Annual Electricity Performance Report **2022**

September 2023

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EirGrid

ESB NETWORKS

Contents

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 sixth 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 2022.

2022 was the second year of Price Review Five (PR5). The PR5 Determination[1] 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 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.

In December 2022, the Irish Government issued an updated climate action plan, building on the previously set targets for the electricity sector.

The Climate Action Plan (CAP) 2023[2] 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. EirGrid and ESB Networks strongly support this vision for Ireland's future.

Renewable generation accounted for 39%[3] of all electricity consumed in Ireland in 2022. In March 2022, EirGrid successfully concluded the trial of 75% System Non-Synchronous Penetration (SNSP)[4] on the system with over 359 hours of operation above 70% SNSP. 75% SNSP then became operational policy allowing for an increase in renewable penetration on the grid, as we move towards 95% SNSP by 2030.

A number of Wind Farm and Solar Farm projects were completed in 2022 and are expected to deliver over 600 MWs of new Renewable Generation. During 2022, two new Battery Energy Storage System technology projects totalling 33 MW MEC were completed.

1 Price Review 5: https://www.cru.ie/publications/26834/
2 Climate Action Plan 2023: Climate Action Plan 2023 (www.gov.ie).
3 Per EirGrid System and Renewable Reports: Fuel Mix 2022.
4 Comprising mainly of wind and solar generation: see here for technical definition.

Significant progress was made on the development of the Celtic Interconnector in 2022, with the construction phase commencing in December 2022.

EirGrid and ESB Networks worked to address security of supply concerns throughout 2022, 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.

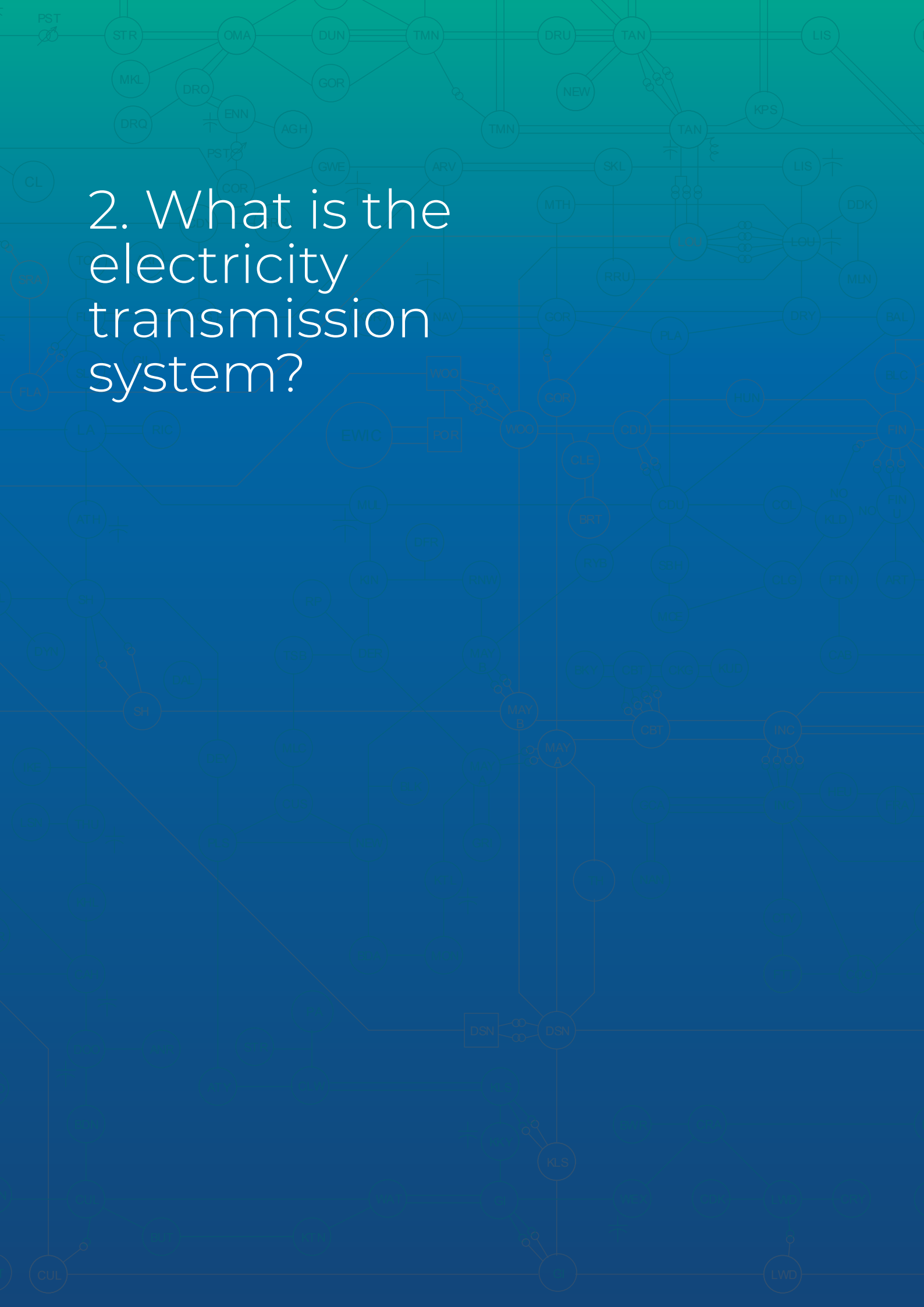
In October 2021, the CRU directed EirGrid to secure circa 300MW of Temporary Emergency Generation (TEG). In June 2022, the CRU directed EirGrid to secure an additional 450MW of TEG. EirGrid and ESB Networks continued to develop and update emergency communication plans to respond to potential security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

In March 2022, DECC established the Energy Security Emergency Group (ESEG) to coordinate a response to the impact of the war in Ukraine on the energy system in Ireland. EirGrid is an active member of the ESEG. The work of the ESEG in 2022 included supporting the development of the National Energy Security Framework (NESF) which the Irish Government published in April 2022 and NESF implementation, including the testing of emergency plans. The ESEG also identified regulatory and other measures to support consumers and businesses, to ensure security of supply, and to reduce dependence on imported fossil fuels.

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

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 2022 Annual Investment Planning and Delivery 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.

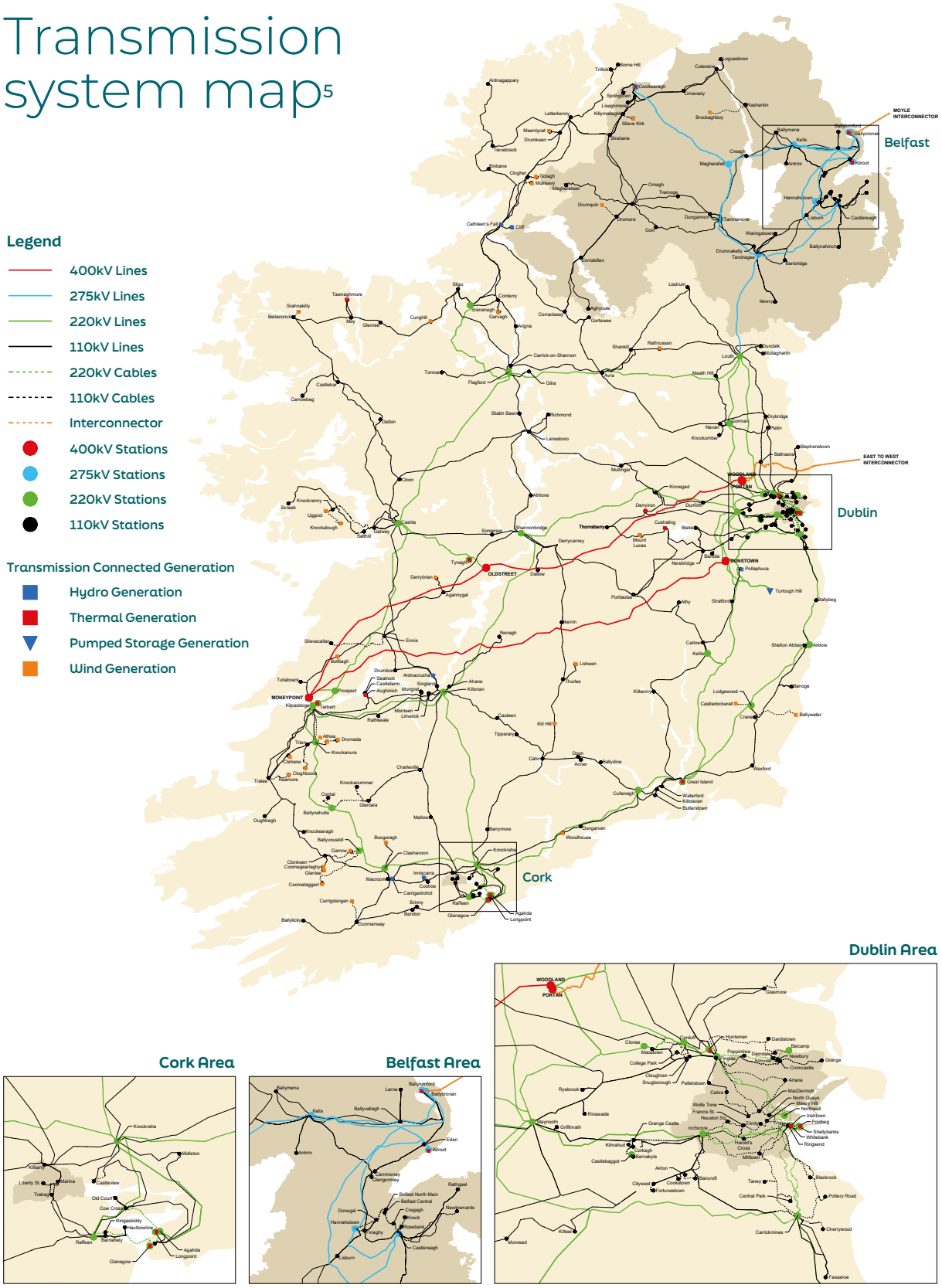
How we work together is governed by the TSO and TAO licences granted by the CRU and by an Infrastructure Agreement which is a contract setting out how the two organisations develop, maintain and operate the transmission system. Efficient operation of TSO/TAO working arrangements is essential and we can report satisfactory operation of these arrangements during 2022.

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 and develop these arrangements throughout 2022. A TSO/TAO working group jointly plans the delivery of the full pipeline of projects out to 2030.

This year was the second 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'.

Transmission system map[5]



5 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 we develop the grid. More importantly, it also explains how the general public and stakeholders can influence the decisions we make. All our projects go through this process. The Joint EirGrid and ESB Network's Investment Planning and Delivery Report which accompanies this report highlights the work carried out and project progress in 2022.

2022 was the third 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 which sets out how the general public and stakeholders can influence the decisions that EirGrid makes on grid development projects. EirGrid's focus has been to increase its value proposition to consumers and stakeholders while improving efficiencies in grid development.

During 2022, EirGrid and ESB Networks continued to partner with some of the biggest companies in the world, to foster jobs and prosperity across the country. We have worked together to develop and build the transmission infrastructure and systems needed to supply power to a number of large energy users, such as new data centres. We continued to upgrade and strengthen the transmission grid where necessary.

Step 1

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

Step 2

What technologies can meet these needs?

Step 3

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

Step 4

Where exactly should we build?

Step 5

The planning process

Step 6

Construction, energisation and benefit sharing

Summary of 2022

The second 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 2022 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 including:

- Five Wind Farms providing over 310 MWs of renewable generation,
- Three Solar Farms providing an additional 300 MWs of renewable generation.
- Two new Battery Energy Storage System (BESS) technology projects totalling 33 MWs were completed.
- A 110 kV station extension project to facilitate a Distribution System Operator (DSO) generation connection.

EirGrid launched the 'Powering Up Dublin' programme in May 2022 which will involve the replacement and upgrade of electrical infrastructure that is reaching the end of its life and the facilitation of renewable electricity, specifically, offshore (being 'offshore ready'). This will help to ensure the security of supply in the Dublin region and improve the overall resilience of the power system.

Figure 1 shows the number of renewable connections and supporting technologies added to the transmission system in 2022.

Further details on transmission infrastructure development and delivery are set out in our 2022 Annual Investment Planning and Delivery Report.

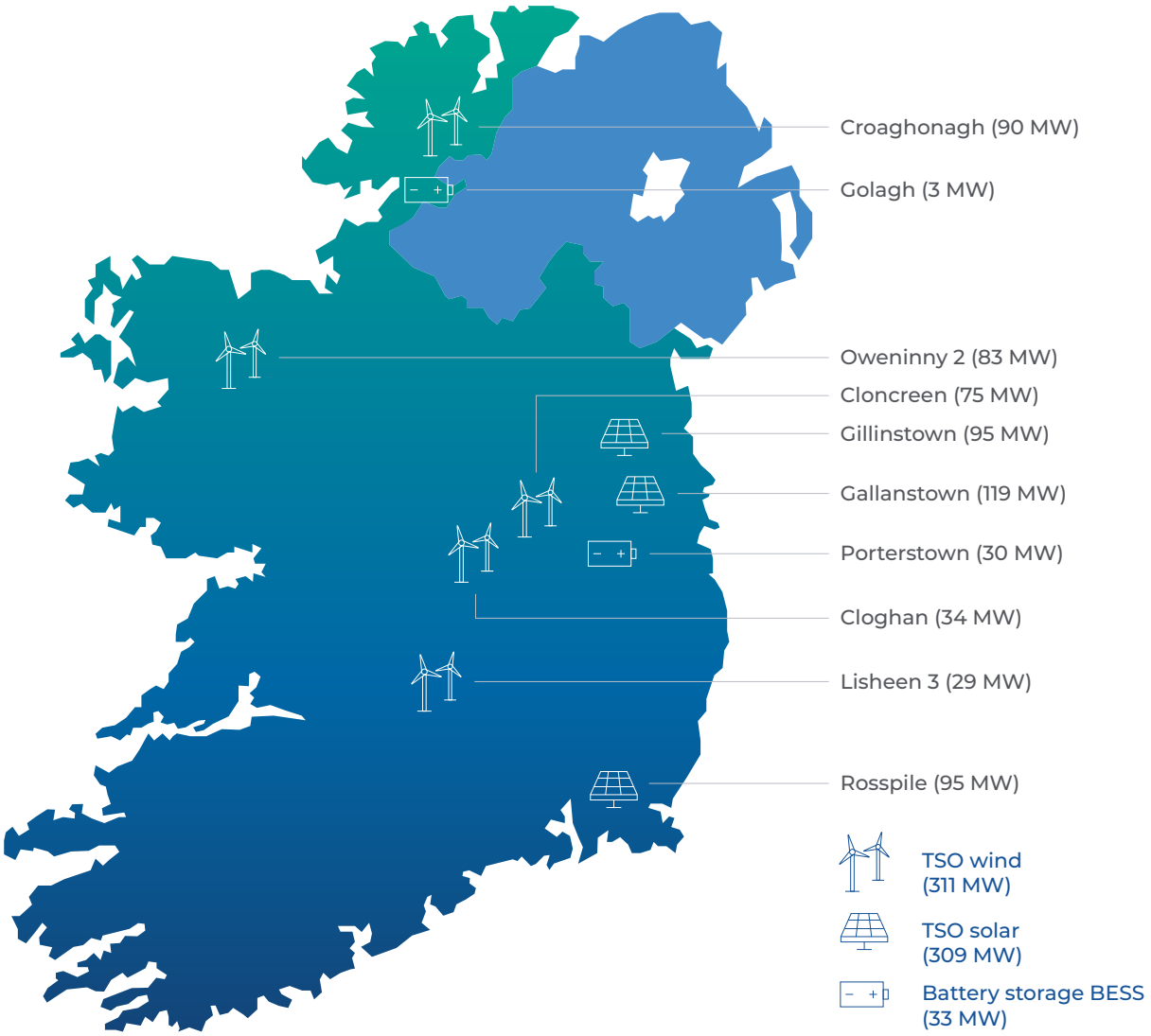


Figure 1: 2022 generation energisations

4. Key performance summary matrix

Table 1: Key performance summary matrix						
Metric	Section of report	2022 target/basis for incentive	2022 performance	2022 incentive outturn[6]	2021 performance	2020 performance[7]
TSO Strategic Objectives Incentive	'How EirGrid performed against strategic incentives' page 37	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	Target: 5 incentive metrics with a total incentive available of €1.675m. Performance: 41% success Incentive: €0.68m
TSO Transmission System Performance System Frequency (SF)	'How EirGrid manage system performance' page 40	€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 98.52% of the time	Incentive: €0.10m	Target: 98% Performance: 98.63% Incentive: €0.10m	Target: 94% Performance: 99.67% Incentive: €0.231m
TSO Transmission System Minutes Lost (SML)	'How EirGrid manage system performance' page 40	0.75-2.5	0.132 System Minutes Lost on the transmission system	Incentive: €0.30m	Target: 0.75 – 2.5 Performance: 0.054 system minutes lost. Incentive: €0.30m	Target: 1.5 – 3 Performance: 0.0645 Incentive: €0.231m
TSO's Stakeholder Engagement	'Engaging with stakeholders' page 91	Max score: 10	Performance: 6.86	Incentive: €0.217m	Target: max score – 10 Performance: 6.74 Incentive: €0.207m	Target: stakeholder engagement Performance: score of 7.3 (out of 10) Incentive: €0.238m
TSO Investment Planning and Delivery Balanced Score Card[8]	'How we performed against transmission delivery incentives' page 20	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	Target: 5 incentive metrics [total incentive available 2% TSO Opex] Performance & incentive: 'strong' €1.13m

6 A penalty is indicated in brackets.
7 2020 APR and IPD.
8 Calculation of the Investment Planning and Delivery Balanced Score Card differs in PR4 (2020 & 2019) and PR5 (2021 & 2022).

Table 1: Key performance summary matrix						
Metric	Section of report	2022 target/basis for incentive	2022 performance	2022 incentive outturn[6]	2021 performance	2020 performance[7]
TSO Delivering New Connections ECP	'How we manage new connections' page 69	Issue connection offers to all applicants in the 2022 ECP Batch	TBC[9]	TBC	Target: Issue connection offers to all applicants in the 2021 ECP Batch Performance: 86% success. Incentive: €0.43m	Target: Issue connection offers to all applicants in the 2020 ECP Batch Full incentive achieved: €0.629
TSO Renewable Dispatch Down Incentive	'How EirGrid manage system performance' page 40	5%[10]	8.3%	Penalty: (€0.196m)	Target: 5% Performance: 7.3% Penalty: (€0.06m)	N/A[11]
TSO SNSP Incentive	'How EirGrid manage system performance' page 40	78% SNSP	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)	N/A
TSO Imperfections and Constraints Incentive	'How we manage constraint costs' page 58	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	N/A

9 Outturn incentive/penalty to be detailed in 2023 iteration of APR due to timing of offer issuance.
10 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.
11 N/A is noted in the table when the metric/incentive is not applicable to the given year.

Table 1: Key performance summary matrix						
Metric	Section of report	2022 target/basis for incentive	2022 performance	2022 incentive outturn[6]	2021 performance	2020 performance[7]
TSO RES-E Incentive	'How EirGrid manage system performance' page 40	Target: 46%[12]	Performance: 39%[13]	Incentive: €0.0m	Target: 43% Performance: 34.9% RES-E Incentive: €0.0m	N/A
TSO Local Security of Supply Incentive	'How we performed against transmission delivery incentives' page 20	Target: 5 incentive metrics with a total incentive available of €1.5m[14]	Performance: 14%	Incentive: €0.211m	Target: 5 incentive metrics with a total incentive available of €1.5m Performance: N/A Penalty: (€0.27m)	N/A
TAO/TSO Joint Incentive	'How we performed against transmission delivery incentives' page 20	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	N/A
DSO/TSO Joint Incentive[15]	'How we performed against transmission delivery incentives' page 20	TSO 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	N/A

12 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.
13 EirGrid's Fuel Mix Data confirms RES-E for 2022 was 39%, as per System and Renewable Data Report.
14 75% allocated annually, 25% allocated at the end of PR5.
15 See DSO Annual Performance Report for DSO outturn performance for 2022.

Table 1: Key performance summary matrix						
Metric	Section of report	2022 target/basis for incentive	2022 performance	2022 incentive outturn[6]	2021 performance	2020 performance[7]
Regulatory Transmission Capital Expenditure[16]	'Network development costs' page 103	CRU Capex Monitoring Process	€176m	N/A	Target: CRU Capex Monitoring Process Performance: €145m	Target: CRU Capex Monitoring Process Performance: €133m
TAO Operational Expenditure	'Network development costs' page 103	CRU Opex Monitoring Process	€68m	N/A	Target: CRU Opex Monitoring Process Performance: €69m	Target: CRU Opex Monitoring Process Performance: €66m
TAO Project Delivery Incentive	'How we performed against transmission delivery incentives' page 20	€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	€2.66m full incentive payment
TAO Management of planned outages[17]	'How we performed against transmission delivery incentives' page 20	Complete planned work in less than 10,863 outage days	All planned works completed in 10,154 actual outage days, meeting target	€1m full incentive payment	Target: Complete planned work in less than 10,707 outage days Performance: All planned works completed in 9,950 actual outage days Incentive: €1m	Target: 10,785 scheduled outage days Performance: 9,842 outage days Incentive: €0.49m

16 Regulatory Transmission Capex Expenditure is not inclusive of Interest During Construction (IDC) of €17.9m and Customer Contributions of €27.8m. See table 3 for Gross Transmission Capex Spend.
17 Per CRU/20/154, this incentive relates to the TAO's ability to meet the 3-weekly outage plans published on the TSO website.

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.

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 2022, CRU awarded an incentive payment of €3.5m to TAO.

Table 2: TAO Project Delivery Incentive Performance

TAO Project Delivery Balanced Scorecard	2020	2021	2022
Incentive award	Full	Full	Full
Incentive value[18]	€2.66m	€3.5m	€3.5m

18 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 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 2022 against the above measures is outlined in Table 3.

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 for 2022.

Table 3: The Project Delivery Incentive

Performance for 2022 against the four performance measures

Item	TAO Project Delivery Measure	2022 Plan[19]	2022 Actual
1	Project Implementation Plans	22	21
2	Customer Project Energisations	21	21
3	Transmission Capex Spend[20]	€239.2m	€221.7m
4	Process Improvement	–	See below

19 Plan adjusted for items outside the TAO control.
20 Transmission Capex Spend in this table refers to the gross transmission capex spend in 2022. Transmission Capital Expenditure figure of €176m (see table 1) for 2022 is calculated as €221.7 less Interest During Construction (IDC) of € 17.9m and Customer Contributions of €27.8m.

Process Improvements – 2022

Two process improvements implemented by the TAO during 2022 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 2022 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 2022 was to implement a significant first phase PMM roll-out. The main components delivered in 2022 and demonstrated to the auditors included the following elements:

- Complete training of all project managers on PMM.
- Configuration, implementation and training on PMIS to project managers and supervisors.
- A systems linkage between the PMIS and the SAP financial system for each project.
- A system linkage between the Design Stage schedules in Microsoft Project Server (MSP) and PMIS, with defined KPIs, monitoring and reporting.
- Design stage schedules, for 100% of TAO projects, implemented in MSP in 2022 with a dashboard view of all design deliverables showing KPI outputs.
- Optimised scheduling of design teams to deliver outputs on time and to target while improving resource utilisation and capacity.
- The RAID (Risk, Assumptions, Issues and Dependencies) functionality on PMIS was deployed, implemented, trained, and supported across the project teams in 2022 for all transmission projects. The implementation of RAID provides full visibility and critical end-to-end management and facilitates communication at all stages of the projects. This process improvement de-risks the delivery of Transmission projects helping projects deliver on time and within budget. It provides additional assurance to delivering the full Transmission portfolio of projects managed by TAO and enhances governance at every level.

Renewables and Major Customers Dashboard

TAO is required to manage and deliver new network connections at an unprecedented rate, particularly for renewable generators, to meet the Irish Government's climate action targets. The large numbers of connections in progress, at various stages of development, has necessitated the development of an advanced projects tracking and information sharing tool for connections to the transmission system.

During 2022, a new approach was developed to track, monitor, and assure delivery of these critical projects. A visual dashboard, giving visibility on the up-to-date status of all Renewable and Major Customer connections to the transmission system, was also developed and implemented.

The delivery of this process improvement in 2022 delivers business benefits in terms of increased visibility, governance, assurance, and active monitoring by TAO of TSO customer connections. It facilitates effective resource planning, risk and issue management enabling timely mitigating interventions by teams and improved communications with customers and key stakeholders.

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-weekly 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 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 2022, there were a total of 10,863 scheduled transmission outage days. The total actual outage days in 2022 was 10,154 outage days at year end. The 2022 planned works were delivered within the incentive outage days target and CRU approved the full outage incentive payment of €1m.

Table 4: TAO incentive performance 2020-2022

TAO incentives	2020	2021	2022
Outage Management Performance[21]	€0.49m	€1m	€1m

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

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. 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 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 Committed Project Parameters (CPP) (i.e. outline project scope) is agreed.
3. Joint Process Improvement
   This incentive examines the TSO and TAOs 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 TAOs performance on the exchange of information with respect to delivery of transmission network capital investment under the PR5 programme.

CRU2022989 provided direction and guidance to TSO and TAO on the 2022 Balanced Scorecard joint incentives key performance indicators, targets, and the assessment process.

Joint TSO/TAO performance was assessed by independent external auditors against the 2022 balanced scorecard. The audit report was submitted to CRU to assist in determining the final incentive outturn award. For 2022, CRU awarded the full incentive payment to TSO and TAO as outlined in Table 5.

Table 5: TSO and TAO Joint Incentive Balanced Scorecard

	2022 incentive award	2022 incentive value
TSO incentive award	Full	€0.2m
TAO incentive award	Full	€1.5m

The joint incentive measures delivered by TSO and TAO in 2022 and assessed during audit are detailed below:

1. Deployment of New Technology in 2022

There were 15 specific targets in 2022 across eight technologies for Overhead Lines, Underground Cables, and Substation technology. All substantive elements of the targets and the delivery plan for 2022 were achieved. In particular, and in keeping with the new guidance in CRU2022989, a new technology deployment of Dynamic Line Rating (DLR) technology was implemented on the Lisheen – Thurles 110 kV overhead line in 2022. This new technology will allow for much better utilisation of the power carrying capacity of the overhead line.

Traditionally overhead lines are assigned seasonal (winter, spring/autumn, and summer) ampacity ratings that are based on conservative assumptions as to the weather conditions (air temperature and wind speed) for that season. With DLR installed, the ampacity rating of the overhead line can be updated on a minute-by-minute basis based on the actual prevailing local weather conditions. These dynamic ampacity ratings are expected to be higher than the applicable seasonal rating for over 95% of the time and at times, when the wind is blowing, the 'boost' in ampacity rating will be significantly above the seasonal rating.

The deployment of this new technology facilitated a new windfarm connection at Lisheen and eliminated the need for the line to be uprated, therefore achieving a considerable cost saving.

In addition, TSO and TAO established a joint New Technology working group which maintains a Technology Toolbox tracker. The tracker utilises an industry standard approach to assigning Technology Readiness Level (TRL) to each technology. TSO and TAO submit a joint annual status report on the Technology Toolbox to CRU. The status report categorises the new technologies within the toolbox by stage of assessment & readiness for deployment. For technologies deemed ready for deployment, the status report summarises the potential benefits, the plans for trials and deployment and what specific steps the TSO and TAO are taking to ensure these new technologies feature in business as usual. Further information on TSO and TAO collaboration on new technology is contained in the 'Innovation' section 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.

Due to the various delays, outside of the control of TSO and TAO, approximately half of projects manage to proceed unimpeded to an agreed project scope within a 98-day target window. During 2022, TSO and TAO met or exceeded this target timeline for 17 new projects.

The average time to scope agreement for these projects was 80 days, which is an acceleration of infrastructure delivery timelines. Enhanced collaboration and process improvements are on-going between TSO, TAO, and stakeholders to mitigate 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. The TSO and TAO have worked collaboratively throughout 2022 in identifying, planning, and implementing improvements to the Transmission Outage Planning (TOP) process. Seven TOP process improvements were delivered in 2022, including three high impact improvements.

Examples of business benefits were shared with the external auditors. This included the work of a new Quality Assurance (QA) Outage team who review all outage requests for accuracy and consistency and provide support to Project managers leading to less in-season outage changes, increased delivery and greater confidence. Projects with challenging outage requirements were reviewed and change requests submitted to alter the scope of works to reduce outage requirements. Project interdependencies and timelines have been aligned to achieve multiyear outage optimisation of outage requirements to reduce the volume of outages and improve the utilisation of available outages.

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.

One important aspect of TAO to TSO information exchange relates to project costs. TSO relies on a suite of Transmission Standard Development Costs (TSDCs) provided by TAO for project cost estimation to assess alternative project development options and to advise customers regarding contestable build options or pass-through costs. With the large number of new connections to the transmission system, particularly renewable generators, it is important that the detailed costs that TAO assign to a project at capital approval is generally within the range +/– 10% of the costs TSO estimate at quotation stage. TSO and TAO formed a joint working group to examine, explain, identify and implement solutions to minimise cost variances and to provide greater cost certainty to customers.

The updated processes, documentation, templates, estimation tools, training and support developed and implemented by the joint working group were demonstrated to the auditors.
A performance review of 22 projects in 2022 noted that these initiatives resulted in an average cost variance in this period of 9%, which is within the target variance range of +/– 10%. The collaboration between EirGrid and ESB Networks has resulted in improved project cost outcomes for customers, providing greater transparency and accuracy in cost estimates and reducing the risk of cost overruns.

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 2022 incentives in December 2022, CRU2022989. This information paper contains direction and guidance on the 2022 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 6.

Table 6: 2022 balanced scorecard aspects	
Reducing dispatch down of renewable generation	The TSO and DSO must demonstrate the benefits in the collaborative actions in 2022 to target reduced dispatch down/ and or curtailment compared to 2021 levels after allowing for the impact of COVID e.g. on overall system demand. 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	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.
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.

CRU2022989 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 2022, both EirGrid and ESB Networks regularly met and collaborated on topics such as dispatch-down, protection setting for our large customers, Qualification Trial Process, hybrids, 'whole of system' challenges and security of supply, including the 'Beat the Peak' campaign. Key milestones included quarterly touchpoints on operational policy reviews, workshops on known and locational scarcities and a number of joint TSO/DSO workshops on development 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 new Joint System Operator Programme.

In accordance with the detail in CRU2022989 (the CRU's 2022 Balanced Scorecard Information Paper), the CRU has confirmed an incentive award of €0.135m for the above incentive, be applied to EirGrid for 2022.

TSO Transmission 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 decision paper relates specifically to the TSO's Investment Planning & Delivery (IPD). The CRU's 2022 Balanced Scorecard information paper CRU2022989 provides additional guidance to the TSO on the 2022 IPD incentive framework as set out in Table 7.

Table 7: PR5 balanced scorecard framework 2022

Area	Metric no./type	%	Steps of the 6-step process	Strong full assurance: €0.9m	Acceptable satisfactory assurance: €0.2m	Below acceptable limited/ unsatisfactory assurance: €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%	74-61%	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 2022 and the findings of the audit were submitted to the CRU for their consideration. The incentive payment range is outlined in the table above. Per CRU2022989, the CRU thereafter considers performance on a holistic basis when setting the final score, the balanced scorecard is assessed by CRU 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%).

For 2022, 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 1-5 was strong in 2022, with significant progress made across the portfolio of projects, illustrated by the number of capital approvals (67) and project agreements achieved (27) during the year. The projects newly approved in 2022 are located right across the transmission network in the north-west, west, midlands and north-east, but they all facilitate large west to east flows of electricity due to the connection of renewable energy in the West of Ireland.

  A number of projects also facilitate electricity production across Ireland to be transferred into the Dublin area to meet domestic, commercial and other demand needs. These new projects include 40 customer connections, 17 system reinforcement projects, 9 asset refurbishments and 1 diversion of an existing circuit section.

- Metric 5: The timely completion of outages remained a challenge throughout the year, impacting delivery of the annual outage programme (TOP22) and leading to a lower than expected number of projects achieving energisation. The TOP22 outturn performance at the end of 2022 was 71% (adjusted) and 63% (unadjusted), representing an acceptable performance.
  The TOP22 programme included outages for 66 capital projects and outages for 10 additional projects were also completed when slots became available. EirGrid and ESB Networks aim to make use of all available outage slots during the outage season.

- EirGrid implemented a number of TOP process improvements in 2022 to facilitate greater TOP delivery in future years, and has also commenced an Outage Transformation Programme, that will become a catalyst for greater improvements to outage congestion and availability and create a step change in outage delivery to 2030.
- Metric 6: Timeliness – EirGrid's average project delivery outturn performance in 2022 was considered to equate to an acceptable performance with 72% of the major project milestones of capital approval, project agreement with ESB Networks and energisations in line or ahead of the current PR5 plan.

EirGrid's performance against the IPD incentive and associated metrics underwent an independent audit in April 2023, which confirmed EirGrid's declaration of an overall Acceptable IPD incentive performance for the 2022 calendar year.

For 2022, the CRU confirmed an outturn incentive award be applied for the IPD incentive for 2022 of €0.62m. The outturn awarded is an 'Acceptable' performance as per CRU's grading scale noted above.

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. Via CRU/20/154, CRU's decision on the PR5 regulatory framework, incentives and reporting, the CRU 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 2022–2026 to CRU in June 2022. 82% of the milestones set out for delivery in EirGrid's LSoS plan for 2022 were completed during the 2022 calendar year.

The LSoS incentive plan benefits delivered in 2022 are summarised as follows:

- A Dublin Programme identity which is being used across all communications, so the public and industry stakeholders experience consistent messaging;
- A consenting masterplan which is strategically coordinating the infrastructure consenting activities effectively;
- Milestones for 8 projects 100% complete with the infrastructure planning well under way; and
- A Stakeholder Engagement and Communications plan which is already actively engaging several of the Dublin Programme key stakeholders to deliver for the security of supply need.

In December 2022, the CRU's balanced scorecard for 2022 was set out in CRU2022989, introducing four new aspects (accounting for ~ 60% of the total incentive) into the LSoS balanced scorecard entitled Quantification, Identification, Landbank and Demand.

The CRU's 2022 balanced scorecard for this incentive is outlined in Table 8.

Table 8: 2022 balanced scorecard aspects	
Quantification	Development and description of a methodology for quantifying the security of supply issues and the quantitative impact of remedies/actions.
Identification	Development and description of a methodology for quantifying the security of supply issues and the quantitative impact of remedies/actions.
Landbank	Progress report on identified landbank locations and detailed update on procurement and procurement timeline.
Demand	Evidence of the use of additional generation capacity from Data Centres in 2022. Quantify capacity and impact on Security of Supply.
Infrastructure (transmission reinforcement)	Progress and report on delivery of Tier 1 and 2 projects as proposed. Report on the impact each will have in helping resolve Security of Supply (see quantification aspect above).

The additional LSoS incentive CRU plan benefits delivered in 2022 based on the CRU's scorecard were:

- Consideration of the development of a methodology for quantifying and identifying the security of supply issue and the quantitative impact of remedies/actions;
- Provision of a progress report on landbank acquisition; and
- A path has been identified for demand customers to provide additional generation.

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 CRU2022989 (the CRU's 2022 Balanced Scorecard Information Paper), the CRU has confirmed an outturn award be applied for the above incentive for 2022 of €0.211m.

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, regarding the following three areas:

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

EirGrid built on the CRU's three proposed incentive indicator headings above and proposed a number of initiatives for 2022. As per the CRU's Balanced Scorecard 2022 information paper, in 2022, the TSO's performance in relation to this incentive was based on the initiatives set out in Table 9.

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 CRU2022989 (the CRU's 2022 Balanced Scorecard Information Paper), the CRU confirmed an outturn incentive award be applied for the above incentive for 2022 of €0.333m against a total possible incentive upside of €0.5m.

Table 9: 2022 balanced scorecard aspects	
Networks	1. Report on engagement with planning authorities – outcome and strategic projects identified and raised. 2. Report on TSO/TAO joint approach to optimise Infrastructure programme delivery. The report should focus on TSO roles (as required under the Infrastructure Agreement). 3. Develop flexible networks strategy for deployment of 'non-wires' electricity grid technologies.
Operations	1. Develop an 'Operational Policy Roadmap to 2030' to set out our plans for evolving operational policy. 2. Undertake suite of studies to identify the capability to reduce the minimum number of large synchronous units from 8 to 7 and the inertia floor from 23,000 MWs to 20,000 MWs and develop an interim operational policy. 3. Undertake a public consultation on the technical and locational requirements for low carbon inertia services, develop a proposed decision paper and submit it to the Regulatory Authorities for approval. 4. Undertake a public consultation on low carbon inertia services on the fixed term contracts, develop a proposed decision paper and submit it to the Regulatory Authorities for approval. 5. Conduct ongoing short-horizon operational studies to ensure a secure power system with increasing levels of renewables as we transition to 2030. This report is separate to any capacity statements already required by the TSO. 6. Assist the CRU in Emergency response measures as required. 7. Develop TSO processes and procedures related to the operation of the Greenlink and Celtic Interconnectors.

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 2022.

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. In 2022, the system frequency was operated within the target operating limits of 49.9 Hz and 50.1 Hz for 98.52% of the time. In 2022, EirGrid achieved a partial incentive award of €0.1m for this incentive.

98.52%

EirGrid maintained system frequency in line with target

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 2022, there were 0.132 SML on the transmission system. There were several instances where we 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 2022.

EirGrid achieved an incentive award of €0.3m for this incentive, in 2022.

0.132

In 2022, there were 0.132 System Minutes Lost on the transmission system, significantly below the target level of between 0.75-2.5

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. The target for 2022 is outlined in the below table. In 2022, 8.3% of renewables were dispatched down. As a result, in accordance with CRU/20/154, EirGrid received a penalty of €0.196m for 2022.

Table 10: Renewable Dispatch Down	
	2022
PR5 upside target	5%
PR5 downside target	7%
TSO 2022 achieved	8.3%

System Non-Synchronous Penetration (SNSP)

In December 2022, the Irish Government released CAP23 which aims to achieve, amongst others, a target of having up to 80% of all electricity generated from renewable energy sources (RES) by 2030. EirGrid has significant obligations to undertake studies and implement relevant policies to help realise the Irish Government's renewable energy targets and objectives.

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. In 2010, our analysis identified 50% as the then maximum allowable level of renewable generation on the power system, referred to as the SNSP limit. As part of the PR5 Regulatory Framework, the CRU introduced a new annual incentive focussed on increasing SNSP operating policy levels. A target of 78% SNSP was set for 2022.

There was previously an operational system constraint within EirGrid's operational policy that limited the operation of the all-island power system to up to 70% SNSP. One of the DS3 Programme targets was to relax this operational system constraint to 75% SNSP in order to enable more renewable energy to be transferred through the power system.

During 2021, extensive studies were carried out to ensure that the all-island power system could be operated in a secure and reliable manner when increasing SNSP to 75%. Due to a range of system and weather conditions in 2021, it was not possible to conclude the 75% SNSP trial in 2021. The 75% SNSP trial was extended to March 2022 with approval from the SEM Committee. The extension of the 75% SNSP trial delivered the same benefits as if 75% SNSP had become enduring operational policy. The trial successfully concluded in March 2022 and 75% SNSP became enduring operational policy.

As noted in the section '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 TSO's internationally.

Increasing SNSP is part of the DS3 Programme 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. In accordance with the direction in CRU/20/154, the full penalty of €0.3m applied for 2022.

Renewable Energy Source – Electricity (RES-E)

The RES-E is a binary incentive. The total award is subject to meeting the 46% RES-E target for 2022. If the annual target % is achieved, the incentive rewarded is subject to assessment of performance against the quality of the applicable plan (20%), quality of implementation (40%) and the effectiveness of the plan (40%).

In spite of much progress being made on EirGrid's part re the deliverables initially proposed in EirGrid's RES-E plan, the 46% RES-E target was not achieved. A RES-E level of 39% was achieved in Ireland in 2022[22].

In accordance with the detail in CRU/20/154, no incentive award applied for the above for 2022.

22 Per EirGrid System and Renewable Reports – Fuel Mix 2022.

8. Development of the Celtic Interconnector

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

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 continued throughout 2022. The 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. SECAD were appointed as the grant administrator of the Community Benefit Fund and have begun work developing the strategy. Four Celtic Community Forum meetings were held in 2022.

In May 2022, An Bord Pleanála published its decision to approve the onshore infrastructure, subject to a number of conditions. The Department of Housing, local Government and Heritage issued its notice of determination with respect to the foreshore licence application in August 2022. In September 2022, the application to the UK Marine Management Organisation for a marine licence to undertake the installation of a portion of the Celtic Interconnector within the UK Exclusive Economic Zone, was granted.

On the 19 October 2022, the CRU issued an Authorisation to Construct an Interconnector to EirGrid for the construction of the Celtic Interconnector and subsequently issued Section 48 and 49 Consents on 21 October 2022. A Section 48 consent grants applicants the power to lay electric lines across or under a street, road, railway or tramway, and the right to break up any street, road, railway or tramway for that purpose. A Section 49 consent grants applicants the power to lay electric lines across or under any land not being a street, road, railway, or tramway including the entering of wayleaves to facilitate same.

The CRU and their French counterpart CRE issued their coordinated decision on the cross-border cost allocation (CBCA) decision in November 2022 (CRU2022976) concerning the Celtic Interconnector project.

This decision confirmed the project cost sharing arrangement between EirGrid and RTÉ taking into account the significant grant funding for the project secured by EirGrid and RTE under the Connecting Europe Facility (CEF) in 2019. The grant is governed by the European Climate, Infrastructure and Environment Executive Agency (CINEA). Following engagement with CINEA throughout 2022, an amendment to the Grant Agreement for Celtic was issued by CINEA on 6 December 2022.

This extended the period of the Grant Agreement to December 2026. EirGrid and RTE welcome the ongoing strong commitment from CINEA and other European Partners for the Celtic Project.

These key enablers allowed the project to move to the Final Investment Decision (FID), with EirGrid and RTÉ signing key technical and financial agreements to move forward with the project in November 2022.

Siemens Energy have been contracted to develop converter stations in both Ireland and France. Nexans, a French Cable manufacturer, will design and install the 575 kilometre cable between both countries.

The last of the development phases, the Detailed Design and Consents phase (phase 3), of the Celtic Interconnector project was completed on the 30 November 2022. The construction phase (phase 4) commenced on 1 December 2022.

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

Project benefits

Competition

Apply downward pressure on the cost of electricity to consumers in Ireland and France

Sustainability

help facilitate Ireland's transition to a low carbon energy future

Security of Supply

Enhanced security of supply for Irish electricity consumers

Fibre Optics

Provide a direct telecommunications link between Ireland and France (and continental Europe)

Key facts

575km

Length of the interconnection (500km subsea)

2

Project promoters: EirGrid and RTÉ working in partnership

700 MW

Capacity (450,000 homes)

9. How we ensure network resilience

EirGrid designs and plans the transmission network in accordance with the Transmission System Security and Planning Standards (TSSPS) and operates it in accordance with the Operating Security Standards 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 2022 was €23m (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.

In 2022, the delivery of the maintenance work programme continued to be impacted by disruption to the outage programme in the first half of the year

as a result of low-capacity margins and forced outages. While the performance in delivering all maintenance works where an outage was scheduled was positive, a significant amount of maintenance works were deferred (i.e. not 'scheduled').

Challenges remain in the delivery of the annual outage programme and security of supply continues to be a key focus for EirGrid. The ability to provide an increased number of outages is not expected to improve in future years as capacity margins remain tight, and the provision of outages has therefore been identified as a key risk to delivering on our strategy of transforming the power system.

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 monthly basis, or as necessary. Details regarding the 2022 All-Island Generation Outage Plan can be found on the EirGrid 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 2022, the TOP delivery percentage was 71%[23].

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

Delivery of the 2022 TOP was subject to a number of influencing factors including:

- Outage complexity, particularly for existing brown field station projects, accommodating changes and difficulty in achieving large volumes/ durations of outages regionally.
- Delays on the part of customers.
- Difficulties in gaining access to land.
- Changes in the project scope.
- Availability and scarcity of specialised resources.
- Increasing difficulty in achieving compliance with environmental conditions.
- Issues with the quality of early proposed designs on contestable builds.
- Weather delays associated with weather alerts, storms and unfavourable weather conditions.

The CRU has 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. The TSO and TAO are now applying this mechanism as part of the Outage Management process. In 2022, the SNOAM provisions were employed in relation to 1 outage.

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

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 Shaping Our Electricity Future (SOEF) Roadmap[24] seek to address this issue. In March 2022, the 75% SNSP trial concluded and the power system moved to permanent system operation policy at 75% SNSP. This meant we could securely operate the power system with up to 75% of the electricity at a single point in time coming from newer forms of variable, renewable generation. With the SOEF programme we are aiming toward 95% SNSP by 2030.

It is also important to optimise the delivery of maintenance on the transmission system in order to enhance its resilience. In 2022, 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.

24 Shaping Our Electricity Future

Network resilience in action

In 2022, there were several instances where we were 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 were two adverse weather events which caused a fault on the transmission system, however neither resulted in supply interruptions in 2022:

- Between 07:05 on Friday, 18 February 2022 and 04:55 on Monday, 21 February 2022, there were a total of 17 single-phase-to-ground faults and 5 two-phase faults. The cause of the faults was wind caused by Storms Eunice and Franklin. All faults were zone 1 clearances and fault clearance times were between 50 ms and 99 ms. No interruptions to end-users occurred.

Four other loss of load events occurred in 2022 for other reasons:

- In February, Knockearagh – Oughteragh – Tralee 110 kV line tripped, reclosed and tripped again for a single-phase-to-ground fault. The cause of the fault was wind and a yellow weather warning was in place at the time of the disturbance due to Storm Eunice, with some counties on orange and red weather warnings. The impedance and earth protection operated to clear the fault in 80 ms and 79 ms respectively. An interruption to end-users occurred, resulting in 0.007822 system minutes lost.
- In March, the Dallow – Derrycarney – Shannonbridge 110 kV Tee line tripped and reclosed for three-phase-to-ground faults. The cause of the faults was lightning, and a local thunder warning was in operation. The impedance and earth protection operated to clear the fault in 95 ms and 112 ms respectively. An interruption to end-users occurred, resulting in 0.030273 system minutes lost.
- In August, the T141 110 kV circuit breaker tripped at Tullabrack 110 kV station due to an inadvertent Special Protection Scheme operation. An interruption to end-users occurred, resulting in 0.010388 system minutes lost.
- In September, the Coraclassy – Gortawee and Arva – Gortawee 110 kV lines tripped for a two-phase-to-ground fault. The cause of the fault was lightning, and a local thunder warning was in operation. The impedance and earth protection operated to clear the fault in 442 ms. An interruption to end-users occurred, resulting in 0.083696 system minutes lost.

Power System Emergency Communications Plan

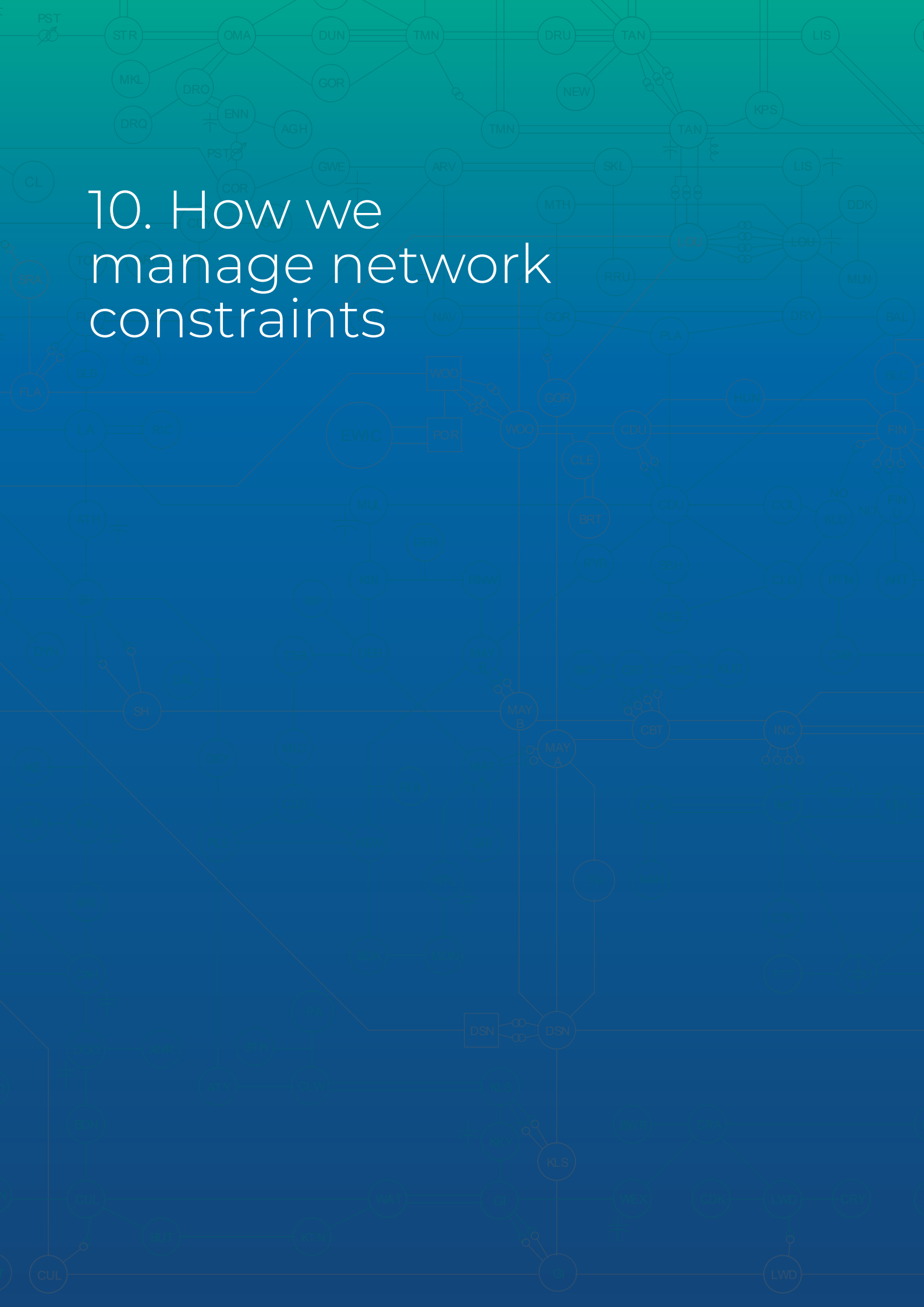
In 2022, the Power System Emergency Communications Plan (PSECP), which was developed in 2021, was integrated into the terms of reference developed by the CRU for a new national energy sector response structure in Ireland – the Joint Energy Emergency Response Team (JEERT). The JEERT and PSECP processes provide for the coordination of crisis communications across the energy sector in the event of an emergency involving gas, electricity, and oil.

The PSECP and JEERT were activated for one of the largest national energy sector exercises in Ireland, held on the 9th and 16th September 2022 (Exercise Dara).

This exercise included the participation of the National Emergency Coordination Group (NECG) in the National Emergency Coordination Centre (NECC) on 16th September 2022. 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), as well DECC and Irish Government Departments. The objectives of the exercises were successfully achieved, and key learnings from the exercises have since been implemented.

The role of the PSECP, along with the preprepared messaging developed by EirGrid and ESB Networks, was particularly well demonstrated for a variety of scenarios across the two days, including a rapid-onset incident requiring controlled demand reduction (load shedding) and an extended duration emergency affecting the gas, electricity and oil sectors over several days.

10. How we manage network constraints



EirGrid implements system operational constraint, 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 published in December 2022, which covers all the operational constraints in place at the end of 2022.

A review is carried out on all operational constraints annually. A review of operational constraints is 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 2022 were published in a timely manner and are publicly available here.

In terms of short-term management of network constraints, this is carried out in the control centre through the use of a specialist software tool. Using this specialist software tool means short term constraints are identified and information is provided to EirGrid staff which allows them to take the most cost-effective action. The most effective measure of performance in managing constraints is action taken to reduce constraint costs. This is discussed further in the next chapter.

Information on 2022 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 2022, 988GWh or 8.3% of all renewables in Ireland were dispatched down. Further details can be found in The Annual Renewable Constraints & Curtailment Report[25].

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 installed on the system, system demand and the capacity factor[26] of the renewable generation.

Following a very low wind year in 2021, capacity factors in Ireland have recovered very well in 2022. Over the year, the capacity factor of wind farms was 27% which was lower than in 2021. For comparison, it was 26%, 29% and 24% in 2019, 2020 and 2021 respectively.

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 has been performed in 2022 to maximise renewable output wherever possible across the transmission system.

25 Annual Renewable and Constraint Curtailment Report 2022
26 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 we manage constraint costs

Sometimes we 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 Single Electricity Market (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 Imperfection and Constraints incentive for 2022 is based on a balanced scorecard containing five key measures as outlined in Table 11.

Table 11: 2022 Balanced Scorecard Aspects	
Updated Constraints Report	Constraints Report detailing all active/removed constraints (for 2022), how long each has been in place for and how long each is forecasted to be in place for.
Assessment of Constraints	Constraints Report should set out: • Technical scarcity that is causing the constraint. • The estimated annual cost of the constraint; and • The options considered to remove the constraint (e.g. market based measures, infrastructure-based measures and operational based measures).
System Services	The Constraints Report should also set out the volume of system services dispatched by the TSO through non-energy actions during the 2022 period when there were available volumes of system services at FPN that were not dispatched.
TSO Actions	The Constraints Report should set out: • The actions undertaken in 2022 and the imperfections savings attributable to those actions. • What constraint the actions targeted. • The total cost of imperfections relative to the expected cost that year.
Enhanced Imperfections Reporting	4 published Quarterly Imperfections Cost Reports in 2022 with clear evidence of the imperfection reductions actions, progress on plan and the future improvements that the TSO will make to remove or reduce the cost of each constraint in the next period. Identify and report on the improved accessibility to the latest reports on the TSO's website.

The CRU published an information paper on the 2022 incentives in December 2022, CRU2022989 which contains direction and guidance on the 2022 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%).

In accordance with the direction in CRU2022989 (the CRU's 2022 Balanced Scorecard Information Paper), the CRU has confirmed an outturn incentive award be applied for this incentive for 2022 of €0.263m against a total possible incentive allowance of €1.5m.

2021/22 Main constraint changes and TSO Initiatives for cost savings

TSO initiatives gave rise to imperfections cost savings of approximately €10.2m in 2021/2022. These initiatives included:

- The removal of the Ireland Negative Reserve Constraint on conventional units in Ireland.
- The reduction of the Minimum Required Dynamic Primary Operating Reserve Constraint from 135 MWs to 75MWs.
- The reduction of the conventional requirement for all reserve categories following the commissioning of new technologies.

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

During 2021/22, EirGrid progressed a number of studies to allow for future constraints to be addressed. Table 12 gives a summary of the studies and the work done.

Table 12: Transmission constraint studies/reviews undertaken in 2021/2022

Workstream	Details
Transmission Constraint Group (TCG) review and roadmap – (South West – Ballyvouskill Reactor).	Reactor was commissioned and studies completed.
Undertake suite of studies to identify the capabilities needed to reduce the minimum number of large synchronous units requirement from 8 to 7 and the inertia floor from 23,000 MWs to 20,000 MWs.	Studies complete.
Develop operational policy for operation with 7 large synchronous units and 20,000 MWs Inertia Floor.	Completed policy review.

12. How we minimise the financial Impact of transmission losses on consumers

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.

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 the 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 2022 are shown in Figure 2 with green indicating a higher and therefore financially better TLAF. The second map indicates the change in regional TLAFs from 2021. 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.

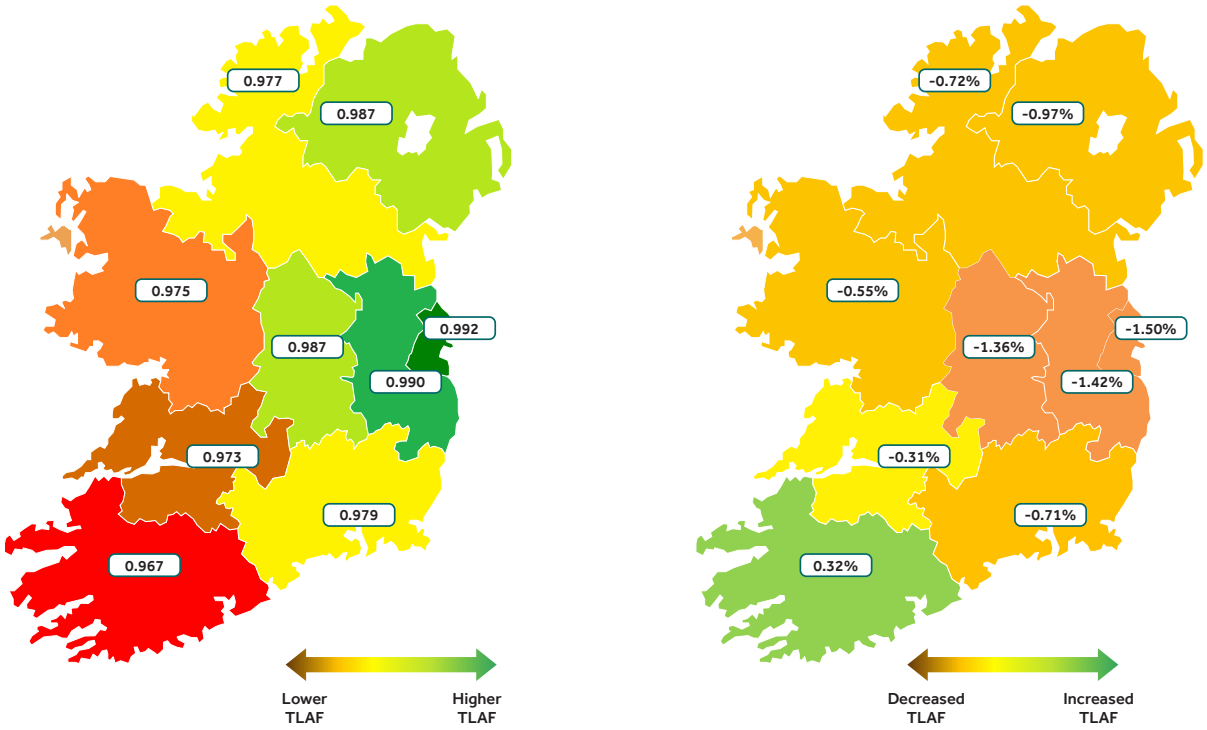


Figure 2: 2022 regional TLAFs % change from 2021 to 2022 – regional TLAFs

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 0.99 (a range of approx. 4%) in 2022.

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. 396GWh in 2022. Using the average Imbalance Settlement Price for 2022 of €225.50/MWh this would equate to a reduction in all-island costs of around €89m. Further information on TLAFs can be found on EirGrid's website located here.

13. How EirGrid supports market operation

In its role as TSO, EirGrid provides critical support in the operation of the Single Electricity Market.

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 successfully 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 900MW 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 ESRI (Economic and Social Research Institute), 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 2022 can be found in the Generation Capacity Statement 2022-2031.

In the median scenario, the energy demand is forecasted to increase 37% by 2031 in Ireland.

The long-term demand forecast in Ireland continues to be heavily influenced by the expected growth of large energy users, primarily data centres. EirGrid's analysis shows that demand from data centres could account for 28% of all demand in Ireland by 2031 in our median demand scenario. Furthermore, by 2031 there will be some new additional load from the heat and transport sectors as they move towards electrification.

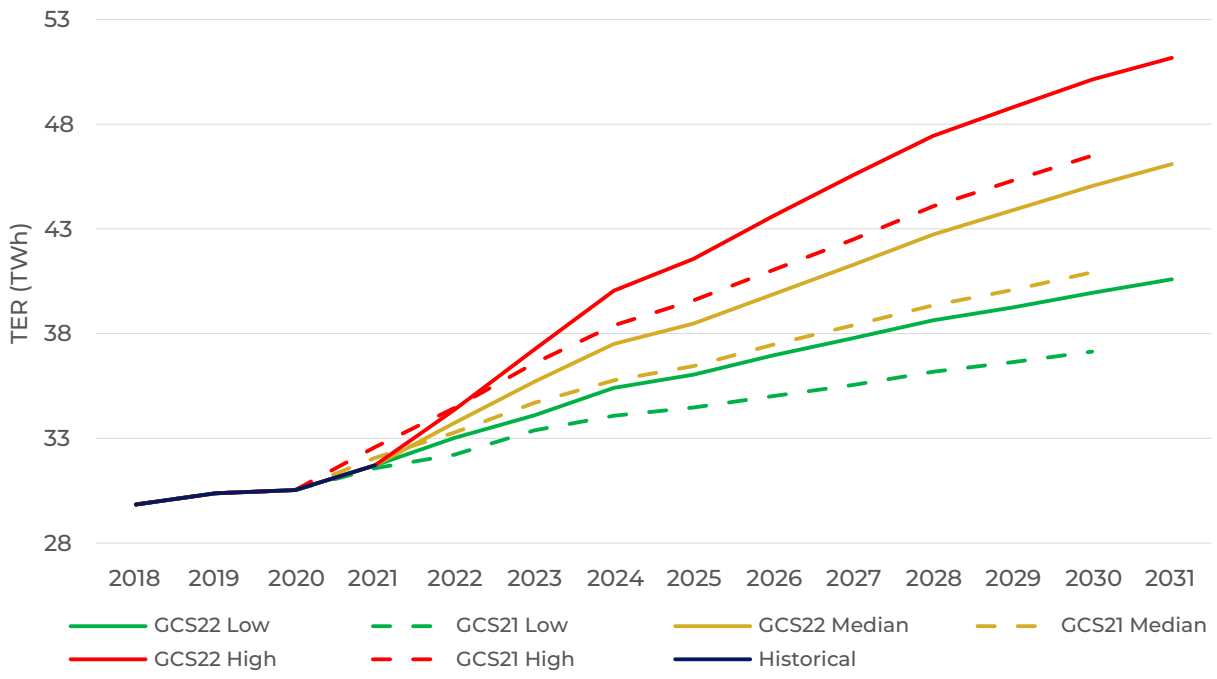


Figure 3: Total electricity requirement forecast for Ireland 2022-2031

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.

T-4 auctions take place every year. In March 2022, the TSOs ran a T-4 Capacity Auction for the 2025/2026 Capacity Year (October 2025 to the end of September 2026). The auction secured a total of 6,484.468 megawatts (MW) of Capacity. The auction clearing price was €46,000 per MW per year.

Of the 141 units that qualified to take part in the auction, 113 units submitted offers in to auction. A total of 112 units were successful. A total of €363 million of capacity payments will be paid during the period October 2025 to September 2026. Between the T-4 and T-3 auctions which took place in 2022, a total of 686.668 (T-4) and 1,447.186 (T-3) of new capacity was successful across the two auctions. Although 14.25 MW has since been terminated.

The capacity required from the auction took into account 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 2025/2026 T-4 Capacity Market Auction Results Report.

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

- 2025/26 T-4 Final Capacity Auction Results Report.
- 2024/25 T-3 Final Capacity Auction Results Report.

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 January 2022, the TSOs ran a T-3 Capacity Auction for the 2024/2025 Capacity Year (October 2024 to the end of September 2025). The auction secured a total of 1471.095 MW and the auction clearing price was €146,919.99 per MW per year.

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 2022.

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 provide 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 2022 was 13,114 GWh which supported 39% of the total demand.

When an offer is issued it means that the TSO, or 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.

Table 13: Offers issued – new and modifications – total in 2022		
	No.	MEC (MW)
New Transmission Generator Connection Offers Issued	11	1,466.5
Modifications to pre-existing Transmission Generator Connection Agreements Issued	22	381.8
Modifications to pre-existing Interconnector Connection Agreements Issued	1	0
Modifications to pre-existing Autoproducer Connection Agreements Issued	1	0
Total	**35**	**1,848.3**

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 2022 includes offers issued prior to 2022.

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

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

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 set down by the CRU.

Table 14: Offers executed – new and modifications – total in 2022		
	No.	MEC (MW)
New Transmission Generator Offers Executed	17	1,470.46
Modifications to pre-existing Transmission Generator Connection Agreements Executed	24	275.80
Modifications to pre-existing Interconnector Connection Agreements Executed	1	0
Total	**42**	**1,746.26**

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 MVA connect directly to the transmission system. In 2022, no new demand customers were issued connection offers. Similarly, no offers were executed in 2022. Table 15 sets out the demand customer modifications issued and executed in 2022.

At the end of 2022, there were 28 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 2022, three demand customers connected to the transmission system and two transferred from the distribution system.

Table 15: Demand offers issued and executed – total in 2022

	No.	MIC (MVA)
New Demand Connection Offers Issued	0	0
Modifications to Demand Connection Offers Issued	7	0
New Demand Connection Offers Executed	0	0
Modifications to Demand Connection Offers Executed	10	0

Demand Side Units

Demand Side Units (DSUs) do not receive connection offers. A Demand Side Unit or 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 2022, there were 59 DSU's contracted with a total capacity of 455 MW.

Efficiency Improvements in the processing of connection offers and modifications

In 2022, EirGrid processed connection offers for projects awarded access to the grid under a series of regulatory directions. These included the ECP-2.2 batch as well as successful applicants in the Capacity Market T-3 2024/2025 and Capacity Market T-4 2025/2026 auctions. EirGrid refined its early engagement meetings which improved efficiency and enhanced engagement with customers. EirGrid also introduced Grid Connection Assessments for offshore wind applications to facilitate customers participating in the ORESS-1 auction. This involved the provision of information to customers in relation to their connection methods and connection charges in advance of the auction and will allow EirGrid to build on these to prepare the Connection Offers in a timely manner post auction.

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 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 ESB Networks and EirGrid takes over operational control when the new network is energised and becomes part of the transmission system.

Ten contestably delivered projects were connected to the transmission system in 2022. The increasing numbers of contestably delivered projects is illustrated in Table 16, also showing the increasing volumes of renewable generation connected in this way.

Twenty-three new contestable delivery projects were in design review stage during 2022. TSO and TAO actively managed the design review of over 330 design packages submitted by customers during 2022.

Table 16: Contestably delivered projects

	2020	2021	2022
Projects Connected/Energised	4	5	10
Renewables Generation MW (incl. Battery) – Additional MW Connected*	187 MW (100%)	229 MW (100%)	541 MW (83%)
Number of Projects in Design Review	12	20	23

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

Connection Policy developments 2022

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.

ECP-2, which was published in June 2020 prioritises 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.

The application window for ECP-2.2 opened on schedule in September 2021 and offer processing for this batch was completed in 2022 and 2023.

The application window for ECP2.3 opened in September 2022 and this batch will be processed in 2023 and 2024.

Data centre grid connections

In November 2021, following public consultation, the CRU published the Direction to the System Operators (SOs) related to Data Centre grid connection processing, CRU/21/224. The purpose of this was to direct the SOs to implement a set of additional assessment criteria by which the SOs must process data centres applications. Under this direction, to date, no new data centres have been offered a connection to the grid by EirGrid. The growth in the data centre sector out to the end of the decade is currently from already contracted projects.

Since the direction, there has been a number of further developments, including the Government Policy Statement on Security of Electricity Supply (November 2021)[27] and the Climate Action Plan 2023 (December 2022). We understand these developments are currently being taken into consideration for any future direction on data centre offer policy.

27 Policy Statement on Security of Electricity Supply (www.gov.ie).

Security of Supply

EirGrid and ESB Networks worked to address security of supply concerns throughout 2022, 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 300MW of Temporary Emergency Generation (TEG). In June 2022, the CRU directed EirGrid to secure an additional 450MW of TEG. EirGrid and ESB Networks continued to develop and update emergency communication plans to respond to potential security of supply issues in 2022.

In March 2022, DECC established the ESEG to coordinate a response to the impact of the war in Ukraine on the energy system in Ireland. EirGrid is an active member of the ESEG. The work of the ESEG has included supporting the development of NESF which the Irish Government published in April 2022 and NESF implementation, including the testing of emergency plans. It also identified regulatory and other measures to support consumers and businesses, to ensure security of supply, and to reduce dependence on imported fossil fuels.

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 are planning for 5GW of offshore wind generation being connected to the Irish electricity grid by 2030. The first phase of delivery will be based off the east and west coasts of Ireland with further offshore generation opportunities on the south in the second phase. 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.

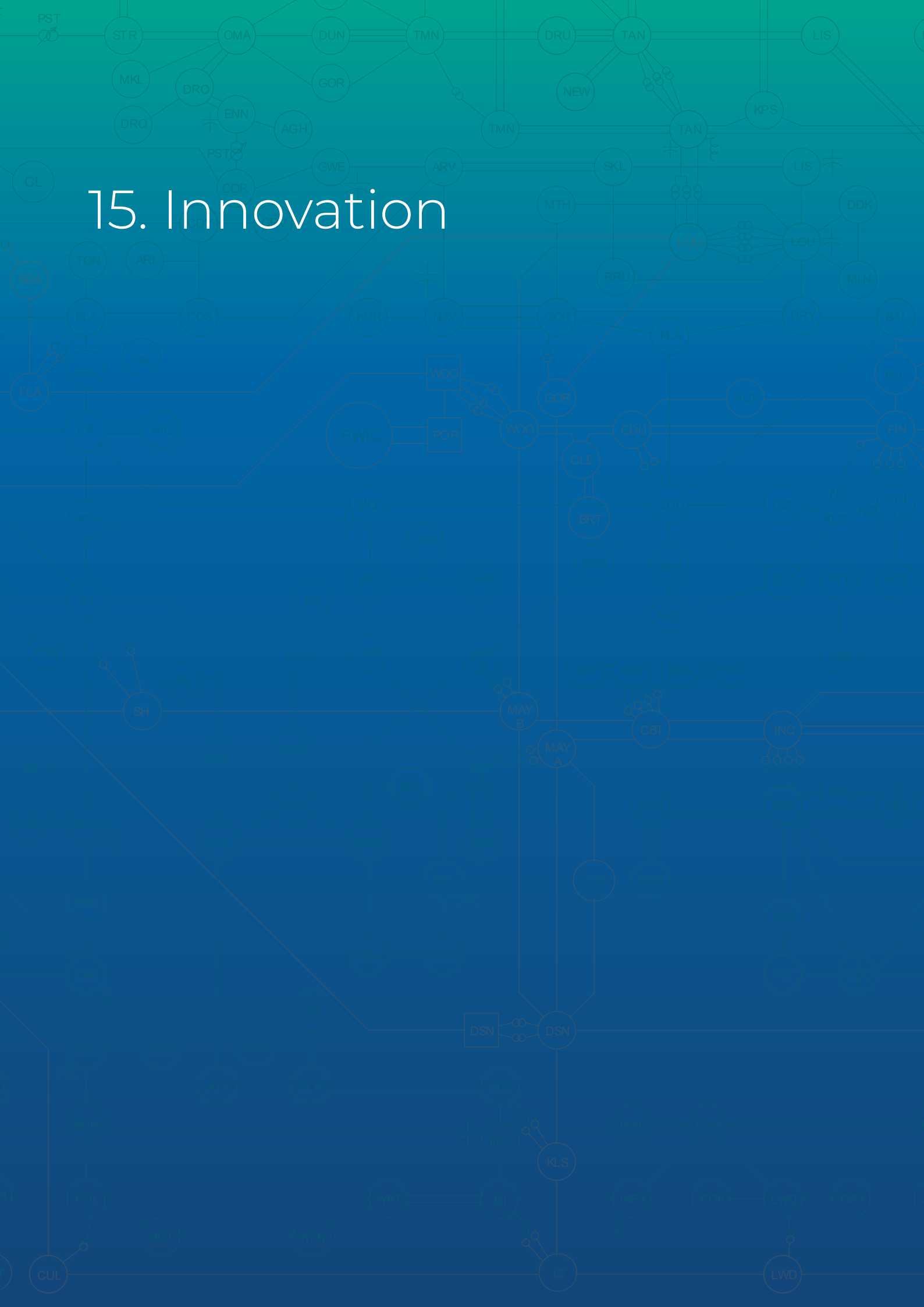
In May 2022, EirGrid received applications for 4.4GW of offshore wind and have issued key technical specifications and connection information to the Phase 1 developers. Whilst there is a particular focus on the successful delivery of the Phase 1 projects, EirGrid are also working hard to ensure that actions and decisions support the transition to a planned approach for offshore grid delivery as provided for in the Government's policy statement on the Framework for Ireland's Offshore Electricity System. EirGrid recognises the key role that offshore wind will play in meeting Ireland's energy needs and in the Irish economy in the next decade and beyond.

Much of the focus in 2022, has been on ensuring that the developers of Phase 1 projects are ready to participate in the first Offshore Renewable Electricity Support Scheme (ORESS) through the development of functional specifications for the offshore transmission assets and the progression of grid connection assessments for these projects. EirGrid also supported DECC in the development of the requirements for the first ORESS auction in advance of the auction being run in 2023.

EirGrid strongly supports the Government's ambition through collaboration with key stakeholders and industry, and through the work being undertaken in the organisation. Three half-day offshore engagement workshops were held between 2021 and 2022, along with approximately 12 shorter technical workshops with Phase 1 offshore developers.

EirGrid continues to work closely with the CRU and industry to develop these vital projects as quickly as possible.

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 2022, 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 several smaller individual projects that enhance the way we operate.

The focus in 2022 was on implementation of the EirGrid and SONI's Innovation and Research Strategy[28] which outlines the necessary support structures, frameworks, and people we need to enhance our innovation and research capability on an all-island basis.

The strategy complements publications from EirGrid and SONI on the Shaping Our Electricity Future 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 our 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 2022, progress has been made by EirGrid on various strategic innovation programmes. The 2022 Annual Innovation Report documents progress of EirGrid and SONI on the strategic innovation programmes throughout 2022 and points out our ambition for future developments of the programmes and new initiatives.

28 Innovation & Research Strategy

In 2022, some of the key projects from the strategic innovation programmes included:

1. Partnership with Electric Power Research Institute which involves specific projects focused on advanced power flow control, HVDC planning and contingency analysis methods and tools.
2. EirGrid's involvement in the NexSys project. Targeted projects are focussing on managing extended low renewable energy source periods, investigating the impact of green hydrogen integration on the power system, and enhancing the utilisation of the power system network infrastructure.
3. The MaREI Public Engagement initiative which aims to increase public involvement with the energy transition.
4. The HyLight project which is providing data and the necessary tools to guide the cost-effective decarbonisation and roadmaps for sustainable large-scale implementation of hydrogen technologies.
5. The Horizon Europe project Ready4DC which deals with technical and legal aspects of creating an interoperable multi-vendor Direct Current grid, with the goal of developing the first multi-terminal, multi-vendor HVDC project in Europe.

For more information, please refer to EirGrid's 2022 Annual Innovation Report[29].

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:

(i) Safely maximise and optimise the load carrying capability of existing network.
(ii) Optimise Operations and Maintenance processes and policies.
(iii) Identify 'non-wires' solutions to defer traditional reinforcement projects and expenditures.
(iv) Upgrade networks utilising innovative assessment and investment approaches and strategies.
(v) Interconnect with other transmission systems.
(vi) Develop interoperability with the Distribution system.
(vii) Develop infrastructure to connect largescale offshore wind generation.

29 2022 Annual Innovation Report

The joint TSO and TAO innovation working group continued to operate during 2022 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 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.

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 seven OECD jurisdictions between the years 2020-22. The assessment considered performance in established areas of activity, such as the efficient development of the transmission network and maintaining system reliability, as well as newer areas of activity, such as supporting the transition to a low carbon energy system.[30]

While the performance measurements in the scope of the assessment are principally the responsibility of EirGrid as TSO, a number of measures are delivered with the TAO, ESB Networks. This is particularly the case regarding the efficient development of the network.

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

Table 17: Selected performance measures and comparator TSOs			
	System reliability and resilience	Facilitating the energy system transition	Developing the network
Performance measures	System Minutes Lost (SML)	Renewable Energy Source-Electricity (RES-E)	Imperfection costs per capita
	Energy Not Supplied (ENS) as a proportion of energy consumed	Renewable Dispatch Down	Connections offers per capita
	System Frequency (SF) deviation	System stability measures	Planned outage days per capita
Comparator TSOs[31]	Great Britain (GB) New Zealand Italy Denmark	Australia – Tasmania California Portugal	

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

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 other TSOs. Each performance rating is an average of the scores assigned to the underlying measures in that area of performance:[32]

A score of 3 indicates that EirGrid is outperforming its peers.

A score of 2 indicates that EirGrid performance is in line with its peers.

A score of 1 indicates that EirGrid is underperforming its peers.

Table 18: Summary of results

Area of performance	Measure	Results comparability[33]	Performance rating (out of three)
System reliability and resilience	System Minutes Lost (SML)	High	2.5 
	Energy Not Supplied (ENS) as a proportion of energy consumed	High	
	System Frequency (SF) deviation	High	
Energy system transition	RES-E	Medium	2.5 
	Renewable Dispatch Down (RDD)	Medium	
	System stability measures	Low	
Network development	Imperfection costs per capita	Medium	2 
	Connection offers per capita	High	
	Planned outage days per capita	Medium	

32 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.
33 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) 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.

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

System reliability and resilience

Of the TSOs assessed, all have resilient and reliable systems, within which EirGrid is a relatively strong performer. For ENS as a proportion of energy consumed, EirGrid's performance is in line with its counterparts in Portugal and GB and significantly outperforms its counterparts in Australasia (see Figure 4).

Despite strong ENS performance in recent years, as well as across SML and System Frequency (SF), 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), and collaborating with the DSO on measures such as increasing the capacity of demand response on the network.

0.000037%

ENS as proportion of energy consumed in Ireland in 2022

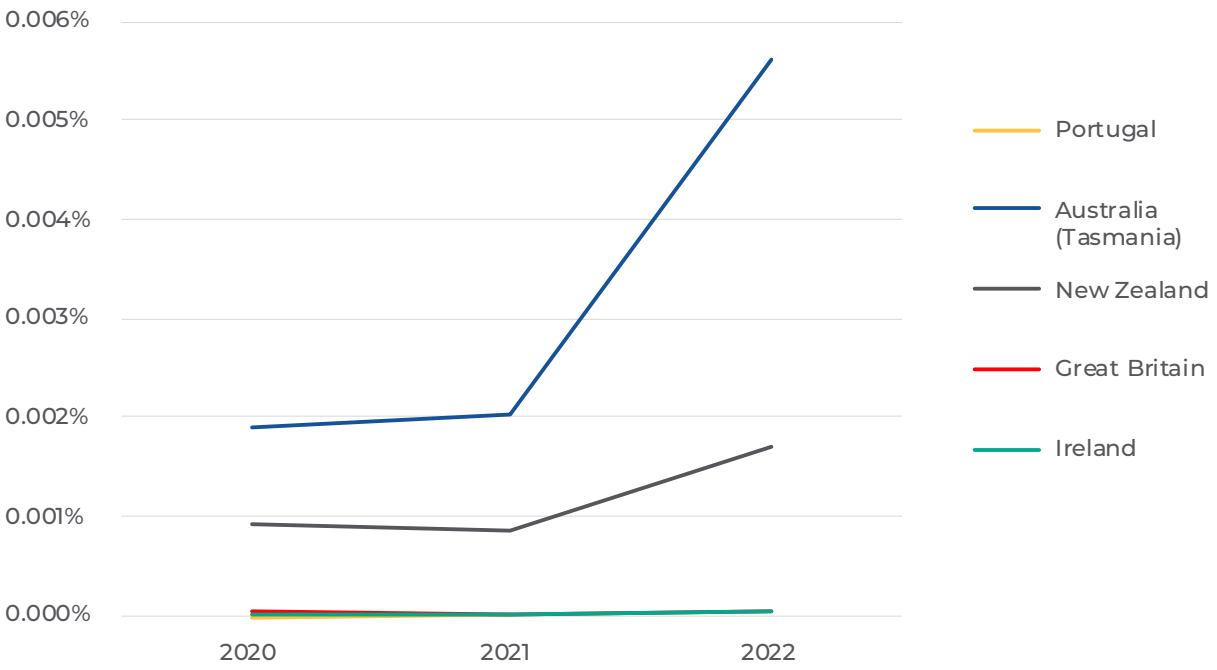


Figure 4: ENS as a proportion of energy consumed (%), 2020-22

Energy system transition

Evaluation of the TSOs' performance in enabling the transition to net zero whilst maintaining secure and resilient systems is a complex task, as performance is highly sensitive to each TSO's national and regional context. For example, national emission reductions targets and the type and availability of renewable resources connecting to the system are key drivers in the pace and scale of change to a low carbon energy system. Despite these wider considerations, the results from this comparative assessment provide important findings.

Ireland has the second highest energy share of wind of the observed TSOs, behind Denmark (see Figure 5). While this does not provide a comprehensive picture of renewable penetration (including solar and dispatchable sources such as hydro), isolating intermittent renewables is important as these energy sources present specific challenges for TSOs in operating secure and resilient systems.

75%

2022 saw a limit of 75% SNSP becoming operational policy

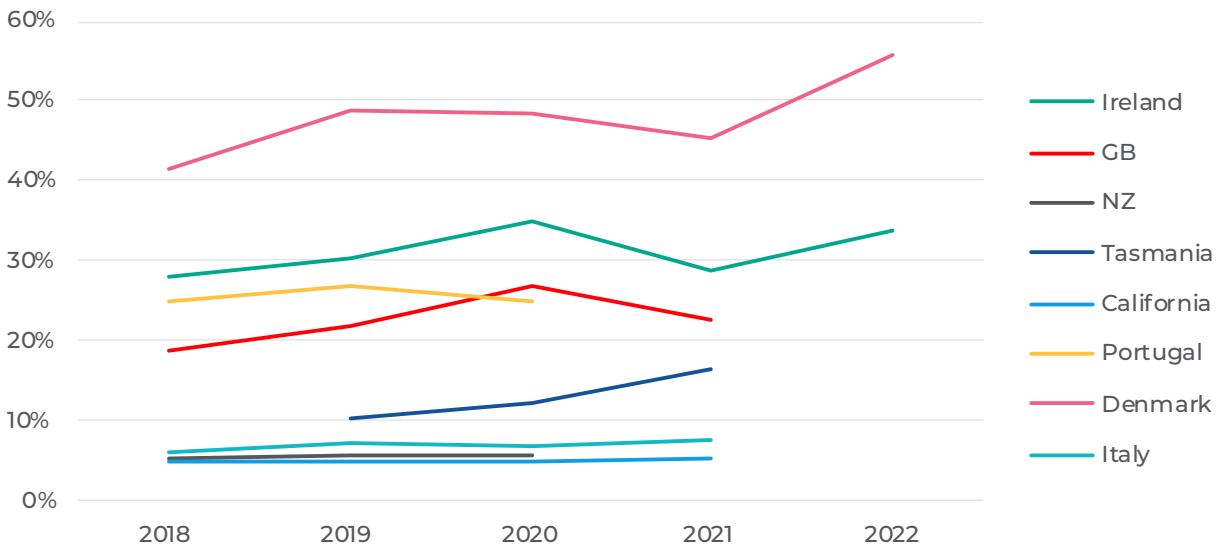


Figure 5: Energy share of wind based on consumption (%), 2018-22

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.

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 performed broadly in line with the closest comparator, GB, in recent years.

Adjusting for scale and system characteristics, EirGrid's imperfection costs were comparable to those of its counterpart in GB across 2020-22.

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.

EirGrid has started addressing these network needs through their programme of planned network developments, reflected in their increasing number of planned outage days per capita for 2023 onwards. On a larger scale, EirGrid will continue to support the deployment of more variable renewables through increasing storage capacity on the network and in construction of the Celtic interconnector to France.

EirGrid performed broadly in line with its closest comparator, GB

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.

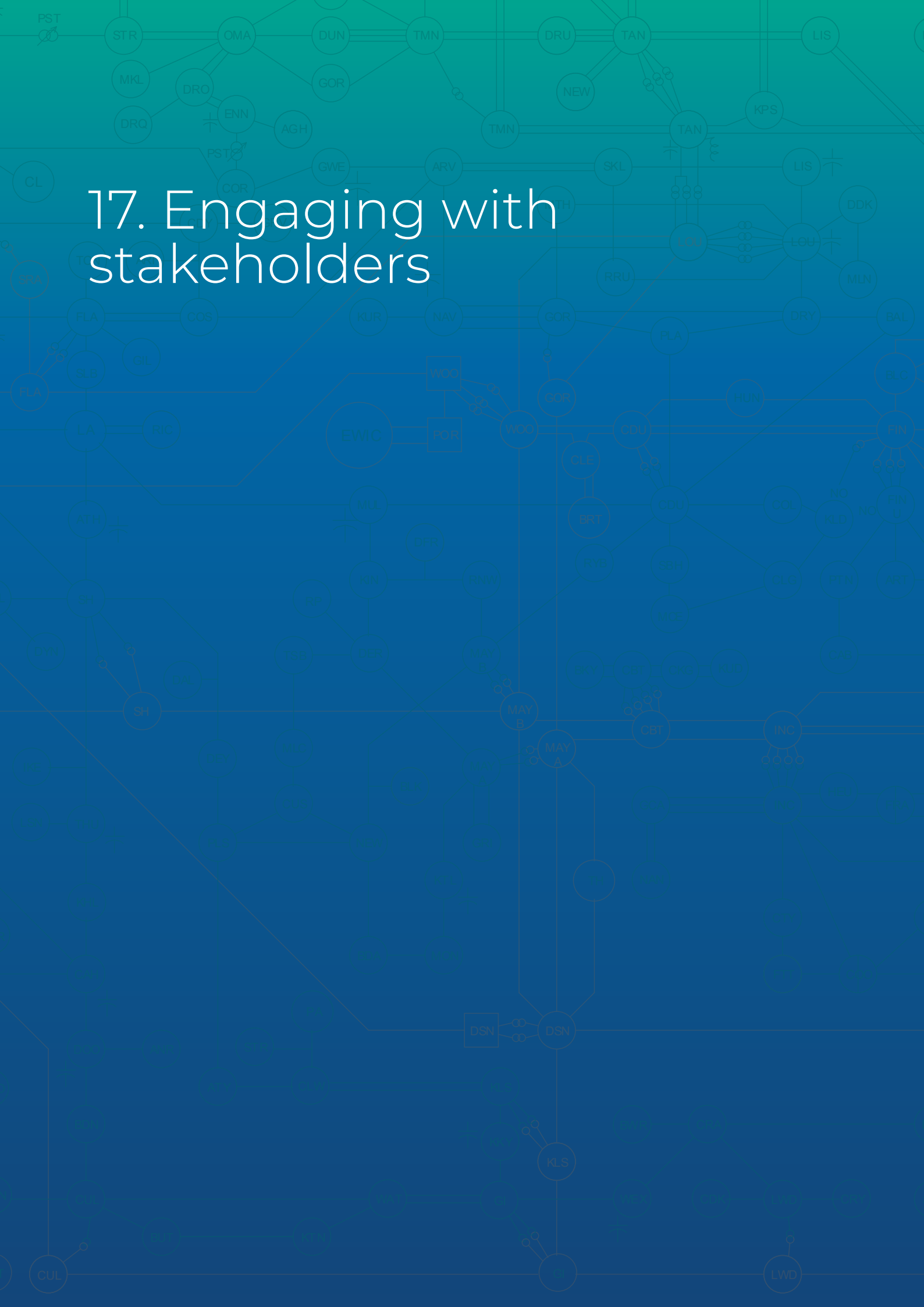
For example, EirGrid is leading the way in both its trialling of higher SNSP limits and in its translation of these increasing limits into operational policy. EirGrid's performance is also demonstrated through its collaboration and knowledge sharing with other best performing TSOs through the Global Power System Transformation (G-PST) consortium, of which EirGrid is a founding TSO.[34] 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.

Despite strong performance relative to peers, EirGrid is struggling to meet incentive targets set by the CRU in some areas.

The review identified a number of considerations for the development of the regulatory framework for PR6. This includes the extent to which performance is in the TSO's control, which is likely to change over time. This includes consideration of EirGrid incentives such as RES-E, RDD and SNSP, as well as the broader calibration of incentives between the TSO, TAO and the DSO. Future incentive frameworks should take into account the relative responsibilities and extent of control of the regulated entity.

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

17. Engaging with stakeholders



EirGrid's commitment to meaningful stakeholder engagement is embedded across the company and forms part of our core company strategy. The commitment to understanding the needs of stakeholders is critical to informing all EirGrid activity.

EirGrid stakeholder engagement

EirGrid's six-step grid development process was designed with a particular focus on engaging with the public and landowners on grid projects – more often and earlier in the decision-making process. This approach is consistent when exploring options and making decisions, this means we follow the same steps for every project. It ensures we are identifying stakeholders and giving them an opportunity to shape the proposals as early as possible. The decision-making tools we use and the amount of engagement we carry out at each step depends on the scale and complexity of each project. The level of stakeholder engagement is dependent on the type of project. EirGrid's approach to engagement is tailored to a specific project or initiative. A bespoke engagement plan is developed for each project, the plan identifies the best channels to provide information to stakeholders.

EirGrid's Strategy 2020-25, was informed by extensive engagement with key stakeholders. Achieving the scale of transformation in our strategy requires a significant increase in the scope and frequency of our stakeholder engagement, this journey began in 2020. A fresh approach to stakeholder engagement is one of the pillars of the strategy and this was reflected in how we engaged with a wide range of stakeholders during 2022. Effective engagement is essential for EirGrid to achieve our purpose – to transform the power system for future generations.

EirGrid published its Stakeholder Engagement Report for 2022. This report provides an overview of the effectiveness of EirGrid's stakeholder engagement during 2022, including a more in-depth look at several areas of engagement under the key goals of EirGrid's corporate strategy. The report can be found on the Stakeholder Engagement section of EirGrid's website here.

EirGrid has a deeply interconnected role in leading the changes necessary for a clean electricity system. We are creating stronger links with Government, local Government, NGOs, the business community and local community and voluntary group, while also building new alliances with business, industry, education and research bodies. Amongst other benefits, these alliances allow us to develop common practices with key partners. This is important for rolling out coordinated approaches to engaging with local communities.

In September 2022, the consultation and engagement process of SOEF was recognised at EU level with the award of the Renewables Grid Initiative 2022 'Good Practice of the Year' award in the 'Communications and Engagement' category. The judging panel was chaired by a senior official from The Directorate-General for Energy and the award was presented by EU Energy Commissioner Kadri Simson. Deliberative participatory approaches, effective nature restoration and decarbonisation of transport recognised at RGI's 2022 'Good Practice of the Year' award (renewables-grid.eu). The awards were presented at an EU Commission event, at which the Celtic Interconnector project featured prominently.

As a result of the stakeholder feedback received throughout the SOEF engagement process, EirGrid and SONI assessed potential options for facilitating ongoing industry engagement on the issues, challenges and activities set out in the SOEF Roadmap. Delivery of the Renewable Ambition relies on effective communication and coordinated efforts of many stakeholders in our industry.

The SOEF Advisory Council was established in 2022 as a multidisciplinary group of representatives from across the Irish energy ecosystem including industry, government, regulatory, consulting, and utilities. The focus of the Council is to facilitate understanding and communication on the SOEF strategic goals and how those can be best be delivered. These SOEF strategic goals are aligned with the governments' climate action goals for increased renewables integration and EirGrid Group's strategic goal of achieving world leading levels of SNSP.

EirGrid looks forward to continuing our engagement with the SOEF Advisory Council, increasing the understanding and communication amongst the Irish energy ecosystem, and working to deliver on SOEF towards the mutually beneficial and shared goals expressed in the climate action plans and strategic grid and market advancements.

The Networks Stakeholder Engagement (NSEE) panel

In 2018, the CRU introduced the NSEE Panel in accordance with PR4 Decision on Reporting and Incentives CER/18/087, CRU have retained this process for the PR5 period, CRU/20/154. The panel is composed of representatives from industry, academia and wider stakeholders and is tasked with assessing the quality, implementation and effectiveness of the network operators, EirGrid and ESB Networks, on their respective stakeholder engagement strategies on an annual basis.

EirGrid was awarded a score of 6.86 out of a possible 10 by the panel for its activities in 2022, which resulted in an incentive payment of €0.217m.

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 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.


OUR STAKEHOLDERS
Communitites and representatives
Schools and colleges
Local business and enterprise groups
Healthcare
Vulnerable customer representatives
Community interest groups
Charities/NGOs
Industry
Transmission System Operator
Gas
Water
Electricity Suppliers
Telecoms
Developers and representative bodies and associations
Housing associations
Landowner/ farmers
Generation customers
Builders and developers
National government and policy influencers
Trade Unions
Regulators
TDs
Government bodies
Emergency Services
Other
Fire
Ambulance
Gardaí
Domestic customers
Future customers
Hard to reach
Vulnerable poor customers
Domestic Customers
Local government
Other
State agencies
Local authorities
Supply Chain
Technical Suppliers
Contractors
Academia research
Schools and Universities
Research bodies, think tanks etc
Media
National media
Local media
SMEs
Business
Large users

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.

Improving our engagement

Listening to and acting upon stakeholder feedback is an essential part of the continuous cycle of improvement in our engagement process. We have significantly ramped up the level of stakeholder consultations, surveys, events, webinars, workshops, and various meetings/fora, which provide valuable insights and opportunities for improvement. Each year we publish a 'Stakeholder Engagement Strategy & Plan' setting out our proposed engagement approach, priorities, and planned activities, and providing our stakeholders with pathways to engage with us throughout the year. We greatly encourage all our stakeholders to continue to engage with us through these pathways.

We are pleased that 2022 has seen a significant improvement in engagement activity, with a welcome return to face-to-face engagement opportunities in addition to our virtual platforms. We continued to improve our engagement approach by listening to our stakeholders, and through independent benchmarking and analysis.

We have delivered strong outcomes for our customers and stakeholders, including, delivering against our targeted roll-out strategies and large-scale programmes for the future and driving ongoing collaboration with EirGrid to ensure we have the necessary relationships in place to ensure a reliable and future-proofed network.

The investment in the transmission system is projected to rise to meet the climate challenge in line with the Government targets. Cross agency collaboration between ESB Networks, EirGrid and all our partners and stakeholders will continue to be key to the successful delivery of transmission projects. For example, ESB Networks landowner engagement team works closely with EirGrid and various landowner representatives to facilitate land access necessary to build the network infrastructure and fundamental to the development and maintenance of the electricity network.

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 2022, which are included in the 2024 revenue allowance. Please note that the tables will be updated following CRU's publication of the Electricity Transmission Network Allowed Revenues for 2024 And Demand Transmission Use of System (D-TUoS) Tariffs 2023/24, information paper.

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 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.

Work is ongoing regarding the establishment of the TSO Monitoring Committee. The TSO and TAO have not utilised the above mechanisms to date but have sought additional monies as part of the 2024 revenue process on the basis of pre-existing revenue provision arrangements.

Table 19: TAO 2022 allowed outturn and resulting k-factor			
	PR5 Allowance (ex-ante) for 2022 (ex-ante)	CRU Outturn Allowance (ex-post)	2022 Adjustments
	€m	€m	€m
Pass through/external costs			
CRU regulatory levy	1.23	1.72	0.48
Local authority rates	36.26	27.18	-9.07
Uncertain costs: non-capitalised			
Additional use of system (AUoS)	0	1.08	1.08
PR5 Audit Costs	0	0.01	0.01
Incentives	0	6.61	6.61
Inflation correction	–		18.87
Uncertain costs: capitalised			
Depreciation	–	-0.55	-0.55
Return	–	-0.94	-0.94
Total k-Factor adjustment (before interest) in 2022 prices			**16.97**
Total k-Factor (after interest) in 2022 prices			**18.52**

Table 20: TSO 2022 allowed outturn and resulting k-factor		
	CRU Tariff Decision for 2022 revenues	CRU approved updated actual costs of 2022
	€m	€m
External Costs		
Inter TSO compensation (€m)	2.22	3.26
CRU levy (€m)	1.13	1.70
CORESO subscription (€m)	0.73	0.83
Interconnector services (€m)	1.01	1.43
DUoS costs (€m)	3.64	3.47
Ancillary services (€m)	3	1.80
DS3 System Services	176.25	162.45
EWIC TUoS Entitlement	11.31	11.20
Dublin Security of Supply	27.12	18.21

Table 20: TSO 2022 allowed outturn and resulting k-factor		
	CRU Tariff Decision for 2022 revenues	CRU approved updated actual costs of 2022
	€m	€m
External Costs continued		
TAO payment (€m)	210.43	210.43
Rolling Retention	0.66	0.72
Allowed TSO Operating Revenue		
Internal Costs	61.86	67.39
Depreciation (€m)	24.85	27.07
Return on Stage 1 working capital (€m)	1.19	1.80
Return on other working capital (€m)	7.44	8.02
Return on fixed assets in the RAB (€m)	2.74	2.99
Approved adjustments		
PR4 Adjustment	-1.53	-1.67
Strategic Projects Side-RAB (2019 Adjustment) Updated) – Celtic	1.15	1.05
Celtic - debt service and liquidity costs	0	5.24
Adjustments GoO	0.38	0.42
Adjustments Constraints bank fee	0	0.21
Land Acquisition	1.08	1.20
Offshore	0	3.97
Greenlink Readiness - Depr & Rtn	0	0.02
Abandoned Projects/Unrecovered Stage 1 Costs	0.374	0.40
SoS Costs – Expedited Return to Service Costs	115	106.52
TSO Market System Release Capital	0	0.63
Incentives 2022 Incentive allowance	0.000	3.07
K-factor Y-2	**-5.86**	**-5.54**
Total (2022 Prices)	**646.17**	**638.28**
Total CRU approved updated actual costs of 2021 (2021 prices)	(a)638.28	
TUoS collected in 2022 (2022 prices) **Total k-factor adjustment in 2022 prices**	(b)704.83 (b)-(a) = €66.55	

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 (2020 Prices), of which €254m was allocated to 2022. 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. On an annual basis EirGrid and ESB Networks jointly submit detailed reports to the CRU on our network expenditure as required under the enhanced PR5 reporting arrangements.

The PR5 programme evolved in 2022 as projects were completed, progressed, added, rescheduled or removed. The total regulatory spend on transmission capital projects for 2022 was €176m, an increase of €31m when compared with 2021. The variance of 2022 outturn versus the 2020 determination was -€78m and this variance is associated with an underspend across 11 projects, a number of which have experienced challenges due to a combination of complexity of scope, legal delays, procurement and outage related issues. The Network Capex spend profile is heavily influenced by spending on major projects (such as North Connacht, North South 400 kV Interconnector, major station and cable projects), which have experienced schedule delays.

It is anticipated that the Network Capex delivery on major projects, and therefore the spending trend, will ramp up significantly in the period 2023-25. This is in line with EirGrid's Q1 2023 Network Delivery Portfolio[35] forecast for the remaining three 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.

The annual investment by ESB Networks in new or refurbished Transmission assets is known as Capital Expenditure and is shown in Table 21.

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 22.

Day to day expenditure not related to building assets are referred to as Operating Expenditure or Opex. The TAO Opex is shown in Table 23.

Table 21: TAO capital expenditure (nominal)

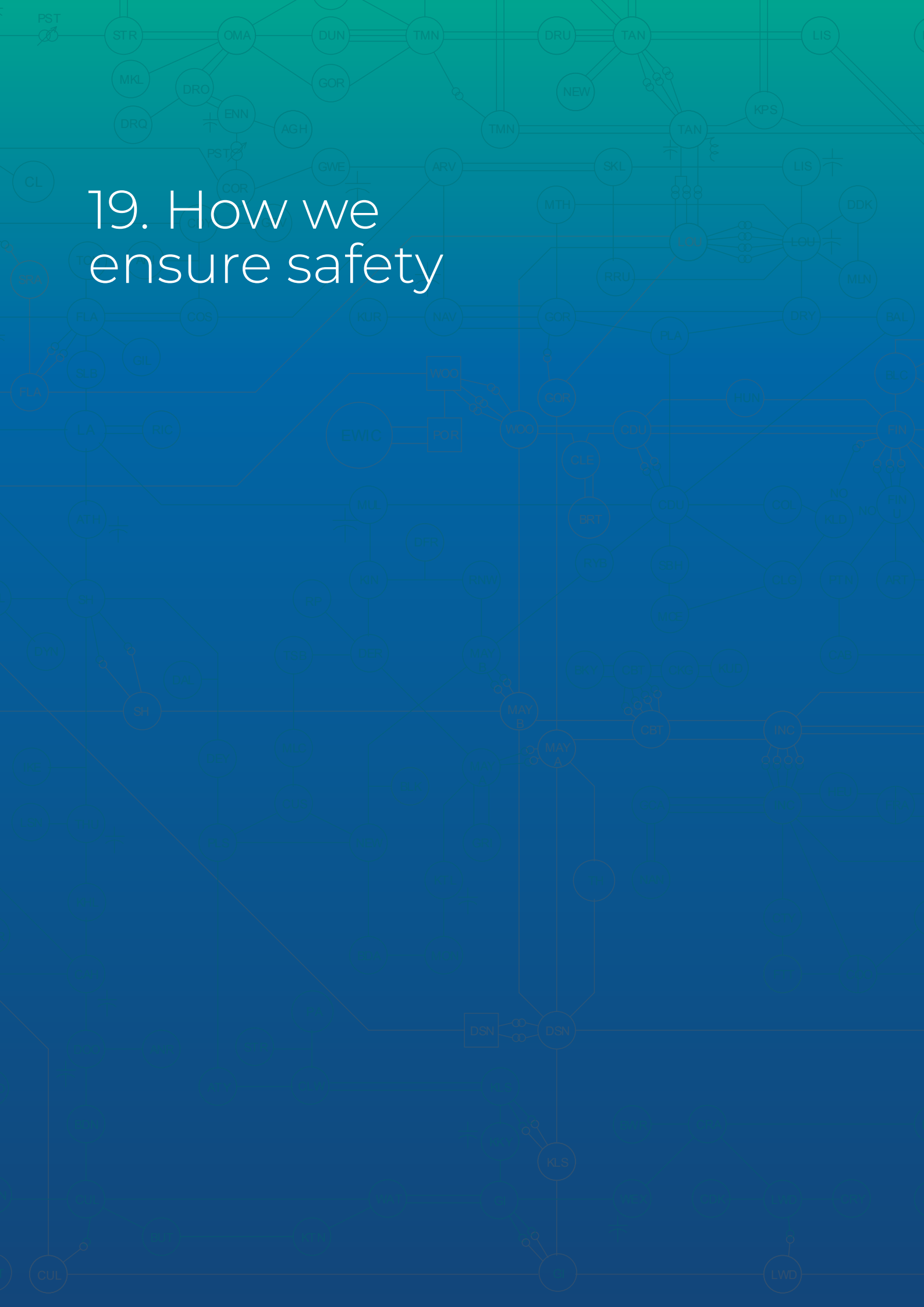
	PR4	PR5	
	2020 €m	2021 €m	2022 €m
Gross capital expenditure	144	182	221
Customer contributions	(11)	(37)	(28)
Total regulatory spend	**133**	**145**	**176**

35 https://www.eirgridgroup.com/site-files/library/EirGrid/20230515_External_NDP_Report.pdf

Table 22: TAO Regulated Asset Base (RAB) (nominal)			
	PR4	PR5	
	2020 €m	2021 €m	2022 €m
Closing net book value	**2,556**	**2,663**	**2,713**

Table 23: TAO operating expenditure (nominal)			
	PR4	PR5	
	2019 €m	2021 €m	2022 €m
Transmission operations	2	3	3
Planned & fault maintenance	22	18	23
Asset management	1	1	1
Non-controllable costs	26	33	29
Controllable costs	12	14	12
Total	**63**	**69**	**68**

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.

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.

2022 health and safety update

EirGrid maintained safe Management Controls in relation to Health & Safety which was successfully achieved.
In summary, there were no lost time accidents, environmental incidents or adverse events. 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.

2022 health and safety initiatives

Developments of note in 2022 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.
- Financial supports were put in place for remote working to ensure a safe and comfortable environment.

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.

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, and how we raise awareness about the importance of Safety, Health and Wellbeing among our staff and contractors, as well as the dangers of coming into contact with, or close proximity to, our electricity networks and equipment for the general public.

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. The National Standards Authority of Ireland (NSAI) recognised the continued effort and commitment that is required to continuously drive safety improvements. In 2022, ESB Networks further aligned their ISO 45001 surveillance audit with our CRU TAO licence condition to conduct an independent public safety audit to help streamline and bring efficiencies to ESB Networks safety management system. 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, 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.
- 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. A Mobile App for 'stop work notices' is used to allow staff to easily log these positive safety interventions and to indicate if the Health and Safety Authority (HSA) 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 HSA approved Codes of Practice in relation to electricity.

Communications and engagement

Our customers are at the heart of everything we do, and 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 campaign messaging of 'Are You Sure It's Safe?' and 'Stay Safe, Stay Clear' public safety advertising marketing campaigns helps encourage the public to stop and think of the danger when they are close to the electricity network. This campaign has continued to resonate with our four key at risk groups since its creation in 2016 and maintained awareness levels at 85-95%. To maintain engagement, the campaign had been revamped and re-launched 'Are You Sure It's Safe?' advert in Q4 2021.

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

Stakeholder education and awareness

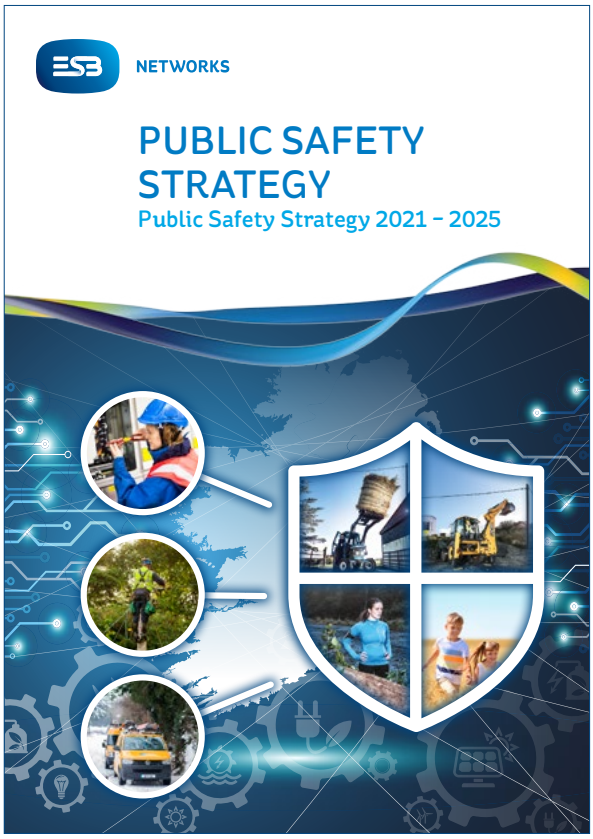
In 2022, we continued to implement our Public Safety Strategy 2021-2025, which is anchored in the core purpose of our business and continues to be a core strategic priority and area of focus for ESB Networks.

A number of Electrical awareness sessions were held with the Local Authority Safety Officers Group and various Local Authority areas during 2022 with approximately 850 staff engaging in the sessions.

Through our partnership with the Irish Farmers Journal, we ran eight adverts/ articles which were issued to both their online and offline readers (+235K from the farming audiences). Our informative videos during Farm Safety Week 2022 along with ESB Networks own social media channels reached over 600K individuals.

Our 'Safe Family Farms' partnership with the Irish Farmers Journal continued into its eighth year, with 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.

Our partnership with the Construction Industry Federation (CIF) resulted in a strong focus on electricity for Construction Safety Week, with electricity recognised and promoted as one of the five key construction risks via a webinar discussion titled – 'Safe Control of Hazardous Energies'. This panel discussion was chaired by our partners in the Joint Utility Safety Forum with contributors from other CIF member bodies.



20. How we manage our environmental footprint

EirGrid Group has a target to cut our organisation's energy consumption in half by 2030.

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 (SBTi) in March 2022.

From the baseline year of 2019, EirGrid is committed to reducing absolute scope 1 and 2 greenhouse gas emissions 50% by 2030. EirGrid also aims to reduce scope 3 greenhouse gas emissions from dispatch balancing services by 35% per MWh of overall system demand and reduce all other absolute scope 3 emissions 30% by 2030. In March 2023, we completed our second assessment of the carbon footprint for the years 2021 and 2022. In calculating our emissions, we considered all business operations, including emissions from areas such as office energy usage, purchased goods and services, and employee commuting and business travel. Further information can be found in EirGrid's 2022 Annual Performance Report[36]

Since 2019, we have observed a significant decrease in both our business travel carbon footprint and our employee commuting carbon footprint. This is due to increased use of technology to facilitate virtual meetings in place of in-person meetings and changes in our employee commuting habits, inclusive of the impact of the hybrid working model.

Notwithstanding the above improvement, in 2022, energy use in our offices rose by 9.8% compared to 2021, due to staff returning to the office and an expansion in the scope of our activities since the baseline year. Significant increases in capital goods, and purchased goods and services have resulted in an increase in our carbon footprint. We remain focussed on reducing our carbon footprint and are developing an intervention plan baselined against the latest assessment.

The sources of energy usage for EirGrid sites are electricity and natural gas. In 2022 EirGrid consumed 3,473 MWh of energy in our six office locations. This energy use can be broken down as follows:

- 2,650 MWh of electricity.
- 823 MWh of gas.

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With Gas Networks Ireland, we continued to co-chair the 'Low Carbon Pledge 'Leaders' Group as part of our commitment to Business in the Community. In 2022, 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, degradation, prevent pollution 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.

Finally, in 2022 EirGrid continued to bear the Business Working Responsibly Mark. This is the leading standard for CSR and Sustainability Certification in Ireland.

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 SEA and AA covers the period 2017-2022. They integrate Ireland's Grid Development Strategy, the approved Transmission Development Plan (TDP) and the Grid Implementation Plan 2017-2022 which includes policies and objectives that guide sustainable grid development. In December 2022, we consulted on the SEA for our new Grid Implementation Plan 2023-2028.

In parallel with each TDP and associated consultation, an annual Environmental Appraisal Report (EAR) for each TDP is published. This ensures any new projects in subsequent TDPs are consistent with the strategic environmental objectives of the SEA.

The TDP (2021-2030) was published by EirGrid in August 2022, which included an Environmental Appraisal Report (EAR)[37]. A commitment of the SEA process is to conduct an environmental appraisal for each TDP. 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 SEA were considered best practice in peer-reviewed research instigated by the Environmental Protection Agency. We continued to monitor and report on the environmental impact of Grid Implementation Plan 2017-2022 throughout its cycle. The results of monitoring will help us reduce the environmental impact of future plans in consultation with stakeholders including the Environmental Protection Agency (EPA).

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.

37 https://www.eirgridgroup.com/site-files/library/EirGrid/Transmission-Development-Plan-2021-2030-Environmental-Appraisal-Report.pdf

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.

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. See ESB Networks' Policy Statement on the Environment[38].

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, prioritize, 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 2022, ESB Networks EMS underwent a recertification audit by an external Certification Body, against the requirements of the ISO 14001:2015 standard. This Recertification Audit sampled a large range of activities within the scope of ESB Networks' certification. No major non-conformances were identified by the Auditors during any EMS Audits in 2022. Following the process, ESB Network EMS was recertified in line with ISO 14001:2015.

Managing the environment during construction

In line with our commitment to deliver PR5 by 2025 and in keeping with our ESB Networks strategy, Environmental management is a key consideration in the design and construction stage of all our projects.

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 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, Waste Management Plans, etc.) is key to

38 https://www.esbnetworks.ie/docs/default-source/publications/esb-networks-policy-statement-on-the-environment.pdf?sfvrsn=c85b249f_12

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, etc.

The Waste Enforcement Regional Lead Authorities (WERLA) oversees enforcing waste regulations and ensuring the appropriate handling of construction and demolition waste at a national level. In 2022, ESB Networks provided WERLA with data on their 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 2022, ESB Networks had three Local Authority notifiable leaks of 2,108 litres related to the Transmission fluid-filled cables Network. You will find detail of cable leaks on our website.

In 2022, approximately 114.21 kgs of sulphur hexafluoride (SF6) was emitted due to equipment faults on transmission switchgear. SF6 is used in most of ESB Networks' high – voltage switch gear on the Transmission network. It is used because of its very high electrical insulating properties which facilitate efficient and safe operation of the switchgear. Emissions 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 we replace and repair our older switch gear.

Acronyms

AA	Appropriate Assessment
AIF	Agile Investment Framework
APR	Annual Performance Report
ATR	Associated Transmission Reinforcement
AUoS	Additional Use of System
BESS	Battery Energy Storage System
CA	Capital Approval
CAP	Climate Action Plan
CAP21	Climate Action Plan 2021
CAP23	Climate Action Plan 2023
CEF	Connecting Europe Facility
CHP	Combined Heat & Power
CIF	Construction Industry Federation
CINEA	European Climate, Infrastructure and Environment Executive Agency
CPP	Committed Project Parameters
CRU	Commission for Regulation of Utilities
DECC	Department of Environment Climate and Communications
DPMS	Digital Performance Monitoring System
DS3	Delivering a Secure Sustainable Power System
DSM	Demand Side Management
DSO	Distribution System Operator
DSUs	Demand Side Units
DUoS	Distribution Use of System
EAR	Environmental Appraisal Report
ECP	Enduring Connection Policy
EIA	Environmental Impact Assessment
EMFs	Electric and Magnetic Fields
EMS	Environmental Management System
ENS	Energy Not Supplied
EPA	Environmental Protection Agency
EPC	Engineer Procure and Construct
ESEG	Energy Security Emergency Group
ESRI	Economic and Social Research Institute
FAQ	Firm Access Quantity
FID	Final Investment Decision
EI	Energisation
EU	European Union
GCA	Grid Connection Assessment
G-PST	Global Power System Transformation
HSA	Health and Safety Authority
HS&E	Health, Safety & Environmental
HVDC	High Voltage Direct Current
IPD	Investment Planning and Delivery
I-SEM	Integrated Single Electricity Market
JEERT	Joint Energy Emergency Response Team
JPMO	Joint Programme Management Office
JSOP	Joint System Operator Programme
LSoS	Local Security of Supply
MEC	Maximum Export Capacity
MIC	Maximum Import Capacity
MSP	Microsoft Project Server
MW	Megawatts
MVA	Megavolt Ampere
NDP	Network Delivery Portfolio
NECC	National Emergency Coordination Centre
NECG	National Emergency Coordination Group

NESF	National Energy Security Framework
NSAI	National Standards Authority Ireland
NSEE	Network Stakeholder Engagement Evaluation
OHSAS	Occupational Health and Safety Assessment Series
ORESS	Offshore Renewable Electricity Support Scheme
PA	Project Agreement
PCI	Project of Common Interest
PID	Project Initiation Document
PIP	Project Implementation Plan
PMBOK	Project Management Body of Knowledge
PMIS	Project Management Information System
PMM	Project Management Methodology
PMO	Project Management Office
PR4	Price Review Four
PR5	Price Review Five
PSECP	Power System Emergency Communications
PV	Solar Photovoltaic
QTP	Qualifier Trial Process
RAB	Regulatory Asset Base
RA's	Regulatory Authorities
RAID	Risk, Assumptions, Issues and Dependencies
RDD	Renewables Dispatch Down
RES-E	Renewable energy sources for electricity
RGI	Renewables Grid Initiative
RoCof	Rate of Change of Frequency
RTE	Réseau de Transport d'Électricité
SBTi	Science Based Targets initiative
SEA	Strategic Environmental Assessment
SEM	Integrated 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
SO's	System Operators
SONI	System Operator Northern Ireland
SOEF	Shaping Our Electricity Future
TAO	Transmission Asset Owner
TCG	Transmission Constraint Group
TEG	Temporary Emergency Generation
TES	Tomorrow's Energy Scenarios
TII	Transport Infrastructure Ireland
TLAFs	Transmission Loss Adjustment Factors
TOL	Technical Operating Limit
TOP	Transmission Outage Programme
TRL	Technical Readiness Level
TSO	Transmission System Operator
TSSPS	Transmission System Security and Planning Standards
TUoS	Transmission Use of System
UFLS	Under-Frequency Load Shedding
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