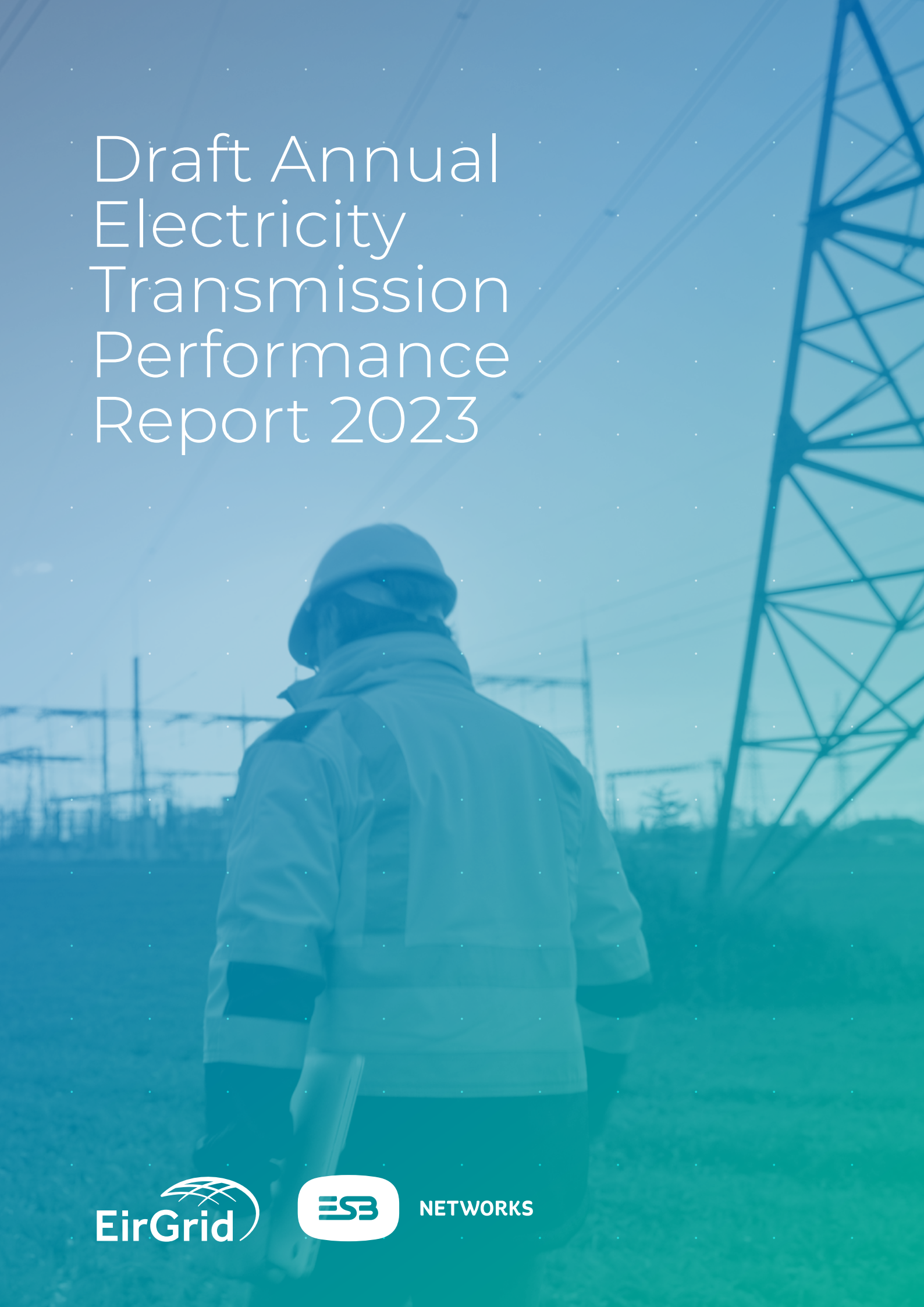
Draft Annual Electricity Transmission Performance Report 2023



EirGrid

ESB NETWORKS

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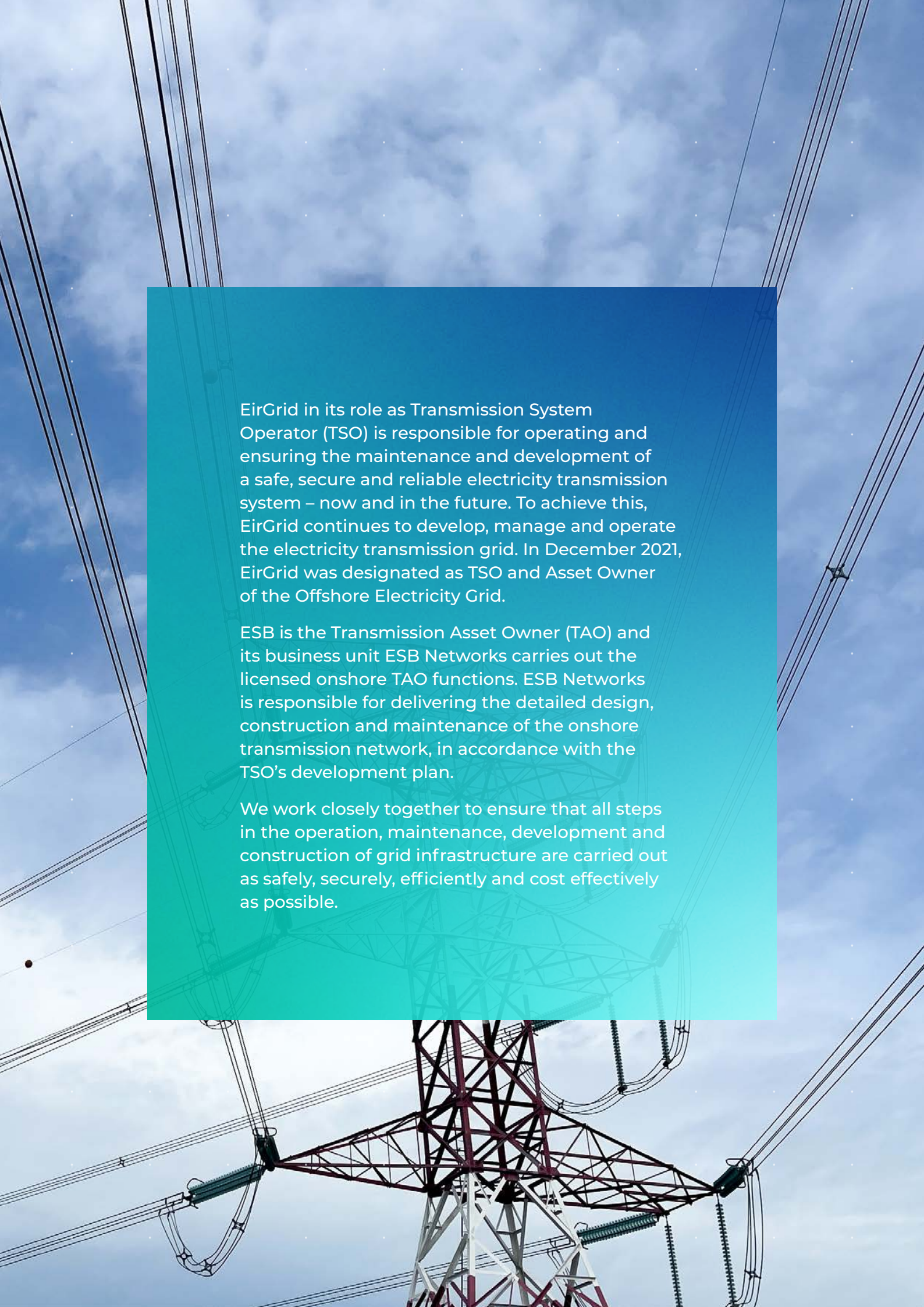


EirGrid in its role as Transmission System Operator (TSO) is responsible for operating and ensuring the maintenance and development of a safe, secure and reliable electricity transmission system – now and in the future. To achieve this, EirGrid continues to develop, manage and operate the electricity transmission grid. In December 2021, EirGrid was designated as TSO and Asset Owner of the Offshore Electricity 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, in accordance with the TSO's development plan.

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

1. Welcome

Welcome to the seventh annual EirGrid and ESB Networks' Electricity Transmission Performance Report. This report seeks to provide customers, industry and stakeholders with clear and accessible reporting on our operation, development and maintenance of the transmission system throughout 2023.

2023 was the third year of Price Review Five (PR5). The PR5 Determination contains the Commission for Regulation of Utilities (CRU) decision on EirGrid and ESB Networks' revenues for 2021 to 2025. It aligns with the PR5 Determination[1] objectives and ambition set out by the CRU in relation to grid delivery, decarbonisation and local security of supply and is underpinned by cost efficiency and a regulatory framework which supports the delivery of value to customers.

EirGrid and ESB Networks are fully committed to the successful delivery of PR5. The annual delivery of capital investment in transmission projects has increased year on year making steady progress towards overall delivery of the PR5 programme of works[2].

The Climate Action Plan 2023[3] (CAP23) includes a national target of delivering up to 80% of our electricity generation from renewable sources, 9GW of which is to be generated by onshore wind, 8GW by solar and at least 5GW of electricity generation coming from offshore wind, by 2030. In December 2023, a draft of the Climate Action Plan 2024[4] (CAP24) was agreed by the Irish government with the final version published in May 2024 following public consultation. The targets as set out above for CAP23 remain the same in CAP24. However, CAP24 builds on the previous Plan by refining and updating the measures and actions required to deliver the carbon budgets and sectoral emissions ceilings. EirGrid and ESB Networks strongly support this vision for Ireland's future.

1 Price Review 5
2 See Draft Investment Planning and Delivery Report 2023 for further detail on the progress of Capital projects in 2023.
3 Climate Action Plan 2023: Climate Action Plan 2023 (www.gov.ie)
4 Climate Action Plan 2024: Climate Action Plan 2024 (www.gov.ie)

Renewable generation accounted for 42%[5] of all electricity consumed in Ireland in 2023. In May 2023, EirGrid concluded the operational trial of an increased Rate of Change of Frequency (RoCoF) and this was implemented as enduring operational policy. Following the completion of the RoCoF trial, EirGrid commenced the trial to reduce the required minimum number of conventional units online (MUON) constraint from five conventional fossil fuel generators to four in Ireland. Reducing this constraint was identified as the next critical step in the evolution of operational policy and in reducing dispatch down of renewable generation. This trial continued throughout 2023.

A number of wind farm and solar farm projects were completed in 2023 and are expected to deliver over 370 megawatts (MWs) of new Renewable Generation. During 2023, two new Battery Energy Storage System (BESS) technology projects totalling 105 MW maximum export capacity (MEC) were completed. Twelve renewable projects (860 MW) and three BESS projects (250 MW) achieved Capital Approval (CA) in 2023.

EirGrid and ESB Networks continued working to address security of supply concerns throughout 2023, in collaboration with key stakeholders. As part of the CRU's Electricity Security of Supply Programme, EirGrid works closely with the CRU and Department of the Environment, Climate and Communications (DECC) to implement a coordinated approach to address security of supply challenges in Ireland in the short, medium and long term with the aim of securing adequate supply to meet demand.

During 2021 and 2022, the CRU directed EirGrid to secure approximately 750 MW of Temporary Emergency Generation (TEG). In 2023, TEG projects equating to 330 MW of capacity became operational. EirGrid and ESB Networks continued to develop and update emergency communication plans to respond to potential security of supply issues in 2023.

EirGrid's Shaping Our Electricity Future (SOEF) 1.1 Roadmap[6], published in July 2023, built on SOEF 1.0 to take account of the updated government electricity ambitions of 80% renewable electricity by 2030 and further definition of sectoral carbon emission limits as set out in CAP 2023.

5 Per EirGrid System and Renewable Reports: Fuel Mix 2023
6 Shaping Our Electricity Future

In 2023, key milestones achieved by EirGrid in progressing offshore included ensuring developers of Offshore Phase 1 projects were prepared to participate in the first Offshore Renewable Electricity Support Scheme (ORESS) as well as supporting DECC in the development of the requirements for the first ORESS auction. EirGrid ran the ORESS 1 Auction in May 2023, resulting in 3,074 MW of offshore wind generation being successful. The TSO also engaged with developers and the CRU to finalise offshore transmission asset functional specifications. In 2023, EirGrid also worked with the CRU to develop the connection policy for Offshore Phase 2 projects and an Offshore Revenue Recovery Model.

ESB Networks' strategy 'Networks for Net Zero'[7] was published in January 2023 setting out ESB Networks' role in enabling the delivery of the Government's Climate Action Plan. The Strategy outlines the actions that ESB Networks is taking towards delivering the transmission electricity network for Ireland's clean electric future.

Joint working and collaboration between ESB Networks and EirGrid is fundamental to the delivery of the Strategy. Enhanced joint working arrangements between ESB Networks and EirGrid were initiated in 2023 in areas such as digital collaboration and outage management, through initiatives like the Joint Outage Transformation Programme (JOTP).

There were significant developments in infrastructure delivery in 2023 with EirGrid securing planning permission for the North Connacht 110 kV project and two major infrastructure developments under the Powering Up Dublin Programme, Belcamp Substation and Poolbeg Substation. Progress was made in engagement through initiatives such as the Energy Citizen Roadshows as well as the Powering Up Dublin Business and Community Forums which ran throughout 2023.

We hope that you find this document of use and we look forward to working together with you to further develop our plans. We welcome all feedback with regard to the information set out in this booklet and any additional information you might wish to see included in future versions.

Please contact us at:
esbnetworks@esb.ie
info@eirgrid.com

7 ESB Networks Strategy: Networks for Net Zero

2. What is the electricity transmission system?

Electricity transmission encompasses the operation, planning and development of the high-voltage network in Ireland, predominately assets that operate at 110 kV, 220 kV or 400 kV, ensuring that supply and demand is balanced on a minute-by-minute basis.

The transmission system moves power around the country. It brings power directly to industry and businesses that use large amounts of electricity and also powers the distribution network. The transmission system supplies the electricity used every day in our homes, businesses, schools, hospitals and farms. For further information on the TSO's and TAO's activities in the delivery of the transmission network, please see the 2023 Annual Investment Planning and Delivery (IPD) report published on the EirGrid and ESB Networks' websites. Working closely together, we develop and build energy infrastructure when it is needed. Through our operation and maintenance of the transmission system, we ensure a safe, secure and reliable supply of electricity.

How we work together is governed by the TSO and TAO licences granted by the CRU and by an Infrastructure Agreement (IA) which sets out how the two organisations develop, maintain and operate the transmission system.

Efficient operation of TSO/TAO working arrangements is essential and we can report satisfactory operation of these arrangements during 2023.

An Infrastructure Delivery Charter with joint committee structures underpinning the mutual working arrangements between the TSO and TAO is in operation. This charter commits both companies to renewed levels of engagement and partnership to meet the evolving needs of the electricity customer and society into the future.

The operation of a Joint Programme Management Office (JPMO) and other agreed processes are important aspects of TSO/TAO co-operation. EirGrid and ESB Networks continued to effectively operate, review, develop and communicate regular updates to key stakeholders regarding these arrangements throughout 2023. The TSO and TAO Transmission Programme teams jointly plan the delivery of the full pipeline of projects out to 2030, as set out in EirGrid's SOEF Roadmap and ESB Networks' 'Networks for Net Zero' strategy.

This year was the third year of the operation of the PR5 Joint TSO/TAO Incentive for EirGrid and ESB Networks. Details of the performance outcomes for this incentive are provided in Section 5 of this report 'How we performed against transmission delivery incentives'.

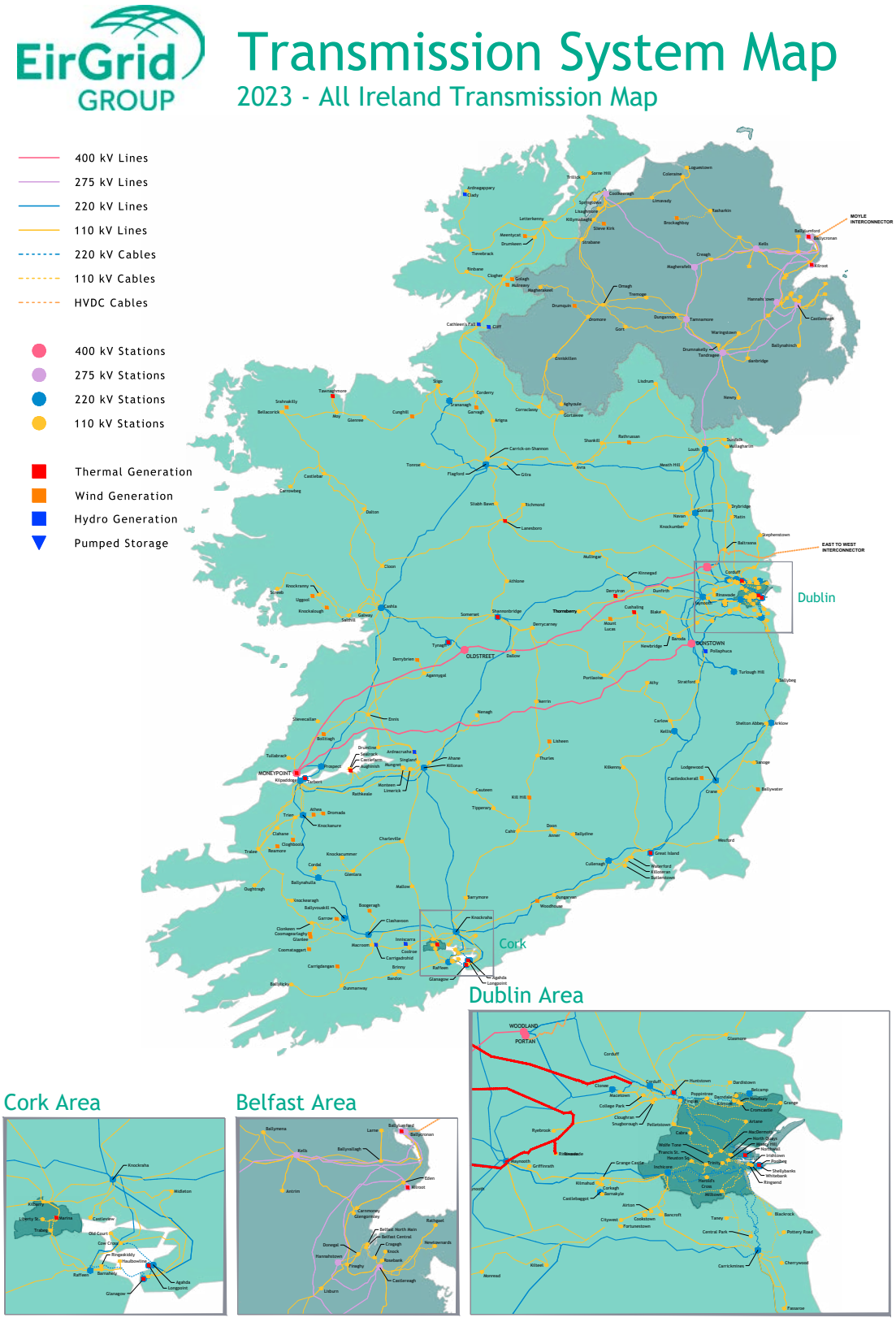


Figure 1: All Ireland transmission system map 2023[8]

8 Please note that the Northern Ireland Transmission Network is included for illustration purposes only in the above map. The Northern Ireland Transmission Network is outside of the scope of this report.

3. How we plan, deliver and use the network

EirGrid's approach to grid development uses a six-step process which explains why and how the grid is developed. More importantly, it also explains how the general public and stakeholders can influence the decisions that are made. All our projects go through this process. The Joint EirGrid and ESB Networks' IPD Report which accompanies this report highlights the work carried out and project progress in 2023.

2023 was the fourth year of EirGrid's Strategy 2020-25, the aim of which is to transform the power system for future generations. Central to Strategy 2020-25 is EirGrid's six-step approach for grid development. EirGrid's focus has been to increase its value proposition to consumers and stakeholders while improving efficiencies in grid development.

During 2023, EirGrid and ESB Networks partnered with some of the biggest companies in the world, to foster jobs and prosperity across the country. We continued to upgrade and strengthen the transmission grid where necessary.

Figure 2: EirGrid six-step framework for grid development

3.1 Summary of 2023

The third year of PR5 saw significant progress made by the TSO and TAO in terms of project development, delivery, system and market operation.

Notable trends in 2023 include the continued strong progression of transmission infrastructure development with a large number of pipeline projects moving to approved ongoing capital projects in Step 3 of the six-step framework and the completion of a large number of renewable energy connection projects (see right).

Figure 1 shows the number of renewable connections and supporting technologies added to the transmission system in 2023.

In 2023, EirGrid confirmed the best performing route options for a number of major cable circuit replacement and upgrade projects in Dublin, through the Powering Up Dublin (PUD) Programme.

Further details on transmission infrastructure development and delivery are set out in our 2023 Annual Investment Planning and Delivery Report.

175+ MW

Four wind farms providing over 175 MW of renewable generation

197 MW

Three solar farms providing an additional 197 MW of renewable generation

105 MW

Two new BESS technology projects totalling 105 MW were completed

860 MW

Twelve renewable projects (860 MW) achieved CA in 2023

250 MW

Three BESS projects (250 MW) achieved CA in 2023

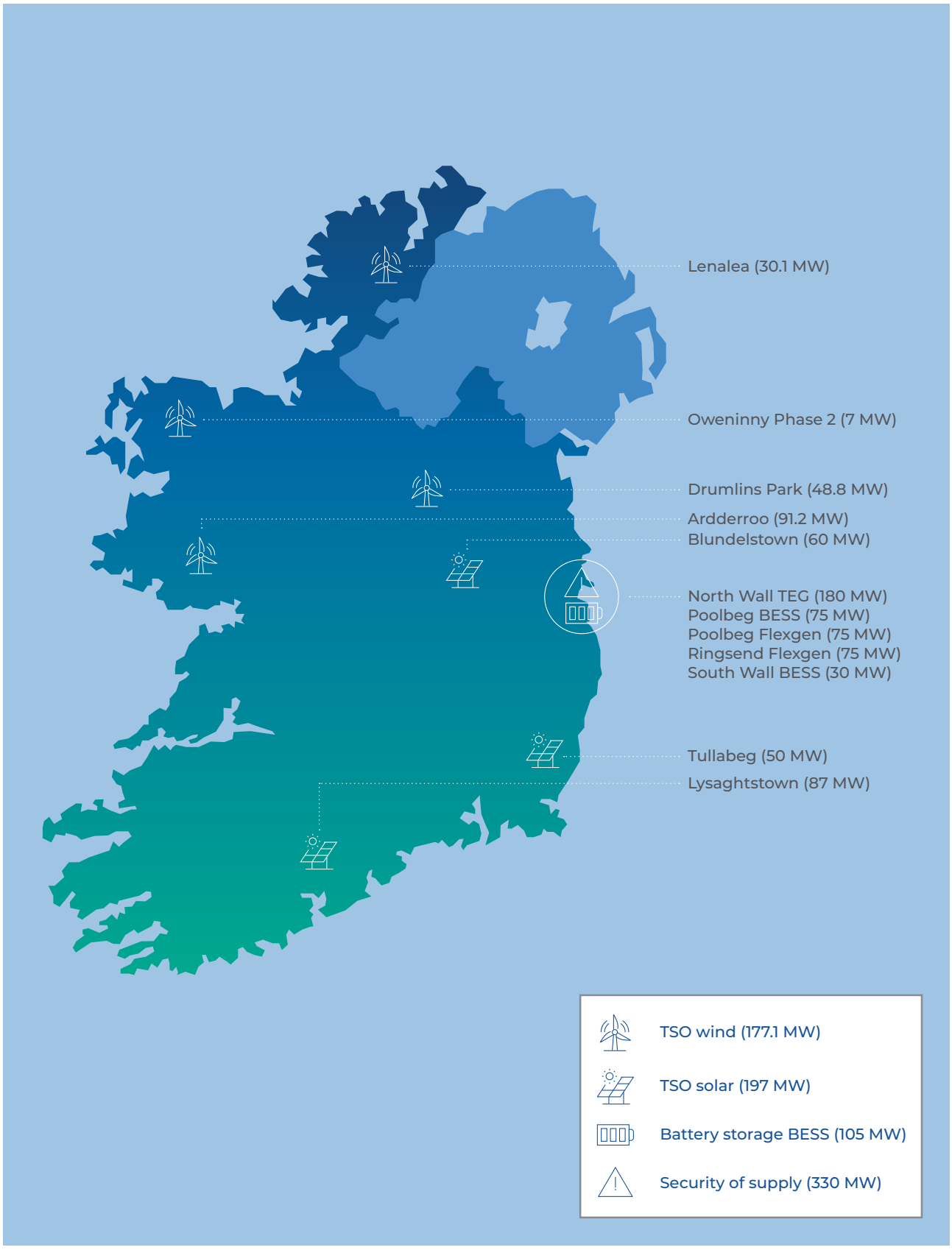


Figure 3: 2023 generation energisations

4. Key performance summary matrix

Table 1: Key performance summary matrix

Metric	Section of this report	2023 target/basis for incentive	2023 performance	2023 incentive outturn[9]	2022 performance[10]	2021 performance[11]
TSO Strategic Objectives Incentive	'How EirGrid performed against strategic incentives' page 41	Target: 10 incentive metrics with a total incentive available of €0.5m	Performance: 69% success	Incentive: €0.345m	Target: 10 incentive metrics with a total incentive available of €0.5m Performance: 67% success Incentive: €0.333m	Target: 10 incentive metrics with a total incentive available of €0.5m Performance: 34% success Incentive: €0.17m
TSO Transmission System Performance System Frequency	'How EirGrid manage system performance' page 44	€0.1m p.a. for each step if exceeds 98%, 99% and 99.5%	SF was operated within the target operating limits of 49.9 Hz and 50.1 Hz for 98.71% of the time	Incentive: €0.10m	Target: 98% Performance: 98.52% Incentive: €0.10m	Target: 98% Performance: 98.63% Incentive: €0.10m
TSO Transmission System Minutes Lost	'How EirGrid manage system performance' page 44	0.75-2.5	4.461 System Minutes Lost on the transmission system	Penalty: (€0.50m)	Target: 0.75 – 2.5 Performance: 0.132 system minutes lost. Incentive: €0.30m	Target: 0.75 – 2.5 Performance: 0.054 system minutes lost. Incentive: €0.30m
TSO's Stakeholder Engagement	'Engaging with stakeholders' page 99	Max score: 10	Performance: 6.66	Incentive: €0.19m	Target: max score: 10 Performance: 6.86 Incentive: €0.217m	Target: max score: 10 Performance: 6.74 Incentive: €0.207m
TSO Investment Planning and Delivery Balanced Score Card	'How we performed against transmission delivery incentives' page 23	Target: 6 incentive metrics with a total incentive available of €0.9m.	Performance: 80%	Incentive: €0.72m	Target: 6 incentive metrics with a total incentive available of €0.9m Performance: 69% Incentive: €0.62m	Target: 6 incentive metrics with a total incentive available of €0.9m Performance: 24% Incentive: €0.215m

9 A penalty is indicated in brackets.
10 2022 APR and IPD
11 2021 APR and IPD

Metric	Section of this report	2023 target/basis for incentive	2023 performance	2023 incentive outturn[9]	2022 performance[10]	2021 performance[11]
TSO Delivering New Connections ECP	'How we manage new connections' page 77	Issue connection offers to all applicants in the 2023 ECP Batch	TBC[12]	TBC	Target: Issue connection offers to all applicants in the 2022 ECP Batch Performance: 6% success Incentive: €0.03m[13]	Target: Issue connection offers to all applicants in the 2021 ECP Batch Performance: 86% success Incentive: €0.43m
TSO Renewable Dispatch Down Incentive	'How EirGrid manage system performance' page 44	5%[14]	8.9%	Penalty: (€0.28m)	Target: 5% Performance: 8.3% Penalty: (€0.196m)	Target: 5% Performance: 7.3% Penalty: (€0.06m)
TSO SNSP Incentive	'How EirGrid manage system performance' page 44	80% SNSP	75% SNSP	Penalty: (€0.30m)	Target: 78% SNSP Performance: 75% SNSP Penalty: (€0.30m)	Target: 75% SNSP Performance: The system was operated with a 75% SNSP limit for 70% of the calendar year 2021. The CRU levied the full penalty applicable to this incentive as a result. Penalty: (€0.30m)
TSO Imperfections and Constraints Incentive	'How we manage constraint costs' page 63	Target: 5 incentive metrics with a total incentive available of €1.5m	Performance: 7% success	Incentive: €0.105m	Target: 5 incentive metrics with a total incentive available of €1.5m Performance: 18% success Incentive: €0.263m	Target: 4 incentive metrics with a total incentive available of €1.5m Performance: 9% success Incentive: €0.14m

12 Outturn incentive/penalty to be detailed in 2024 iteration of APR due to timing of offer issuance.
13 EirGrid submitted the Incentive Outturn Report for the 2022 ECP Batch to the CRU in September 2023, which has been factored into this year's revenue submission and assessed by CRU in its consideration of 2023 outturn, as per Section 2.5.6 of CRU2023104.
14 As per CRU/20/154, an upside payment of €0.054m is applied if the TSO meets the target of 5.0% and an additional €0.054m for every 0.1% below 5.0% up to a maximum of €0.6m. A downside penalty of €0.014m is applied if the TSO meets the limit of 7.0% and an additional €0.014m for every 0.1% above 7.0% up to a maximum of €0.3m.

Metric	Section of this report	2023 target/basis for incentive	2023 performance	2023 incentive outturn[9]	2022 performance[10]	2021 performance[11]
TSO RES-E Incentive	'How EirGrid manage system performance' page 44	Target: 49%[15]	Performance: 42%[16]	Incentive: €0.0m	Target: 46% Performance: 39% RES-E Incentive: €0.0m	Target: 43% Performance: 34.9% RES-E Incentive: €0.0m
TSO Local Security of Supply Incentive	'How we performed against transmission delivery incentives' page 23	Target: 4 incentive metrics with a total incentive available of €1.5m[17]	Performance: 26%	Incentive: €0.396m	Target: 5 incentive metrics with a total incentive available of €1.5m Performance: 14% Incentive: €0.211m	Target: 5 incentive metrics with a total incentive available of €1.5m Performance: N/A Penalty: (€0.27m)
TAO/TSO Joint Incentive	'How we performed against transmission delivery incentives' page 23	Target: 4 incentive metrics with a total incentive available of €1.5m for TAO and €0.2m for TSO	Performance: 100%	Incentive: TSO – €0.20m TAO – €1.5m	Target: 4 incentive metrics with a total incentive available of €1.5m for TAO and €0.2m for TSO Performance: 100% Incentive: TSO – €0.20m TAO – €1.5m	Target: 4 incentive metrics with a total incentive available of €1.5m for TAO and €0.2m for TSO Performance: 100% Incentive: TSO – €0.20m TAO – €1.5m
DSO/ TSO Joint Incentive[18]	'How we performed against transmission delivery incentives' page 23	TSO target: 4 incentive metrics with a total incentive available of €0.2m for TSO	Performance: 75%	Incentive: TSO – €0.15m	Target: 3 incentive metrics with a total incentive available of €0.2m for TSO Performance: 68% Incentive: TSO – €0.135m	Target: 3 incentive metrics with a total incentive available of €0.2m for TSO Performance: 46% Incentive: TSO – €0.091m

15 Achievement of RES-E target is binary. If annual target % achieved, the incentive reward will depend on the CRU's assessment of (i) quality of plan, (ii) quality of implementation; and (iii) effectiveness of plan. If annual target % not achieved, no incentive awarded, regardless of plan.
16 EirGrid's Fuel Mix Data confirms RES-E for 2023 was 42%, as per System and Renewable Data Report.
17 75% allocated annually, 25% allocated at the end of PR5.
18 See DSO Annual Performance Report for DSO outturn performance for 2023.

Metric	Section of this report	2023 target/basis for incentive	2023 performance	2023 incentive outturn[9]	2022 performance[10]	2021 performance[11]
Regulatory Transmission Capital Expenditure[19]	'Network development costs' page 116	CRU Capex Monitoring Process	€234.8m	N/A	Target: CRU Capex Monitoring Process Performance: €176m	Target: CRU Capex Monitoring Process Performance: €145m
TAO Operational Expenditure	'Network development costs' page 116	CRU Opex Monitoring Process	€71.3m	N/A	Target: CRU Opex Monitoring Process Performance: €68m	Target: CRU Opex Monitoring Process Performance: €69m
TAO Project Delivery Incentive	'How we performed against transmission delivery incentives' page 23	€3.5m	€3.5m 4 Balanced Scorecard Incentive Metrics	€3.5m full incentive payment	Target: 4 Incentive Metrics with a total incentive available of €3.5m Performance: 100% Incentive: €3.5m	Target: 4 Incentive Metrics with a total incentive available of €3.5m Performance: 100% Incentive: €3.5m
TAO Management of planned outages[20]	'How we performed against transmission delivery incentives' page 23	Complete planned work in less than 10,496 outage days	All planned works completed in 10,061 actual outage days, meeting target	€1m full incentive payment	Target: Complete planned work in less than 10,863 outage days Performance: All planned works completed in 10,154 actual outage days Incentive: €1m	Target: 10,707 scheduled outage days Performance: 9,950 outage days. Incentive: €1m

19 Regulatory Transmission CapEx Expenditure is not inclusive of Interest During Construction (IDC) of €14.6m and Customer Contributions of €22.8m. See Table 7 for Gross Transmission Capex Spend.
20 Per CRU/20/154, this incentive relates to the TAO's ability to meet the 3-week ahead outage plans published on the TSO website

Balanced scorecard based incentives were introduced for PR5. In 2021, the TSO was awarded an aggregate incentive of 11% and 24% in respect of its balanced scorecard and non-balanced scorecard based incentives, respectively. In 2022, the TSO was awarded an aggregate incentive of 37% and 4% in respect of its balanced scorecard and non-balanced scorecard based incentives, respectively. In 2023, the TSO was awarded an aggregate incentive of 40% in respect of its balanced scorecard based incentives and an aggregate penalty of 27% in respect of its non-balanced scorecard based incentives.

This penalty was mainly due to a single incident that impacted the System Minutes Lost (SML) incentive. The TAO was awarded 100% of its total incentive upside for 2021, 2022 and 2023. A breakdown of the aggregate incentive outcomes for the TSO and TAO over the past three years can be seen in Table 2 below.

Please refer to Tables 3 and 4 for further information regarding trends for each incentive from 2021 to 2023 for the TSO and TAO.

Table 2: Aggregate incentive outcomes (2019 money)*

	2021		2022		2023	
Incentive category	%	€m	%	€m	%	€m
TSO balanced scorecard	11	0.546	37	1.762	40	1.916
TSO non-balanced scorecard	24	0.681	4	0.121	-27	-0.76
TSO aggregate total		**1.227**		**1.8834**		**1.156**
Joint incentives – TAO	100	1.5	100	1.5	100	1.5
TAO incentives	100	4.5	100	4.5	100	4.5
TAO aggregate total		**6**		**6**		**6**

Table 3: Key performance trends – balanced scorecard based incentives	
Incentive	Performance trends
TSO Strategic Objectives	Performance in 2023 was strong and broadly comparable with outturn performance in 2022 for this incentive. 2022 saw a significant improvement over 2021.
TSO Investment Planning and Delivery	There have been strong year on year improvements in performance for this incentive since 2021.
TSO Imperfections and Constraints	There have been variations in performance against this incentive with a decrease in performance seen between 2022 and 2023.
TSO Local Security of Supply	EirGrid has achieved strong increases in performance against this incentive over 2022 and 2023.
TAO/TSO Joint Incentive	Performance against the TAO/TSO Joint Incentive has been consistently strong over 2021, 2022 and 2023 with the full incentive awarded each year.
DSO/TSO Joint Incentive	Since 2021, there have been annual improvements in performance against this incentive.
TAO Project Delivery Incentive	Performance against the TAO Project Delivery Incentive has been consistently strong over 2021, 2022 and 2023 with the full incentive awarded each year.
TSO RES-E (%)	Since 2021, EirGrid has achieved annual increases in RES-E but has not reached the targets set out for this incentive.

Table 4: Key performance trends – non-balanced scorecard based incentives	
Incentive	Performance trends
TSO System Frequency	EirGrid has performed consistently in maintaining System Frequency within the target operating limits for over 98% of the year since 2021, with improvements evident year on year.
TSO System Minutes Lost	In 2021 and 2022, EirGrid kept SML within the target band. In 2023, due to a single incident on the system, there was an increase in SML. Had this single incident not occurred, SML for 2023 would have been within the target band.
TSO Stakeholder Engagement	Since 2021, performance from this incentive has ranged from 6.6-6.864 out of a maximum possible score of 10. 2023 saw a slight decrease in performance compared with 2022.
TSO Connections – ECP	In 2021 and 2022, EirGrid received 86% and 6% of this incentive respectively. The outturn for 2023 will be determined after the final offer in ECP 2.3 issues.
TSO Renewable Dispatch Down	There has been a steady increase in renewable dispatch down over the period 2021-23, in line with increased levels of renewables on the system over the same years.
TSO System Non-Synchronous Penetration (SNSP)	In 2021, EirGrid operated with a 75% SNSP limit for 70% of the calendar year. In 2022 and 2023, EirGrid has had an SNSP limit of 75%. It has not reached target levels which are set at annual increasing intervals rather than step changes.
TAO Management of Planned Outages	Performance against the TAO Management of Planned Outages Incentive has been consistently strong over 2021, 2022 and 2023 with the full incentive awarded each year.

Table 5: Key performance trends – non-incentive metrics	
Metric	Performance trends
TAO Operational Expenditure	Steady
Regulatory Transmission Capital Expenditure	Strong upward investment

5. How we performed against transmission delivery incentives

EirGrid and ESB Networks are incentivised against targets set by the CRU for the delivery of the transmission network as detailed in CRU/20/154. These incentive arrangements apply from 2021 to 2025.

5.1 TAO incentives

Project Delivery Incentive performance

CRU/20/154 defined a balanced scorecard of incentive measures that applied to TAO investment and project delivery activities during PR5. The performance measures and targets are focused on incentivising activities central to meeting the challenges of the Government's Climate Action Plan.

The TAO Project Delivery Incentive includes both qualitative and quantitative measures and performance is independently assessed each year by external auditors. The audit report is submitted to CRU to assist in determining the final incentive outturn award. In 2023, CRU awarded an incentive payment of €3.5m to TAO.

Table 6: TAO Project Delivery Incentive performance

TAO project delivery balanced scorecard	2021	2022	2023
Incentive award	Full	Full	Full
Incentive value[21]	€3.5m	€3.5m	€3.5m

21 A penalty would be indicated in brackets. There are no penalties in this period.

The four performance measures included in the TAO Project Delivery balanced scorecard are:

1. Project Implementation Plans (PIPs)

A PIP is the committed programme of work agreed between TSO and TAO for a new project. The PIP is the baseline schedule against which the work is planned and progress is monitored. The target list of projects is agreed annually between TSO and TAO. The TAO's performance is measured by the actual percentage of the target PIPs issued during the calendar year.

2. Customer project energisation/connection

The TAO performance is measured by the actual percentage of the target Customer Projects energised/connected in the calendar year.

This includes customer energisation works scheduled in the annual transmission outage programme.

3. Transmission CapEx Spend

The TAO performance is measured by the actual percentage of the Budgeted Annual Capital Expenditure (CapEx) spend delivered in the calendar year.

4. Project delivery process improvement

This component is qualitatively audited by independent external auditors and examines the TAO's performance on the quality and rigour of its processes for identifying and implementing efficiencies and improving processes in project delivery.

The Project Delivery Incentive performance for 2023 against the above measures is outlined in Table 7.

The TAO Project Delivery incentive performance, for the above measures, was verified by external independent audit and following a review, the CRU determined an overall assessment of 'Strong' performance outcome.

Table 7: The Project Delivery incentive – performance for 2023 against the four performance measures

Item	TAO Project Delivery measure	2023 plan[22]	2023 actual
1	Project implementation plans	45	45
2	Customer project energisations	16	16
3	Transmission CapEx spend[23]	€267.1m	€272.2m
4	Process improvement	–	See below

22 Plan adjusted for items outside the TAO control.
23 Transmission Capex Spend in this table refers to the gross transmission CapEx spend in 2023. Transmission Capital Expenditure figure of €234.8m (see table 1) for 2023 is calculated as €272.2 less Interest During Construction (IDC) of €14.6m and Customer Contributions of €22.8m.

5.2 Process improvements – 2023

Two process improvements implemented by the TAO during 2023 are described in the section below.

The implementation of these initiatives demonstrates continual improvement in TAO project delivery processes. The external assessors were satisfied that both 2023 Process Improvement candidates demonstrated at audit were delivering significant improvements and benefits to the TAO and the electricity customer.

Project management initiatives

TAO has embarked on a multi-year plan to establish a single Project Management Methodology (PMM) that follows the internationally recognized Project Management Body of Knowledge (PMBOK) across all transmission projects and delivery teams supported by a Project Management Office (PMO), a Project Management Information System (PMIS) and other associated systems and processes.

The plan for 2023 was to implement a further planning and scheduling phase of PMM and PMIS implementation and roll-out. The main components delivered in 2023 relate to implementing end to end project schedules for all transmission projects supported by expert schedulers and integrated into the PMIS suite of systems.

The main components implemented during 2023 and demonstrated to the auditors include the following elements:

- The Project Management Methodology Office (PMMO), working with the business, defined the project scheduling functionality and features to implement as standard.
- Complete training of all transmission project managers on standardised project scheduling.
- Complete project schedules for all Transmission projects within the PMIS environment in cooperation between the project managers, the PMO and the expert Planning and Scheduling (P&S) team.
- Implement planning and scheduling update and review processes to business-as-usual processes supported by the PMO and P&S team.
- PMIS dashboards for management reporting were developed by PMMO to monitor project scheduling milestones and delivery Key Performance Indicators (KPIs).

Commercial and contract management – 2023

In 2023, another significant and complementary aspect of Transmission project delivery was implemented across the TAO Transmission project management teams. Separate from the PMM suite of modules being implemented by the PMMO, Commercial and Contract Management was identified as a key skill and risk to be managed given the major transmission capital spend to be delivered via contracts over the PR5 and Price Review 6 (PR6) periods. In 2023, the Commercial and Contract Management Office (CCMO) developed a competency framework and training materials to deliver across the business. The training was rolled out across project management teams in 2023 and was received by all transmission project managers.

The Commercial and Contract Management course that was developed, and the training delivered, is to best international practice standard and has received external certification. Questionnaires were taken throughout the process to assess the competency across the teams before, during and after training. The survey data, the external certification and the feedback on the programme demonstrate the raised competency levels achieved across the project management teams.

Effectively managing commercial contracts is a critical success factor for TAO to deliver the infrastructure required to meet the 2030 climate action targets. Embedding this competency across the teams during 2023 is a significant contributor to overall TAO process improvements in the PR5 period.

5.3 Outage Management incentive performance

The TAO Outage Management incentive is designed to improve the availability of the transmission network by reducing outage durations and providing greater certainty to affected parties on expected start and finish dates. This minimises the potential for deviations from the plan and any associated disruption to schedules. The outage incentive mechanism relates to TAO's ability to meet the 3-week ahead outage plans published on the TSO website. Performance is measured as the number of actual outage days relative to the baseline of the published plans.

TAO endeavours to complete the full scope of planned works within the scheduled days target for all activities such as new installation works, refurbishment and maintenance activities within the outage window except for situations outside the control of TAO.

CRU/20/154 sets three performance bands. If actual outage days are less than or equal to the baseline total scheduled days, then the full incentive payment €1m is received. There is no incentive if the actual days exceed the scheduled days and there is a penalty of €1m if the actual days exceeds the scheduled days by 5% or more.

In 2023, there were a total of 10,496 scheduled transmission outage days. The total actual outage days in 2023 was 10,061 outage days at year end. The 2023 planned works were delivered within the incentive outage days target and CRU approved the full outage incentive payment of €1m.

Table 8: TAO incentive performance 2021-2023

TAO incentives	2021	2022	2023
Outage management performance[24]	€1m	€1m	€1m

24 A penalty would be indicated as a bracket. There are no penalties in this period.

5.4 TSO and TAO joint incentive

The TSO/TAO joint incentive focusses on network project delivery, with an aim of promoting efficiencies through enhanced collaboration.

The TSO/TAO joint incentive is based on a balanced scorecard containing four separate measures as outlined below. The TSO and TAO consult on and submit a 5-year joint incentive plan to CRU annually, outlining targets in each area. Annual performance is assessed by independent external auditors against this balanced scorecard which includes both quantitative and qualitative measures:

1. Deployment of New Technology
   This incentive is to ensure that the TSO and TAO actively deploy new technology on the grid and operate effective processes to enable the trialling and piloting of emerging technologies.
2. Project Initiation to Committed Project Parameters (CPP) Agreed
   This incentive rewards timely project development, measuring from the time that TSO notifies TAO of a new project to the time that the CPP (i.e. outline project scope) is agreed.
3. Joint Process Improvement
   This incentive examines the TSO and TAO's performance on the quality and rigour of application of joint processes, as well as joint efforts identifying and implementing efficiencies in project and programme delivery.
4. Asset and Programme Data Exchange
   This incentive examines the TSO and TAO's performance on the exchange of information with respect to delivery of transmission network capital investment under the PR5 programme.

CRU202354 provided direction and guidance to TSO and TAO on the 2023 Balanced Scorecard joint incentives key performance indicators, targets and the assessment process.

Joint TSO/TAO performance was assessed by independent external auditors against the 2023 balanced scorecard. The audit report was submitted to CRU to assist in determining the final incentive outturn award. For 2023, CRU awarded the full incentive payment to TSO and TAO as outlined in Table 9.

Table 9: TSO and TAO joint incentive balanced scorecard framework 2023

	2023 incentive award	2023 incentive value
TSO incentive award	Full	€0.2m
TAO incentive award	Full	€1.5m

The joint incentive measures delivered by TSO and TAO in 2023 and assessed during audit are detailed below.

1. Deployment of new technology in 2023

There were 14 specific targets in 2023 across nine technologies for Overhead Lines, Underground Cables and Substation technology. All substantive elements of the targets and the delivery plan for 2023 were achieved. In particular, and in keeping with the guidance in CRU202354, the TAO and TSO can report the first successful deployment and assessment of Distributed Temperature Sensing (DTS) technology on 220kV cable network in the southwest in 2023.

The benefits of installing DTS on an underground cable are that it will:

- Provide continuous condition monitoring of the cable which should ensure that the lifetime of the asset is maximised.
- Determine the real or installed power carrying capacity of the cable as opposed to the design rating.
- Identify where the cable is most constrained. If these areas are relatively localised and accessible this will then present the opportunity for uprating the circuit in future by carrying out upgrade works at those locations.
- Potentially provide dynamic ratings for the cable. This will be particularly beneficial in circumstances where the load on the cable is extremely cyclic in nature, such as will occur with a cable that is carrying predominantly wind generated electricity. In such cases it will allow the cable capacity to better match the output of the wind farm.

In 2023, the TSO and TAO continued to operate a joint New Technology working group which maintains the Technology Toolbox tracker. The tracker utilises an industry standard approach to assigning a Technology Readiness Level (TRL) to each technology.

Further information on TSO and TAO collaboration on new technology is contained in Section 15: 'Innovation' of this report.

2. Project initiation to CPP Agreed

Developing and agreeing the technical scope of works for new transmission infrastructure projects to meet system and customer needs is a critical milestone stage for a project to proceed. It is a complex process involving onsite assessment, outage planning and consultation with multiple agencies. Many unknowns exist at this early stage of a project and customer projects can be refused or delayed by planning, environmental or other permissions.

During 2023, TSO and TAO reached CPP Agreed stage for 35 projects. The TSO and TAO agreed the project scope for 28 projects within the incentive target timeline of 98 days meeting the incentive threshold set for 2023. The 98-day target was exceeded on 7 projects.

Enhanced collaboration and process improvements are on-going between TSO, TAO and stakeholders to mitigate risks and accelerate these processes to ensure as many projects as possible benefit from accelerated early-stage project development.

3. Joint process improvement

This qualitative metric examines the TSO and TAO's performance on the quality and rigour of application of efficient joint processes in project and programme delivery.

Transmission Outage Planning (TOP) 2024

The TOP plans, prioritises and delivers outages which are required to complete system reinforcement, refurbishment and customer connection projects. In 2023, the TSO and TAO planned and issued the TOP 2024 (TOP24) six months earlier than normal by publishing the 2024 capital projects work programme in Q3 2023. The annual TOP has historically not issued until mid-February. This was a very significant milestone and implementation of a key joint outage working group recommendation.
A lessons learned review was undertaken to document and baseline the new TOP planning process and to deliver further quality improvements for the TOP 2025 (TOP25) planning cycle.

Transmission Line Assessment (TLA)

The TAO and TSO identified requirements in PR5 to uprate the capacity of many overhead transmission lines to meet the capacity needs of large electrical users (LEUs), industrial and domestic electrification demand requirements and to accommodate renewable generation connections to meet climate action targets. This necessitated a more optimised approach to transmission line assessment and design to shorten the project development timelines, optimise costs and outages and to de-risk the construction stage.

The revised TLA process delivered up to the end of 2023 amounts to 730km of overhead transmission lines, including approximately 1000 steel tower locations and has resulted in:

- Reduced outages due to optimised design approach and retention of existing assets. 90% of tower structures have been retained contributing significantly to the environmental and sustainability objectives of both TSO and TAO.
- Greater certainty of scope prior to capital investment and resource scheduling to minimise and de-risk the construction works while still delivering line capacity uprating and 20-year life extension.
- Reduced costs due to optimised survey schedules, a risk-based approach to line design and a targeted approach to asset replacement and life extension. This gives greater cost certainty at scoping and procurement stage to optimise project and programme planning.

4. Asset and programme data exchange

This incentive is intended to optimise TSO/TAO collaboration arrangements for information exchange to support the delivery of transmission network investment under PR5.

The high-level review during 2023 identified a need to take a new approach. This involves a move away from incremental and discrete digital developments and improvements. A joint strategic approach will be required to enable and govern all information exchange and system integration requirements via a fully co-ordinated joint digital information exchange project. The sections below outline progress towards these aims during 2023.

Renewables and Major Connections dashboard

During 2022, ESB Networks had developed an in-house digital application to monitor and report on all Renewable and Major Connections to the transmission system. During 2023, this platform was developed further to facilitate direct access and information sharing with other stakeholders beginning with EirGrid and the Irish Government, DECC.

Through the Renewable Energy Support Schemes (RESS) reports screen, EirGrid and DECC users can also view specifics and access all Renewable and Major Connection information within the various dashboards and reports relating to both the TSO and Distribution System Operator (DSO) systems. This provides a valuable and detailed record of what is connected to the TSO and DSO systems and what is in the pipeline.

Process, Systems and Information Charter

The TAO and TSO developed and agreed a Process, Systems and Information (PSI) Charter in 2023. It contains a set of high-level principles that will guide the development of digital collaboration arrangements between the two companies. This marks the achievement of a major milestone in Asset and Programme Data Exchange between TAO and TSO. The PSI Charter provides the basis for significant work already underway between the two companies to progress next steps on the digital collaboration journey.

Joint Programme Management Office – iteration 3.0

The TAO and TSO information flows at each stage in the project lifecycle are critical to successful project delivery. The Joint Programme Management Office (JPMO) was established to manage the programme level view to coordinate the range of parallel and interdependent activities. The terms of reference (ToR) for the JPMO were updated in 2023 and are referred to as JPMO 3.0. This review led to new JPMO membership, more focused monthly meeting arrangements and the clarification of roles and responsibilities which optimises the information exchange and governance arrangements across the full project lifecycle between TAO and TSO.

5.5 TSO and DSO joint incentive performance

The Joint System Operator Programme (JSOP) was established to facilitate collaboration between EirGrid in its role as TSO and ESB Networks in its role as DSO in jointly addressing system and customer needs.

The CRU published an information paper on the 2023 incentives in June 2023, CRU202354. This information paper contains direction and guidance on the 2023 balanced scorecards targets and the performance assessment process. For this joint incentive, a single balanced scorecard applies for both System Operators. The aspects included in the balanced scorecard are outlined in Table 10.

Table 10: TSO and DSO joint incentive balanced scorecard framework 2023

Whole of system approach	The quality of the outputs will be important here. Report against how the actions delivered against the whole of system approach requirement. All project documents should clearly demonstrate the benefits of a whole system approach and how outputs have deepened TSO and DSO collaboration.
Facilitating new technology and system services	The TSO and DSO must demonstrate how the actions delivered through enhanced collaboration have facilitated the delivery of new technology or removed barriers for existing technology.
Reducing dispatch down of renewable generation	The TSO and DSO must demonstrate the benefits in the collaborative actions in 2023 to target reduced dispatch down/and or curtailment compared to 2022 levels after allowing for the impact. Positive incentive award will require clear evidence to show how the TSO and DSO's collaborative actions will lead to a curtailment reduction. A strong submission will show a clear link to whole system benefits, demonstrating actions that deliver quantifiable outcomes. A number of actions overlap with other incentives, so it will be important to focus on the impact of collaboration.
Addressing security of supply (referred to as 'Secure Future Power System')	The TSO and DSO should clearly demonstrate the collaboration with each other and any insights gained through collaboration when achieving the actions as set out. The TSO and DSO should document the collaborative steps taken to improve the outcome for market participants.

CRU202354 states that each aspect of the balanced scorecard will be assessed against the following: quality of the plan and defined actions (20%); quality of implementation of the plan (40%); and effectiveness of the plan and demonstrable impacts (40%).

In 2023, both EirGrid and ESB Networks regularly met and collaborated on topics such as dispatch-down, protection setting for our large customers, Qualification Trial Process, 'whole of system' challenges and security of supply, including the 'Beat the Peak' campaign. Key milestones included workshops on the DSO 'Flexibility Pilot of Scale', a collaborative technical assessment of Distributed Energy Resource (DER) system performance.

The TSO-DSO Operating Model was the primary focus of the JSOP in 2023. The system operators identified the need to effectively develop and deliver a coherent approach to optimising the electricity system as a whole and deliver a secure and efficient power system for consumers, rather than focusing on the transmission and distribution systems in isolation.

The future TSO-DSO Operating Model will act as the backbone to deliver across all objectives of TSO-DSO collaboration. Advancing the operating model was prioritised due to its impact on other workstreams and a number of milestones in relation to developing the operating model were achieved such as agreeing the high-level design. There were frequent workshops held between the two system operators in relation to various aspects of the operating model.

The programme allowed for effective and efficient co-ordination between the system operators. The Management Liaison Board met monthly to govern the consistent delivery of the JSOP.

In accordance with the detail in CRU202354 (the CRU's 2023 Balanced Scorecard Information Paper), the CRU has confirmed an incentive award of €0.15m to EirGrid for the above incentive for 2023.

5.6 TSO Transmission Infrastructure Delivery incentive performance

As required by CRU, EirGrid has developed a Balanced Scorecard Framework in order to facilitate an annual assessment on the quality and rigour of its end-to-end processes for investment planning and delivery. CRU/20/154 contains direction and guidance to the TSO on incentives and reporting arrangements for PR5.

Section 7.8 of the CRU's decision paper relates specifically to the TSO's IPD. The CRU's 2023 Balanced Scorecard information paper CRU202354 provides additional guidance to the TSO on the 2023 IPD incentive framework as set out in Table 11 below:

Table 11: PR5 TSO IPD incentive balanced scorecard framework 2023

Area	Metric no./type	%	Steps	Strong €0.9m	Acceptable €0.2m	Below acceptable €0.5m
Investment planning (40%)	Metric 1 Qualitative	10%	Step 1	Audit Full assurance	Audit Satisfactory assurance	Audit Limited/ Unsatisfactory assurance
	Metric 2 Qualitative	10%	Step 2			
	Metric 3 Qualitative	20%	Step 3			
Delivery (40%)	Metric 4 Quantitative	20%	Step 4-5			
	Metric 5 Quantitative	20%	Step 6	Greater than or equal to 75%	61-74%	Less than 60%
Timeliness (20%)	Metric 6 Quantitative & qualitative	20%	–	Strong (ahead of plan)	Acceptable (in line with plan)	Below acceptable (behind on plan)

The incentive payment is determined by the CRU, informed by an independent audit and performance is graded as 'strong', 'acceptable', or 'below acceptable'. An independent audit was carried out on the balanced scorecard for 2023 and the findings of the audit were submitted to the CRU for their consideration. The incentive payment range is outlined in Table 11 above. Per CRU202354, the CRU thereafter considers performance on a holistic basis when setting the final score.

For 2023, EirGrid's performance on the aspects outlined in the balanced scorecard above can be summarised as follows:

- Metrics 1-4: EirGrid's performance across steps 1 to 5 was strong in 2023, with significant progress made across the portfolio of projects, illustrated by the number of capital approvals (50) achieved during the year. 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 security of supply and facilitate the integration of renewable energy onto the transmission system to meet domestic, commercial and other demand needs. These new projects include 25 customer connections, 10 system reinforcement projects, 12 asset refurbishments and 3 diversions of an existing circuit projects.
- Metric 5: EirGrid achieved a strong performance in 2023, delivering 84% (adjusted) and 70% (unadjusted) of TOP 2023 (TOP23). This represents an improvement compared to the outturn performance for 2022 of 71% (adjusted) and 63% (unadjusted).
- TOP23 included outages for 70 capital projects and outages for 9 additional projects were also completed when slots became available during the outage season. EirGrid and ESB Networks aim to make use of all available outage slots during the outage season.
- Metric 6: Timeliness – EirGrid's average project delivery outturn performance in 2023 was considered by EirGrid to equate to an acceptable performance, with 74% of the major project milestones of capital approval, project agreement with ESB Networks and energisations in line with or ahead of the current PR5 plan.

In addition to achieving strong performance in each of the 6 metrics listed in Table 11, in 2023, EirGrid increased the likelihood of achieving a CRU assessment of strong performance through the demonstration of implemented process improvements.

EirGrid develops and implements process improvements across the 6-step framework annually and in 2023 significant progress was made. EirGrid and ESB Networks jointly developed and implemented the JOTP. A joint EirGrid/ESB Networks statement in relation to the ambitious programme that is being collaborated on was agreed in December 2023, formally communicated to DECC and CRU and published on EirGrid[25] and ESB Networks' [26] websites in January 2024.

In addition, EirGrid and ESB Networks jointly developed an Early Engagement Process, under the current IA, to enable project engagement earlier in the project lifecycle. In April 2023, EirGrid and ESB Networks wrote to the CRU setting out the proposed approach.

Further details on the JOTP and Early Engagement process are included in the Investment Planning and Delivery Report 2023.

EirGrid's performance against the IPD incentive and associated metrics underwent an independent audit in February 2024, which confirmed EirGrid's declaration of an overall 'Strong' IPD incentive performance for the 2023 calendar year.

For 2023, the CRU confirmed an outturn incentive award be applied for the IPD incentive for 2023 of €0.72m. The outturn awarded is a 'Strong' performance overall as per CRU's grading scale noted above.

5.7 TSO Local Security of Supply incentive performance

The CRU highlighted the importance of resolving the local security of supply issues within its PR5 Strategic Objectives. The CRU considered that given the significant forecasted growth in demand in the Greater Dublin Region, constraints in the Dublin Region represent a security of supply risk. CRU/20/154, the CRU's decision on the PR5 regulatory framework, incentives and reporting, introduced the Local Security of Supply (LSoS) incentive the aim of which is for EirGrid to demonstrate progress in addressing and managing key transmission network security of supply/ constraint areas during PR5.

EirGrid submitted the LSoS multi-year plan for 2023–2027 to CRU in May 2023. In June 2023, the CRU's balanced scorecard for 2023 was set out in CRU202354, outlining four main aspects of the LSoS incentive.

The CRU's 2023 balanced scorecard for this incentive is outlined in Table 12.

25 EirGrid Joint Statement
26 ESB Networks Joint Statement

Table 12: Local Security of Supply incentive balanced scorecard 2023	
Infrastructure solutions	**Major project delivery including Dublin Programme** • Progress and report on delivery of projects as per NDP (and summarised in Table 27 of CRU202354). • Report on the impact each will have in helping resolve Security of Supply, including specifically short circuit issues and with quantification of the impact of remedies/actions. **Planning and environment** • Successful completion of pre-application consultations for all Cables Projects and/or undertaking the process for Declarations of exempted development and reporting on any changes made to project delivery. • Submission of planning application for Poolbeg to relevant authority and provide evidence Belcamp has moved into Project Agreement stage. **Stakeholder and public engagement** • Report on the progress for Dublin Energy Citizen Roadshows. • Provide brief summaries of TSO engagement in Dublin Programme Infrastructure Forum quarterly meetings, Project specific consultations, Community Forums and Business Forums. • Report on the outcomes of the forums and how the TSO plan to account for stakeholder, community and local businesses views during the lifecycle of relevant projects. • Include in all reports how this engagement is used to inform project planning and delivery.
Quantification	As with the previous year's requirement, the CRU expects EirGrid to develop a methodology for quantifying the local security of supply issues and the quantitative impact of each action proposed and implemented.
Demand	Provide report: (i) quantifying level of flexibility available following engagement with data centres; (ii) outlining progress on other services which can be provided by data centres to address local security of supply issues in Dublin (e.g., short circuit management).
T-3/T-4 non-contestable project delivery	Provide evidence of delivery of 300 MW of the total of 1,500 MW by end of 2023.

EirGrid's performance against the areas set out in the balanced scorecard for 2023 are summarised as follows:

- Milestones for the 13 projects reported under the major project delivery aspect were 87.5% complete with the infrastructure consenting well under way;
- The consenting masterplan developed in 2022 has been used as a key tool throughout 2023 to strengthen the engagement process;
- The defining of the masterplan has played a key factor in two major projects progressing through pre-application consultation to submitting the planning application and it being granted without any third party appeals to An Bord Pleanála;
- The Stakeholder Engagement and Communications plan continues to actively engage several of the Dublin Programme key stakeholders at the right time, to agree the right option which is key to delivering the infrastructure need to support the supply need;
- A path has been identified for demand customers to support additional demand reduction measures and support risk plans where needed in the future; and
- The 300 MW target was exceeded by delivering a total of 140 MW of gas fired generation and 210 MWh of battery storage, totalling 320 MW.

As per CRU/20/154, 25% of this incentive reward will be withheld until the end of the PR5 period.

Therefore 75% of the incentive reward/penalty will be applied annually and the remaining 25% of each years' reward/penalty will be at stake at the end of price review period and will be subject to resolving the Dublin Security of Supply issue.

In accordance with the detail in CRU202354 (the CRU's 2023 Balanced Scorecard Information Paper), the CRU has confirmed an outturn award be applied for the above incentive for 2023 of €0.396m.

6. How EirGrid performed against strategic incentives

We are in a time of unprecedented change to the electricity system as we move to a low carbon future. EirGrid is at the forefront of guaranteeing that this change is brought about in a timely and cost – effective manner while realising a broad range of benefits for end users and market participants.

We do this by maintaining a safe, secure and reliable transmission system while integrating an ever – increasing number of renewables. This is supported by our development of a wide variety of innovative projects and the roll out of new system services.

The CRU PR5 Regulatory Framework Reporting and Incentives Decision Paper (CRU/20/154) invited the TSO to propose key performance indicators for its strategic incentive, in the following three areas:

1. Facilitating a secure low carbon future;
2. Increasing efficiency and protecting consumers; and
3. Anticipation of future investments.

EirGrid built on the CRU's three proposed incentive areas above and proposed a number of initiatives for 2023. As per CRU202354, in 2023, the TSO's performance in relation to this incentive was based on the initiatives set out in Table 13.

Table 13: Strategic Objectives incentive balanced scorecard 2023	
Networks	• Develop a flexible network strategy: maximising network utilisation readiness plan. • Commence process to procure new Computerised Maintenance Management System (CMMS). • Investigate new approach for transmission maintenance. • Complete risk assessments from impacts of climate change on transmission system and identify climate change adaptation measures. • Optimise the Network Delivery Programme (NDP) by integrating outage constraints. • Complete Online Condition Monitoring (OLCM) pilot project and if deemed successful, develop proposal for wider OLCM on transmission system.
Markets	• Develop a detailed design and programme plan for regulatory approval on scheduling and dispatch changes. • Submit full implementation plan for Future Arrangements for System Services (FASS) to the RAs one quarter after both receipt of detailed decisions regarding programme for the RAs and RAs confirmation of the funding provision. • Offshore RESS auction completed. • Network tariff review – EirGrid to update market deliverables for 2023 following CRU provision of guidance regarding next steps to EirGrid.
Operations	• Conclude all power system studies to support the commencement of an operational trial with seven large synchronous units/20,000 MW inertia floor. • Control centre of the future: develop a delivery plan for the tools and capability the TSO needs to operate the system to 2030. • Subject to Regulatory Authority approvals, commence a procurement process for low carbon inertia services.

EirGrid understands its crucial role in delivering on our climate targets. Our strategic objectives are a vital component of the radical change we will see in the run up to 2030. We will continue to operate and maintain a system, which will see dramatic positive change, as we enter a new era of low carbon, for the benefit of all.

In accordance with the detail in CRU202354, the CRU confirmed an outturn incentive award be applied for the above incentive for 2023 of €0.345m against a total possible incentive upside of €0.5m.

7. How EirGrid manages system performance

In a highly competitive global marketplace, continuity of supply is crucial to attracting inward investment and ensuring economic growth, especially in the technology sector. A changing generation portfolio with increased penetration of variable renewable generation makes it more difficult to maintain current high levels of security of supply.

As an island with limited interconnection, Ireland is leading the way in resolving the complex technical challenges that the integration of high levels of renewable generation presents. Examples of this include the Celtic and Greenlink interconnectors.

Two of the primary metrics by which a transmission system's performance is measured are System Frequency and System Minutes Lost. These measures are a recognised, robust way of measuring the reliability and quality of supply delivered by an electricity transmission system. Given their importance, EirGrid is incentivised to maintain certain levels for each of these.

For further information see the All-Island Transmission System Performance Report 2023.[27]

7.1 System frequency

Frequency must be maintained at the standard level in order to support the stability of the system. If the frequency is not maintained within defined limits, the system will collapse leading to wide-scale power outages. For the Irish transmission grid, the standard for frequency is 50 Hz. This means that at this level load and generation are perfectly balanced. If the system becomes significantly unbalanced, transmission equipment can be damaged. Household devices are also designed to only handle a certain range of frequencies and can be damaged if this range is not maintained.

Ensuring control of the system frequency is critical and challenging as EirGrid seeks to further increase the level of renewable generation connected to the grid. EirGrid continues to be incentivised to maintain system frequency within prescribed limits. As per CRU/20/154, the target is to keep system frequency between 49.9 Hz and 50.1 Hz. In 2023, the system frequency was operated within the target operating limits of 49.9 Hz and 50.1 Hz for 98.71% of the time. Therefore, EirGrid achieved a partial incentive award of €0.1m for this incentive.

27 All-Island Transmission System Performance Report 2023 (eirgrid.ie)

7.2 System Minutes Lost (SML)

SML is an internationally recognised measure of transmission system performance. It measures the severity of each system disturbance relative to the size of the system. By measuring SML EirGrid's performance can be compared against other TSOs.

EirGrid is incentivised to ensure SML remain low. EirGrid has maintained downward pressure on SML through diligent frequency management, developments in generator performance incentivisation and monitoring and through the transmission system protection upgrade programme. As per CRU/20/154, the SML annual target is 0.75-2.5 for the PR5 period.

In 2023, there were 4.461 SML on the transmission system. A substantial portion of this SML figure is due to a single incident that occurred on Saturday 25th November 2023 at 23:50. A high voltage component failure occurred on the transmission network in the North Mayo Region, resulting in the disconnection of a number of 110 kV transmission stations from the network and loss of electricity supply to a large number of customers in the North Mayo Region. At the time of the fault, transmission system development and maintenance works were taking place in the North Mayo Region. Due to the local transmission network configuration, an alternative electricity transmission supply route was not available.

During the outage, ESB Networks in its capacity as DSO was able to restore power to some customers via the 38 kV distribution network. Although the damaged component was bespoke in nature, it was replaced, tested, approved and energised such that the electricity supply to North Mayo was fully restored by 18:54 on Sunday 26th November.

For more detailed information on this incident, please see the All-Island Transmission System Performance Report 2023[28].

Without the occurrence of this single incident, SML for 2023 would have been 0.06535 which would have resulted in a full incentive award of €0.3m for 2023.

In 2023, there were several other instances where EirGrid were required to manage interruptions to the network and maintain its resilience, ensuring that a constant, safe and secure supply of electricity was available at all times.

There were no Under Frequency Load Shedding disturbances in 2023.

EirGrid received a penalty of €0.5m for this incentive in 2023.

28 All-Island Transmission System Performance Report 2023 (eirgrid.ie)

7.3 Renewable dispatch down

Dispatch-down of renewable energy refers to the amount of renewable energy that is available but cannot be used by the system. The dispatch down percentage is based on the average renewable dispatch down for the aggregate of both constraints and curtailment (as currently measured) over the 12 months of the calendar year. It is expected that as the energy share of renewables increases, so too will the percentage of renewable generation dispatched down. During 2023, EirGrid progressed a number of operational policies to mitigate dispatch down levels such as the RoCoF and MUON trials.

The target for 2023, per CRU/20/154, is outlined in Table 14 below. In 2023, 8.9% of renewables were dispatched down. As a result, in accordance with CRU/20/154, EirGrid received a penalty of €0.28m for 2023.

Table 14: Renewable Dispatch Down incentive

	2023
PR5 upside target	5%
PR5 downside target	7%
TSO 2023 achieved	8.9%

7.4 System Non-Synchronous Penetration (SNSP)

EirGrid has significant obligations to undertake studies and implement relevant policies to help realise the Irish Government's renewable energy targets and objectives. This includes a target of having up to 80% of all electricity generated from renewable energy sources (RES) by 2030.

EirGrid has a responsibility to enable increased levels of renewable energy generation on the power system while making sure that the system is operated safely and securely. As part of the PR5 Regulatory Framework, the CRU introduced a new annual incentive focused on increasing SNSP operating policy levels. SNSP operating policy sets the maximum allowable level of renewable generation on the power system, referred to as the SNSP limit. A target SNSP operating policy of 80% was set for 2023.

The TSO successfully concluded the 75% SNSP trial in March 2022 and 75% SNSP became enduring operational policy. In 2023, the TSO prioritised the reduction of the MUON constraint. The MUON constraint relates to the number of large conventional fossil fuel generation units which must be online at a point in time. For more detail on the reduction of the MUON constraint, see Section 11: 'How EirGrid manage constraint costs'.

As noted in Section 16 'How EirGrid performs relative to comparator TSOs internationally', EirGrid is leading the way in both its trialling of higher SNSP limits and in its translation of these increasing limits into operational policy, in comparison to TSOs internationally.

Increasing SNSP is part of the SOEF 1.1 Roadmap and will facilitate higher levels of non-synchronous renewable generation on the system. This is just one step in the pathway towards 95% SNSP by 2030, which is required to fulfil government RES-E targets.

There is no balanced scorecard related to the SNSP incentive. SNSP Operating Policy remained unchanged at 75% in 2023 and as a result, in accordance with the direction in CRU/20/154, the full penalty of €0.3m applied for 2023.

7.5 Renewable Energy Source – Electricity (RES-E)

The PR5 RES-E Incentive is binary. The total award is subject to meeting a 49% RES-E target for 2023. If the annual target as specified by the CRU is achieved, the incentive rewarded is subject to an assessment of performance against the quality of the applicable plan (20%), quality of implementation of the plan (40%) and the effectiveness of the plan (40%).

Despite much progress being made on EirGrid's part in relation to the deliverables initially proposed in EirGrid's RES-E plan, the 49% RES-E target for 2023 was not achieved. A RES-E level of 40.5% was achieved on an all-island basis in 2023 while the RES-E level achieved in Ireland in 2023 was 41.5%[29].

In accordance with the detail in CRU/20/154, no incentive award applied for the above for 2023.

41.5%

RES-E level achieved in Ireland in 2023

29 Per EirGrid System and Renewable Reports – Fuel Mix 2023.

8. Interconnector development

EirGrid, along with our French counterpart Réseau de Transport d'Électricité (RTE) is continuing the development of the Celtic Interconnector project, a planned subsea High Voltage Direct Current (HVDC) electricity link between Ireland and France.

8.1 Development of the Celtic Interconnector

The Celtic Interconnector will deliver a wide-ranging package of benefits to consumers and businesses in both Ireland and France. It will apply downward pressure on the cost of electricity, enhance Ireland's security of electricity supply and facilitate our national transition to a low-carbon economy.

The interconnector power cables will reach landfall in Ireland at Claycastle Beach, near Youghal in East Cork. From there an underground cable will run inland and continue north of Midleton to the converter station. This will be built at Ballyadam, on part of an IDA-owned site, to the east of Carrigtwohill. The final connection will be by underground cable from Ballyadam to a substation on the national grid at Knockraha.

The Celtic Community Forum is made up of local community representatives. It provides for dialogue between stakeholders with interests in the project and the project team and represents local communities in the design and implementation of the Community Benefit Fund. Three Celtic Community Forum meetings were held in 2023. The Celtic Interconnector Community Benefit Fund has been established by EirGrid with the overall aim of increasing public and environmental wellbeing in the community and leaving a positive legacy in the communities hosting this grid infrastructure. The fund is released in three phases, when construction begins, mid-way through the project and when the project is energised. Phase 1 of the fund opened in June 2023 and was awarded in December 2023. More information on the Celtic Interconnector Community Benefit Fund can be found here.

Siemens Energy have been contracted to develop converter stations in both Ireland and France. Nexans, a French Cable manufacturer, is responsible for the design and installation of the 575 km cable between both countries.

During 2023, Nexans and Siemens progressed the detailed design and ordering of equipment for the Celtic Interconnector and some manufacturing works commenced. EirGrid and RTE have been working with both contractors to ensure designs meet project requirements. Agreements were also signed for €800 million of financing to be provided by the European Investment Bank, Danske Bank, Barclays and BNP Paribas.

The project continued to progress through the construction phase in 2023. Pre-work activities such as surveys along the cable route took place in preparation for works to commence. In November 2023, construction commenced with the initiation of on-land cable works (trenching and ducting). The work began at Knockraha substation and will progress towards Carrigtwohill; continuing easterly over the course of the project. By December 2023, trenching and ducting work for Phase One of the Celtic Interconnector cable installation was completed.

Initial marine surveys for sections of the submarine route also commenced in 2023 and will continue in 2024 in preparation for the first installation of the cable in the Celtic Sea in 2025.

As a European Project of Common Interest, EirGrid and RTE maintain a dedicated project website www.celticinterconnector.eu. Full details on the ongoing activities of the project are published on the website which is available in both English and French.

For up to date information please see our website that is updated regularly here.

Co-financed by the Connecting Europe Facility of the European Union

8.2 Development of the Greenlink Interconnector

The Greenlink Interconnector is a proposed subsea and underground electricity interconnector cable between the electricity grids in Ireland and Great Britain, with a capacity of 500 MW, being constructed by Greenlink Interconnector Limited. The project will transfer electricity via submarine and underground cables over 190 km between the Great Island 220 kV Station in County Wexford and the Pembroke Station in Wales. The interconnector power cables will reach landfall in Ireland at Baginbun Beach, near Ramstown in South Wexford. From there, underground cables will connect via Campile Converter Station to the Great Island 220 kV Station.

This project brings significant benefits on both sides of the Irish Sea, Ireland and Wales, for the integration of low carbon energy sources. This project will provide Ireland with a link to the EU and the Nordic electricity market via Great Britain. EirGrid will be facilitating the connection into Great Island 220 kV Station.

In 2023, installation of the cable ducting required between the marine landfall at Baginbun Beach and the converter station at Great Island continued. Cable laying works continued throughout 2023. Installation of the cable ducts at Baginbun Beach, which is the landfall site for the marine section of the interconnector, commenced in March 2023.

Phase 1 of the offshore marine works was successfully completed in September and October 2023.

The main civil construction activities at the converter station site at Great Island were completed in 2023 and installation of the electrical equipment began. In August 2023, four grid transformers which were manufactured by Siemens Energy, were delivered, being transported from Nuremberg, Germany by sea.

In 2023, EirGrid's Greenlink Readiness Project moved to the implementation phase in line with the operating model for Greenlink previously approved by the Regulatory Authorities in 2022.

As part of the implementation phase of EirGrid's Greenlink Readiness Project, in 2023, detailed IT system changes were identified and built and the development of operating processes and procedures to support the integration of Greenlink into the Single Electricity Market (SEM) and the power system continued.

Greenlink is expected to be commissioned by the end of 2024.

9. How we ensure network resilience

EirGrid designs and plans the transmission network in accordance with the Transmission System Security and Planning Standards (TSSPS)[30] and operates it in accordance with the Operating Security Standards[31] while ESB Networks constructs and maintains the transmission network on the ground.

As the transmission network is vital to the supply of electricity for all customers and end users, these standards are critical to ensuring that the transmission network is designed in a way which guarantees this in a safe, secure and robust manner. The operation of the grid once in place is supported and underpinned by robust policies and procedures both in our control centres and on the ground.

On-going transmission system maintenance is crucial to ensuring the resilience of the network.

The Asset Maintenance Policy is kept under review to ensure that it continues to meet the requirements of the system and best international practice. The most up to date Guide to Transmission Equipment Maintenance can be found on the EirGrid website here.

The transmission network contains a large number of overhead lines, cables and substations distributed across the country and at customer's installations. Transmission maintenance work requires a wide range and high volume of complex maintenance tasks to be undertaken annually. EirGrid and ESB Networks agree an annual maintenance programme based on the applicable Transmission Maintenance policies and standards. ESB Networks delivers the transmission maintenance programme utilising teams of highly skilled technicians and specialists distributed nationally. The maintenance expenditure in 2023 was €26m (including both planned and fault maintenance). ESB Networks delivers transmission maintenance efficiently and to a high standard contributing to the health, performance, life and resilience of the transmission system. There is some flexibility in scheduling maintenance within the year, or from year to year.

EirGrid and ESB Networks report and manage the maintenance work programme actively and dynamically, based on criticality, on an on-going basis. The ability to deliver the full maintenance work programme is affected by the availability of outages; interdependencies with capital project works; weather and other unplanned maintenance or faults arising; additional work or materials requirements identified following inspection; and a wide range of other issues.

30 EirGrid Transmission System Security and Planning Standards (TSSPS) (eirgrid.ie)
31 Operating Security Standards (eirgrid.ie)

A resilient network requires prioritisation of maintenance work to ensure that the most important maintenance is completed first. ESB Networks has a Prioritised Maintenance Process that involves the analysis of data and, working with EirGrid, takes account of the outages required to complete the necessary remedial actions. This ensures we address high risk issues and that network safety/resilience driven work is prioritized.

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 our Joint Outage Transformation Programme is under way. As mentioned in Section 5: 'How we performed against transmission delivery incentives', EirGrid and ESB Networks issued a joint statement in relation to the JOTP in December 2023. The interventions that the JOTP is focused on are aimed at increasing outage availability, maximising utilisation and effectiveness of outages.

Co-ordinated outage planning is another core requirement to ensuring network reliance on a day-to-day and week-to-week basis. The ability of the system to meet demand, even where generation or system assets are unavailable, is carefully monitored and planned for. The All-Island Generation Outage Plan ensures co-ordination of planned outages when power stations will not be available due to maintenance or other reasons. The plan takes into account security of supply in Ireland, as well as economic operation of the power system and the maintenance/ resource needs of generators.

The All-Island Generation Outage Plan is published in September each year. During the year, the plan for that year is updated on a daily basis, or as necessary. Details regarding the All-Island Generation Outage Plans can be found on the Single Electricity Market Operator (SEMO) website here. Generators can send outage requests to EirGrid using the Generator Outage request form on EirGrid's website here.

Transmission Outages involve planned times when lines, cables and substations will be maintained and not in service. It also involves times when plant testing, connection of new plant and decommissioning of old plant is carried out. The annual TOP includes all outages of transmission infrastructure which are planned to occur in the year.

The outturn delivery percentage of planned outage-related capital works and energisations is reported with reference to the annual TOP. In 2023, the TOP delivery percentage was 84%[32].

Delivery of the 2023 TOP was subject to a number of influencing factors including:

- Outage availability.
- Outage scoping and complexity, particularly for pre-existing brown field station projects, accommodating changes and the difficulty in achieving large volumes/durations of outages regionally.
- The need for 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 meeting contractual milestones applicable, 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.
- Tight generation margins.

The CRU introduced Short Notice Outage Adjustment Mechanism (SNOAM) provisions, providing for the reduction of the duration of planned outages at short notice. In March 2020, the CRU published an information paper CRU/20/038 containing further details of this mechanism. In 2023, the SNOAM provisions were not employed in relation to any outages.

Further Information on the Transmission Outage Programme can be found here.

32 Includes an ex-post adjustment for issues outside of the TSO and TAO's control.

9.1 Network resilience in an ever-changing system

One of the biggest challenges is maintaining network resilience in an increasingly diverse and complex power system with ever increasing levels of renewable generation.

EirGrid's DS3 programme and SOEF 1.1 Roadmap[33] seeks to address this issue.

With the SOEF programme EirGrid continue to aim toward 95% SNSP by 2030 and studies have commenced to investigate mitigating measures needed to commence an 80% SNSP trial.

It is also important to optimise the delivery of maintenance on the transmission system in order to enhance its resilience. In 2023, critical maintenance plans were again incorporated earlier in the transmission outage planning process giving higher priority to critical maintenance considerations in developing the outage plans and schedules.

9.2 Network resilience in action

In 2023, there were several instances where it was required to manage interruptions to the network and maintain its resilience, ensuring that a constant, safe and secure supply of electricity was always available.

There was one adverse weather event which caused a fault on the transmission system, however; it did not result in supply interruptions in 2023. On 13 November 2023 at 05:40, Athlone – Lanesboro 110 kV circuit tripped, reclosed and tripped again for a single-phase to ground fault. The fault clearance time was approximately 64 ms. The fault was caused by heavy wind and a red weather warning was in place due to Storm Debi. No interruptions to end-users occurred.

Five other loss of load events occurred in 2023 for other reasons:

- On 5 May 2023 at 18:59, Blake – Maynooth – Newbridge 110 kV circuit tripped for a three-phase fault. The cause of the fault was lightning and a thunderstorm weather warning was in place at the time of the disturbance. The circuit's impedance and differential protection operated to clear the fault in 69 ms. An interruption to end-users occurred, resulting in 0.00004 system minutes lost.

33 Shaping Our Electricity Future (eirgrid.ie)

- On 17 June 2023 at 15:23, Booltiagh – Moneypoint – Tullabrack 110 kV circuit tripped and reclosed for a three-phase to ground fault. The fault clearance time was approximately 49 ms. The fault was caused by lightning and a yellow weather warning was in place at the time of the disturbance. An interruption to end-users occurred, resulting in 0.000024 system minutes lost.
- On 17 June 2023 at 19:27, Ikerrin – Shannonbridge – Thurles 110 kV circuit tripped for a single-phase to ground fault and reclosed with the Ikerrin tee circuit remaining out. The fault clearance time was approximately 51 ms. The fault was caused by lightning and a yellow weather warning was in place at the time of the disturbance. An interruption to end-users occurred, resulting in 0.000042 system minutes lost.
- On 19 June 2023 at 16:37, Ikerrin – Shannonbridge – Thurles 110 kV circuit tripped for three-phase to earth fault. The fault clearance time was approximately 110 ms. The fault was caused by lightning and a yellow weather warning was in place at the time of the disturbance. At 16:56, the Ikerrin – Thurles 110 kV circuit was re-energised. An interruption to end-users occurred, resulting in 0.065589 system minutes lost.
- On 25 November 2023 there was a fault on the Sligo 110 kV cubicle at Cunghill 110 kV station which resulted in four trips on the transmission network. On investigation it was found that the 'T' phase of the busbar disconnect was damaged. This led to the loss of supply to a significant number of customers in the region on 26 November. Although the damaged component was bespoke in nature, it was replaced, tested, approved and energised such that the electricity supply to North Mayo was fully restored by 18:54 on Sunday 26th November. During the outage the DSO was able to back-feed some of the load via the 38 kV network. 4.39565 system minutes lost were attributed to the incident.

Ensuring transmission assets are resilient to climate change has required greater focus with stakeholder engagement necessary to identify the latest projections and climate risks. ESB Networks continues to engage with the Office of Public Works on their climate models and flood maps to identify climate risks on the transmission network and will be working further with them as stakeholders in the development of their Flood Risk Management Sectorial Adaption Plans (SAPs).

Please refer to Section 12 of the IPD for further details on EirGrid's proposed climate adaptation measures relevant to the transmission system.

9.3 Power System Emergency Communications Plan

In 2023, the Power System Emergency Communications Plan (PSECP), was enhanced to integrate it into the National Emergency Coordination Group (NECG) and the newly established Energy Sector Crisis Communications Subgroup processes.

The Joint Energy Emergency Response Team (JEERT) and Energy Press Officers' Network (EPON) structures, which give effect to the PSECP processes, have been designed to respond to any emergency involving gas, electricity and oil. Integration of the PSECP into the NECG process means that government sector departments are engaged in the energy sector response at a national level.

The PSECP and JEERT were again activated for one of the largest national energy sector exercises in Ireland, held on the 14th September 2023 (Exercise Brigid).

This exercise included the participation of the NECG in the National Emergency Coordination Centre (NECC). It was attended by all relevant stakeholders from the energy sector including EirGrid, ESB Networks, Gas Networks Ireland, the National Oil Reserve Agency, the CRU, DECC and other Irish Government Departments.

Large energy users participated in the exercise to test the operational engagements in the event that these would be requested for voluntary demand reduction or instructed to curtail in the event of a system Emergency State.

The objectives of the exercises were successfully achieved in 2023, demonstrating the implementation of actions identified during Exercise Dara (held on 9th and 16th September 2022).

10. How EirGrid manage network constraints

EirGrid implements system operational constraints, in conjunction with SONI, the TSO of Northern Ireland, in order to maintain acceptable levels of system stability and voltage levels to enable efficient operation of the system. More information can be found in the Operational Constraints Update[34], which is published weekly.

There is an annual process in place whereby all operational constraints are reviewed at the beginning of the business year. Based on inputs from various teams across EirGrid and a review of the Weekly Operational Constraints document, the specific operational constraints to be reviewed are selected and subsequently analysed. A review of operational constraints is also carried out if there have been significant network changes made to a particular area of the transmission system, connection of significant generation in an area of the transmission system, or closure of significant generation in an area of the transmission system. The TSO publishes Operational Constraints Updates weekly. EirGrid can confirm that all reports for 2023 were published in a timely manner and are publicly available here.

Short-term management of network constraints is carried out in the Control Centre through the use of specialist software tools. Using these specialist software tools ensures that short-term constraints are identified and information is provided to the Control Centre to ensure that the most cost-effective action is taken. The most effective measure of performance in managing constraints is action taken to reduce constraint costs. This is discussed further in the next chapter.

34 Weekly Operational Constraints Update (sem-o.com)

10.1 Information on 2023 curtailment volumes

Curtailment refers to the dispatch-down of wind/solar for system-wide reasons (where the reduction of any or all wind/solar generators would alleviate the problem). There are different types of system security limits that necessitate curtailment including:

1. System stability requirements (synchronous inertia, dynamic and transient stability).
2. Operating reserve requirements, including negative reserve.
3. Voltage control requirements.
4. SNSP limit.

In 2023, 1,163GWh or 8.9% of all renewables in Ireland were dispatched down. Table 15 below shows a breakdown of curtailment volumes for renewable generation in Ireland. There was no curtailment of solar generation in 2021 and 2022 as there was no transmission-connected solar generation until 2023.

Table 15: Renewable curtailment volumes

Year	Wind curtailment volumes (MWh)	Solar curtailment volumes (MWh)
2023	594,595	9,548
2022	412,827	–
2021	291,412	–

Further details can be found in the Annual Renewable Constraints & Curtailment Report[35].

The level of dispatch-down is affected by a number of factors which vary from year to year, such as the amount of wind and solar connected to the system, system demand and the capacity factor[36] of renewable generation.

The capacity factor of wind farms was 28% in 2023 which is broadly in line with the capacity factor in 2022.

In recent years, significant capital works have been undertaken to upgrade the transmission system to allow more wind and solar generation to be exported on to the power system. Every year a range of planned transmission outages are undertaken which at times will increase constraints. Increasingly complex operational switching was performed in 2023 to maximise renewable output wherever possible across the transmission system.

35 Annual Renewable and Constraint Curtailment Report 2023 (eirgrid.ie)
36 The capacity factor is the amount of energy produced (MW output) relative to the theoretical maximum that could have been produced if the wind generation operated at full capacity. Therefore, it represents the average output of the wind generation.

11. How EirGrid manage constraint costs

Sometimes EirGrid will have to dispatch or call in some power generators differently from the market schedule, in order to ensure security of supply to end users and market participants. This is because of the technical realities of operating a dynamic and fast–changing power system, such as preventing overloads or maintaining enough generation reserve.

Where power stations are run differently from the market schedule, it is termed 'constraint'. Generators are kept financially neutral with the original market schedule and the cost associated with doing this is the constraint cost.

Constraint costs are the most significant part of dispatch balancing costs. Dispatch means the sending of instructions from the EirGrid control centre to power generators, demand side units, interconnectors or pumped storage plant about their times, fuel, manner of operation or output. Dispatch balancing costs are a suite of payments that relate to how generators are instructed.

In addition to constraint costs, dispatch balancing costs also include uninstructed imbalance payments and generator testing charges. Constraint costs are an inherent feature of the SEM design. These costs are levied on suppliers through the Imperfections Charge. EirGrid, working with SONI, the TSO in Northern Ireland, is responsible for forecasting and managing dispatch balancing costs. They form part of the imperfections charge which is paid for by market participants.

As part of PR5, the CRU has introduced an incentive for Imperfections and Constraints. The aim of the incentive is to promote EirGrid to mitigate and reduce the costs of constraints on the system. The incentive involves EirGrid identifying areas that are related to imperfections costs and putting in place actions to reduce costs.

The CRU published an information paper on the 2023 incentives in June 2023, CRU202354 which contains direction and guidance on the 2023 Balanced Scorecards targets and the performance assessment process. The information paper outlines each aspect of the balanced scorecard is assessed against the following: quality of the plan and defined actions (20%); quality of implementation of the plan (40%); and effectiveness of the plan and demonstrable impacts (40%).

The Imperfection and Constraints incentive for 2023 is based on a balanced scorecard containing five key measures as outlined in Table 16.

Table 16: Imperfections and constraints incentive balanced scorecard 2023	
Reserve policy review and changes	• Provide evidence of any changes made to Reserve Policy and provide rationale on how and which constraints this will help alleviate. • Report on the System Services Product review carried out by the TSO and outline key action points as a result of the review. • Develop the System Service Forecast Methodology by the end of 2023. • Provide an outline of the methodology and how the TSO plans to use it within the 2023 Outturn report.
Transmission Constraint Group (TCG) review and roadmap	• Carry out and report on the review of thermal based TCGs that are constraining the power system and outline what measures the TSO plans to take following the review to alleviate constraints. • Carry out and report on the review of voltage based TCGs that are constraining the power system and outline what measures the TSO plans to take following the review to alleviate constraints. • Further development of the quantitative methodology for estimating imperfection cost forecasts and subsequent cost reductions to be used in future multi-year plan submission to quantify the impact of proposed actions.
Minimum Conventional Units Online (MUON)	• Provide evidence of the TSO carrying out operational trial. • Reflect on the operational trial and describe impact on market participants/consumers, key learnings and outline next steps.
Imperfections reporting	• Report on imperfection cost reductions for each measure undertaken by the TSO in the year. • Submit mid-year report to the CRU by the end of March to provide an analysis of imperfections spend for the first 5 months of tariff year and a view of the imperfections spend for the last 7 months of the tariff year. • Publish four Quarterly Imperfections Cost Reports with clear evidence of the imperfection reductions actions, progress on annual plan and the future improvements that the TSO will make to remove or reduce the cost of each constraint in the next period.
Updated constraints reporting	• Report on constraints including detailing all active/removed constraints for 2023, how long each has been in place for and how long each is forecasted to be in place for. • The constraints report should also include volume of system services dispatched by the TSO through non-energy actions during the 2023 period and the associated cost. The report should provide a comparative analysis of performance against 2022

The CRU included EirGrid's Minimum Conventional Units Online (MUON) operational trial in its Imperfections and Constraints Incentive Balanced Scorecard for 2023.

The focus of the MUON operational trial was on reducing the minimum number of large conventional units online in Ireland from five to four. Studies for reducing the minimum number of units began in the second half of 2022 and were completed in early 2023. In May 2023, the MUON operational trial commenced and continued for the remainder of 2023.

In accordance with the direction in CRU202354, the CRU has confirmed an outturn incentive award be applied for this incentive for 2023 of €0.105m against a total possible incentive allowance of €1.5m.

2022/23 main constraint changes and TSO initiatives for cost savings

Our modelling shows that TSO initiatives gave rise to imperfections cost savings of approximately €1.43m in 2022/2023.

These initiatives included:

- South Voltage Constraints updated 12 March 2023.
- MUON constraint trial commenced on 30 May 2023.

Further information on these initiatives can be found in Table 18 below.

For reference, previous imperfection cost savings due to TSO initiatives and total imperfections spend are shown in Table 17 below.

For a full list of changes to constraints and the full set of constraints that are currently applicable, please see the Weekly Operational Constraints Update report located here.

During 2022/23, EirGrid progressed a number of studies to assess the impact of recent changes to the power system. Table 18 gives a summary of the studies and the work done.

€1.43m

imperfections cost savings (approximate) resulting from TSO initiatives

Table 17: Imperfections cost savings and imperfections spend		
	Cost saving to imperfections from TSO initiative (€m)	Total imperfections spend (€m)
2022/23	1.43	553
2021/22	10.2	512
2020/21	22.44	274

Table 18: Transmission constraint studies/reviews undertaken in 2022/2023	
Workstream	Details
Transmission Constraint Group (TCG) roadmap and review – (thermal and voltage based TCGs).	The continual assessment of thermal and voltage transmission constraint groups as part of the Operational Policy Roadmap 2023 to 2030 is being implemented. The set of loadbased South TCGs was assessed. The outcome simplified and relaxed the set of TCGs to separately manage high voltage issues in low demand and low voltage issues in high demand.
Dynamic stability commenced operational trial to reduce the Minimum Conventional Units Online (MUON) from 8 to 7 large synchronous units on an all-island basis.	System trial with a reduced number of large synchronous units commenced in May 2023 and continued throughout 2023.

12. How the financial impact of transmission losses on consumers are minimised

When electricity is transported through electricity networks, there are inherent losses, which means that not all of the power generated reaches end users. This occurs on both the transmission and distribution networks, although higher voltages generally reduce losses.

12.1 Treatment of losses in the wholesale market

To ensure that the all-island wholesale market is settled correctly, transmission losses are allocated to generators in Ireland and Northern Ireland (including generators connected to the distribution system), using Transmission Loss Adjustment Factors (TLAFs). TLAFs are only applied to generators so the costs of transmission losses are not directly charged to end consumers.

The TLAFs for the island of Ireland are calculated annually by EirGrid, jointly with SONI in Northern Ireland and approved jointly by the CRU in Ireland and the Utility Regulator (UR) in Northern Ireland. They effectively discount the value of lost generation being produced by individual generators.

The further power must flow through the system from where it is generated to where it is needed, the greater the potential losses. As a result, TLAFs are location specific. The regional TLAFs for 2023 are shown in Figure 4 with green indicating a higher and therefore financially better TLAF. The second map indicates the change in regional TLAFs from 2022. These changes are influenced by yearly dispatch, demand and topology changes.

Such signals provide a commercial incentive for generators to make informed investment decisions concerning their use of the transmission system.

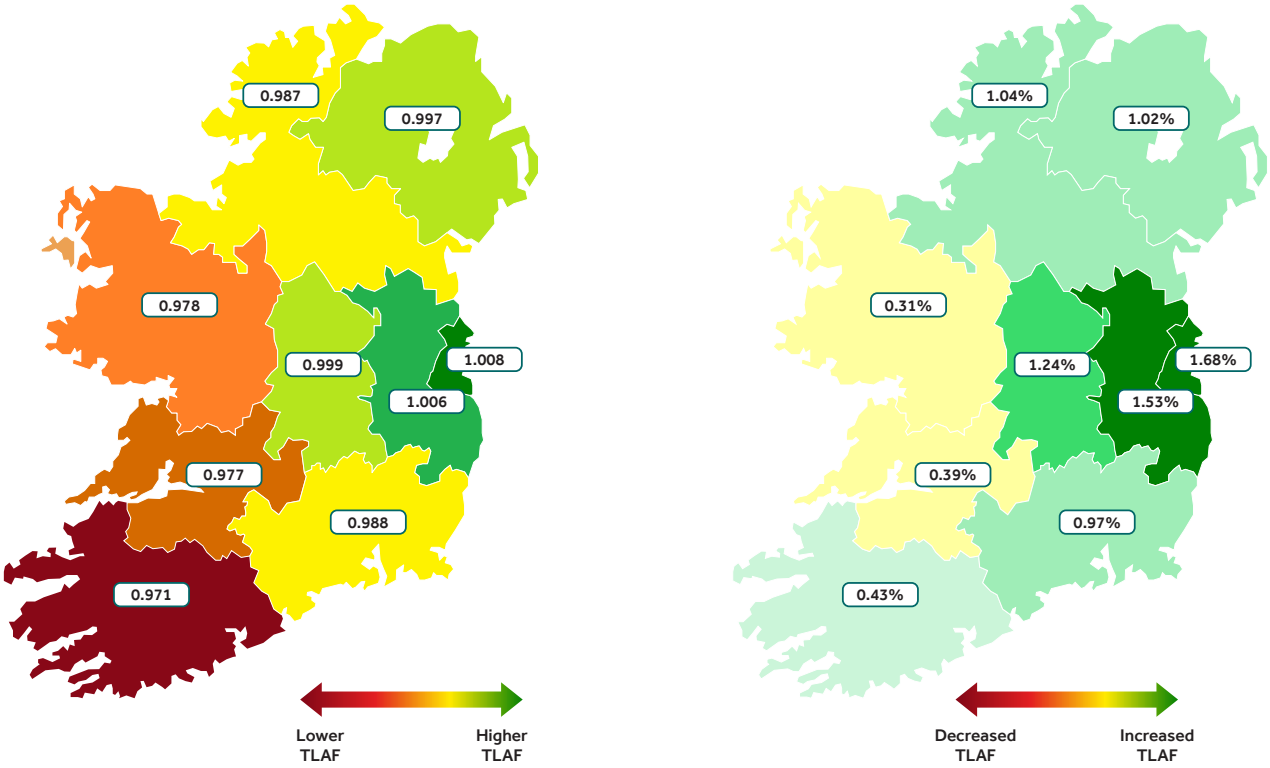


Figure 4: 2023 regional TLAFs % change from 2022 to 2023 – regional TLAFs

TLAFs are designed to provide locational signals to facilitate a more efficient real time dispatch. They are calculated using a forecast annual dispatch based on the latest assumptions for the tariff year ahead (forecast demand, fuel prices, generator outages, etc.). The All Island TLAF average typically sits in the 0.98 to 0.99 band, however, the average TLAFs of individual participants have ranged from, but are not limited to, 0.95 to 1.01 (a range of approx. 6%) in 2023.

Given the possibility for improving real time dispatch efficiency, even if the TLAFs conservatively achieved just a 1% reduction in lost energy, it would have accounted for a saving in the all-island wholesale energy required of approx. 402GWh in 2023. Using the average Imbalance Settlement Price for 2023 of €102/MWh this would equate to a reduction in all-island costs of around €48m. Further information on TLAFs can be found on EirGrid's website located here.

12.2 Overall transmission losses

Total system losses were 1.32% and 1.56% for 2022 and 2021, respectively[37].

Supporting data can be found in Table 19 below.

Table 19: Data on transmission losses for 2021 and 2022

Total system losses	
2021	1.56%
2022	1.32%

Total injections in transmission network (GWh)	
2021	25,232
2022	24,959

Total withdrawals from transmission network (GWh)	
2021	24,838
2022	24,630

Losses in transmission network (GWh)	
2021	394
2022	329

12.3 Measures to reduce network losses

EirGrid undertakes long term strategic transmission network planning to determine where network adequacy is likely to be compromised in the future and to determine network and market-based solutions. When determining future transmission network development, a number of measures are considered to reduce network losses on the transmission system:

- When comparing network reinforcement options in Step 3 of the framework for grid development, the impact on losses for each option is considered. Minimising overall electricity system cost, including minimising losses, is a key factor in the creation of generator dispatches used for network analysis in the network design phase. SOEF highlighted the need to optimise the connection of new generation in regions with realisable capacity through renewable hubs and locating new large demand customers closer to renewable generators. Both these approaches will help to avoid transmitting large volumes of power over long distances, often on lower voltage circuits and, in doing so, avoid transmission losses increases.
- The Control Centre 'Voltage Control Policy' provides recommended voltages ranges across various times of the day. The recommended voltages are higher than the nominal voltages which has the effect of reducing losses.

37 Information on 2023 losses was not available at the time of publication. Future iterations of this report will include the most up to date information on losses available.

13. How EirGrid supports market operations

In its role as TSO, EirGrid provides critical support in the operation of the SEM.

The market arrangements are designed to integrate the all-island electricity market with European electricity markets, making optimal use of cross-border interconnectors, enhancing security of supply, delivering increased competition and further enabling the integration of renewables onto the system.

New market arrangements for the All Island Single Electricity Market came into operation on 1st October 2018 under the Integrated-Single Electricity Market project. A number of Capacity Market auctions have been held which are central to generation adequacy. New types of capacity such as batteries and flexible generators have entered the market as a result.

The second North South Interconnector remains critical to improving the security of electricity supply across the island of Ireland. It resolves an historical bottleneck on the all-island grid that is vital if the system is to carry more renewables in the future. It will allow for the flow of at least 900 MW of renewable electricity across the border, in both directions.

This is enough to power 600,000 homes using clean electricity from renewable sources. While the capacity auctions ensure provision of adequacy in the near to medium term, the second North South Interconnector remains essential to ensuring long term security of supply across the island.

EirGrid and SONI are working towards the delivery of the second North South Interconnector as soon as possible. Together with the SEM, this will enable all consumers on the island of Ireland to realise the ambition of maximising the considerable benefits of an all-island electricity system and market.

Demand in Ireland is increasing and long-term demand is forecast to increase significantly due to the expected expansion of many large energy users and as the heat and transport sectors move towards electrification.

One of our key responsibilities is providing accurate system demand forecasts. This is a crucial aspect of ensuring generation adequacy and maintaining security of supply. Using a complex modelling system which predicts electricity demand based on changes in economic parameters and with the support of bodies such as the Economic and Social Research Institute (ESRI), we ensure that market participants can make informed decisions due to the accuracy of our demand forecasts.

Further details on our work in demand forecasting in 2023 can be found in the Generation Capacity Statement 2023-2032.

In the median scenario, the energy demand is forecasted to increase 43% by 2032 in Ireland, from 2022 levels.

The long-term demand forecast in Ireland continues to be heavily influenced by the expected growth of large energy users, primarily data centres. By 2032, 30% of all electricity demand is expected to come from data centres and new technology loads. Furthermore, by 2032 there will be new additional load from the heat and transport sectors as they move towards electrification.

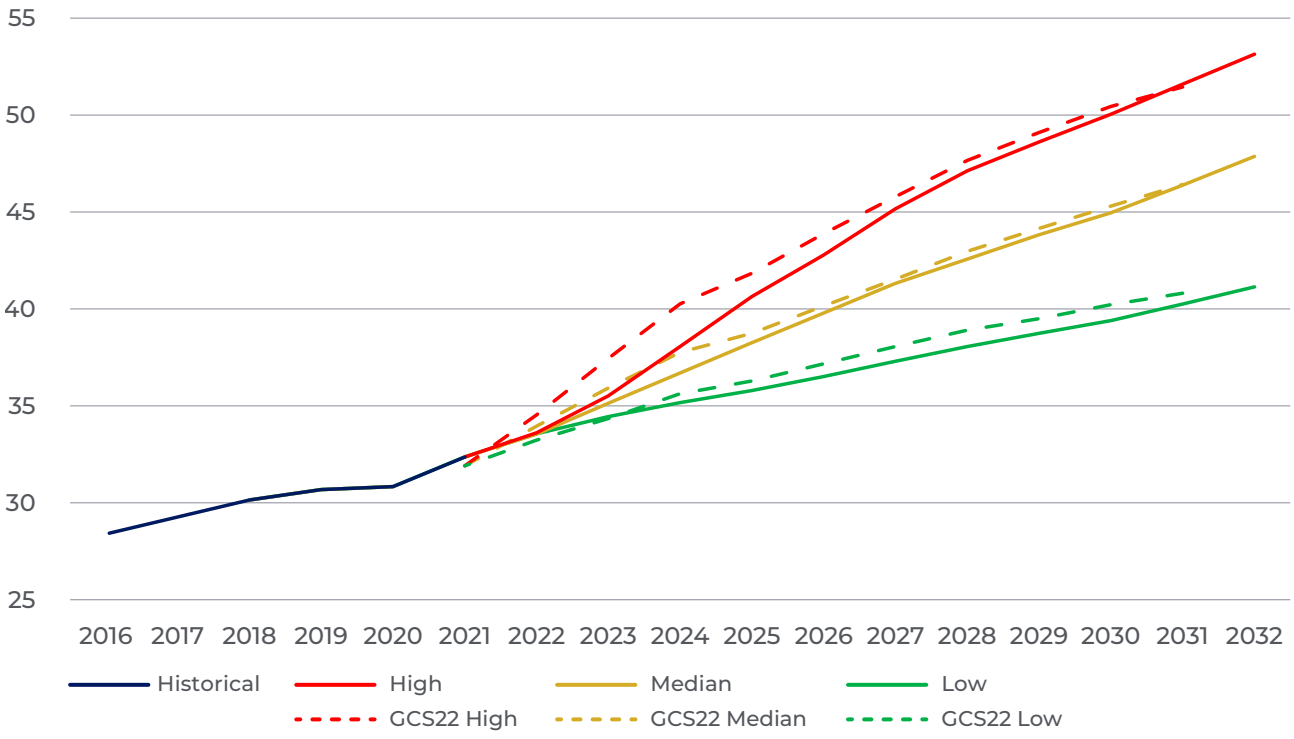


Figure 5: Total electricity requirement forecast for Ireland 2023-2032

13.1 Capacity auctions

EirGrid, working with SONI, also has a critical role in the operation of the Capacity Market, securing generation capacity to meet the further demand needs of the all-island network. This is achieved through Capacity Auctions.

In March 2023, the TSOs ran a T-4 Capacity Auction for the 2026/2027 Capacity Year (October 2026 to the end of September 2027). The auction secured a total of 7,204 MW of Capacity. The auction clearing price was €83,050 per MW per year.

Of the 166 units that qualified to take part in the auction, 125 units submitted offers in to auction. A total of 113 units were successful. A total of €698 million of capacity payments will be paid during the period October 2026 to September 2027.

In October 2023, the TSOs ran a T-4 Capacity Auction for the 2027/2028 Capacity Year (October 2027 to the end of September 2028). The auction secured a total of 5,469.72 MW of capacity. The auction clearing price was €106,666.67 per MW per year.

Of the 177 units that qualified to take part in the auction, 111 units submitted offers into the auction. A total of 111 units were successful. A total of €597 million of capacity payments will be paid during the period October 2027 to September 2028.

Between the two T-4 and auctions and the T-1 auction which took place in 2023, a total of 230.764 (2027/2028 T-4), 1518.731 (2026/2027 T-4) and 345.366 (2023/2024 T-1) of new capacity was successful across the auctions. Although 0.75 MW has since been terminated.

The capacity required from these auctions considered peak demand, security of supply, as well as the reliability and performance of generators and a range of demand forecasts and interconnection. The final results are available to view in the 2026/2027 T-4 Capacity Market Auction Results Report[38] and the 2027/2028 T-4 Capacity Market Auction Results Report.[39]

38 2026/2027 T-4 Capacity Market Auction Results Report (sem-o.com)
39 2027/2028 T-4 Capacity Market Auction Results Report (sem-o.com)

There is typically one T-4 capacity auction held each year to procure capacity for a 'capacity year' in approximately 4 years times. A 'Capacity Year' runs from 30th September in one year to 30th September the following year. This capacity can be made up from existing connected capacity or new capacity. Where new capacity is successful there is a lead time associated to consent, construct and deliver it in time for the start of the associated Capacity Year. There has been a clear need to procure new generation in recent years to meet growing capacity needs and to cater for older capacity existing the system however there are challenges in this new capacity being delivered on schedule. We therefore ran a second T-4 Capacity Auction this year for 2027/28 to extend the available delivery time for new capacity in advance of the start of the Capacity Year. The intention going forward is to run one T-4 auction a year in September/October so as to maximise the lead time between the issuance of the auction results and the delivery of new capacity for the start of the Capacity Year

EirGrid has also published the following document on the SEMO website:

- 2023/24 T-1 Final Capacity Auction Results Report[40].

In the event that not all the Awarded Capacity achieves successful completion in the designated timeframes, the SEM Committee may direct the system operators to hold supplementary T-1, T-2 or T-3 auctions in order to procure the additional volume necessary to ensure security of supply. In July 2023, the TSOs ran a T-1 Capacity Auction for the 2023/2024 Capacity Year (October 2023 to the end of September 2024). The auction secured a total of 638.81 MW and the auction clearing price was €146,919 per MW per year.

638.81 MWm

secured for the 2023/2034 Capacity Year

40 2023/2024 T-1 Final Capacity Auction Results Report (sem-o.com)

14. How we manage new connections

EirGrid issues connection offers to large scale generators, interconnectors and demand customers, who seek connection to the transmission system in line with connection policy and directions as issued by CRU from time to time. This section provides a summary of 2023.

14.1 Connecting generators and interconnectors

Large generators, typically with a capacity of more than 40 MW, connect to the transmission system. Offers are issued to generators seeking connection in line with the regulatory framework set down by the CRU. EirGrid also provides connection offers to the DSO so that generators connecting to the distribution network can export power onto the transmission system.

Generator types include thermal plants using fossil fuels, hydro, Combined Heat & Power (CHP) plants, wind and other newer generation types such as solar power or commercial energy storage facilities.

EirGrid operates the connection process for new generators in close co-operation with ESB Networks, as DSO and in line with regulatory policy.

The total renewable generation provided to the grid at the end of 2023 was 13,697 GWh which supported 42% of the total demand.

When an offer is issued it means that the TSO, or the DSO, has issued a connection offer to an applicant.

This does not mean the offer has at the time been accepted by the applicant. A connection offer which is accepted in one year is also unlikely to impact on connected generation capacity in the same year given the lead times associated with construction.

In addition to issuing connection offers for new generation and demand capacity, EirGrid facilitates existing contracted customers in modifying existing connection agreements.

EirGrid also facilitates the connection of interconnectors between the transmission system in Ireland and transmission systems in other countries. Offers are issued to companies seeking to construct an interconnector in line with the rules determined by the CRU.

Table 20: Offers issued – new and modifications – total in 2023		
	No.	MEC (MW)
New transmission generator connection offers issued	34	4,121.4
Modifications to pre-existing transmission generator connection agreements issued	23	441.6
Modifications to pre-existing interconnector connection agreements issued	0	0
Modifications to pre-existing autoproducer connection agreements issued	0	0
Total	**57**	**4,563**

When a connection offer is executed, this means that the applicant has signed a connection agreement but has not yet energised. The total number of offers executed in 2023 detailed in Table 21 below also includes offers which may have issued prior to 2023 but were executed in 2023.

A list of the currently contracted and connected customers to the Transmission system is located on EirGrid website here.

Table 21: Offers executed – new and modifications – total in 2023		
	No.	MEC (MW)
New transmission generator offers executed	17	2,441.4
Modifications to pre-existing transmission generator connection agreements executed	17	230.9
Modifications to pre-existing interconnector connection agreements executed	0	0
Total	**34**	**2,672.3**

14.2 Connecting demand customers

A demand customer is a large commercial or industrial user of power. They can apply to connect to either the transmission or the distribution system. In general, customers who require a power supply of over 20 megavolt-amperes (MVA) connect directly to the transmission system. In 2023, no new demand customers were issued connection offers. Similarly, no new demand offers were executed in 2023. Table 22 sets out the demand customer modifications issued and executed in 2023.

At the end of 2023, there were 31 demand customer sites connected directly to the transmission system. When a connection agreement is executed for a new connection, it typically takes a number of years before it is connected to the transmission system. This period includes project development, time taken to obtain consents and to construct the connection. In 2023, two demand customers connected to the transmission system and one transferred from the distribution system.

Table 22: Demand offers issued and executed – total in 2023

	No.	MIC (MVA)
New demand connection offers issued	0	0
Modifications to demand connection offers issued	11	0
New demand connection offers executed	0	0
Modifications to demand connection offers executed	12	0

14.3 Demand Side Units

Demand Side Units (DSUs) do not receive connection offers. A DSU is a single demand site or group of demand sites that can reduce their electricity consumption when instructed by the National Control Centre. These are registered in the market and are offered system services contracts. In 2023, there were 85 DSUs contracted with a total capacity of 508.37 MW.

14.4 Efficiency Improvements in the processing of connection offers and modifications

In 2023, EirGrid processed connection offers for projects awarded access to the grid under a series of regulatory directions. These included the Enduring Connection Policy (ECP) 2.2 and ECP-2.3 batches as well as successful applicants in the T-4 2026/2027 Capacity Market Auction. EirGrid has also completed a lessons learned review of its previous batches with a view to introduce efficiencies into ECP-2.4.

14.5 Contestable Delivery projects

Contestable Delivery is the arrangement whereby customers can opt to construct the new network required to connect their facility to the transmission system. This approach has been available to transmission customers since the year 2000 and provides flexibility to customers to manage and control the costs, programme and risks associated with their transmission connection. Customers can still opt for TSO and TAO to quote, manage and construct the new connection infrastructure but Contestable Delivery has become the preferred approach for customers. This has required the TSO and TAO to put multidisciplinary teams and processes in place to support and facilitate the increasing levels of contestably delivered connections.

TSO and TAO work closely together with customers to manage the design review, construction quality monitoring, due diligence, commissioning and asset transfer processes associated with contestably delivered projects to ensure the connected assets are fit for purpose. This provides the necessary assurance on behalf of TSO, TAO and the electricity customer and gives feedback to industry on issues arising and lessons learned at an early stage in each project's development. Ownership of the new assets transfers to TAO and then TSO takes over operational control when the new network is energised and becomes part of the transmission system.

Seven contestably delivered renewable generation projects (including Battery) were connected to the transmission system in 2023. The number of contestably delivered projects is illustrated in Table 23.

Thirty-nine new contestable delivery projects were in design review stage during 2023 which resulted in the review of over 490 design packages submitted by customers during 2023.

Table 23: Table 22: Contestably delivered renewable generation projects

	2021	2022	2023
Projects connected/energised	5	10	7
Renewables generation MW (including battery) – additional MW connected*	229 MW (100%)	541 MW (83%)	442 MW (94%)
Number of projects in design review	20	23	39

*The percentage (%) of all additional renewable MW capacity that was connected via the Contestable Delivery process.

14.6 Connection policy developments 2023

Enduring Connection Policy (ECP)

The process for issuing generation offers was consulted on in 2017 resulting in the ECP which has led to a significant increase in the number of new generation capacity offers issuing in 2019 and 2020.

The CRU ECP-2 decision CRU/20/060 published in June 2020, prioritises the issuance of connection offers for large renewable energy projects in the first instance, in line with the CRU strategic priority of delivering sustainable low-carbon solutions with well-regulated networks.

Since its introduction, ECP-2 has led to a significant increase in the number of new generation capacity offers issuing.

A number of iterative ECP-2 batches have been processed to date. The application window for ECP-2.3 opened in September 2022 with batch offer processing taking place across 2023 and 2024.

In April 2023, the CRU issued CRU202326, a direction to hold a fourth ECP-2.4 batch in 2024. The application window for ECP-2.4 closed in November 2023 with batch processing scheduled to take place across 2024 and 2025.

14.7 Data centre grid connections

In November 2021, following public consultation, the CRU published its Direction to the System Operators (SOs) related to Data Centre grid connection processing, CRU/21/124, which directed the SOs to implement a set of additional assessment criteria by which to process data centres applications.

Since the direction, there have been a number of further developments, including the Government Policy Statement on Security of Electricity Supply (November 2021)[41] and The Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy (July 2022)[42]. EirGrid has been engaging to date with the CRU, data centre developers and all relevant stakeholders to ensure that data centre applications are processed in line with CRU/21/124 and relevant government and national policy.

14.8 Security of Supply

EirGrid and ESB Networks worked to address security of supply concerns throughout 2023, in collaboration with key stakeholders. As part of the CRU's Electricity Security of Supply Programme, EirGrid works closely with the CRU and DECC to implement a coordinated approach to address security of supply challenges in Ireland in the short, medium and long term.

In October 2021, the CRU directed EirGrid to secure circa 300 MW of TEG. In June 2022, the CRU directed EirGrid to secure an additional 450 MW of TEG. EirGrid and ESB Networks continued to develop and update emergency communication plans to respond to potential security of supply issues in 2023.

In 2023, EirGrid continued to ensure security of supply. 330 MW of the TEG projects became operational in 2023. EirGrid continues to engage with the CRU and with DECC to ensure that Security of Supply is maintained.

In August 2023, following Direction from the CRU, EirGrid entered into a Services Agreement with ESB for the continued availability of the three units at Moneypoint after their planned closure date for the provision of Security of Supply services on an out of market and temporary basis. Planning and environmental permitting requests have been submitted to convert the station from coal to run solely on lower carbon Heavy Fuel Oil (HFO) for the retention period.

41 Policy Statement on Security of Electricity Supply Nov 2021
42 Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy Jul 2022

14.9 Offshore grid connections

In December 2021, the Marine Area Planning Bill was enacted which legislated for EirGrid's new role to develop and own the offshore electricity grid. As part of this role, EirGrid is playing a leading part in transitioning our electricity system to accommodate this magnitude of offshore wind onto our grid and into the electricity market.

EirGrid's SOEF 1.1 Roadmap, published in July 2023, provides a roadmap with 5 GW of offshore wind generation to be connected to the Irish electricity grid by 2030. The first phase of delivery, 'Phase 1', will be based off the east and west coasts of Ireland with further offshore generation opportunities in the south in 'Phase 2'. This is an ambitious goal and meeting these targets requires simultaneous development of various policy, legislative and regulatory workstreams. Many of these developments are underway and EirGrid is working closely with DECC and CRU in supporting their development.

Much of the focus in 2022 and early 2023 was on ensuring that the developers of Phase 1 projects were prepared to participate in the first ORESS Auction. EirGrid further supported DECC in the development of the requirements for the first ORESS auction. ORESS 1 was successfully held in May 2023, resulting in 3,074 MW of offshore wind generation successful in the support scheme[43]. During 2023 and 2024, EirGrid engaged extensively with developers and the CRU to finalise transmission asset functional specifications.

Furthermore, in March 2023 the Government published its Policy Statement on the Framework for Phase Two Offshore Wind[44]. EirGrid strongly supports the Government's ambition where, throughout 2023 and 2024, EirGrid has been engaging with the CRU on developing the connection policy for Phase 2 offshore developers as well as on an Offshore Revenue Recovery Model which is required to enable and deliver on Ireland's ambitious offshore generation targets, as outlined in Government policy. EirGrid has also been engaging extensively with DECC, the CRU and offshore developers regarding the next offshore support scheme ORESS 2 Auction scheduled to take place in 2024.

43 ORESS 1 Final Auction Results (eirgid.ie)
44 Policy Statement on the Framework for Phase Two Offshore Wind Mar 2023

15. Innovation

EirGrid and ESB Networks have innovation programmes through which we research, develop and use innovative solutions which help us manage the ever-changing power system. We innovate to bring value to all users of the power system.

Both innovation and research are essential in getting us to where we need to be, enabling solutions to realise sustainable energy benefits. Throughout 2023, EirGrid, together with the Northern Ireland TSO, SONI, have strategically innovated to deliver key projects, such as Shaping Our Electricity Future, as well as delivering a number of smaller individual projects that enhance the way we operate.

The focus in 2023 was on continued implementation of the EirGrid and SONI Innovation and Research Strategy[45] which outlines the necessary support structures, frameworks and people needed to enhance innovation and research capability on an all-island basis.

The strategy complements publications from EirGrid and SONI on the SOEF Roadmap to 2030, by focusing our collective research and innovative strategies to deliver on Ireland's and Northern Ireland's respective ambitions to 2030, while enabling and supporting the innovation and research in our ecosystem to deliver on longer term net zero carbon commitments. There is a need to understand the options and solutions which will work best for the island of Ireland, to ensure we are on the right path to deliver on a cleaner energy future.

EirGrid's collaboration with partners has been, and continues to be, fundamental in delivering innovation programmes. Enhancing these strong relationships, as well as building new ones will be vital as we strive to innovate further with our strategic innovation programmes of work. Throughout 2023, progress has been made by EirGrid on various strategic innovation programmes. The 2023 Annual Innovation Report documents progress of EirGrid and SONI on the strategic innovation programmes throughout 2023 and points out our ambition for future developments of the programmes and new initiatives.

45 Innovation & Research Strategy (eirgrid.ie)

In 2023, some of the key projects from the strategic innovation programmes included:

- EirGrid's involvement in the NexSys project. NexSys will identify credible and accelerated pathways for a net zero energy system and have developed technologies and talent needed for the energy transition. EirGrid is an industrial partner of the overall programme and has identified three targeted projects with NexSys researchers.
- The MaREI Public Engagement initiative which aims to increase public involvement with the energy transition.
- The HyLight project which is providing roadmaps for sustainable large-scale implementation of hydrogen technologies.
- The Horizon Europe project Ready4DC which brings together a community of experts that assess and give recommendations on the major technical and legal aspects of designing and building an interoperable multi-vendor DC grid.
- The CleanerGrid Competition which is a competition for third-level students to use publicly available data to create a digital prototype that encourages citizens to be more mindful of their energy use and flexibly adapt electricity use.
- Sources of very low frequency oscillations project to identify the sources on the island of Ireland.

Membership of a number of groups, including the Electric Power Research Institute, Energy Systems Integration Group and Industry Research and Development Group gives EirGrid access to expertise in many different areas as well as wide networks of companies and colleagues in innovation.

For more information, please refer to EirGrid's 2023 Annual Innovation Report[46].

46 Annual Innovation Report 2023 (eirgrid.ie)

Collaboration on innovation between TSO and TAO plays an important role in meeting the system resilience and capacity challenges within the climate action plan for the electricity transmission network.

The required levels of system security and investment requires new ways of thinking, innovation and collaboration between TSO and TAO focused on several key enabling systems, processes and technologies to:

1. Safely maximise and optimise the load carrying capability of existing network.
2. Optimise operations and maintenance processes and policies.
3. Identify 'non-wires' solutions to defer traditional reinforcement projects and expenditures.
4. Upgrade networks utilising innovative assessment and investment approaches and strategies.
5. Interconnect with other transmission systems.
6. Develop interoperability with the distribution system.
7. Develop infrastructure to connect large-scale offshore wind generation.

The joint TSO and TAO innovation working group continued to operate during 2023 in line with the framework agreement on Innovation that sets out how both companies will work together to proactively progress viable technology options.

The Joint Working Group meets monthly and maintains a register of new technologies that are under consideration (studies, surveys, trials, etc.) for inclusion in the 'technology toolbox'. Progress is measured using an agreed assessment of the TRL.

Key milestones for each technology are planned and monitored. The CRU has linked progress on certain innovation initiatives to the joint annual incentive available to both companies as outlined in Section 5: 'How we performed against transmission delivery incentives'.

16. How EirGrid performs relative to comparator TSOs internationally

This section includes a benchmarking assessment of EirGrid's performance relative to the best performing relevant TSOs internationally. Considering the characteristics and challenges particular to the Irish electricity transmission system, the benchmarking results show that EirGrid is overall performing well relative to its comparators. This includes leading the way in integrating intermittent renewables whilst maintaining a resilient system and developing the transmission network.

16.1 Aims and approach

The aims of this assessment were to understand how EirGrid performs relative to other TSOs, to identify best practice and to establish areas for improvement. EirGrid's performance was compared with TSOs in nine OECD jurisdictions for the most recent three years (2021-2023). In some instances, either due to data availability or to understand longer-term trends, we observed data outside this range. The assessment considered EirGrid's actual performance against comparator companies' actual performance but did not consider the performance of comparators relative to their targets and/or incentives.

The assessment considered performance in three key areas: (i) system reliability and resilience; (ii) facilitating the energy system transition; and (iii) developing the network (see Table 24)[47]. These were selected because they correspond to network activities that underpin our key objectives and that have associated Performance Incentives set by the CRU. Facilitating the energy system transition is especially pertinent to analyse, given that it includes activities that are relatively new developments in Ireland and internationally and can provide insights on any innovative steps that are being taken by other TSOs.

47 Where possible, we sourced data for the assessment from the TSOs or the relevant regulators' websites. Where this was not possible, we sourced data from research papers prepared by internationally recognised research bodies or scientific papers that have been subject to double-blind peer review.

This year's report builds on last year through benchmarking an additional performance measure on approving and energising transmission infrastructure, in line with feedback from the CRU on the International Benchmarking Assessment 2022. It also includes two new comparator TSOs, Cyprus and Israel.

While the performance measurements in the scope of the assessment are principally the responsibility of EirGrid as TSO, there are also some dependencies in certain areas with our delivery partners. These include the TAO, ESB Networks and the DSO, ESB Networks DAC.

Table 24: Selected performance measures and comparator TSOs

	System reliability and resilience	Facilitating the energy system transition	Developing the network
Performance measures	System minutes lost (SML) Energy Not Supplied (ENS) as a proportion of energy consumed System Frequency (SF) deviation	Share of renewables in the generation mix Renewables dispatched down relative to energy share of wind SNSP and other system stability measures	Imperfection costs per capita Connections offers per capita Planned outage days per capita Approving and energising transmission infrastructure
Comparator TSOs[48]	Great Britain (GB) New Zealand Italy Denmark Australia – Tasmania	California Portugal Cyprus Israel	

48 From a longlist of OECD jurisdictions, we selected comparator TSOs based on comparability of institutional and regulatory frameworks, as well as on data availability.

16.2 Summary of results

A summary of the results is outlined in the table below. For each area of performance, a performance rating out of three was assigned, which indicates how EirGrid performs relative to the comparator TSOs over the observed timeframe. Each performance rating is an average of the scores assigned to the underlying measures in that area of performance:[49]

A score of 3 indicates that EirGrid is demonstrating consistent best practice among our observed comparators in the observed time period.

A score of 2 indicates that EirGrid is broadly in line with the median performance among our observed comparators in the observed time period.

A score of 1 indicates that observed comparators demonstrate relatively stronger performance than EirGrid in the observed time period.

Table 25: Summary of benchmarking results

Area of performance	Measure	Results comparability[50]	Performance rating (out of three)
System reliability and resilience	SML	High	 (2.25, relative to 2.5 last year)
	ENS as a proportion of energy consumed	High	
	SF deviation	High	
Energy system transition	Share of renewables in the generation mix	Medium	 (2.5, relative to 2.5 last year)
	Renewables dispatched down relative to energy share of wind	Medium	
	SNSP and other system stability measures	Low	
Network development	Imperfection costs per capita	Medium	 (2.25, relative to 2 last year)
	Connection offers per capita	High	
	Planned outage days per capita	Medium	
	Approving and energising transmission infrastructure	Medium	

49 A score of 3 means that, on average across the three performance measures, EirGrid outperformed 75% of TSOs. A score of 2 means that on average EirGrid outperformed 50% of TSOs. A score of 1 means EirGrid on average only outperformed 25% of TSOs at best.

50 The comparability of performance across TSOs is affected by two key factors – data comparability and the influence of external factors. We created a balanced 'results comparability rating' of high, medium or low for each measure to capture whether results are comparable across TSOs based on these factors. The performance rating (in the right-hand column) only considers measures with a high or medium results comparability rating. However, measures with a low results comparability rating provided helpful context.

Despite the unique challenges facing the Irish electricity transmission system, EirGrid is performing well relative to comparators. It has the second highest penetration of wind energy of the observed TSOs and demonstrates levels of renewables dispatched down (RDD)[51] comparable with Great Britain (GB) for similar energy shares of wind. While some other TSOs, like Denmark and California, have lower levels of RDD, these jurisdictions have significantly higher interconnection capacity as well as access to a larger synchronous system containing jurisdictions with relatively low penetration of intermittent renewables.

Below, we spotlight key measures from each area of performance, outlining observations on EirGrid's performance and supporting explanatory factors. Finally, we reflect on some of the challenges with comparing the TSO performance internationally.

16.3 System reliability and resilience

Of the TSOs assessed, all have resilient and reliable systems, within which EirGrid has demonstrated relatively strong performance over the period observed.

For System Frequency (SF), we maintained frequency within a narrow range of 50 ± 0.1 Hz for 99.67% of recorded intervals in 2020, outperforming GB and Tasmania, where the normal operating frequency bands (NOFBs) are wider (see Figure 6). Since 2022, we have shown greater resilience than our comparators.

For SML, the networks used for comparison are Tasmania, GB, New Zealand and Portugal. All observed networks demonstrate less than 0.4 SML across 2020-2022 and all but Tasmania demonstrate less than 0.15 SML across the same period.

In 2023, New Zealand and Ireland both exhibited a large increase in SML due to isolated incidents. On our own network, SML increased as a result of a single incident caused by a fault at Cunghill 110 kV station in the North Mayo Region. More information on this can be found in Section 7: 'How EirGrid manages system performance'. Without this event, SML in 2023 would have shown an improvement on our 2022 performance.

51 RDD refers to the amount of renewable energy that is available but cannot be used by the system, for example due to constraints of the network.

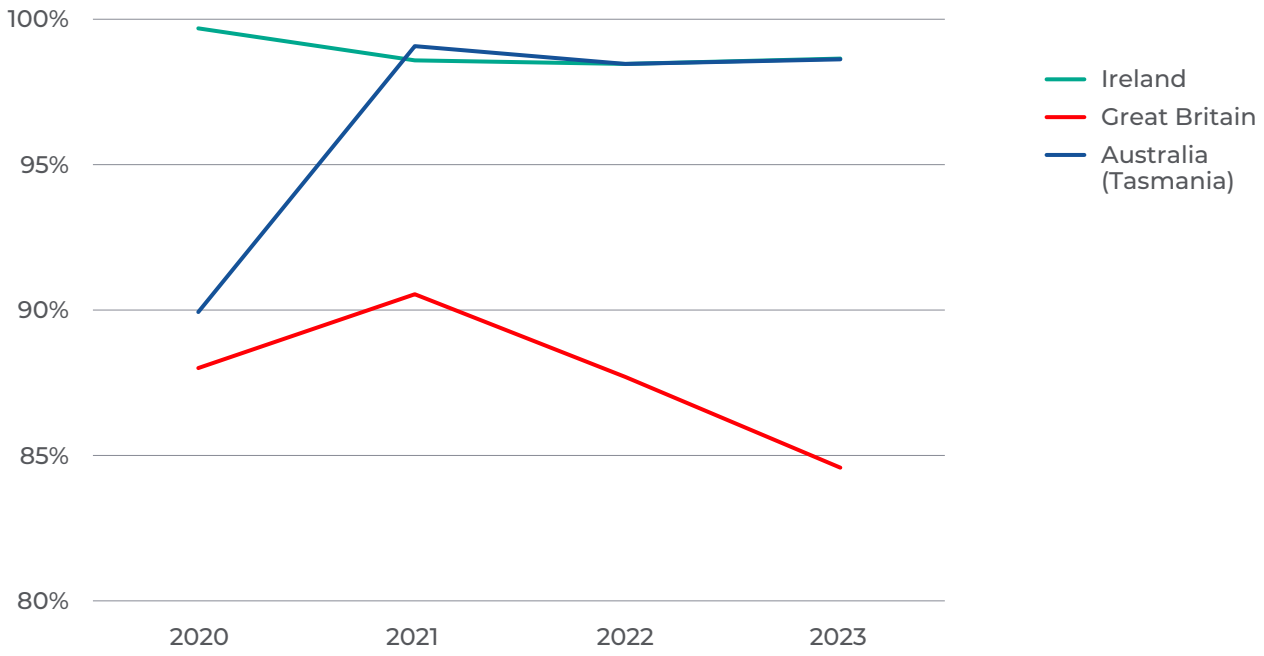


Figure 6: Proportion of time SF sits within 50 ± 0.1 Hz (%), 2020-23

It will be beneficial for EirGrid to continue to focus on developing innovative solutions to maintain a reliable and resilient system as more variable renewables are integrated.

This could include increasing the adoption of energy storage technologies, facilitating better interconnection with the European energy market (already underway through the Celtic and Greenlink interconnectors, which are under construction) and collaborating with the DSO on measures such as increasing the capacity of demand response on the network.

98.71%

of recorded intervals in 2023 maintained frequency within our target bands

16.4 Energy system transition

The evaluation of a TSO's performance in facilitating the transition to a net zero grid, whilst maintaining secure and resilient systems is a significant and multi-faceted task. It is important to consider the composition of the renewables considered given national and regional variables, making performance metrics highly sensitive for the applicable TSOs. However, comparison to equivalent TSOs performance can be a useful barometer on overall performance and offer valuable comparative insights.

Ireland has the second highest penetration of wind energy of all TSOs compared. Additionally, the results show that Denmark consistently has the highest share of wind based on consumption and Ireland has the second highest. Despite 2021 being a low wind year, Ireland experienced a consistently high share of wind relative to comparators (38.6%). In 2023, Denmark's energy share of wind was 32% onshore and 25% offshore whilst Ireland's share was onshore except for a single small offshore installation. To harness the potential of offshore wind energy and achieve RES-E targets, offshore electricity will now become a greater component of our electricity supply over the coming years. EirGrid's role as TSO has been expanded to own and operate the offshore transmission network.

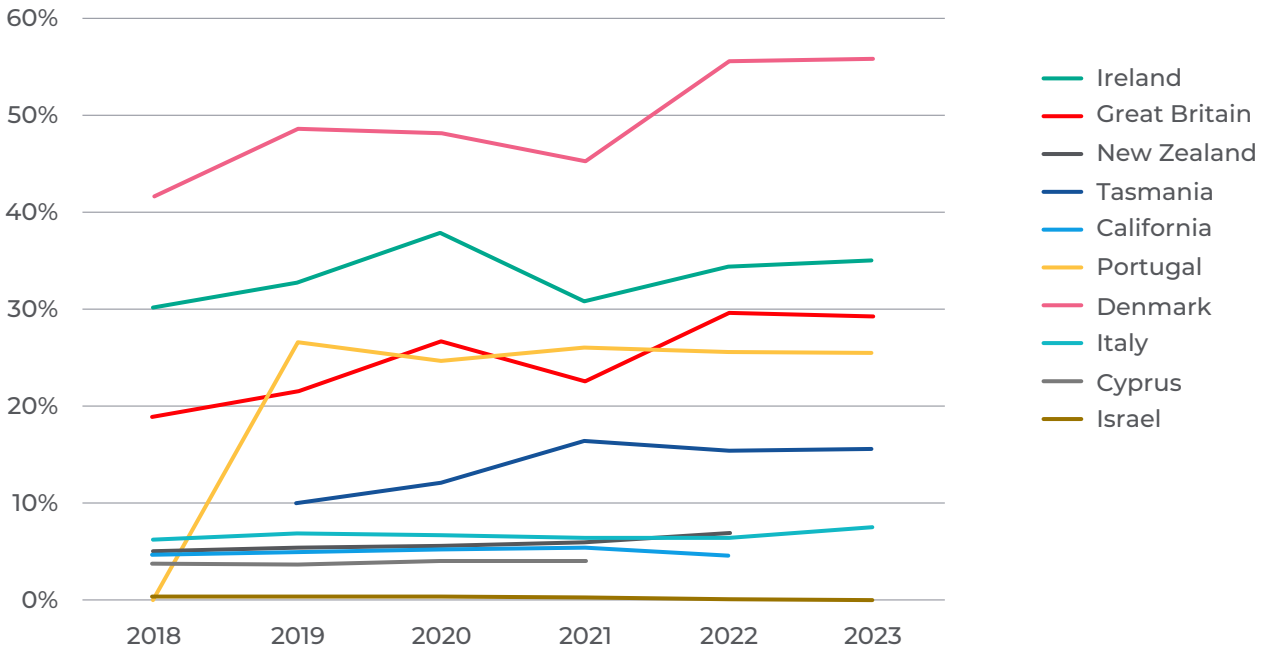


Figure 7: Energy share of wind based on consumption (%), 2018-2023

Ireland demonstrates levels of renewables dispatched down comparable with GB for similar energy shares of wind, although higher than other TSOs including Denmark and California. Additionally, EirGrid demonstrates international best practice in its progress to increase SNSP limits over time. As outlined above, the Irish electricity transmission system is also highly resilient, evidencing EirGrid's capability in maintaining a secure and resilient system whilst facilitating the transition to net zero.

In 2023, EirGrid has commenced studies to investigate the mitigating measures needed to commence an 80% SNSP limit trial.

16.5 Network development

Against a challenging context – including tight generation margins, a high penetration of intermittent renewable energy and a relatively low integration with the European Electricity Market through interconnectors – EirGrid imperfection costs per capita over recent years have been broadly comparable with our comparator in GB. In 2023, those per capita costs decreased from 2022 levels, albeit at a slower rate than in GB.

Our generation connection offers per capita increased between 2020 and 2023. We have also seen an increase in the size of generation connection batches, which means the scale of transmission connection offers is set to continue the upward trajectory in the coming years.

As more variable renewable generation comes online, the management of imperfection costs will become increasingly challenging. To meet this challenge, EirGrid will continue to facilitate a balanced portfolio of technologies and continue with efforts to develop the network both in terms of regional transmission links and interconnectors with other transmission networks.

2023

EirGrid achieved a reduction in imperfection costs per capita in 2023

EirGrid has started addressing these network needs through a programme of planned network developments. This is reflected in our improvement in planned outage days performance in 2023, when we completed 84% of the TOP, relative to 71% in 2022 and surpassing the 75% CRU Incentive Target for strong performance in outage performance. On a larger scale, EirGrid will continue to support the deployment of more variable renewables through increasing storage capacity on the network and through the Celtic Interconnector to France.

Our efforts to address network needs are further evidenced in our performance in approving and energising transmission infrastructure. EirGrid's delivery of average annual transmission circuit length in the period 2019-2023 is relatively strong compared to other TSOs (see Figure 8).

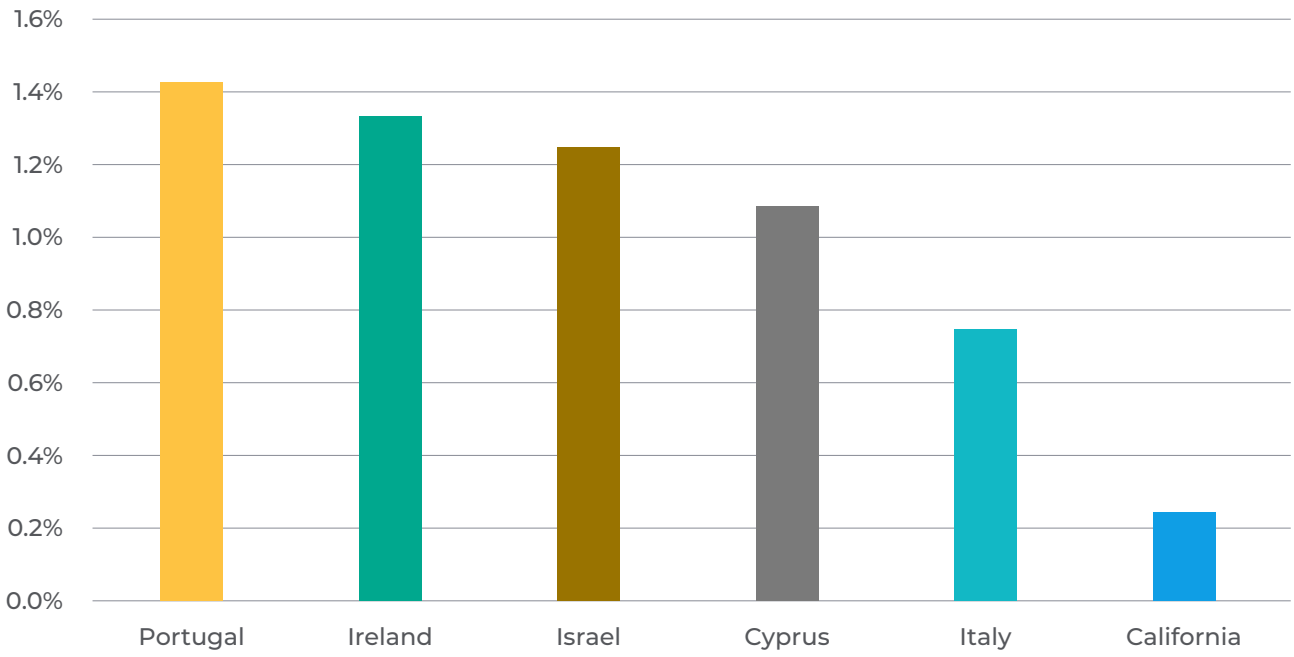


Figure 8: Average annual change in transmission circuit length, 2019-2023

16.6 Key findings

By facing a number of system-related challenges first, EirGrid is identifying solutions and paving the way for other TSOs in many areas.

For example, EirGrid is leading the way in both its trialling of higher SNSP limits and in its translation of these increasing limits into operational policy. EirGrid's performance is also demonstrated through its collaboration and knowledge sharing with other best performing TSOs through the Global Power System Transformation (G-PST) consortium, of which EirGrid is a founding TSO.[52]

Through collaborating on research and development, sharing best practice and advocating for policy change, the G-PST consortium plays an important role in accelerating the transformation of the electricity sector to a low carbon future.

The report has considered the actual performance of EirGrid across certain metrics in comparison with other companies' actual performance. The analysis has indicated EirGrid has performed strongly relative to peers in various metrics.

EirGrid

has performed strongly relative to peers in various metrics

52 Other founding system operators include National Grid ESO (GB), Energinet (Denmark), CAISO (California), AEMO (Australia) and ERCOT (Texas).

17. Engaging with stakeholders

Effective engagement is essential for EirGrid to achieve our purpose – to transform the power system for future generations. It is also built into EirGrid's corporate strategy via our 'engage for better outcomes for all' pillar, making it a central focus for us.

As the needs of the transmission grid continue to evolve, so does our approach, including the methods we use to carry out this strategy.

17.1 EirGrid stakeholder engagement

EirGrid's 2020–25 corporate strategy is informed by extensive engagement with key stakeholders. A key goal of the strategy is to 'engage for better outcomes for all'. This has been a key focus for EirGrid over the past four years with engagement across all stakeholder groups.

Part of this involves regularly updating EirGrid's list of stakeholders to ensure we are engaging with everyone who is impacted by the constant changes occurring within the energy ecosystem. Recognising stakeholder's changing needs, demands and interests, allows us to improve engagements by tailoring the activities to address specific stakeholder requirements. To promote inclusivity, we perform this mapping exercise at a granular level, which ensures we capture all our stakeholders.

EirGrid endeavours to maintain open, genuine and collaborative dialogue with all of our stakeholders, so that we can deliver positive change for all.

As part of this work, EirGrid puts communities at the heart of our decision making when delivering grid infrastructure. When we consider grid development, we consult with local landowners, local communities that may be affected and the general public. In recent years, we transformed and evolved our public and stakeholder engagement for grid development projects. We use a consistent, six-step process to explore options and make decisions. This means we follow the same steps for every project. The decision-making tools EirGrid uses, and the amount of engagement we carry out at each step, depends on the scale and complexity of each project. Engagement with our customers, the wider energy industry and statutory and other stakeholders can take place at every step.

EirGrid also works closely with businesses, academia, industry representative organisations, Non-Governmental Organisations (NGOs) and not-for-profit organisations, political and regulatory authorities and statutory and other state bodies at all levels. This helps us to get the insights of those with a specific interest in our plans or on a specific issue. It also ensures that we are engaging on the policy that affects our operations and therefore our customers.

We engage with many special interest groups across multiple areas such as environment, tourism and heritage. We also engage with the regulatory authorities and relevant government departments on a regular basis.

EirGrid's forums allow for continued collaboration and discussion and we run a number of business, industry and community forums to keep us connected with our stakeholders, as well as the 'Shaping Our Electricity Future' Advisory Council, which meets four times a year.

EirGrid aims to deliver quality services to customers and other industry stakeholders within our regulatory constraints. We respond to a wide range of needs across the wholesale energy sector in Ireland. We recognise that many of our customers are key to achieving 80% of Ireland's electricity needs from renewable sources by 2030.

In addition, our stakeholder engagement extends beyond Ireland, across continental Europe and Great Britain. By working closely with other transmission grid operators, we are able to promote innovation, share insights and work collectively towards our climate ambitions, with interconnections playing a critical role.

The Stakeholder Wheel exemplifies the range of stakeholders EirGrid engages with across society, industry and statutory bodies.

Figure 9: EirGrid stakeholder wheel

Improving our engagement

Stakeholder Engagement is critical for ensuring our methods remain modern and innovative. In 2023, EirGrid piloted a digital data capture method with stakeholders through the use of online feedback opportunities for engagements (to replace paper-based feedback forms). This has allowed for efficient, timely and simple data capture processes for our stakeholders to engage with. It has also provided us with real time dashboards to ensure data is read and used as and when we receive it.

EirGrid's consultation tools are equally, always evolving. 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. Following feedback from stakeholders, we undertook a significant project in 2023 to overhaul the EirGrid website. The new website has a cleaner, more accessible design for all users.

2023 also marked year two of our three-year programme with MaREI – the research centre for energy, climate and marine research and innovation at University College Cork. This work has predominantly been focused on evaluating how EirGrid can improve our public engagement initiatives while working innovatively.

For further information on our Stakeholder Engagement please refer to EirGrid's 2023 Stakeholder Engagement Report.[53]

53 EirGrid 2023 Stakeholder Engagement Report (eirgrid.ie)

The Networks Stakeholder Engagement (NSEE) Panel

EirGrid's performance (as Ireland's TSO) in relation to the PR5 Stakeholder Engagement Incentive is assessed annually by the NSEE Panel. The Panel is composed of representatives from industry, academia and wider stakeholders and is tasked with assessing the quality, implementation and effectiveness of EirGrid's stakeholder engagement strategy on an annual basis, The NSEE Panel's feedback and recommendations are key considerations as we continue to build on and strengthen our stakeholder engagement strategy and activities.

EirGrid was awarded a score of 6.6 out of a possible 10 by the panel for its stakeholder engagement activities in 2023, which resulted in an incentive payment of €0.19m.

17.2 ESB Networks stakeholder engagement

Engagement with our external stakeholders is integral to our day-to-day operations and is at the heart of everything we do at ESB Networks.

We define our stakeholders as the individuals, groups of individuals, communities or organisations that affect (or could be affected by) our activities, products or services and associated performance.

Since considerable changes are taking place within the energy sector at an unprecedented scale, we are fully aware that who we engage with and how is constantly changing.

Our stakeholder segmentation wheel outlined below, is a working example of how we are looking to improve the granularity of our stakeholder mapping through further subgrouping/ segmentation. This will enable us to be even more purpose-driven in how we conduct our engagement activities and help to ensure that we are driving inclusive engagement by not leaving any stakeholder group behind.

Figure 10: ESB Networks stakeholder wheel

Why we engage

For ESB Networks, engaging with our customers and stakeholders is crucial to how we shape the future of our business and the electricity network. It helps us develop new initiatives which benefit the communities and industries we serve, as well as improving and enhancing existing ones. It shapes our business planning and strategic priorities and informs the decision-making process. Engagement with wider industry accelerates innovation within the business and the energy sector through shared learnings and ideas.

For our customers and stakeholders, engagement provides opportunities to contribute to projects and programmes, have their issues heard and inform the decision-making process. It gives these groups better understanding of our priorities, increased ownership of outcomes and greater capacity to engage in how energy will be used in the future. For ESB Networks, engagement provides insights by understanding changing priorities, tapping into specialist or local knowledge and gives us the opportunity to 'road – test' proposals or initiatives with stakeholders. It helps us identify emerging issues and risks and is central to us meeting our statutory obligations and better meeting customer needs.

Engagement is embedded

Stakeholder engagement forms a core element of our business processes and remains embedded in our business culture and is seen as the role and responsibility of every employee within the organisation. As a strategic priority, it is led by the Managing Director and the senior leadership team and is seen as a vital activity at every level of the organisation. An internal Stakeholder Engagement Steering Group made up of stakeholder leads from across the business meets regularly to discuss planned engagement activities, review stakeholder feedback and agree proposed improvements and adjustments based on recommendations. This group which is led by the Stakeholder Engagement Team and chaired by the Managing Director provides overall direction to the stakeholder engagement strategy for ESB Networks.

Our stakeholder engagement strategy

Our stakeholder engagement strategy and plans are published on an annual basis to set out our proposed engagement priorities and activities for the year ahead and to provide our stakeholders with pathways to engage with us. The focus of our engagement in 2023 was to support the delivery of our Networks for Net Zero Strategy. This Strategy, which launched in January 2023, outlines ESB Networks' role in facilitating the implementation of the Irish Government's Climate Action Plan, with a view to achieving Ireland's net zero target by 2050.

Progress can only be achieved through continued collaboration with our customers, stakeholders and business partners, so that we can deliver a clean electric future together.

Stakeholder engagement planned activities 2023

You can view all of our 2023 Stakeholder Engagement public consultations, publications and pathways to engagement listings here.

Public consultations

Stakeholder engagement publications

Pathways to engagement

As the licenced onshore TAO in Ireland, ESB Networks is responsible for managing and delivering the detailed design, construction and maintenance of the transmission network.
ESB Networks funds the large-scale investments and arranges procurement of materials and specialist skills for construction, maintenance, repair, operator attendance, telecommunication services and emergency response for the transmission network.

These works are delivered in collaboration with EirGrid, who as the licenced TSO is responsible for planning the development and operation of the transmission system.

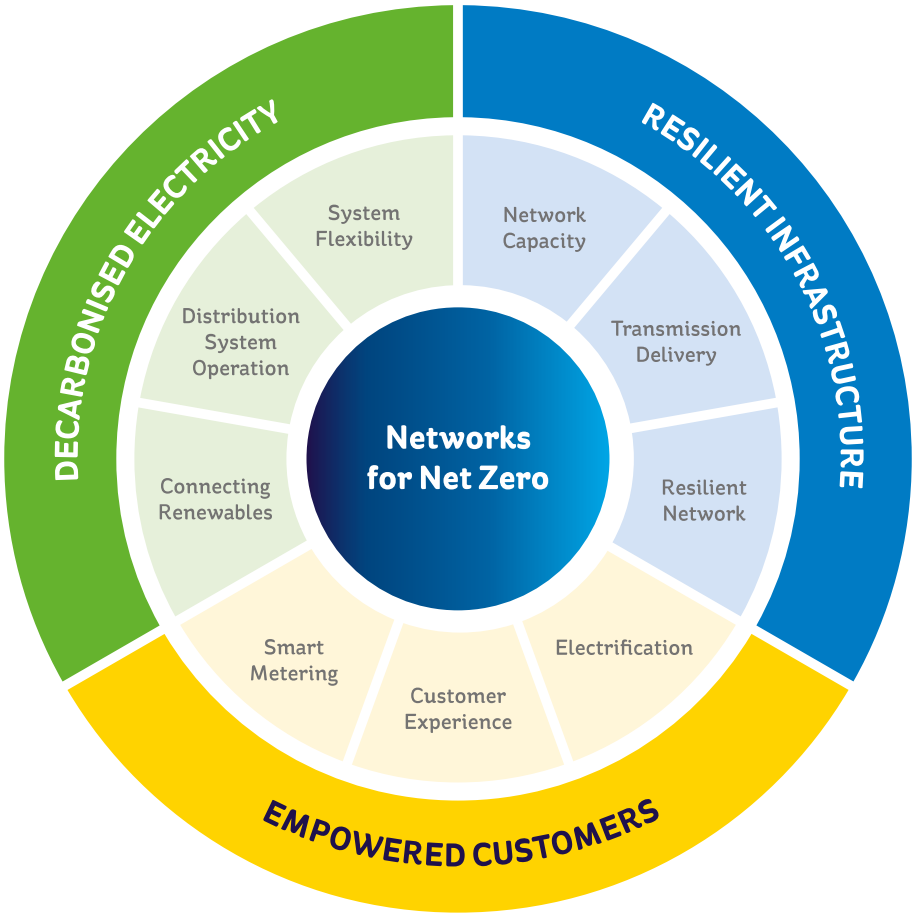


Figure 11: Networks for Net Zero

17.3 TAO engagement highlights 2023

The stakeholder engagement that occurred throughout 2023 supported the key actions that we set out in our Networks for Net Zero Strategy. In particular, to deliver the transmission network needed for Ireland's clean electric future.

Some key achievements from transmission related stakeholder engagements in 2023 include:

- Established an EirGrid/ESB Networks' JOTP, which sets out various interventions focused on increasing outage availability and maximising their utilization and effectiveness. ESB Networks outage co-ordination team worked extensively with their EirGrid counterparts to come up with actions to improve how we work together in coordinating work and outages on the TSO system.
- 3-way, EirGrid, customer and ESB Networks engagement, in addition to quarterly engagement with key renewable industry stakeholders, ensured processes were understood and developed to enable achievement of CAP deliverables.
- Through early engagement with developers of renewable generation projects, we offered a free initial assessment of potential grid connection options. This allowed the customer to make better-informed decisions regarding participation in the ECP process.
- Contractor partners conference. Teams from ESB Networks met in person with our key partners from across the electricity construction industry. This helped to strengthen our partnerships and roadmap regarding how we will collaborate to provide resilient infrastructure to allow for a reliable low carbon electricity system of the future. We were also joined by the CRU, which was a valuable addition to the conversations. Strengthening our partnerships is of key strategic significance as we continue to safely deliver ESB Networks' ambitious work programmes on our collective path towards achieving net zero.
- ESB Networks issued formal responses to 15 externally led stakeholder consultations in 2023. ESB Networks submitted comprehensive responses to DECC, CRU & EirGrid led consultations, providing a constructive basis for further engagement with all stakeholders.

18. How we monitor expenditure against PR5 allowances

Every five years the CRU determines the revenue price control for EirGrid and ESB Networks as TSO and TAO for the following five-year period. The price control sets out the amount of revenues the companies are allowed to recover through tariffs. The allowances are designed to ensure that we, both EirGrid and ESB Networks, have adequate revenues to carry out our activities as TSO and TAO respectively while delivering value for all of our stakeholders.

In the interest of delivering value to our customers more efficiently, the current Price Review (PR5) places more emphasis on the results of the network companies' work, while building in agility to adapt to the changing needs of the system.

Within the price control periods there is an opportunity each year for the companies to submit adjustments in advance of tariffs being set. This is to make sure that the most up to date information is used. The CRU publishes updated information on the approved revenues on an annual basis.

After each year, EirGrid and ESB Networks carry out a review of what was actually required to carry out our functions. Updates would include any changes to costs outside of our direct control, updates for inflation rates and incentive payments. We also look back on the previous year and compare the amount the CRU approved to be recovered against the amount that was actually recovered through the tariffs in that year. Any under or over recovery of monies against those approved by the CRU is fed into future tariffs. This is done using the K-factor mechanism.

The k factor captures the difference between what was actually required by the TSO and TAO to carry out their responsibilities and what was recovered through the tariffs. This figure is then included as a line item in the following year's tariffs. If there was an over-recovery, meaning that the amount recovered was more than required, this figure is taken off the next year's revenue allowance. Likewise, if there is an under-recovery this figure is added to the next year's revenue allowance.

Please see below tables setting out the TAO and TSO's k factors for 2023, which are included in the 2025 revenue allowance.

The Agile Investment Framework (AIF) is one of the main components of the delivery phase of PR5. The AIF comprises of mechanisms to allow access to additional revenues in response to the changing needs of the electricity system.

The mechanisms relevant to the TSO and TAO include:

- Uncertainty Mechanism – requests for additional revenue arising from newly identified system requirements;
- CapEx Adjustment Mechanism retained from Price Review 4 (PR4) and allows the TSO and TAO to request adjustments to the overall infrastructure development capital allowance;
- Innovation and Research and Development Mechanism; and
- The TSO Monitoring Committee (TMC).

In November 2023, EirGrid published an Open Letter calling for expressions of interest for membership of the TMC. Applications were evaluated in December 2023 and January 2024 and the TMC was officially established in February 2024.

Please note that the tables below will be updated following the CRU's publication of the Electricity Transmission Network Allowed Revenues for 2025 and Demand Transmission Use of System (D-TUoS) Tariffs 2024/25 information paper.

Table 26: TAO 2023 allowed outturn and resulting K-factor			
	PR5 allowance for 2023 (ex-ante) €m	CRU outturn allowance (ex-post) €m	2023 adjustments €m
Pass through/external costs			
CRU regulatory levy			
Local authority rates			
Uncertain costs: non-capitalised			
Additional use of system (AUoS)	–		
PR5 audit costs	–		
Incentives	–		
Inflation correction			
Uncertain costs: capitalised			
Depreciation	–		
Return	–		
Total K-factor adjustment (before interest) in 2023 prices			
Total K-factor (after interest) in 2023 prices			

Table 27: TSO 2023 allowed outturn and resulting k-factor		
	CRU Tariff decision for 2023 revenues €m	CRU approved updated actual costs of 2023 €m
External costs		
Inter TSO compensation		
CRU levy		
CORESO subscription		
Interconnector services		
DUoS costs		
Ancillary services		
DS3 system services		
EWIC TUoS entitlement		
Dublin Security of Supply		
TAO payment (€m)		
Rolling retention		
Allowed TSO operating revenue		

Internal costs		
Depreciation (€m)		
Return on Stage 1 working capital (€m)		
Return on other working capital (€m)		
Return on fixed assets in the RAB (€m)		

	CRU Tariff decision for 2023 revenues €m	CRU approved updated actual costs of 2023 €m
Approved adjustments		
PR4 adjustment		
Strategic projects side-RAB (2019 adjustment) updated) – Celtic		
Celtic – debt service and liquidity costs		
Adjustments GoO		
Adjustments constraints bank fee		
Land acquisition		
Offshore		
Greenlink readiness – Depr & Rtn		
Abandoned projects/unrecovered Stage 1 costs		
Security of Supply costs – expedited return to service costs		
TSO market system release capital		

Incentives		
2023 incentive allowance		
K-factor Y-3		
Total (2023 Prices)	**3**	**3**
Total CRU approved updated actual costs of 2023 (2023 prices)	**3**	
TUoS collected in 2023 (2023 prices) **Total K-factor adjustment in 2023 prices**	**33**	

18.1 Network development costs

As part of the revenue price control for PR5 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 the changing needs of grid development. The costs associated with development of the national transmission grid are recovered over a 50-year period consistent with the expected network asset life.

Funding arrangements for the construction of the national transmission grid (network capital works) are the responsibility of ESB Networks. Costs incurred by EirGrid as part of the development of network capital works are ultimately recovered by EirGrid from ESB Networks.

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 (2023 prices) was allocated to 2023. Further information on the PR5 final determination can be found here.

The CRU does not approve individual projects. The CRU monitors our actual spend against the overall envelope, with the monies identified by the CRU being provided via the regulated Use of System Tariffs on an annual basis.

EirGrid and ESB Networks jointly submit detailed reports to the CRU annually on our network expenditure as required under the enhanced PR5 reporting arrangements.

The PR5 programme evolved in 2023 as projects were completed, progressed, added, rescheduled or removed. The total regulatory spend on transmission capital projects for 2023 was €235m, an increase of €59m when compared with 2022. The variance of 2023 outturn versus the 2023 allowance in the PR5 determination was -€9m (expressed in nominal 2023 money).

It is anticipated that the Network Capex delivery on major projects, and therefore the spending trend, will ramp up significantly in the period 2024-25. This is in line with EirGrid's Q4 – 2023 Network Delivery Portfolio[54] forecast for the remaining two years of PR5, which predicts an increased joint delivery of Project Agreements (PA) and Energisations (EI).

Expenditure in relation to the network is covered in more detail in our Investment Planning and Delivery Report 2023.

The annual investment by ESB Networks in new or refurbished transmission assets is known as Capital Expenditure and is shown in Table 28.

This capital investment less the annual depreciation of the asset gives the net value of the transmission assets also known as the Regulated Asset Base (RAB) shown in Table 29.

Day to day expenditure not related to building assets are referred to as Operating Expenditure or Opex. The TAO Opex is shown in Table 30.

€235m

regulatory spend on transmission capital projects for 2023

54 Network Delivery Portfolio Publication Q4 2023 (eirgrid.ie)

Table 28: TAO capital expenditure (nominal)			
	PR5		
	2021 €m	2022 €m	2023 €m
Gross capital expenditure	182	221	258
Customer contributions	(37)	(28)	(23)
Total regulatory spend	**145**	**176**	**235**

Table 29: TAO Regulated Asset Base (RAB) (nominal)			
	PR5		
	2021 €m	2022 €m	2023 €m
Closing net book value	2,663	2,713	3,272

Table 30: TAO operating expenditure (nominal)			
	PR5		
	2021 €m	2022 €m	2023 €m
Transmission operations	3	3	3.6
Planned & fault maintenance	18	23	26.0
Asset management	1	1	0.1
Non-controllable costs	33	29	32.0
Controllable costs	14	12	9.6
Total	**69**	**68**	**71.3**

19. How we ensure safety

EirGrid is committed to achieving and maintaining the highest standards of health, safety and welfare for all of its staff and for any other persons who may be affected by our activities and to the protection of the environment.

19.1 EirGrid safety statement

EirGrid operates a Health, Safety & Environmental (HS&E) Management System based on the requirements of the International Occupational Health & Safety Standard: ISO45001:2018. Our HS&E Management System enables us to consider various risks associated with our activities, to staff and others who may be affected by these activities and those to the environment; and to place these risks in the context of any relevant legal or other requirements, thereby ensuring that preventative and control measures are adequate and meet best practice standards.

EirGrid aims to ensure that all operations and activities are carried out at all times in such a manner as to minimise the health, safety and welfare risks to workers and others who may be affected by our activities. EirGrid are committed to ensuring compliance with statutory and TSO licence requirements which are associated with its business.

19.2 2023 health and safety update

EirGrid maintained safe Management Controls in relation to Health & Safety which was successfully achieved. The proactive monitoring (audits and inspections) continued to provide opportunities to improve the system and overall HS&E performance.

A major milestone during this period was the successful external review for ISO45001 accreditation and our EirGrid TSO technical and safety audit with zero non-conformances identified on all external audit reports.

19.3 2023 health and safety initiatives

Developments of note in 2023 include:

- Successfully completed surveillance audit for ISO Health & Safety 45001/14001 Environment accreditation standards with no findings.
- Third party Health and Safety strategic partner ensured that EirGrid Group continually had access to the latest Health and Safety compliance professional skills and capability in this area of expertise.
- Legal Compliance registers updated with the latest legislation requirements for all jurisdictions for EirGrid Group.
- Held internal bi-monthly HS&E forums with an external Health and Safety expert.
- Review and development of EirGrid Project Compliance in relation to the Construction Regulations 2013.

19.4 Electric and Magnetic Fields (EMFs)

Electric and Magnetic Fields are produced when electric current flows. EMFs are created from electrical appliances and power lines which produce extremely low frequency in the electro – magnetic spectrum. Following research, measurement and monitoring the consensus from health and regulatory authorities is EMFs do not present a health risk. However, some people have genuine concerns about the EMFs found near electricity lines and cables. Information on the EirGrid website here explains the facts about EMFs, based on current information from health and scientific agencies.

19.5 ESB Networks' safety

The safety, health and wellbeing of our staff and contractors, as well as the communities and customers we serve, continues to be a core strategic priority and area of focus. Our Safety Strategy sets out our strategic intent and commitment to how we:

- Keep our network safe;
- Raise awareness about the importance of safety, health and wellbeing among our staff and contractors; and
- Raise awareness of the dangers of coming into contact with, or close proximity to, our electricity networks and equipment for the general public.

In 2023, ESB Networks continued to make improvements across the key areas of compliance, engagement and communications, safety culture transformation, road safety and public safety, while all the time ensuring the provision of essential services to the communities we serve.

External validation of safety management system

In keeping with our aim to continuously improve and develop our capability and performance levels in safety, health and wellbeing, ESB Networks successfully retained its certification to the international ISO 45001 Occupational Health and Safety Management System standard after a full recertification audit. The National Standards Authority of Ireland (NSAI) recognised the continued effort and commitment that is required to continuously drive safety improvements. In 2023, ESB Networks fully aligned our ISO 45001 recertification audit with our CRU TAO licence condition to conduct an independent public safety audit. The aim of this was to help streamline and bring efficiencies to ESB Networks' safety management system and to help identify potential synergies and areas for continual improvement. This was recognised as a significant safety improvement by the auditing body and was a further validation of ESB Networks' efforts and commitment to drive safety performance improvements.

Competence and assurance

In line with our commitment to the safety of staff, contractors and the public and to ensure compliance with standards, in 2023 the Competence & Assurance Team continued to carry out independent audits across key risk areas for ESB Networks. The main strands of audit focus delivered by the team are:

- Safe behaviour assessments; and
- Competence assessments.

We have seen a significant level of conformance across all of the focus areas year-on-year. A key driver of this improvement is the use of feedback and coaching style audits by the Competence & Assurance Team when interacting with ESB Networks' front line staff and approved contractors.

Critical safety processes

We continued to implement critical public safety interventions by serving 'Notifications to Stop Work' where ESB Networks staff became aware of unsafe work near electricity networks of all voltages up to an including transmission assets. A mobile app for 'Stop Work Notices' has been embedded in the business and allows staff to easily log these proactive safety interventions and to indicate if the Health and Safety Authority (H.S.A.) should be notified where appropriate.

The 'Dial Before You Dig' service provided maps of the overhead and electricity networks to construction companies, to support compliance with H.S.A. approved electricity codes of practice.[55]

A dedicated engineering team is in place to deal with all queries relating to developments in proximity to the Transmission network and maintaining compliance with the code of practice. This team maintains close relationships with other infrastructure development agencies in relation to their plans and is involved directly with developers in reviewing or processing circuit alteration requests to facilitate their developments. It is vital to the resilience of the Transmission network and the safety of the public that no unauthorized developments take place in proximity to overhead lines or cables. ESB Networks and EirGrid teams take every opportunity to inform our stakeholders of the requirement to notify plans at the early development stages to allow adequate design review and time for the required mitigation works to take place. Arranging to switch out and alter the Transmission network is a complex and sometimes lengthy process and requires the awareness and co-operation of all agencies and professionals in the industry to maintain the safety and security of the system.

55 ESB Networks (2019), Code of Practice for Avoiding Danger from Overhead Electricity Lines

Communications and engagement

Our customers are at the heart of everything we do. ESB Networks continue to strive to ensure their safety and the safety of those who work on, or may come in close contact with, the electricity network. Increasing awareness of electrical safety risks is essential and education and awareness programmes in this regard continue to be a strategic objective of our public safety activities.

The public safety advertising campaign messaging of 'Are You Sure It's Safe?' and 'Stay Safe, Stay Clear' helps to encourage the public to stop and think of the danger when they are close to the electricity network. This campaign (which launched initially in 2016 and was refreshed in 2021), has continued to resonate with our four key at risk groups and maintained awareness levels at 85-95%. The campaign has high recall rates amongst our audience. In 2023, we introduced a new element to further amplify our safety message. We introduced an Irish language safety advertisement to ensure we are appealing to every community across the island of Ireland.

In 2023, we introduced an 'always on' approach to our social campaigns for safety, to ensure that our safety messages are always available. We also introduced a creative, reactive and proactive social strategy to educate the public and help combat accidents. We established new formats and channels to appeal to a younger demographic. This channel is proving particularly useful with over 2 million impressions in 2023.

We issued several press releases on topics covering transporting of high loads, winter safety, Christmas safety and working near electricity wires. This resulted in opportunities to engage with large audiences through both national and local radio.

Stakeholder education and awareness

In 2023, we continued to implement our Public Safety Strategy (2021-2025). This is anchored in the core purpose of our business and continues to be a core strategic priority and area of focus for ESB Networks.

A number of electrical awareness sessions were held for various Local Authority outdoor staff, Office of Public Works (OPW) construction teams, as well as senior fires service staff and safety representatives for An Garda Síochana. These face-to-face engagement sessions help to raise awareness among these key at risk stakeholder groups.

Our safety campaign initiatives are built on strong partnerships with key stakeholders, aiming to foster safety awareness and education across various sectors. Two prominent collaborators in 2023 were the Irish Farmers Journal and our National Primary Schools' safety poster competition campaign.

Our ‘Safe Family Farms’ partnership with the Irish Farmers Journal continued into its ninth year. We made further additions to the library of general farm safety videos, as well as the regular safety pages and full-page public safety advertorials, to raise awareness of electrical safety on farms. We also partnered with Agriland to further promote our online presence in the important agricultural sector.

The Irish Farmers Journal, a trusted source for farming news and insights, collaborates closely with us to promote safety within the farming community. Their extensive readership includes farmers, agricultural professionals and rural families. Together, we address critical safety topics related to electricity, such as safe handling of farm machinery, proper maintenance of electrical installations and precautions during adverse weather conditions.

By leveraging the Irish Farmers Journal’s reach, we amplify safety messages and encourage proactive measures to prevent accidents. We can reach over 710,000 people through its engaged audience groups.

Our National Primary Schools’ safety poster campaign targets the next generation, recognising that children and young adults are essential influencers in their families and communities.

Through engaging in educational materials and competitions, we empower students to understand electrical safety principles. We emphasise the dangers associated with electricity lines, substations and electrical equipment. By instilling safety habits early, we create a ripple effect, as students carry these messages home and share them with their families.

Our collaborative efforts with schools ensure that safety becomes an integral part of young minds, fostering a culture of vigilance around electricity. In 2023, a total of 141 schools participated, which resulted in 2,541 competition entries.

Our partnership with the Construction Industry Federation (CIF) resulted in a strong focus on electricity for ‘construction safety month’, with electricity recognised and promoted as one of the key construction risks via a webinar discussion titled – ‘Avoiding the Dangers of Electricity’. The ‘construction safety month’ campaign had a total of 6 million impressions, across all social channels.

20. How we manage our environmental footprint

EirGrid was one of the first semi-state bodies to have our carbon footprint assessment and targets for reduction validated by the Science Based Targets initiative in March 2022.

Our submitted targets are as follows:

- EirGrid Group commits to reduce absolute scope 1 and 2 greenhouse gas (GHG) emissions 50% by 2030 from a 2019 base year.
- EirGrid Group also commits to reduce scope 3 GHG emissions from dispatch balancing services by 35% per MWh of overall system demand within the same timeframe.
- EirGrid Group further commits to reduce all other absolute scope 3 GHG emissions 30% by 2030 from a 2019 base year.

Scope 1, 2 and 3 categories include direct and indirect emissions namely mobile combustion, stationary combustion, fugitive emissions, purchased electricity and heating, business travel, employee commuting, purchased goods & services, capital goods, fuel and energy related activities and waste.

Further detail on EirGrid's progress against the targets set out above will be included in the EirGrid Sustainability Report 2023 which will be published later this year.

Electricity consumption at our offices drives the vast majority of the emissions in Scope 1 and 2 – whilst we have made some modest improvements due to energy efficiency measures in our offices, our overall consumption remains broadly similar. In 2023, EirGrid consumed 2648 MWh of electricity and 637.2 and 145.59 MWh of purchased gas and direct gas, respectively, in our four offices plus East-West Interconnector (EWIC) sites.

Throughout 2023, EirGrid continued to support the Business in the Community Ireland's Low Carbon Pledge, committing to reducing Scope 1 and Scope 2 emissions and the monitoring and measuring of Scope 3 emissions. As a signatory of this pledge, we have committed to a collective platform to track the journey towards emissions reduction.

Following a successful audit, in October 2023, EirGrid Group was re-accredited with the Business Working Responsibly (BWR) Mark by Business in the Community Ireland. The BWR Mark is an independently audited standard for Corporate Social Responsibility in Ireland, certifying excellence in responsible and sustainable business practices. Our recertification of the Mark further evidences our primary goal and notes our position amongst leading companies committed to sustainability.

EirGrid has committed to reporting annually on our performance against each pillar outlined in our sustainability strategy, including performance against our Science Based Targets. In March 2023, EirGrid made its first submissions to the NewERA Commercial Semi State bodies Climate Action Framework. In 2023, we also commenced our preparation to align our sustainability reporting with the new EU Corporate Sustainability Reporting Directive (CSRD) which will be required from 2026. The new directive will elevate all areas of our Sustainability Programme, under the pillars of Environmental, Social and Governance.

In 2023, we also continued our financial support for the Friends of the Earth 'Our Energy Future' campaign. This project seeks to facilitate inclusive discussions and reflections with communities, civil society organisations, local groups and other stakeholders.

We recognise that we have a responsibility to demonstrate sound environmental management and promote sustainability. We have in place a programme to manage our environmental impacts responsibly through setting strategic objectives annually and will endeavour to implement best practice when practicable.

We set strategic objectives annually to support the 'Preservation' area of our corporate social responsibility strategy. Our Preservation Pledge is: 'We respect the environment: We strive for best practice in environmental protection when developing the grid. We enable the grid to carry ever-growing amounts of renewable electricity. We carefully manage our own environmental impacts.'

Our commitment is to conduct our activities in an environmentally responsible manner to protect the environment from harm and degradation, prevent pollution, deliver nature restoration and continually improve the management systems performance.

In the context of climate change and the need to de-carbonise the electricity supply, EirGrid is playing a key role in connecting high levels of renewable energy and in developing the electricity grid to connect renewable sources, in line with EU and Government targets. EirGrid is developing the Transmission System with due regard for the environment through sound environmental practices and full compliance with its environmental obligations.

20.1 How EirGrid manages its environmental impact when planning the network

Respect for the environment is a key part of the development and operation of the transmission system. Electricity transmission infrastructure (overhead lines, underground cables, substations) interacts with many environmental factors including biodiversity, landscape and cultural heritage.

In accordance with European and National law, we undertake Strategic Environmental Assessments (SEA) and Appropriate Assessment (AA) of our grid implementation plans every five years. This is to ensure that our approach to developing the Grid is sustainable and in line with best environmental practice. Our current grid implementation plan is for the period 2023-2028. Our grid implementation plan integrates Ireland's Grid Development Strategy, the latest and approved Transmission Development Plan (TDP) and identifies policies and objectives that guide sustainable grid development and drive nature protection and restoration, onshore and offshore. In September 2023, we consulted on the Draft SEA Environmental Report and Draft Natura Impact Statement of the Draft Grid Implementation Plan 2023-2028. The Grid Implementation Plan and associated environmental assessments are being finalised and will be adopted and published in late summer 2024.

Between the five yearly SEAs, an annual Environmental Appraisal Report (EAR) is produced for each TDP. This ensures any new projects in TDPs, not subject to SEA, are consistent with the strategic environmental objectives of the SEA. In 2023, there was no EAR produced, given that the TDP 2023 was subjected to an SEA.

The TDP (2023-2032) was published by CRU for consultation in April 2023. Following this consultation, the TDP (2023-2032) was updated and published by EirGrid in December 2023. Further details on the SEA of our Grid Implementation Plans and associated documents are published on the EirGrid Group website.

Aspects of our approach to the previous SEA were considered best practice in peer – reviewed research instigated by the Environmental Protection Agency (EPA). We continued to monitor and report on the environmental impact of Grid Implementation Plans throughout the plan cycle. The results of monitoring help us further reduce the environmental impact of future plans in consultation with stakeholders including the EPA and work to reduce data gaps.

At project level, individual projects are all subject to environmental assessment outside of the SEA process. Some projects fall under a class of development requiring an Environmental Impact Assessment (EIA). In these situations, we submit an Environmental Impact Statement to the relevant planning authority. EirGrid submits a non-statutory Planning & Environmental Considerations Report, where an EIA is not required.

EirGrid has obligations as a public authority under the European Communities (Birds and Natural Habitats) Regulations 2011 and carries out screening for appropriate assessment of all projects. Further information on EirGrid's approach to the environment can be found on our website.

20.2 Minimising ESB Networks impact on the environment

At ESB Networks we are committed to operating our business so that we can be proud of our environmental performance. We recognise that our activities have environmental impacts and that we have a responsibility to manage these impacts in a manner that prevents pollution and provides a high level of protection for the natural environment. ESB Networks' Policy Statement on the Environment is available on our website.

Environmental Management System (EMS)

Since 2010, ESB Networks has been using an EMS, which has received external certification for compliance with the ISO 14001 Standard. The EMS presents a structure that enables ESB Networks to methodically recognise, evaluate, prioritise and handle environmental hazards connected with its business activities. The EMS encompasses all of ESB Networks' operations, services and processes linked with managing the electricity network.

During 2023, ESB Networks' EMS underwent two surveillance audits by an external certification body, against the requirements of the ISO 14001:2015 standard. These surveillance audits sampled a large range of activities within the scope of ESB Networks' certification. No major non-conformances were identified by the auditors during any of the EMS audits in 2023. ESB Networks' EMS continues to be certified in line with ISO 14001:2015.

Managing the environment during construction

A sustainability approach is a key consideration in the design and construction stage of all our projects. This is in line with our commitments to deliver PR5 by 2025 and in keeping with our ESB Networks' Networks for Net Zero Strategy.

ESB Networks has remained committed to achieving timely and cost-effective project delivery, despite the demanding landscape of project planning and consenting. To this end, ESB Networks has made continuous improvements and has adapted to the challenges of the environment, to ensure successful project implementation.

At the planning and design stage for each project, multi-disciplinary technical teams work to develop projects and site-appropriate construction methodologies in order to deliver connections to customers, while protecting sensitive receiving environments. Detailed construction packs, capturing all of the requirements (e.g., planning consents) are provided to our external contractors, who are increasingly important to project delivery.

Project support through document review processes (e.g., inputs to construction environment management plans, traffic management plans, resource waste management plans, etc.) is key to ensuring delivery on planning permission condition requirements. Oversight of construction projects is achieved through the appointment of specialists such as environmental coordinators, project ecologists, ecological clerks of works, project archaeologists.

The Waste Enforcement Regional Lead Authorities (WERLA) oversees the enforcement of waste regulations and ensures the appropriate handling of construction and demolition waste at a national level. When requested, ESB Networks provides WERLA with data on its construction undertakings that could produce construction and demolition waste. This information is then passed on by WERLA to waste enforcement officers from Local Authorities throughout the country, who conduct inspections to verify that waste and materials are being properly managed at construction sites. This effort is part of a strategic approach to managing construction and demolition waste in the state.

Enduring environmental monitoring

ESB Networks have a Supervisory control and data acquisition (SCADA) system which is continually monitoring the network. Faults on our system are notified to staff in our 24/7 control room in Leopardstown Road.

In 2023, ESB Networks had one Local Authority notifiable leak, which totalled 555 litres related to the transmission fluid-filled cables network.

In 2023, 30.7 kilograms of sulphur hexafluoride (SF6) was emitted due to equipment faults on transmission electricity equipment. SF6 is commonly used in ESB Networks' high voltage switchgear on the transmission network. It is used because of its very high electrical insulating properties, which facilitate efficient and safe operation of the switchgear. Emission rates for SF6 gas are reported to the EPA on an annual basis in line with Regulation (EC) No 166/2006. There has been a trend of consistent leakage reduction over a number of years as repair techniques improve and we replace older equipment.

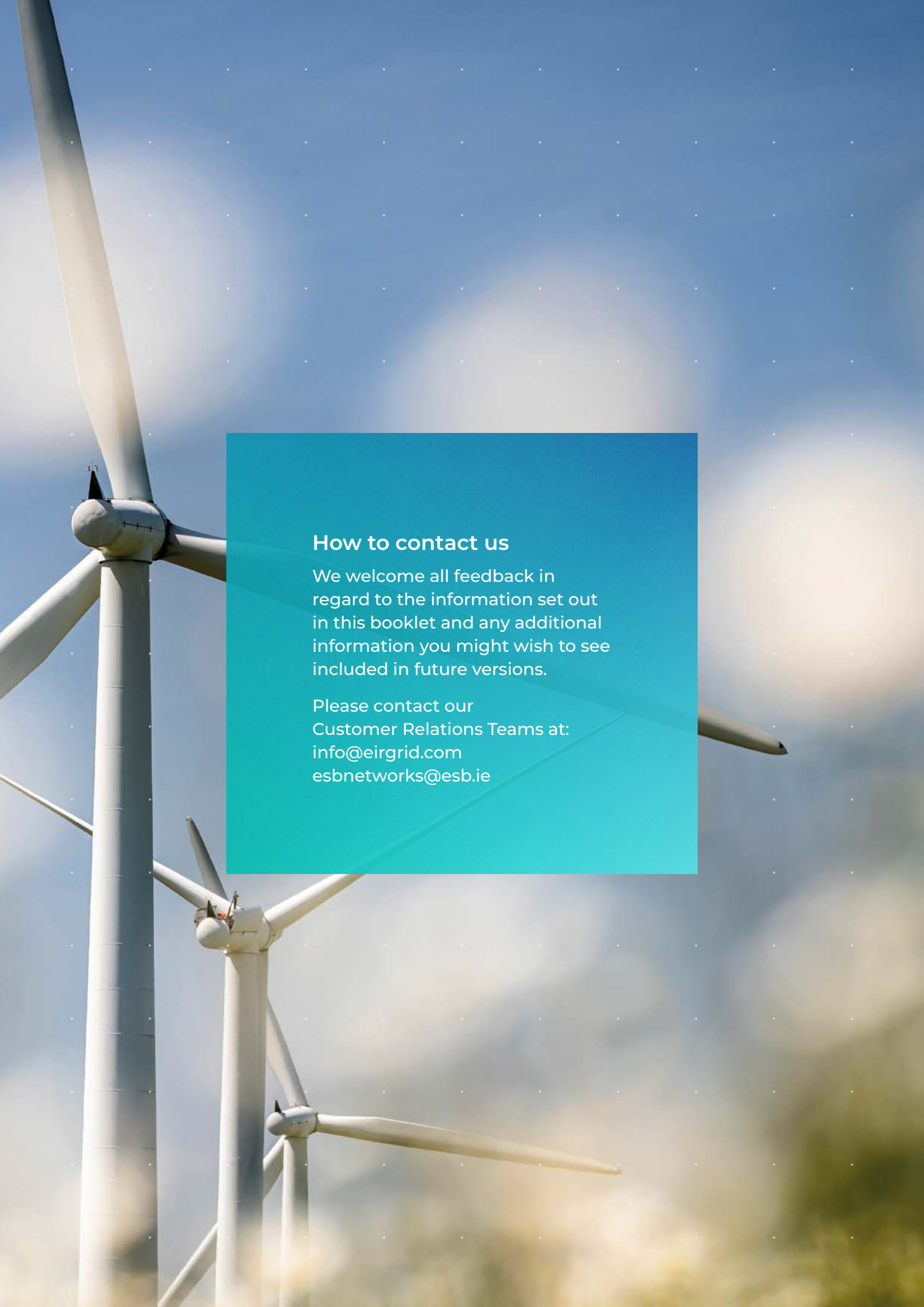
24/7

Faults on our system are notified to staff in our 24/7 control room

21. Acronyms

AA	Appropriate Assessment
AIF	Agile Investment Framework
BESS	Battery Energy Storage System
BWR	Business Working Responsibly
CA	Capital Approval
CAP23	Climate Action Plan 2023
CAP24	Climate Action Plan 2024
CapEx	Capital Expenditure
CCMO	Commercial and Contract Management Office
CHP	Combined Heat & Power
CIF	Construction Industry Federation
CMMS	Computerised Maintenance Management System
CPP	Committed Project Parameters
CRU	Commission for Regulation of Utilities
CSRD	EU Corporate Sustainability Reporting Directive
DECC	Department of Environment, Climate and Communications
DER	Distributed Energy Resource
DSO	Distribution System Operator
DSU	Demand Side Unit
DTS	Distributed Temperature Sensing
D-TUoS	Demand Transmission Use of System
EAR	Environmental Appraisal Report
ECP	Enduring Connection Policy
EI	Energisations
EIA	Environmental Impact Assessment
EMFs	Electric and Magnetic Fields
EMS	Environmental Management System
ENS	Energy Not Supplied
EPA	Environmental Protection Agency
EPON	Energy Press Officers Network
ESRI	Economic and Social Research Institute
EWIC	East-West Interconnector
FASS	Future Arrangements for System Services
GB	Great Britain
GHG	Greenhouse Gas
G-PST	Global Power System Transformation
H.S.A.	Health and Safety Authority
HFO	Heavy Fuel Oil
HS&E	Health, Safety & Environmental
HVDC	High Voltage Direct Current
IA	Infrastructure Agreement
IPD	Investment, Planning and Delivery
JEERT	Joint Energy Emergency Response Team
JOTP	Joint Outage Transformation Programme
JPMO	Joint Programme Management Office
JSOP	Joint System Operator Programme
LEUs	Large Electrical Users
LSoS	Local Security of Supply
KPI	Key Performance Indicator
MEC	Maximum Export Capacity
MUON	Minimum number of conventional units online
MVA	Megavolt Amperes
MW	Megawatt
NDP	Network Delivery Portfolio
NECC	National Emergency Coordination Centre
NECG	National Emergency Coordination Group
NGOs	Non-governmental Organisations
NOFBs	Normal operating frequency bands

NSAI	National Standards Authority Ireland
NSEE	Networks Stakeholder Engagement Evaluation
OLCM	Online Condition Monitoring
OPW	Office of Public Works
ORESS	Offshore Renewable Electricity Support Scheme
P&S	Planning & Scheduling
PA	Project Agreement
PIPs	Project Implementation Plans
PMBOK	Project Management Body of Knowledge
PMIS	Project Management Information System
PMM	Project Management Methodology
PMMO	Project Management Methodology Office
PMO	Project Management Office
PR4	Price Review 4
PR5	Price Review 5
PR6	Price Review 6
PSECP	Power Systems Emergency Communications Plan
PSI	Process, Systems and Information
PUD	Powering Up Dublin
RAB	Regulatory Asset Base
RDD	Renewables Dispatch Down
RES	Renewable Energy Source
RES-E	Renewable Energy Source – Electricity
RESS	Renewable Energy Support Scheme
RoCoF	Rate of Change of Frequency
RTE	Réseau de Transport d'Électricité
SAPs	Sectorial Adaption Plans
SCADA	Supervisory Control and Data Acquisition
SEA	Strategic Environmental Assessments
SEM	Single Electricity Market
SEMO	Single Electricity Market Operator
SF	System Frequency
SF6	Sulphur Hexafluoride
SML	System Minutes Lost
SNOAM	Short Notice Outage Adjustment Mechanism
SNSP	System Non-Synchronous Penetration
SOEF	Shaping Our Electricity Future
SOs	System Operators
TAO	Transmission Asset Owner
TCG	Transmission Constraint Group
TDP	Transmission Development Plan
TEG	Temporary Emergency Generation
TLA	Transmission Line Assessment
TLAFs	Transmission Loss Adjustment Factors
TMC	TSO Monitoring Committee
TOP	Transmission Outage Programme
TOP24	Transmission Outage Programme 2024
TOP25	Transmission Outage Programme 2025
ToR	Terms of Reference
TRL	Technology Readiness Level
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards
UR	Utility Regulator
WERLA	Waste Enforcement Regional Lead Authorities



How to contact us

We welcome all feedback in regard to the information set out in this booklet and any additional information you might wish to see included in future versions.

Please contact our
Customer Relations Teams at:
info@eirgrid.com
esbnetworks@esb.ie

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