transmission network in the Northwest and will provide capacity for economic growth and to connect new renewable generation. The project includes a new 60km 110 kV underground electricity cable circuit from Ballina, Co. Mayo, to Ballaghaderreen, Co. Roscommon; as well as upgrade works to existing infrastructure.

During 2023, substantial progress was made on this project. Following our submission of a Strategic Infrastructure Development planning application to An Bord Pleanála in June 2022, a working group between Transport Infrastructure Ireland (TII), EirGrid, ESB Networks and other relevant stakeholders was convened in January 2023 to address observations received, reach agreement by way of collaboration mitigation and redesign where necessary. In September 2023, planning approval was granted by An Bord Pleanála, subject to 31 conditions, most of which had already been addressed by the working group through a cable route redesign. Extensive engagement with stakeholders and the local community continued throughout this year including through the community forum and a community benefit scheme.

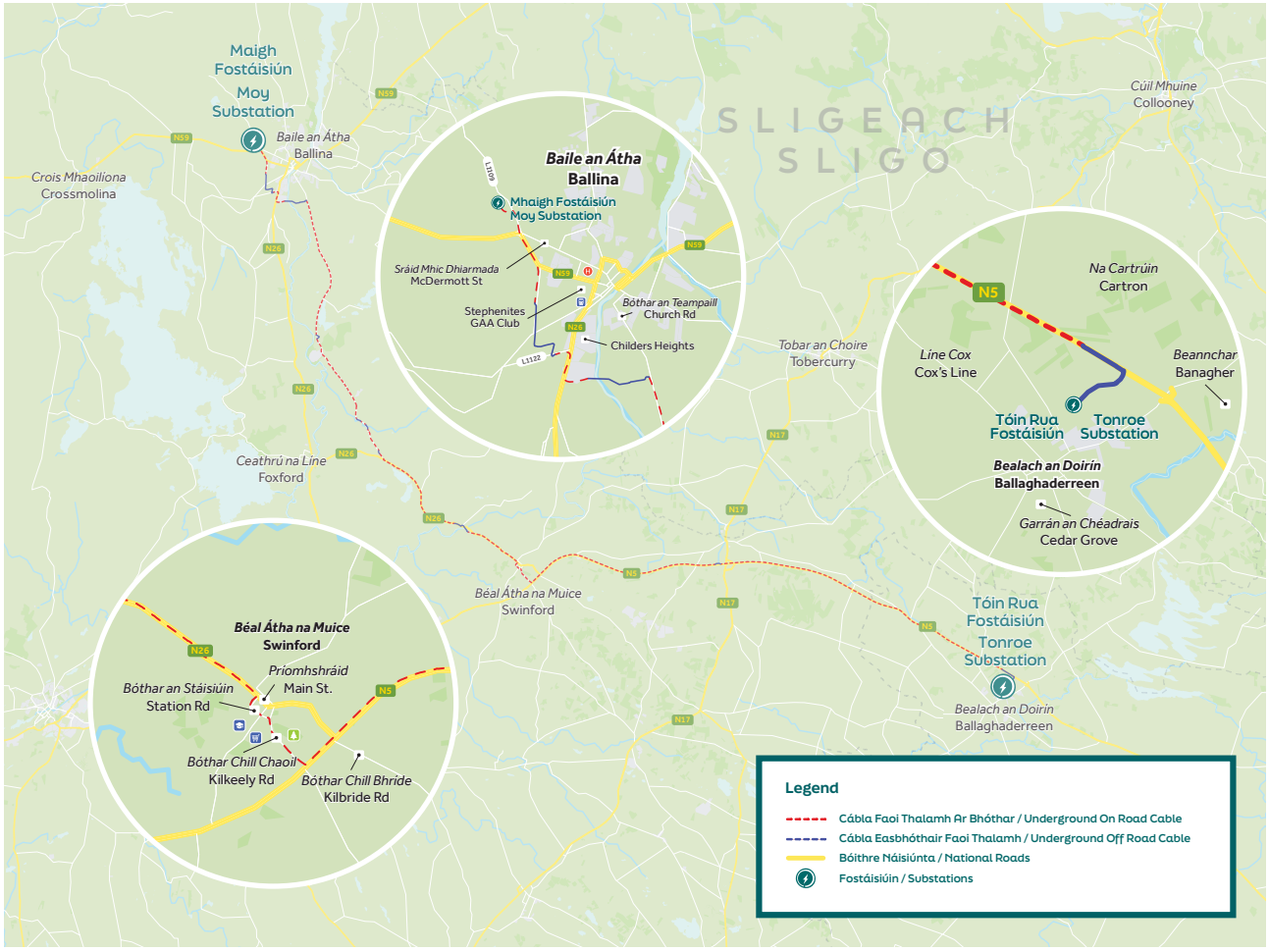


Figure 12: North Connacht 110 kV Project (source: EirGrid)

Derryiron 110 kV uprate projects

The Derryiron uprate projects encompass the Derryiron – Thornsberry 110 kV Thermal uprate, the Derryiron Busbar Uprate and the Derryiron Temporary Arrangement. These projects are driven by the need to increase the security of the electricity grid as well as the future integration of renewable energy. Initial planning studies indicated that the connection of new generation and the building of new infrastructure will increase the power flowing through the area. The temporary arrangement at Derryiron 110 kV station was necessary in order to maintain a robust and reliable electricity supply. This measure is crucial for ensuring Security of Supply and is designed to mitigate the effects of significant power disruptions at Derryiron. It is essential for maintaining the operation of vital circuits throughout the scheduled enhancement and expansion of the station's busbar system.

The Derryiron – Thornsberry 110 kV circuit is expected to accommodate a considerable amount of power flow, either in times of future high wind power, in the event of unforeseen loss of the 110 kV Cushaling – Mount Lucas circuit or due the connection of Moanvane windfarm into Mount Lucas 110 kV station. The Derryiron busbar uprate is also driven by future renewable energy integration. An increase in power transfer through the 110 kV busbar at the Derryiron station is expected due several planned connections to this station which are driving the need for this project.

The thermal uprate of the Derryiron 110 kV busbar is a key enabler to facilitate several customer connections projects which are planned to connect a total of over 264 MW of renewable energy to the grid.

Woodland Station Redevelopment

The Woodland Station in Batterstown, Co. Meath is one of the most important stations on the transmission system and enables the transfer of power to and from the East Coast. Currently, it has several major 400 kV and 220 kV circuits connected to it and its strategic importance will increase further as it is the proposed connection point of several major infrastructure projects such as Kildare – Meath, East Meath – North Dublin and the North South Interconnector.

The need to redevelop the Woodland Station was primarily driven by Security of Supply. The redevelopment of the station will address these issues through the reconfiguration of the existing 400 kV AIS double busbar to ring busbar configuration.

The planning application for the Woodland Station redevelopment was submitted to Meath County Council in November 2022 and full planning permission was granted in April 2023.

10.3 Energisation performance against plan

The Transmission Outage Programme (TOP) is published in February each year. In 2023, 84%[32] of the TOP was delivered representing an acceptable outturn performance for the calendar year. This includes an ex-post-delivery percentage which accounts for third party delays and includes additional works included over and above the baseline TOP23 programme. 69.5% of the baseline TOP23 programme was delivered in 2023.

Table 6: Step 6 TOP23 outturn summary		
Category	Weeks	%
TOP23 baseline	791	
TOP23 completed	550	69.5%
Total adjustments		14.3%
TOP23 final outturn performance		**83.8%**

A summary of the TOP performance for 2021 – 2023 can be found below, indicating the Ex-Post Adjustment by year as well as the 75% CRU Incentive Target for strong performance in outage performance.

Although there is an improvement in outage performance in comparison to 2022, there are still significant challenges in delivering the annual transmission outage programme. Transmission outages are a scarce and valuable resource, with a substantial volume of outages needed to deliver the majority of system reinforcement, connection projects and maintenance works. The development of the transmission system and delivery of the programme of works is therefore dependent upon adequate generation capacity margins and low numbers of forced outages. Outage availability and outage utilisation are also relevant factors. Further information on the Joint TSO/TAO Outage Transformation Programme is discussed in section 11 of this report.

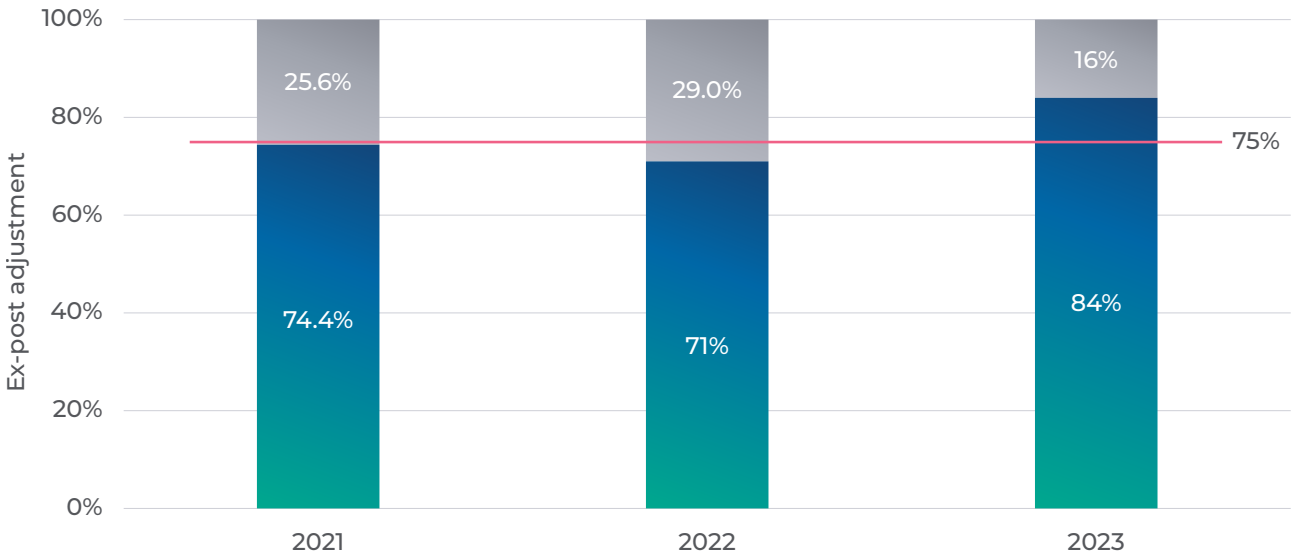


Figure 13: 2021-2023 ex-post adjustment of outage performance

32 This TOP23 delivery percentage includes an ex-post adjustment for issues outside of the control of EirGrid and ESB Networks.

10.4 Projects energised and/or completed in 2023

The twenty-five projects that were energised and/or completed in 2023 represent €196M total capital spend over the lifecycle of these projects. These projects include sixteen customer projects, six system reinforcement projects, one asset refurbishment project and two conflict projects.

The following 25 projects were energised and/or completed in 2023:

- Energisation of four Wind Farm projects and three Solar Farm projects, totalling over 370 MW of new Renewable generation connected to the system.
- There was one additional Solar Farm project that originally energised in 2022, Garballagh 110 kV Station, however, there was a further energisation for the loop in of this project in 2023.
- Energisation of two new BESS projects totalling 105 MW. These projects will provide system services that allow the electricity system to carry a greater proportion of renewably generated power.
- Connection of four data centres totalling 527 MVA MIC.
- Completion of two FlexGen projects. One of these FlexGen projects, the Poolbeg BESS project, was merged with the Poolbeg FlexGen project and is now referred to as Poolbeg FlexGen-BESS. These projects are considered two distinct energisations.
- Completion of two conflict projects.
- Installation of two new ±100 Mvar STATCOM technology projects.
- Completion of two 400 kV line refurbishments.
- Installation of a new a 400-220 kV transformer.
- Completion of a 110 kV Busbar uprate, providing an adequate future rating for the existing and planned generation connections in the local area.
- Completion of one station 110 kV uprate and one 110 kV line uprate.

€196m

total capital spend over the lifecycle of these projects

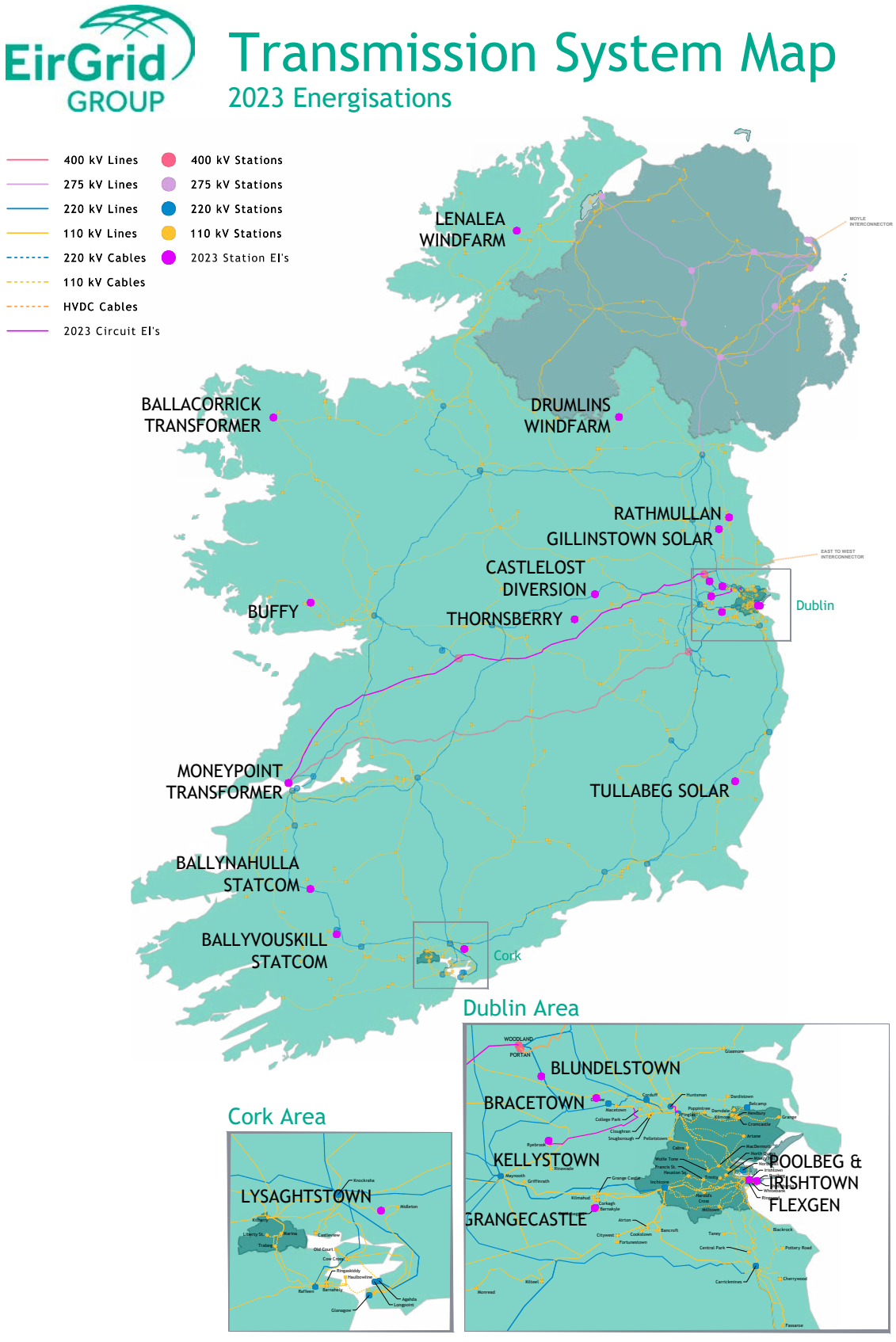


Figure 14: All Ireland transmission system map – 2023 energisations

11. Prioritisation and delivery

A major part of the delivery and completion of each project involves the transmission network outages required to complete the construction within substations or on linked circuits. Outages required for maintenance work must also be included.

There are a number of steps in the annual outage planning process, including:

- Identification of outage requirements, including the sequence of work, expected timing, duration and the plant required for these outages;
- Assessment of readiness for outages in a given year; and the sequences of work, expected timing, duration and plant required for these outages;
- Consultation with impacted stakeholders and the Distribution System Operator (DSO), where appropriate; and
- Prioritisation of works to maximise the delivery of projects within the annual outage programme.

11.1 Programme prioritisation approach

The sequencing and delivery of electricity transmission infrastructure is very complex as it involves incorporating multiple interacting outages and where it is not possible to accommodate all proposed infrastructure works in the period requested, prioritisation decisions may be required. EirGrid's Outage Prioritisation Guidance Document is published on our website[33].

The objective of the transmission outage planning process is to maximise the amount of outage related work that can take place to reinforce the system, connect customers and ensure the required level of maintenance of the transmission system while ensuring a safe and secure system. This process must be completed in accordance with the Operating Security Standards (OSS). All outages are scheduled on the basis that the OSS are not breached for any outage or combination of outages.

33 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Outage-Prioritisation-Guidance-Document-Final.pdf

Where the need to prioritise work does arise, the following guide is used by EirGrid in determining which works should be prioritised. EirGrid has formed this guide by objectively assessing the prioritisation of outages in a proportionate and reasonable manner and, importantly, in a manner that protects the security of the system.

When deciding on outage prioritisation, EirGrid will consider and seek to balance its licence and statutory obligations with customers' requirements, cognisant of security of supply issues, the need to transform the power system, our Climate Action Plan targets and other relevant factors. Priority is given to works that align with delivering on EirGrid's Group Strategy to transform the power system by 2030 per the table below[34].

Table 7: Outage priority

	Project/Project activity categories
1	Works to ensure safety of People, Plant, Equipment & Operating Security Standards (OSS), including Priority Maintenance[35, 36]
2	Works to connect new useable generation greater than 50 MW, which do not fall within the category above
3	New generation, refurbishments, or general backbone transmission reinforcements of existing assets, not associated with the categories above
4	Works to connect new demand
5	Other (diversions, etc.)

34 Table as per EirGrid-Outage-Prioritisation-Guidance-Document-Final.pdf – ATR projects are no longer a specific category of project considered in the prioritisation hierarchy. This follows the conclusion of the Firm Access methodology as requested by the SEM committee and CRU in the SEM Committee Decision Paper SEM-23-004.
35 As per EirGrid's Guide to Transmission Equipment Maintenance.
36 Excluding upgrades or replacements that are not deemed essential to operating the system over the next year.

11.2 Transmission Outage Transformation Programme

Outage Management is a critical and challenging space. An exceptional scale and pace of change in this area is necessary to deliver the new transmission infrastructure required to achieve our electrification and renewable energy targets by 2030. EirGrid and ESB Networks have been working closely on this as a priority and the Joint Outage Transformation Programme (JOTP) was established in 2023. EirGrid and ESB Networks endorsed a Joint Outage Transformation Programme (JOTP) roadmap and associated recommendations. A joint statement in relation to the ambitious programme that both EirGrid and ESB Networks are collaborating on was agreed on the 20th of December 2023, formally communicated to DECC and CRU on 22nd January 2024 and published on EirGrid's[37] and ESB Networks'[38] websites in January 2024.

The JOTP jointly developed 18 interventions to increase outage availability and maximise utilisation and effectiveness of existing outages to create the step change in outage management, delivery and efficiency needed, that fall into 7 natural groupings: Project Delivery, System, Programme, Regulatory, Policy Information and Technology and Customer and Industry.

The interventions also include a number of early wins, such as introducing a new policy of standard ratings for 'brownfield' substations. The implementation of these interventions is planned to begin in early January 2024 and will continue over the coming years. Systematic application of the JOTP interventions will have a cumulative and additive effect on the delivery of the work programme increasing over time contributing to a step change increase in the scale of transmission infrastructure delivery up to 2030.

37 https://www.eirgrid.ie/industry/customer-information/outage-information#joint-outage-transformation-programme
38 ESBN website placeholder

11.3 Early Engagement with ESB Networks, industry and stakeholders

EirGrid and ESB Networks have developed a framework for early engagement on projects. This collaborative initiative is designed to foster earlier interaction in the project's life cycle, thereby improving project execution and contributing to significant time efficiencies. The anticipated advantages of this early engagement include increased program efficiency, as both entities can engage in joint efforts sooner, addressing aspects such as program validation, construction feasibility, operational readiness, outage planning, site assessments, procurement approaches and supply chain coordination.

Some early engagement highlights on major projects in 2023 include:

- For the Woodland 400 kV Station Redevelopment, the process enabled early interaction on combining five projects into one scope to enable a programmatic approach to delivery. This provided a number of benefits in being able to identify outage requirements and constructability needs which were optimised during the consultation and engagement between EirGrid and ESB Networks. This station is one of the most important nodes on the National Grid System and with outages being a scarce resource, the new process allowed a collaborative approach in developing an effective outage plan to enable delivery of the works.
- For the East Meath – North Dublin Reinforcement Project the new process enabled the underground cable route to be developed with input and interaction with ESB Networks' technical teams at route selection stage. This further assisted in engagements with third party landowners/roads stakeholders on the location of proposed High Voltage Infrastructure.

As we move forward, EirGrid will continue to leverage the insights and feedback garnered through this process to drive continuous improvement and innovation in our infrastructure development and delivery.

11.4 Planning and environmental compliance

As outlined in Step 5, Section 9 of this report, EirGrid consults all stakeholders and relevant agencies in the planning application process. On successful grant of planning, ESB Networks' teams undertake strict measures via project management procedures to comply with and discharge all planning and environmental conditions associated with the network development in a timely and effective manner during the project's pre-construction and construction phases. Construction access is managed in consultation with all relevant authorities and landowners in compliance with the agreed access arrangements.

Disruption and damage during the construction phases is kept to an absolute minimum and full reinstatement is arranged in compliance with the access agreements and fair compensation is negotiated when necessary.
For customer related projects, effective three-way communication is maintained between EirGrid, the customer and ESB Networks to ensure that the project timelines and programmes are aligned to ensure optimal delivery dates and to ensure availability and utilisation of outage dates in the annual transmission outage programme (TOP).

12. Climate change adaptation

In 2023, EirGrid completed a Climate Change Risk Assessment (CCRA) of the transmission system in Ireland. This work was informed by a detailed evaluation of the latest climate change science as well as Irish and international climate change data. EirGrid also participated in the Government's Electricity and Gas Networks Sector Working Group for Climate Change Adaptation and contributed to the development of the Electricity and Gas Networks Sector Climate Change Adaptation Plan (CCAP)[39] which was approved by the Government in late 2019.

EirGrid is committed to delivering the actions outlined in the CCAP which include awareness and consideration in planning and design, identification of risks and areas vulnerable to impacts of climate change and identification of Adaptation measures. EirGrid's Asset Management Team has completed several studies into the impacts of climate change on the transmission system. The biggest Climate Adaptation risk to the transmission system has been identified as flooding arising from river or drainage system channel/ infrastructure capacity exceedances (fluvial), storm surges, rises in sea level (coastal) and extreme precipitation levels (pluvial). Assessments were completed to identify geographical areas and specific station and overhead line assets, vulnerable to the impacts of climate change. All Transmission stations were assessed, this included desktop assessment, site visits and interviews with station supervisors.

EirGrid capital approval to implement the climate change adaptative measures was granted in April 2023. This project is listed as part of the NDP (CP1300) with a forecasted Project Agreement date of September 2025 and implementation expected by the end of 2028 (subject to planning approval).

The identification of climate change adaptation measures supports facilitating a secure low carbon future by ensuring that the infrastructure needed to provide this is not at risk of damage. EirGrid will continue to carry out such assessments as required.

39 Electricity and Gas Networks Sector Climate Change Adaption Plan – https://www.gov.ie/en/publication/7fcf4-electricity-and-gas-networks-sector-climate-change-adaptation-plan/

13. Stakeholder engagement and community benefit

EirGrid and ESB Networks are committed to stakeholder and public engagement. Through working together with stakeholders, customers, industry, the public and local communities, we make better decisions.

We are now in the fourth year of EirGrid's 2020–25 corporate strategy that was launched in September 2019. Stakeholder engagement is a foundational element to this strategy and every year we continue to emphasise its importance through our expanded interactions with a diverse group of stakeholders. Our commitment is not only to maintain engagement but to continuously seek out and adopt innovative methods that enhance these interactions. Our aim is to achieve world class standards and to deliver better outcomes. To realise the ambitious changes outlined in our strategy, we recognise the need to significantly broaden and intensify our stakeholder engagement efforts.

In 2023, EirGrid demonstrated a further step change in approach, methodology and channels of stakeholder engagement. We continued to work to ensure that the evolution of our stakeholder engagement was in line with our principles; how we identify stakeholders and how we work to involve them in key decisions.

Throughout 2023, ESB Networks and EirGrid maintained regular interaction with Landowners, Landowner Representative Organisations regarding land access issues and arrangements. EirGrid and ESB Networks also worked co-operatively with statutory bodies and agencies to deliver projects and the inputs needed for the delivery of projects over the coming years.

Further details regarding EirGrid's Stakeholder Engagement in 2023 are included in EirGrid's Stakeholder Engagement Report 2023[40].

40 https://cms.eirgrid.ie/sites/default/files/publications/final-2023-stakeholder-engagement-report.pdf

13.1 Engagement approach

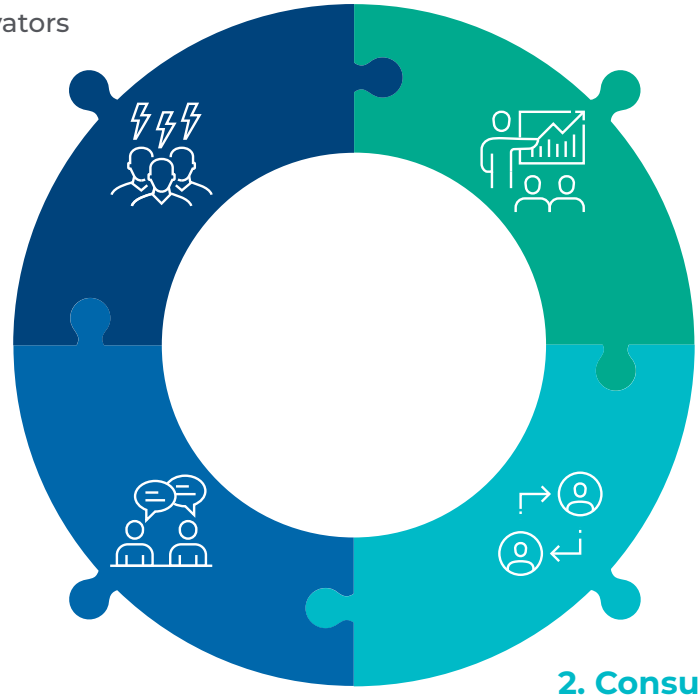
EirGrid uses a consistent, six-step public engagement process to explore options and make decisions. The level of stakeholder engagement is dependent on the type of project. Large infrastructure projects such as the Dublin Programme, North Connacht and the Interconnector projects involve a much wider range of stakeholders with larger numbers of landowners and communities affected by the proposed development. Supporting this approach is our Public Engagement Strategy[41]. Although decision-making may be influenced by regulatory and various external factors, we remain committed to fostering an environment of collaboration. We actively seek and support joint efforts with our stakeholders to innovate and devise solutions collectively.

4. Collaborate

- Partnering with community organisations and local authorities
- Community benefit funds
- Energy citizen roadshows
- Young social innovators

1. Inform

- Accessible information
- Public awareness campaigns
- Media campaigns



3. Engage

- Industry workshops
- Public workshops
- Community forums
- Business forums
- Infrastructure forums
- Open days

2. Consult

- Formal consultation
- Surveys
- Focus groups
- Events

Figure 15: Stakeholder engagement approach

41 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Public-Engagement-Strategy.pdf

Throughout 2023, EirGrid did the following:

- Engaged early with potential customers seeking to connect to the transmission system. We provided information and guidance on the transmission system, potential connection methods, connection policy and the connection process to support customers in making informed decisions.
- Provided clear, comprehensible information through publications, customer clinic meetings and one-to-one engagements.
- Ensured each customer had a clear point of contact at each stage in the connection process and experienced timely feedback and issue resolution.
- Processed connection applications in line with our regulatory obligations and relevant policies.
- Regularly engaged with key industry representative bodies to provide updates, gather feedback and prioritise challenges for resolution.
- Worked closely in collaboration with ESB Networks to deliver our customers' grid connections in a timely manner.

Stakeholder, public and landowner engagement is a particularly significant element of delivering the Celtic Interconnector project. The Celtic Interconnector Community Benefit Fund was established to recognise the importance of local communities who facilitate the development of the electricity grid and will benefit groups and projects in the East Cork area. We are firmly committed to ensuring that our work leaves a strong positive legacy in the area, not just in respect of the electricity system but also in respect of enhanced biodiversity along the route of the cable and in nearby communities.

In our Powering Up Dublin campaign, we completed five Dublin Energy Citizen Roadshows, as well as the running several Energy Citizens Roadshows across the country. To continue our engagement with industry players, we hosted regular meetings of the 'Shaping Our Electricity Future' Advisory Council and as well as frequent industry forums on the roadmap. We also reached a key partnership agreement with the Irish Farmers Association (IFA) and ESB Networks and signed a Memorandum of Understanding (MOU) for our collaboration.

We continue to engage with large energy users. EirGrid acknowledges that this is an important sector for the Irish economy and is committed to working with developers and CRU to help deliver the 'Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy'. Published in July 2022[42], the policy seeks to enable the 'twin transitions' of digitalisation and decarbonisation of our economy and society. EirGrid's approach to engagement is tailored to the project or initiative. A bespoke engagement plan is used for each key project or initiative, identifying the channels we will use to provide information to the stakeholders. This can include emails to customers and stakeholders, project brochures and updates, targeted social media content, advertising in local and national press, letters to landowners and statutory bodies, providing spokespeople for discussions on public radio, providing phonelines and conducting webinars. For grid development projects, it also includes promotion in public locations and open days in the local area where members of the public can meet the experts and have their queries addressed.

Consultation tools and approaches are constantly evolving as are stakeholders' expectations. Our stakeholder engagement is geared towards understanding and responding to learnings and concerns, highlighting impacts and opportunities we were not previously aware of and ensuring we deliver the best possible service with the least disruption.

13.2 Landowner engagement

Throughout 2023, our landowner team actively engaged with landowners across a wide range of transmission infrastructure projects ranging from works on existing lines to proposals for new circuits. For those landowners who host existing overhead lines which have been identified for refurbishment and/or uprating, we explain the works required, anticipated timeframes and seek access to carry out survey works on the lands to help inform the extent of works required.

For new build projects, we engage with potential landowners at the earliest stage possible. For example, on new circuits, where we have a number of potential options proposed, early landowner engagement and feedback forms an important part of the overall consideration in the evaluation of options. This approach ensures that the specific local knowledge of the land and any associated constraints can be understood ahead of any further decision making. The landowner team are also involved in discussing proposals with landowners in relation to requirements for the development of new substations or the enhancement of existing stations.

42 https://enterprise.gov.ie/en/publications/publication-files/government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf

13.3 Dublin Infrastructure Forum

The Dublin Infrastructure Forum was established by EirGrid, with an independent Chair, to enable effective collaboration with ESB Networks as DSO, other state-owned utilities, transport providers and local authorities. The objective of the Forum is to coordinate the planning, development, implementation and monitoring of relevant projects across the programme of works being carried out to strengthen key electricity infrastructure in Dublin and the surrounding areas. It is made up of the following members: Dublin Airport Authority, Dublin City Council; Dublin Port Company; Dún Laoghaire-Rathdown County Council; EirGrid; ESB Networks, Fingal County Council; Gas Networks Ireland; Irish Rail; Irish Water; National Transport Authority; Transport Infrastructure Ireland; and Waterways Ireland.

Throughout 2023, EirGrid, as part of the Dublin Infrastructure Forum continued to look for opportunities for collaboration across other infrastructure developers which will aid ESB Networks in the later stages of the Powering Up Dublin Programme as they will undertake the associated construction work.

Our participation in the Dublin Infrastructure Forum and associated technical working groups has been beneficial in terms of collaboration with other utility operators, such as gas and water and other State bodies, such as TII and relevant local authorities. Towards the end of the year, we commenced an intensive period of engagement with community groups, schools and individuals within the Powering Up Dublin engagement zones, to gather local insights to shape the best performing route options selection in the next financial year.

13.4 Benefits sharing

As EirGrid undertakes the development and expansion of the transmission grid, we acknowledge the potential impacts on nearby communities. These effects may range from visual changes to the environment to temporary disruptions during construction, as well as the necessity for land access to facilitate project delivery. Despite these challenges, the enduring advantages of a reliable, safe and eco-friendly energy supply are significant. Our commitment is to work in harmony with communities and stakeholders to reduce inconvenience and enhance benefits.

EirGrid's Community Benefit Policy[43] is designed to leave a lasting, positive impact on communities that support grid infrastructure projects, fostering enduring partnerships. This policy comes into effect once a project receives planning approval, establishing a scheme that reflects the project's magnitude. In collaboration with the Community Forum, we ensure that the scheme is crafted with local insight, by the community, for the community.

The strategy is built upon three foundational pillars: biodiversity, community and sustainability and is implemented in three phases: at the start of construction, during cabling or stringing and upon project completion. The scheme offers grants to local groups, aiming to complement other funding sources and promote cooperative efforts. More information about EirGrid's Community Benefit policy and fund is available on our website.

At the core of EirGrid's ethos is our dedication to community-centric engagement. We strive to minimise disruptions and maximise benefits for those affected by our projects. The Community Benefit Fund scheme is a testament to this, empowering Community Forums to direct funds towards local improvement and wellness projects. This initiative not only supports the physical and mental well-being of residents but also allows us to contribute positively to the communities that accommodate our operations.

43 https://cms.eirgrid.ie/sites/default/files/publications/EirGrid-Community-Benefit-Policy-Brochure%20June%202023.pdf

14. Acronyms

ALOs	Agricultural Liaison Officers
ATR	Associated Transmission Reinforcement
BESS	Battery Energy Storage System
BSP	Bulk Supply Point
CA	EirGrid Capital Approval
CAPEX	Capital Expenditure
CLOs	Community Liaison Officers
CMMS	Computerized Maintenance Management System
CRU	Commission for Regulation of Utilities
DLR	Dynamic Line Rating
DSO	Distribution System Operator
DTS	Distributed Temperature Sensing
FAQ	Firm Access Quantity
GW	TSO Six-Step Framework Gateways
GW	Gigawatt
HV	High Voltage
IPD	Investment Planning and Delivery
JOTP	Joint Outage Transformation Programme
KM	Kilometre
kV	Kilovolt
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
MVA	Megavolt Amperes
MW	Megawatt
MYDP	Multi-Year Delivery Programme
NDP	Network Delivery Portfolio
OCLM	Online Condition Monitoring
PA	Project Agreement
PFC	Power Flow Controller
PR4	Price Review 4 (2016–2020)
PR5	Price Review 5 (2021–2025)
PR6	Price Review 6 (2026–2030)
RE	Renewable Energy
SEAI	Sustainable Energy Authority of Ireland
SNA	System Needs Assessment
SOEF	Shaping Our Electricity Future
STATCOM	Static Synchronous Compensator
TAO	Transmission Asset Owner
TES	Tomorrow's Energy Scenarios
TOP	Transmission Outage Programme
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards

EirGrid

The Oval, 160 Shelbourne Road,
Ballsbridge, Dublin 4, D04 FW28, Ireland
+353 (0) 1 627 1700 | eirgrid.ie

ESB NETWORKS

Three Gateway, East Wall Road,
Dublin 3, D03 R583, Ireland
esbnetworks.ie