



NETWORKS



EIRGRID

Delivering a cleaner energy future



Annual Electricity Transmission Performance Report 2020

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Welcome

Welcome to the fourth 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.

2020 was the first year of the new [EirGrid Group Strategy \(2020-2025\)](#) – a strategy aimed at de-carbonising the island's electricity system, with a key target of delivering 70% renewable energy on the power system in Ireland by 2030. This target was informed by the Irish Government's Climate Action Plan (CAP) (2019) and reinforced in the Programme for Government agreed in June 2020. This was followed by the Climate Action and Low Carbon Development (Amendment) Bill in October 2020. This bill commits Ireland, in law, to move to a carbon neutral economy by 2050. It also requires the government to revise and update the CAP on an annual basis. EirGrid's 2020-25 Strategy aligns with the CAP – we are key contributors to 14 out of the 21 actions for the electricity sector in this plan.

ESB Networks strongly supports and is fully committed to the delivery of the CAP and Ireland's decarbonisation targets. Connecting and hosting renewables on our network is a key component of ESB Networks' strategy to 2030. We develop and maintain our infrastructure with full appreciation of the customer and system needs that are evident today, and that will emerge as a result of the Climate Action Plan and beyond. ESB Networks' strategy is fully aligned with the delivery of the CAP objectives and reflects our pivotal role in delivering the smart electrical systems and infrastructure necessary to decarbonise Ireland's energy consumption in the electricity, transport and heating sectors.

Renewable generation accounted for 42.1% of all electricity consumed in Ireland during 2020¹. This meant we exceeded the EU Renewable Energy Directive (2009/28/EC) target of 40% renewable electricity by 2020. This was a significant accomplishment, given the challenge of integrating high levels of renewable generation whilst ensuring the electricity system remains stable and the supply secure. This demonstrates that Ireland is a world leader in renewable energy. We are now moving onto our next target, delivering at least 70% of Ireland's electricity from renewable sources by 2030.

2020 was an important year in bringing a successful conclusion to the Price Review 4 (PR4) period (2016-2020) and saw the publication of the decision on the Price Review 5 (PR5) period (2021-2025). The PR5 submissions were influenced and shaped by the objectives and vision set out by Commission for the Regulation of Utilities (CRU) in relation to the process on grid delivery, decarbonisation and local security of supply and will enable us to meet the Government's Climate Action Plan targets. In each instance these are underpinned by cost efficiency and a regulatory framework which supports the delivery of value to customers. In December 2020, following a thorough examination and review, the CRU published their decision on TAO and TSO PR5 revenues.

The COVID-19 pandemic created an unprecedented and challenging backdrop to 2020. The priority for EirGrid and ESB Networks during this period was to ensure public health and security of supply to critical infrastructure such as hospitals, care facilities and generators. Both organisations adapted to the new circumstances and, despite the challenges, stayed focused on developing and maintaining the transmission system. 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 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 us at: esbnetworks@esb.ie/info@eirgrid.com

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.

ESB is the Transmission Asset Owner (TAO) and its business unit ESB Networks carries out the licensed TAO functions. ESB Networks is therefore responsible for building works and carrying out the physical maintenance as identified by EirGrid. We work closely together to ensure that all steps in the development and construction of grid infrastructure are carried out as efficiently and cost effectively as possible.

¹ EirGrid System and Renewable Reports - [Fuel Mix 2020](#)

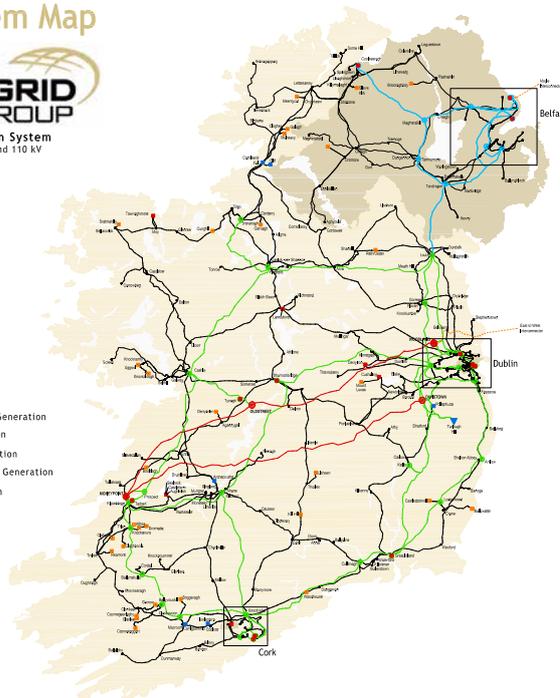
What is the Electricity Transmission System?

Transmission System Map



Transmission System
400, 275, 220 and 110 kV
January 2020

- 400kV Lines
 - 275kV Lines
 - 220kV Lines
 - 110kV Lines
 - 220kV Cables
 - 110kV Cables
 - HVDC Cables
 - 400kV Stations
 - 275kV Stations
 - 220kV Stations
 - 110kV Stations
- Transmission Connected Generation
- Hydro Generation
 - Thermal Generation
 - Pumped Storage Generation
 - Wind Generation



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 basis².

EirGrid is the Transmission System Operator (TSO), and ESB is the Transmission Asset Owner (TAO) and its ring-fenced business unit ESB Networks carries out the licensed TAO functions. 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 network, please see the 2020 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 on how to 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 2020. 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 2020.

EirGrid and ESB Networks also undertook an in depth review of mutual working arrangements during 2020. A new Infrastructure Delivery Charter was developed and agreed with joint committee structures underpinning the arrangements. 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.

² Please note that the Northern Ireland Transmission Network is included for illustration purposes only. It is not covered by this report

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. Since October 2017, all our projects go through this improved process. The joint EirGrid and ESB Networks' Investment Planning and Delivery Report which accompanies this report highlights the work carried out and project progress in 2020.

2020 was the first year of EirGrid's [Strategy 2020-25](#), the aim of which is to *Transform the Power System for Future Generations*. It identifies the scale of shared ambition required to meet our 2030 Climate Action Plan targets, in addition to developing a robust and secure grid which meets the requirements of our economy and society into the future.

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 position to consumers and stakeholders while improving efficiencies in grid development.

During 2020, EirGrid and ESB Networks continued to partner with some of the biggest companies in the world, to foster jobs and prosperity across the country. In particular, 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.

Summary of 2020

It was a challenging year for the transmission capital programme given the impacts of COVID-19 on the development and delivery programmes. The COVID-19 related restrictions, introduced on public health grounds in 2020 and continuing into 2021, created a number of specific challenges with respect to developing the transmission system and completing transmission projects during 2020. Most notably the first lockdown in March 2020 closed many TAO and customer sites for two months causing disruption to projects in progress at that time.

Opportunities to recover the work programme and system outages were limited for the remainder of 2020. COVID-19 restrictions continued to impact work practices throughout the year, for example, the limitations imposed on close proximity working in stations and on cable jointing activities. Overall, this resulted in the deferral of a significant amount of transmission capital work and expenditure to 2021.

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

Notwithstanding the challenges faced by the TSO and TAO during the COVID-19 pandemic, a total of 15 projects were completed in 2020 (against 11 in 2019, 40 in 2018 and 31 in 2017) including new and upgraded transmission stations and circuits.

The following projects were completed and/or energised in 2020:

- Two new 110 kV circuits totalling 57km of new circuits connected to the transmission system.
- Four projects which will facilitate the connection of TSO/DSO renewable/battery storage connections.
- Four projects which will facilitate demand customer connections (Including Belcamp and Castlebagot below)
 - The energisation of the 220 kV transmission station at Belcamp, North County Dublin. Note: While construction of this station was complete in 2019, the station was finally energised in December 2020.
 - The Castlebagot 220 kV station was successfully energised on 26th March 2020 (168 MW MEC). The new station will support large manufacturing industries and datacentres in the area. Castlebagot is one of the largest substations on the transmission network – with eight 220 kV bays, twelve 110 kV bays, four 250 MVA 220/110 kV transformers, four new 220 kV cable circuits and five new 110 kV cable circuits. Note: This project, although energised in 2020, is still ongoing and is not included in the 15 completed projects.
- Completion of the final works and energisation across the multi-year phases of the Moneypoint 400/220/110 kV project;
- Completion of two ATR projects, both located in the West of Ireland. The completion of these ATRs alleviates constraints and strengthens the transmission network in this area.
- Diversion of two overhead circuit sections to facilitate third party customer construction requests.
- Diversion of one underground cable to facilitate a third party customer construction request.

In 2020, 52 new projects were added to the PR4 programme³ in addition to the 272 projects set out at the start of 2020. This compares to 21 projects added in 2019, 17 projects added in 2018 and 16 projects added in 2017.

There were a number of works completed in 2020 which are part of the scope of on-going projects. These projects will be completed in future years:

- Works continued on the Finglas 220 kV station with the Shellybanks, Corduff 2, T2106, T2104 and Huntstown bays transferring to new protection schemes.
- Aghada 220 kV Station Busbar Reconfiguration -T2011/12 Protection Works and the F0-A/ F0-B Installation.
- Great Island 110/38 kV DSO transformer and bay works.
- Killonan 220 kV Station Refurbishment - Killonan Station Works, Limerick 2 Diversion.
- Kilpaddoge 220/110 kV station, Killonan - Tarbert Loop-in to Kilpaddoge.
- Cashla Tynagh 220 kV Line Fibre Wrap, partial completion due to land access issues.

Further details are set out in our 2020 Annual Investment Planning and Delivery report.

³ Further detail on these 52 new projects can be found in the 2020 Annual Investment Planning and Delivery report on EirGrid and ESB Networks websites

Key Performance Summary Matrix

Metric	Section of report	2020 Target	2020 Performance	2020 Incentive outturn	2019 ⁴ Performance	2018 ⁵ Performance	2017 ⁶ Performance
TSO Strategic Incentives	<i>"How EirGrid performed against strategic incentives" Page 16</i>	Target: 5 incentive metrics with a total incentive pot available of €1.675m.	38%	€0.629m	Target: 5 incentive metrics with a total incentive pot available of €1.675m. Performance: 60% success Incentive: €1.009m	Target: 3 incentive metrics with a total incentive pot available of €0.4m. Performance: 63% success Incentive: €0.25m	Target: 6 incentive metrics with a total incentive pot available of €1.25m Performance: 82% success Incentive: €1.023m
TSO Transmission System Performance System Frequency (SF) System Minutes Lost (SML)	<i>"How EirGrid manage system performance" Page 18</i>	94%	99.67%	€0.231m	Target: 94% Performance: 99.66% Incentive: €0.238m	Target: 94% Performance: 99.6% Incentive: €0.33m	Target: 94% Performance: 99.5% Incentive: €0.33m
		less than 1.5 SML	0.0645 SML	€0.231m	Target: 1.5 – 3 Performance: 0.176 Incentive: €0.238m	Target: 1.5 – 3 Performance: 0.411 Incentive: €0.33m	Target: 1.5 – 3 Performance: 0.3 Incentive: €0.33m
TSO management of curtailment	<i>"How we manage network constraints" Page 22</i>	N/A	11.4% of the total available wind energy (12,656,376 MWh) was dispatched down. Of that 47% was related to curtailment volumes.	N/A	6.9% of the total available wind energy (10,293,287 MWh) was dispatched down. Of that 44.93% was related to curtailment volumes.	5% of the total wind energy available i.e. 9,184,961 MWh was dispatched down. Of that, 66.2% was related to curtailment volumes.	3.7% of the total wind energy available i.e. 7,532,359 MWh was dispatched down. Of that, 71.6% was related to curtailment volumes.
TSOs' Imperfections savings for participants	<i>"How we manage constraint costs" Page 23</i>	No Incentive was applied in this period ⁷ .	N/A	N/A	No Incentive was applied in this period.	Performance: The outturn imperfection costs were €12.6m lower than the adjusted baseline in tariff year 2017/18. Incentive: €0 ⁸	Performance: The outturn imperfection costs were €15.3m lower than the adjusted baseline in tariff year 2016/17 Incentive: €0.46m ⁹
TSO's Stakeholder Engagement	<i>"Engaging with stakeholders" Page 35</i>	10	7.3	€0.238m	Target: Improved Stakeholder Engagement Performance: Score of 7.5 (out of 10) Incentive: €0.254m	Target: 10 Performance: Score of 7.14 (out w of 10) Incentive: €0.23m	N/A

4 2019 [APR](#) and [IPD](#)

5 2018 [APR](#) and [IPD](#) paper

6 2017 [APR](#) and [IPD](#) paper

7 Regarding the tariff year 2019/20, it was determined by the RAs that no incentive would apply for this period. The TSOs provided a Reforecast report to the RAs for tariff year 2019/20, where they compared the ex-ante imperfections allowance with the ex-post adjusted baseline and the outturn costs

8 See [SEM-19-040](#)

9 See [SEM-18-047](#)

Metric	Section of report	2020 Target	2020 Performance	2020 Incentive outturn	2019 Performance	2018 Performance	2017 Performance
TSO Investment Planning and Delivery Balanced Score Card	<i>"How we performed against transmission delivery incentives"</i> Page 12	Target: 5 Incentive Metrics [total incentive available 2% TSO Opex]	Due to Covid Restriction the Audit for 2020 was not completed prior to the revenues being set. The RAs have allowed for an assumed 'Acceptable' outcome 100k. The actual outturn will be reported in future years reports.	€0.1m	Target: 5 Incentive Metrics [total incentive available 2% TSO Opex] Performance & Incentive: 'Acceptable' €0.01m	Target: 5 Incentive Metrics [total incentive available 2% TSO Opex] Performance & Incentive: 'Strong' €0.94m	N/A
TSO Delivering New Connections -ECP-1	<i>"How we manage new connections"</i> Page 28	Issue connection offers to all applicants in the '2018 Batch' as defined in the CRU Decision on ECP-1 (CER/18/058) by the target date of 31 May 2020	All connection offers were issued by the TSO by the 31 May 2020	€0.629m Full incentive achieved	N/A	N/A	N/A
TSO/TAO Transmission Capital Outage Programme Delivery	<i>"How we ensure network resilience"</i> Page 19	TSO/TAO: 100% TSO:>75% ¹⁰	86%	See TSO Investment Planning and Delivery Balanced Score Card above ¹⁰	TSO/TAO Target: 100% TSO target:>75% Performance: 72% Incentive: 'Acceptable' ¹⁰	TSO/TAO Target: 100% TSO target:>75% Performance: 83% Incentive: 'Strong' ¹⁰	Target: 100% Performance: 80% Incentive: N/A
TAO Completion of the Transmission Maintenance Work Programme	<i>"How we ensure network resilience"</i> Page 19	100%	89%	N/A	Target: 100% Performance: 81% Incentive: N/A	Target: 100% Performance: 84% Incentive: N/A	Target: 100% Performance: 75% Incentive: N/A
TAO Capital Expenditure ¹¹	<i>"Network Development"</i> Page 39	CRU Capex Monitoring Process	€144m	N/A	Target: CRU Capex Monitoring Process Performance: €154m Incentive: N/A	Target: CRU Capex Monitoring Process Performance: €196m Incentive: N/A	N/A Target: CRU Capex Monitoring Process Performance: €180m Incentive: N/A
TAO Operational Expenditure	<i>"Network Development"</i> Page 39	CRU Opex Monitoring Process	€66m	N/A	Target: CRU Opex Monitoring Process Performance: €63m Incentive: N/A	Target: CRU Opex Monitoring Process Performance: €60m Incentive: N/A	Target: CRU Opex Monitoring Process Performance: €57m Incentive: N/A

10 EirGrid TSO has a target to achieve >75% completion of key projects included in the Transmission Outage Plan (CRU/20/039). This metric forms part of the TSO Investment Planning and Delivery Balanced Score Card assessment above.

11 There is no direct incentive related to TAO Capital Expenditure. There is a related incentive to project delivery in section 5

Metric	Section of report	2020 Target	2020 Performance	2020 Incentive outturn	2019 Performance	2018 Performance	2017 Performance
TAO Project Delivery Incentive	<i>"How we performed against transmission delivery incentives" Page 12</i>	4 Incentive Metrics [total incentive available 4.15% TAO Opex]	Full incentive of 4.15% TAO Opex achieved	Full incentive of 4.15% TAO Opex awarded	Target: 4 Incentive Metrics [total incentive available 4.15% TAO Opex] Performance & Incentive: Full incentive of 4.15% of TAO Opex awarded	Target: 4 Incentive Metrics [total incentive available 4.15% TAO Opex] Performance & Incentive: Full incentive of 4.15% of TAO Opex awarded	Not applicable for 2017
TAO Management of planned outages	<i>"How we performed against transmission delivery incentives" Page 12</i>	No more than 10,785 transmission outage days	9,842 actual transmission outage days	€0.54m	Target: 8,240 scheduled outage days Performance: 7,590 outage days Incentive: €0.49m	Target: 5,410 scheduled outage days Performance: 5,201 outage days Incentive: €0.49m	Target: 9,291 scheduled outage days Performance: 9,024 outage days Incentive: €0.47m



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, by applying downward pressure on the cost of electricity, enhancing Ireland's security of electricity supply, and facilitating our national transition to a low-carbon economy.

In 2020, as part of Step 4, a public consultation took place on the Emerging Best Performing Options along with further engineering and environmental surveys. In November 2020, on conclusion of Step 4 in our six step Grid Development process, the Best Performing Option Decision was published. This was an important milestone in the project's development

The interconnector power cables will reach landfall in Ireland at Claycastle Beach in Youghal. From there they will travel underground to the converter station at Ballyadam and then on to the substation at Knockraha, also by way of underground cables.

An enhanced community benefit scheme will be established for the Celtic Interconnector project and we will work with the affected communities on this.

We would like to thank all of our stakeholders who have contributed to the process to date. EirGrid will continue to engage with all stakeholders as the project develops.

For up to date information please see our website that is updated regularly [here](#).

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
(working in partnership)



700 MW

capacity
(450,000 homes)

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 [CER/18/087](#). These incentive arrangements apply from 2018 to 2020.

TAO Incentives

Project Delivery Incentive Performance

In May 2018, a new TAO Project Delivery incentive arrangement for TAO was introduced, as detailed in [CER/18/087](#) (Decision 6), outlining the new Investment Delivery TAO performance metrics to apply in the period 2018 to 2020. Detailed scorecard metrics are further defined in [CRU/19/150](#) outlining the specific TAO Project Delivery measures. The TAO Project Delivery incentive includes both qualitative and quantitative targets. The performance against the scorecard is assessed each year by independent auditors and the audit results assist the CRU in determining the incentive outturn.

The existing incentive on the TAO's management of outages was retained in CER/18/087 (Decision 8).

At the time of publication of the 2019 Electricity Transmission Performance Report, the results of the 2019 Project Delivery incentive were not available to report as the independent audit assessment had been deferred due to the impact of Covid-19 public health restrictions. The 2019 and 2020 Project Delivery incentive performance reports and audit assessments were completed using remote working arrangements in April 2021 and both years results are contained in this report.

The TAO 2019 and 2020 Project Delivery incentives performance audit reports assessed TAO incentive performance for 2019 and 2020 as "Strong" in their recommendation to CRU. The final 2019 and 2020 incentive performance reports were submitted to CRU in May 2021 and received CRU approval in June 2021, resulting in full incentive payment outturn for the TAO Project Delivery incentives for both 2019 and 2020

The following table outlines the breakdown of the various elements of the TAO incentives and the TAO performance in each category in the years 2016-2020. It also illustrates how the breakdown of incentives changed in 2018, due to the changes introduced by CER/18/087:

TAO Incentive Performance 2016-2020

TAO Incentives	2016	2017	2018	2019	2020
Outage Management Performance	0.85%	0.85%	0.85%	0.85%	0.85%
Project Implementation Plans (PIP's) Issued	0.40%	0.40%	N/A	N/A	N/A
Construction and Energisation Completed	3.75%	3.75%	N/A	N/A	N/A
Project Delivery - 4 Incentive Metrics	N/A	N/A	4.15%	4.15%	4.15%
Confirmed Incentive Payment (as a % of TAO Opex)	5%	5%	5%	5%	5%

Notes:

1. N/A indicates that this incentive line item is not applicable in that year.
2. A penalty would be indicated as a minus figure. There are no penalties in this period.
3. A full incentive payment of 5% of TAO Opex = €3m approx.
4. The TAO Investment Delivery Incentive includes 4 Incentive Metrics – See below for details

The new incentive arrangements for 2018-2020 retain the established Outage Management Incentive and include a new Project Delivery Incentive. The new Project Delivery Incentive replaces the previous Project Implementation Plan (PIP) and Construction/Energisation incentives.

As proposed by ESB Networks and approved by CRU, the new Project Delivery Incentive is made up of four components which include both quantitative and qualitative elements. The four components of the Project Delivery Incentive are assessed and independently audited.

The four metrics making up the Project Delivery incentive are:

1. Project Implementation Plans

PIPs are the committed programme of work for a new project. The PIP is the baseline schedule against which the work is planned and progress is monitored. The TAO 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.

3. Transmission Capex Spend

The TAO performance is measured by the actual percentage of the Budgeted Annual CAPEX spend delivered in 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 rigor of its processes for identifying and implementing efficiencies and improving processes in project delivery.

The potential incentive performance payment to TAO available under the Project Delivery incentive for 2019 and 2020 is 4.15% of TAO Opex.

The Project Delivery Incentive performance for 2019 and 2020 against the above measures is outlined below:

	Project Delivery Measure	2019	2020
1	Project Implementation Plans	23	30
2	Customer Project Energisations	8	3
3	Transmission Capex Spend	€167m	€183m
4	Process Improvements	See below	See below

The following 2019 and 2020 process improvements were implemented in the TAO business and submitted for independent audit and to CRU:

Project Delivery Incentive performance 2019

Technical Operating Limit (TOL)

The enduring Technical Operating Limit (TOL) process involves TAO providing a TOL to TSO for newly constructed assets. The new set of TOL requirements and the associated processes help improve flexibility in operating the Transmission system. The operation of this process has improved the effectiveness of the overall Project Delivery and energisation processes operated jointly by TAO and TSO. This improved process allows the TSO to fully and safely utilise the asset to its limit in all operational conditions with increased levels of confidence and assurance.

Transport Infrastructure Ireland (TII) Protocol

TII have responsibility for all national road infrastructure development in Ireland and are a very important stakeholder of national importance. TII, ESB Networks and EirGrid have responsibilities to manage and protect their respective infrastructures and to meet their customer and stakeholder requirements. Infrastructure development is substantially de-risked where the requirements, complexity and timelines of all the affected infrastructures are considered early in the planning process. Based on lessons learned and a new pilot project, all three parties worked together to examine, strengthen, document and agree a new protocol and new set of working arrangements to ensure all parties requirements are identified and managed at the early stage of project development to avoid any downstream delays to delivering projects.

Project Delivery Incentive performance 2020

Contestable Construction Process

For customers connecting to the transmission system, contestable rules allow the customer to make their own arrangements for building the new connecting transmission assets in accordance with the required specifications. When the project is complete these transmission assets may transfer into the ownership of the TAO for maintenance and operation according to the existing arrangements between TSO and TAO. In recent years, there has been an increase in the number of major new loads and new renewable generator connections adopting contestable build arrangements and the numbers are predicted to increase year on year. TAO has improved contestable connection due diligence processes with improved turnaround times to meet present and future project delivery challenges on the transmission system.

Planning Discharge Monitoring and Reporting

TAO is responsible for discharging the planning conditions with local authorities and other agencies that are set out in the planning permission and other permits for both the pre-construction and construction stages. Failure to discharge a planning condition in a timely and comprehensive way can be costly in terms of both time and money for a project. A proactive process improvement initiative was undertaken to provide real-time leading indicators and a dashboard showing the status of planning discharge for projects in progress. The new process improves visibility and governance on the status of planning discharge on all TAO projects. The process ensures compliance with all planning requirements in a timely manner and gives assurance to the key stakeholders involved.

Outage Management Incentive Performance

The Outage Management Incentive for 2020 was submitted and approved. Outage targets are designed to improve the availability of the network by reducing outage durations and providing greater certainty to all affected parties on expected start and finish dates. In 2020 there were a total of 10,785 scheduled transmission outage days. The incentive requirement is not to exceed the scheduled days by more than 5%. The total actual outage days were within target at 9,842 days at year end. The incentive available to the TAO is 0.85% TAO Opex (€0.54m) for its management of planned outages in 2020. ESB Networks delivered on all its targets relating to these outages and was granted the full incentive.

TSO Transmission Delivery Incentive

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.

The CRU published the Balanced Scorecard Framework for assessing TSO Performance on Investment Planning and Delivery Information Paper ([CRU/20/039](#)), on 23 March 2020 alongside EirGrid's PR4 Investment Planning and Delivery Balanced Scorecard 2018 – 2020 Information Paper [here](#). Under Decision 5 of the CRU's Decision Paper [CRU/18/087](#), EirGrid will be assessed on the quality and rigour of its end-to-end processes for electricity transmission investment planning and delivery of infrastructure. The incentive payment shall be set by the CRU informed by an independent audit and performance will be graded as either "strong", "acceptable", or "below acceptable". If the TSO achieves "strong" performance, the TSO will receive a payment of 2% of its internal opex; "acceptable" performance will result in the TSO receiving payment equal to the reasonable cost of the audit to assess performance and "below acceptable" will result in a penalty of 2% of TSO internal opex.

There are five incentive metrics, split into two main areas: Investment Planning (50%) and Delivery (50%), aligned with EirGrid's 6 Step Process.

PR4 Balance Scorecard Framework

Area	Metric number/type	%	Steps of the 6-step process	(Strong) Full assurance: 2% payment	(Acceptable) Satisfactory assurance: 0% payment + recovery of reasonable audit cost	(Below Acceptable) Limited/ Unsatisfactory assurance: -2% penalty
Investment Planning (50%)	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	30%	Step 3			
Delivery (50%)	Metric 4 Qualitative	20%	Step 4-5			
	Metric 5 Quantitative	30%	Step 6	Greater than or equal to 75%	61-74%	Less than 60%

For the 2018 and 2019 Independent Audit Process, EirGrid's Head of Internal Audit and Compliance commissioned KPMG to carry out an independent review of EirGrid's adherence to the Agreed Upon Procedures (AUPs) pertaining to EirGrid's "six-step" approach to transmission infrastructure development. The findings of these audits were submitted to the CRU for their consideration. The outturn performance and CRU approved incentive payment/ penalty for 2018 was Strong (full assurance) resulting in an incentive award of €0.94m, and for 2019 was Acceptable (satisfactory assurance), resulting in an incentive award of €0.10m

Due to COVID-19 restrictions, the 2020 audit has yet to be completed and submitted to the CRU for consideration. EirGrid will include details of the outcome of the 2020 Audit in a subsequent Annual Electricity Transmission Performance report.

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.

In May 2018, the CRU published its Decision on Reporting and Incentives Framework under PR4, [CER/18/087](#). The Framework sets out twenty decisions for improving the previous reporting and incentives arrangements.

Decision 10 of CER/18/087 invites the TSO to propose metrics for its strategic incentives annually, under two broad headings;

- i. Delivering the energy transition to a low carbon future, and
- ii. Managing the costs and risks of the energy transition.

These are the metrics/criteria against which the TSO’s performance over 2020 was assessed. The 2020 indicators were consulted upon by the TSO before being submitted to the CRU for approval. The approved indicators are summarised in the table below.

Target	Description of Work
Increase SNSP	<ol style="list-style-type: none"> 1. Operational Policy to be deployed to the Control Centre to start 70% SNSP trial by end of 2020. 2. Three “Decision Making Tools” to be introduced in the Control Centre to enhance the stability analysis, voltage control and frequency management of a more complex system with a large penetration of renewables. 3. RoCoF transition from 0.5 to 1Hz/s across the island to cope with less inertia in the system caused by a large penetration of renewables. The TSO to confirm 1Hz/s policy by end of 2020.
Innovative Solutions	<ol style="list-style-type: none"> 1. The TSO to determine the feasibility of uprating existing 220kV towers to be operated at 400kV. The Tower Voltage Uprate technology will be applied to projects CP1017 and 966. 2. The TSO to study the use of Composite Poles as an alternative to traditional wood and steel poles structures.
Annual QTP	<ol style="list-style-type: none"> 1. The 12-months trial close out report of the 2018/19 QTP to be available in September 2020. 2. New 2020/21 QTP tender issued, evaluated and awarded by Q4 2020. 3. New technology trials demonstrating grid services underway from Oct 2020 and PID finalised by end 2020. The TSO aims for “contracts go live” at the end of October, with the trials commencing in Q4 2020.

Establish and mobilise DS3+	The TSO to identify the DS3+ key milestones to 2025 and publish these for consultation with stakeholders by Q4 2020
FlexTech	<ol style="list-style-type: none"> 1. 2nd and 3rd Industry Forums held by end 2020. 2. TSO to publish the response to the initial FlexTech consultation by Q3 2020. 3. The TSO to publish content/priority areas of the WGs and associated deliverables for 12 months by Q3 2020. 4. TSO to publish the FlexTech priorities for the next 3 years by Q3 2020.
DS3 System Services Procurement	<ol style="list-style-type: none"> 1. System services Gate 2: contract execution date for 12 services by 01 April 2020. 2. System Services Gate 3: publication in the OJEU of notice for the 12 services by April 2020; and 3. System Services Gate 3: contract execution date for 12 services by 1 Oct 2020.
Distributed Power Flow Control	<ol style="list-style-type: none"> 1. Complete Gateway 3 documentation for deployment of DSRs on selected OHL by Q1 2020. 2. Issue revised CPP to ESBN for deployment of DSRs by Q2 2020. 3. Prepare implementation plan and scoping of project in collaboration with ESBN and vendor by Q3 2020. 4. Secure outage window for 2021 outage plan by Q4 2020.
Digital Performance Monitoring System (DPMS)	<ol style="list-style-type: none"> 1. Business requirements for delivery of DPMS fully scoped in order to carry out procurement exercise by Q3 2020. 2. Publish Procurement Contract Notice by Q4 2020.

A total of €0.629m strategic incentives allowance relating to 2020 was approved by CRU against a total possible incentive allowance for 2020 of €1.675m. This compares to an incentive allowance of €1.009m in 2019 (against a total possible allowance of €1.675m), €0.25m in 2018 (against a total possible allowance of €0.4m) and an incentive allowance of €1.023m in 2017 (against a total possible allowances €1.25m).

The partial incentive allowance was mainly due to performance against the DS3+, SNSP and Flextech workstreams. The Establishment and Mobilisation of DS3+ was provisionally renamed “Operational Pathways to 2030” which is now one of the pillars of the Shaping Our Electricity Future Roadmap. It looks out to 2030 rather than 2025, which meant we missed the incentive deadlines in 2020. The Shaping Our Electricity Future Roadmap was published for consultation in Q1 2021 instead. There was also partial incentive awarded with regard increasing the System Non Synchronous Penetration (SNSP) limit. EirGrid completed the studies and operational policy to enable us to increase SNSP to 70% in 2020; however, the trials did not start until early 2021.

How EirGrid manage 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. Operational policies and procedures are reviewed on a continuous basis.

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.

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 2020 the system frequency was operated within the target operating limits of 49.9 Hz and 50.1 Hz for 99.67% of the time. In 2020, EirGrid achieved its full incentive amount of €0.231m in this regard. Also, EirGrid achieved the full incentive payments relating to 2019 (€0.238m), 2018 (€0.33m) and 2017 (€0.33m).

System Minutes Lost

System Minutes Lost (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. In 2020, there were 0.0645 System Minutes lost on the transmission system. In 2020, there were a number of 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 (UFLS) disturbances in 2020 which resulted in shedding of normal tariff load customers. In 2020, EirGrid achieved its full incentive amount of €0.231m in this regard. Also, EirGrid achieved the full incentive payments relating to 2019 (€0.238m) 2018 (€0.33m) and 2017 (€0.33m).

For further information see the [All Island Transmission System Performance Report 2020](#)

99.67%
EirGrid maintained system frequency in line with target 94% of the time

0.0645
In 2020, there were 0.0645 System Minutes Lost (SML) on the transmission system, significantly below the target level of 'less than 1.5 SML

How we ensure network resilience

EirGrid designs and plans the network in accordance with the Transmission System Security and Planning Standards and operates it in accordance with the Operating Security Standards while ESB Networks constructs and maintains the 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 network is designed in a way which guarantees this in a safe, secure and robust manner. The operation of the network 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 amount 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 2020 was €17m. 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 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 2020, the delivery of the critical maintenance programme was impacted by disruption to the outage programme as a result of COVID-19 restrictions. While the performance in delivering all maintenance works where an outage was scheduled was positive, a significant amount of maintenance works was deferred due to site closures during lockdown and the on-going disruption that public health restrictions caused to the 2020 outage programme.

The performance in completing the scheduled transmission maintenance programme in the period 2016 to 2020 is shown in the table below:

Transmission Maintenance - % Completion

2016	2017	2018	2019	2020
78%	75%	84%	81%	89%

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. The 2020 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 Transmission Outage Programme (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 2020 the TOP delivery percentage was 86%¹².

Delivery of the 2020 TOP was subject to a number of influencing factors including:

- COVID-19 restrictions experienced in 2020;
- 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.

Further Information on the Transmission Outage Programme can be found [here](#).

Network resilience in an ever changing system

One of our 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 seeks to address this issue. In April 2018, the power system moved to permanent system operation at 65% SNSP. This means we can securely operate the power system with up to 65% of the energy coming from newer forms of variable, renewable generation. In 2020, the system was operated above 60% SNSP for 1,310 hours. In 2021 we plan to carry out trials with an SNSP limit of 70% and if successful, then move to a trial with a limit of 75% SNSP.

It is also important to optimise delivery of maintenance on the transmission system in order to enhance its resilience. In 2020, critical maintenance plans were incorporated earlier in the transmission outage planning process giving higher priority to critical maintenance considerations in developing the outage plans and schedules. New policies also allow significant numbers of operational tests to be conducted remotely. In 2020, remote operational testing on double busbar stations was implemented. Whilst overall numbers of operational tests were down due to COVID-19 restrictions, the new policy allowed continued testing on critical assets to be conducted remotely.

Network resilience in Action

In 2020 there were a number of 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.

We are pleased to report that during these events, the protection equipment on the network ensured that the faults were resolved with minimal impact to customers.

¹² Includes an ex post adjustment for issues outside of the TSO and TAO's control

There were four adverse weather events which caused faults on the transmission system in 2020; however, only one led to power supply interruptions on the transmission system:

- On 9 February 2020, there was a single fault on a 220 kV circuit during Storm Ciara which was cleared in 61 milliseconds (ms).
- On 19 and 20 August, there were 3 faults during Storm Ellen, one at 220 kV and two at 110 kV which were cleared within 87 ms.
- On 25 August, there was a single fault on a 110 kV circuit during Storm Francis, which led to an interruption to end-users, resulting in 0.025459 system minutes lost.
- On 31 October, there was a single fault on a 110 kV circuit during Storm Aiden which was cleared in 65 ms

Blackstart Emergency Communications Plan (BCEP)

EirGrid held a Blackstart Emergency Communications Plan (BCEP) Exercise on 8th September 2020. The exercise centred around a fictional countrywide blackout event and simulated the communications plan that followed from this. The exercise was well attended by all relevant stakeholders. Participants included senior management and communications representatives from ESB Networks, Gas Networks Ireland, CRU, DECC and EirGrid. The main objectives of the exercise were successfully achieved and are as listed below:

- Provide participants with a good understanding of the procedures in the EirGrid BCEP (main objective)
- Provide participants the opportunity to engage with each other during BCEP meetings
- Familiarise participants with the current situation regarding the Tetra communications
- Identify deficiencies, if any, and put forward recommendations for consideration with a view to enhancing the BCEP procedures
- Test the logistics of using teleconferencing for BCEP meetings
- Test the effectiveness of remote problem solving between stakeholders during BCEP meetings conducted via teleconference.

How we manage Network Constraints

EirGrid implements system operational constraints, in conjunction with SONI the TSO of Northern Ireland, in order to maintain acceptable levels of system stability and voltage levels to enable efficient operation of the system. More information can be found in the [Operational Constraints Update](#) published in December 2020, which covers all the operational constraints in place at the end of 2020.

A review is carried out on all operational constraints annually. A review of operational constraints is also carried out if there have been significant network changes made to a particular area of the transmission system, connection of significant generation in an area of the transmission system, or closure of significant generation in an area of the transmission system. The TSO publishes updates to the Operational Constraints monthly and as required if any changes are made. EirGrid can report that all reports for 2020 were published in a timely manner and are available on EirGrid's website.

Ensuring efficient operation of the system is critical to maintaining a safe, secure and robust supply of electricity for end users and market participants. Scheduling operational constraints well in advance also ensures that they are accounted for in the market schedule, reducing the imperfections charge for market participants.

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 2020 Curtailment Volumes

Curtailment refers to the dispatch-down of wind for system-wide reasons. There are different types of system security limits that necessitate curtailment:

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 2020, 1,447,803 MWh or 11.4% of the Total Available wind energy (12,656,376 MWh) in Ireland was dispatched down. Of that 46.60% was related to curtailment volumes which amounted to 674,701 MWh. This compares to 319,252 MWh in 2019, 303,110 MWh in 2018 and 198,291 MWh in 2017. The Annual Renewable Constraints and Curtailment Report capturing this information in detail can be found located [here](#).

Curtailment levels are affected by a number of factors which vary year to year. For 2020, COVID-19 had the effect of reducing the demand across the first lockdown period which resulted in increasing levels of dispatch-down. In 2020, EirGrid and ESB Networks connected c.203 MW of windfarm projects which is made up of c.132 MW on the transmission system and c.71 MW on the distribution system. This is lower than the average annual wind connection level of about 370 MW over the previous 5 years.

In recent years significant capital works have been undertaken to upgrade the transmission system to allow more wind generation to be exported from wind farms on the system particularly in the North West and South West regions of Ireland. These areas have previously experienced the greatest level of restrictions for the export of wind. Every year a range of planned transmission outages are undertaken which at times will increase constraints. In particular during 2020, complex operational switching has been performed to maximise renewable output wherever possible across the transmission system. The total wind capacity installed in Ireland at the end of 2020 was 4323 MW.

More information can be found in the [Operational Constraints Update](#)

203 MW
of wind installed
in 2020

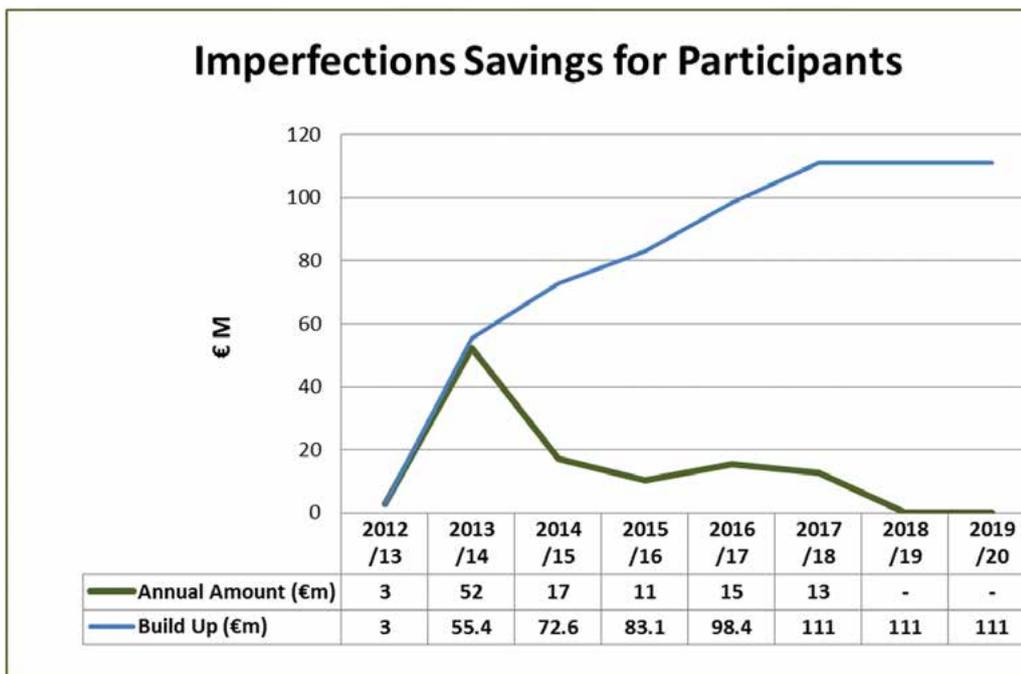
How we manage constraint costs

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.

Between 2012/13 and 2017/18, the TSOs were incentivised to reduce imperfection costs. The incentive mechanism took into account the structure of industry and the degree of control which the TSOs have on the imperfection costs drivers. The TSOs implemented measures in the operation of the transmission system that resulted in cumulative imperfections savings for participants totalling €111m over that period. The incentive mechanism has not been applied by the regulatory authorities for the periods 2018/19 or 2019/20. While no savings were achieved under this mechanism and thus cannot be included in the table below the TSOs have continued to look for way to reduce costs where possible. Further details are set out below.

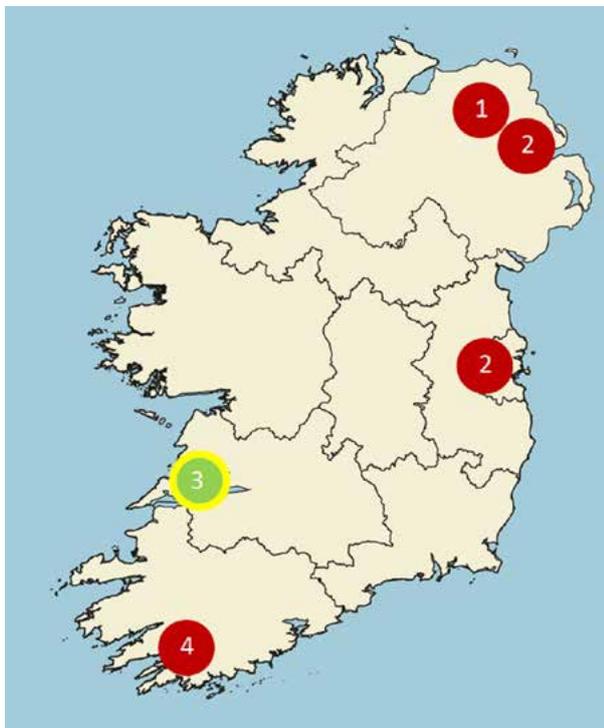


While no incentive applied in 2019/20 the TSOs provided a Reforecast report to the RAs for tariff year 2019/20, where they compared the ex-ante imperfections allowance with the ex-post adjusted baseline and the outturn costs. Further detail on this can be located in the 2019/20 Imperfection Costs Reforecast located [here](#).

2019/20
Imperfections Costs
Reforecast issued in
June [here](#).

2019/20 Main constraint changes and TSO Initiatives

The map below shows some main constraints that were introduced/changed over 2019/20 which influenced imperfections costs; red indicates a change that increased costs, green indicates a change that reduced costs. The green constraint (highlighted in yellow) is a TSO initiative, which is an operational improvement that lowered costs for 2019-20 and continually beyond.



Transmission constraint group introduced in 2019/2020

1	In April 2020, the NI stability constraint was adjusted to include a requirement that at least one of C30, K1 or K2 is on at all times. This was required for system dynamic stability.
2	In May 2020, a “must-not-run” constraint came into effect, which manages the equivalent operating hours for particular generators to minimise risks for margins across Winter 2020/21. This was applied to B31, B32, HN2 and DB1.
3	In May 2020, the 400kV Network Constraint was relaxed to only be active when Ireland wind is less than 1,000MW.
4	In June 2020, a South West Generation constraint was introduced. To support South-West voltage, at times of low demand and low wind generation, additional generation is required.

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](#).

2019-20 TSO initiatives to reduce constraint costs

The level of savings to constraint costs in recent years represents a significant effort on behalf of the TSO to reduce costs where possible. Contrary to previous years, in 2020, constraints were introduced to combat the adverse conditions that resulted from the COVID-19 pandemic which may have increased costs. The initiative which reduced constraint costs in 2020 is as follows:

400 kV Network Constraint

Prior to May 2020, one of either the Tynagh and Moneypoint generators had to be on load at all times for system stability. This constraint was relaxed to only be active when wind generation was below 1000 MW therefore reducing costs in the region when wind generation was high.

How we minimise the financial Impact of Transmission Losses on Consumers

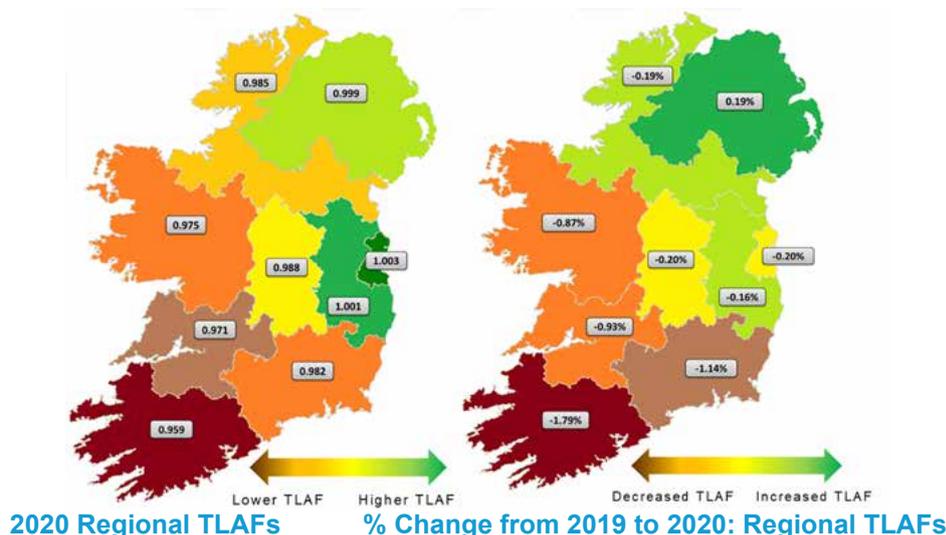
When electricity is transported through networks, there are losses, which means that not all of the power generated reaches customers and end users. This can occur either in transmission or distribution networks, although higher voltages generally reduce losses.

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 has to 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 2020 are shown on the map with green indicating a higher and therefore financially better TLAF. The second map indicates the change in regional TLAFs from 2019. 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.



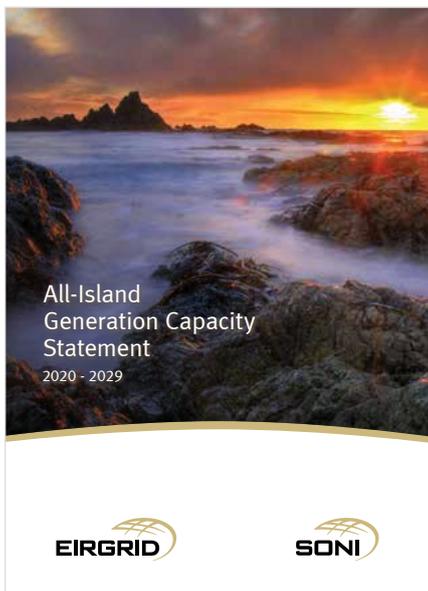
TLAFs are designed to provide locational signals to facilitate a more efficient real time dispatch. They are calculated using a forecast annual dispatch based on the latest assumptions for the tariff year ahead (forecast demand, fuel prices, generator outages, etc.). Historically, the all-island TLAF average typically sits in the 0.98 to 0.99 band, however the TLAFs of individual participants have ranged from, but are not limited to, 0.95 to 1.03 (a range of approx 8%).

Given this 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 almost 400GWh in 2020. Using the average Imbalance Settlement Price for 2020 of €37.24/MWh¹³ this would equate to a reduction in all-island costs of around €15m. Further information on TLAFs can be found on EirGrid's website located [here](#).

Further information on the TLAFs and their calculation can be found in the [TLAF Methodology Explanatory Paper](#)

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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 crossborder 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.

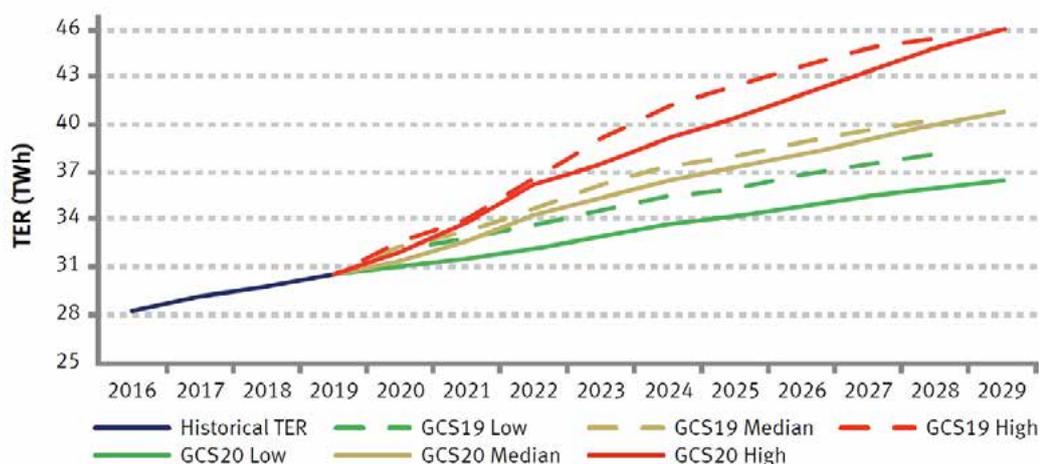
The North South Interconnector remains critically needed for security of supply in both jurisdictions. While the capacity auctions ensure provision of adequacy in the near to medium term, the second North South Interconnector remains essential to ensuring long term security of supply across the island. EirGrid and SONI are working towards the delivery of the second North South Interconnector as soon as possible. Together with the new 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.

In 2020, the COVID-19 pandemic had a significant real-time impact on electricity demand on the Island and while this impact may be short term only, it is still too early to determine how the long term impacts of COVID-19 may be felt.

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 2020 can be found in the [Generation Capacity Statement 2020-2029](#).

Ireland Total Energy Forecast 2020-2029



In Ireland, the growth in energy demand for the next ten years varies between 33% in the median demand scenarios, to 50% in the high scenarios as shown in the above graph. The medium forecast is generally aligned with EirGrid's Tomorrow Energy Scenarios which predicts an overall Energy Requirement for Ireland of approximately 41TWh by 2030.

The long-term demand forecast in Ireland continues to be heavily influenced by the expected growth of large energy users, primarily Data Centres. These need a lot of power and can require the same amount of energy as a large town. EirGrid's analysis shows that demand from data centres could account for 27% of all demand in Ireland by 2029 in our median demand scenario.

Capacity Auctions

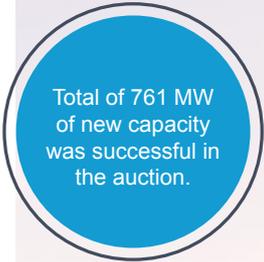
EirGrid, working with SONI, also has a critical role in the operation of the Capacity Market, securing generation capacity to meet the further demand needs of the All-Island network. This is achieved through Capacity Auctions.

T-4 auctions take place every year. In 2020 the second T-4 auction closed on April 27, procuring sufficient capacity at that stage to meet security of supply for the period October 2023 to the end of September 2024. The auction secured a total of 7,322 megawatts (MW) of capacity. The auction clearing price was €46,149 per MW per year. Of the 172 generating units that qualified to take part in the auction, 115 were successful. A total of €363million of capacity payments will be paid during the period October 2023 to September 2024. A total of 761 MW of new capacity was successful in the auction.

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 [Capacity Market Auction Results report](#). EirGrid has also published the following documents on the SEMO website:

- [Capacity Market Overview & Auction Provisional Results Summary](#)
- [Quick Guide to the Capacity Market and 2023/2024 T-4 Capacity Auction Final Results](#)

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 2020, The SEM Committee directed the system operators to hold a T-1 2022/23 capacity auction. This is a supplementary auction to the 2022/23 T-4 auction held in March 2019.



Total of 761 MW
of new capacity
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How we manage new connections

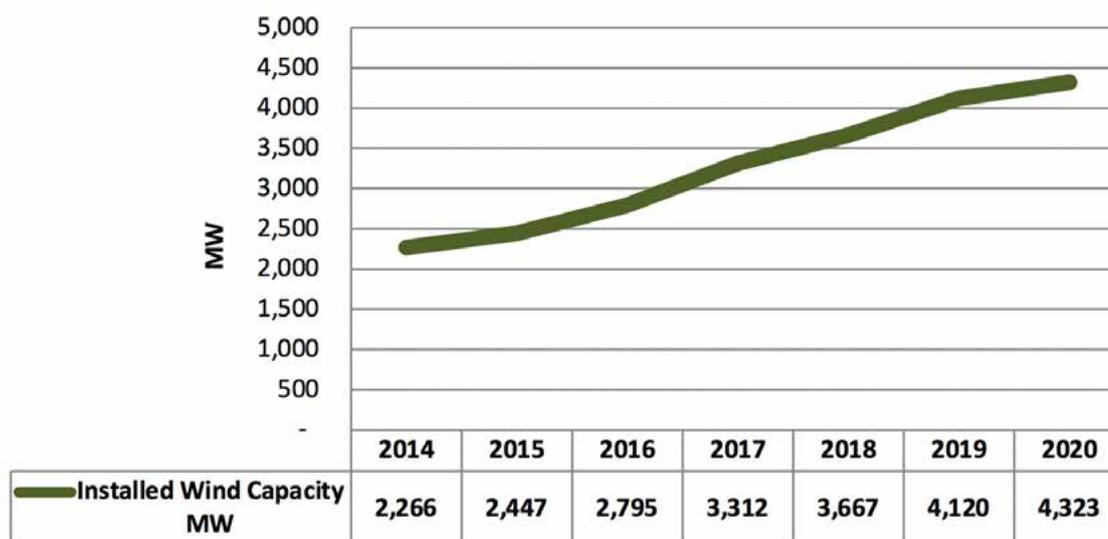
EirGrid issues connection offers to large scale generators, interconnectors and demand customers, who seek connection to the transmission system in line with connection policy and directions as issued by CRU from time to time. This section summarises the offers issued in 2020.

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 Distribution System Operator (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.

In 2020, EirGrid and ESB Networks facilitated the connection of c.203 MW of installed windfarm projects which is made up of c.132 MW on the transmission system and c.71 MW on the distribution system. A graph charting the increase of installed wind capacity can be seen below. By the end of 2020 the connection of these new windfarms resulted in the overall generation provided from wind energy sources reaching 36.3% of total demand in Ireland. Together with other renewables such as solar and hydro, the total renewable generation provided to the grid at the end of 2020 was 13,405 GWh which makes up 42% of the total demand.

Installed Wind Capacity Ireland



When a connection offer is executed this means that the applicant has signed a connection agreement but has not yet energised. 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 participant. A connection offer which is accepted in one year is also unlikely to impact on connected generation capacity in the same year given the lead times associated with construction.

In addition to issuing connection offers for new generation and demand capacity, EirGrid facilitates existing contracted customers in modifying existing connection agreements. A list of the currently contracted and connected customer to the Transmission system is located on EirGrid website [here](#).

Offers executed New and Overall Total in 2020	No.	MW
New Transmission Generator Connection Offers Executed	15	951.5
Modifications to pre-existing Transmission Generator connection agreements executed	34	33
Total	49	984.5

Offer issued New and overall Total in 2020	No.	MW
New Transmission Generator Connection Offers Issued	13	1327.373
Modifications to pre-existing Transmission Generator connection agreements issued	32	10
Total	45	1337.3

In addition we facilitate the connection of Interconnectors between the transmission system in Ireland and the 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. No interconnector offers were issued in 2020.

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 20MVA connect directly to the transmission system. At the end of 2020 there were 21 demand customer sites connected directly to the transmission system. A total of three transmission demand connection agreements were executed in 2020.

	No.	MVA
Demand Connection Offers Executed	3	143
Demand Connection Offers Issued (includes modifications to contracts)	12	178

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 2020, there was one demand customer connected to the transmission system.

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 2020, a total of fifteen new DSU's were contracted, adding 177MW of capacity to the network. This brought the total number of contracted DSUs at the end of 2020 to 29 with a total capacity of 563MW. The table below shows the change from 2017 to 2020.

	2017	2018	2019	2020
DSU Total Capacity (MW) - Ireland	348	403	511	563
Total No. of Operational DSU's - Ireland	19	22	26	29

Contestable Construction

Contestable construction is the arrangement whereby customers build their own connection assets required to connect to the transmission system, this has been in place for several years. This mechanism provides flexibility to customers to manage and control their costs, their programme and their risk. The ownership of the contestably constructed transmission assets transfers to ESB Networks on completion. EirGrid takes over operational control of the new assets. TSO and TAO work closely together to manage the takeover processes associated with contestable construction.

Connection Policy Developments 2020

Enduring Connection Policy

The process for issuing generation offers was consulted on in 2017 resulting in the Enduring Connection Policy (ECP) which led to a significant increase in the number of new generation capacity offers issuing in 2019 and 2020. Under Decision 7 of the PR4 Reporting & Incentives Decision, CER/18/087, a new incentive was introduced which placed a focus on the TSO's performance in issuing connection offers to all applicants in the '2018 Batch' as defined in the CRU Decision on ECP-1 (CER/18/058) and ensuring the ECP-1 offer process was completed in advance of ECP-2. The target completion date for the issuing of offers by the TSO was 31 May 2020. EirGrid issued its last offer of the 2018 Batch on the 26 May 2020 and in so doing achieved the target as set by the CRU, resulting in an incentive payment of €0.629m. The delivery of the connection offers against these challenging timeframes was only possible following the implementation of a new trial process for issuing offers developed internally within EirGrid.

The next iteration of this policy, ECP-2, was published in June 2020 which now prioritises, in the first instance, large renewable energy projects in line with the CRU strategic priority of delivering sustainable low-carbon solutions with well-regulated networks. Applications for ECP-2.1 opened in September 2020 and are currently being processed.

RESS -1 Auction

To promote the generation of electricity from renewable sources, the Irish Government announced a new Renewable Electricity Support Scheme (RESS). Framed within the context of Ireland's Climate Action Plan the RESS-1 auction provisionally awarded 2,237GWh of contracts in August 2020¹⁴. This auction result accounts for approximately 10% of the amount forecast to be required to meet the 2030 targets. EirGrid worked closely with the Department of the Environment, Climate and Communications (DECC) and the CRU to implement the RESS auction process.

Data Centre Connection Offer Process & Policy (DCCOPP)

In summer 2019, EirGrid published the first DCCOPP paper. This paper set out the connection offer process and policy for data centres and consolidated existing and new policy measures into a single document for customer clarity. Following feedback from Data Centre customers and related stakeholders, the second iteration of the DCCOPP was published in summer 2020 reflecting some of the industry feedback received by providing more clarity around the implementation of various policy initiatives.

In conjunction with this, EirGrid also published a consultation paper and sought feedback from stakeholders on a number of potential future initiatives in DCCOPP. This included areas around capacity allocation, MIC ramping, planning permission requirements, data publication and the provision of system services/demand response.

¹⁴ [http://www.eirgridgroup.com/site-files/library/EirGrid/RESS-1-Provisional-Auction-Results-\(R1PAR\).pdf](http://www.eirgridgroup.com/site-files/library/EirGrid/RESS-1-Provisional-Auction-Results-(R1PAR).pdf)

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.

One of our main aims is to create flexibility in the system to adapt to the changes in the electricity industry. We are a small island with ambitious targets for renewable generation and increased energy user participation. This creates the opportunity to do things differently and deliver solutions that have real benefits for our customers and the wider community.

In addition to bringing forward innovative projects, in 2020, EirGrid established a dedicated Innovation & Research department. This ensured we continued and enhanced our focus on delivering Innovation to help facilitate a low-carbon energy future, while helping us operate and maintain a safe, secure and efficient power system. In support of this, EirGrid is developing a new Innovation and Research Strategy and focusing on the following Innovation areas.

Innovation Focus Areas

Evolving User Facilitation

As the power system becomes increasingly dynamic we must ensure we are positioned to both facilitate new types of users and manage their impact on the system. We focus on new user types that support energy efficiency and sustainability such as active demand, PV and Storage. By ensuring we are equipped to manage such users we are positioned to utilise them in managing intermittent generation and network congestion.

Reduced Community & Environmental Impact

The TSO is mindful of the impact of transmission infrastructure development on the environment and we are keen to seek out innovative ways to adapt how we approach the deployment of infrastructure so we can minimise the impact on the local environment. By seeking out innovative ways to adapt existing infrastructure to meet our system needs we can minimise the impact on the local environment.

Enhanced Grid Utilisation

This area focuses on how we can identify and test devices which can be added to the network to enable the efficient use of existing infrastructure. Such technologies work by redirecting power flow from heavily loaded circuits to circuits that are less loaded. This functionality provides EirGrid with greater ability to manage system congestion and has the potential to suppress the short term need for infrastructure build, reduce constraint costs and facilitating connection to the grid.

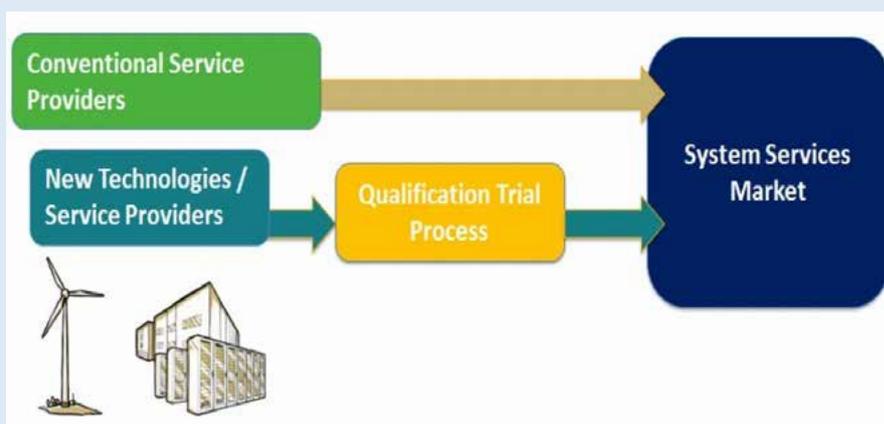
Control Centre Evolution

How we operate and manage the system will become more complex as we move towards an increasingly diverse and dynamic energy mix with new technologies on the system. It is essential that we are innovative in our development and use of sophisticated control system tools that ensure the efficient and effective operation and management of the grid and fully exploit the benefit of our innovations.

2020 Highlights

Qualifier Trial Process (QTP)

The QTP is the mechanism through which EirGrid, working with SONI in Northern Ireland, manages the transition to a wider portfolio of system service providers. The aim is to identify operational complexities that may be associated with new technologies or the delivery of new System Services. In doing so, EirGrid and SONI can develop a deep understanding of these complexities and suggest solutions on how to best integrate these technologies at scale on the power system on the Island of Ireland and Europe.



The 2019 QTP included trials to demonstrate capability in the reserve, ramping and fast-acting services. The solar trial originally planned for completion in September 2020 was concluded in May 2021 as were the residential trials, which were originally scheduled to be complete in March 2021. Finally, the communications trials will continue until Q3 of 2021.

EirGrid issued a tender for the 2020/21 QTP in September 2020, however, no tender applications were received. Based on discussion with some industry stakeholders we feel COVID-19 limited the application for QTP in 2020/2021, as the focus of many participants was on maintaining current business operations, given the economic climate. The TSO is currently reviewing projects with industry stakeholders to identify what may be initiated as part of the 2021 trials.

Detailed information of the trials for 2019/2020 can be found [here](#).

Solar photovoltaic (PV) Trial

PV generation has become a more economically viable form of electricity generation in Ireland and Northern Ireland in recent years. It is likely that large scale solar PV will connect to the system at an increasing rate from the mid-2020s without the need for a subsidy due to decreasing capital costs. EirGrid's Tomorrow's Energy Scenarios consider a range of installed solar PV capacities between 200 MW and 2,500 MW in 2030 due to the uncertainty of how the technology will develop.

Aggregated Residential Services Trial

This project will investigate the potential delivery of residential Demand Side Management (DSM) at scale, which could assist Ireland in its renewable energy targets by providing greater flexibility in operating the power system with increasingly higher levels of renewables.

Alternative Communication Method Trial

Due to the increasing use of renewable energy sources, TSO's worldwide are seeing a shift from operating a centralized portfolio of large conventional fossil-fuel generators to a more widely distributed network which includes small-scale generation. The current communication method was designed for larger generators, which has resulted in a communication solution that may be inflexible or expensive for small scale generation or other service providers on the system such as an aggregator. This project is to enable a two-way communication between a small scale service provider or aggregator and the system operator.

FlexTech Initiative

In 2019, EirGrid and SONI launched the FlexTech Initiative, with support from ESB Networks and NIE Networks. FlexTech aims to breakdown key barriers across a wide range of technical, operational, commercial, regulatory, and market challenges in order to facilitate the integration of renewable energy in Ireland.

In doing so, the objective is to maximise the opportunity to make effective use of new and existing technologies to meet the needs of the future power system. Through collaboration, we can better understand stakeholder's perspectives and key challenges in the electricity sector, which, if resolved, will bring considerable transformation in the further integration of renewables to meet the needs of Ireland's power system. It is recognised that enhanced engagement across the sector is required to help make this happen.



Figure 1 - FlexTech Initiative Framework

To maximise this potential, the FlexTech Initiative will provide a comprehensive platform through which the system operators, regulatory bodies and industry engage with each other. In July 2020, EirGrid published [The FlexTech Response to Consultation](#). The response included the 12-month priority areas and also the medium and long-term goals (3 years).

Control Centre Tools

The evolving power system requires new principles and practices of operation, with the resultant requirement for development and implementation of new control centre tools and capabilities. In keeping with the natural flow of DS3 from system performance to system policies to system tools, many of the new tools requirements will be driven by the outputs of other DS3 workstreams, especially those in the policy area. The evolving Integrated Single Electricity Market (I-SEM) design also drives the requirement for new tools.

Decision Making Tools currently being developed in the Control Centre include:

- **Look-Ahead Security Assessment Tool:** This enables Grid Controllers to analyse the stability of the power system in the near future facilitating optimal system operation with higher levels of wind integration.
- **Voltage Trajectory Tool:** This enables Grid Controllers to assess the impact of varying sources of reactive power across the power system to ensure that local voltage management issues are managed. Enhanced voltage control management capability in the control centre is critical to facilitate increased levels of SNSP.
- **Ramping Margin Tool:** This enables Grid Controllers to accurately schedule and dispatch the Ramping Margin services, and manage changing demand and generation profiles, with increased wind integration.

The Look-Ahead Security Assessment Tool went live in the control rooms of Belfast and Dublin in December 2020. The tool is a world first which enables operation of the all-island power system with world leading levels of variable renewable generation in a safe and secure manner while minimising the level of constraint and curtailment of wind and solar. Thus, the Look-Ahead Security Assessment Tool is a key contributor in the path towards decarbonisation of the electricity sector.

An Interim Ramping Margin Tool went live in the control centres in SONI and EirGrid in September 2020 and the development and deployment of the Enduring Ramping Margin Tool is underway. This tool enables grid controllers to accurately schedule the ramping margin reserve services, thereby enabling more effective management of changing demand and generation profiles with increased wind and solar integration. The Voltage Trajectory Tool has been scoped and development of the tool is underway.

Engaging with Stakeholders

EirGrid Stakeholder Engagement

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'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.

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.

Although the COVID-19 pandemic created an unprecedented and challenging backdrop to our stakeholder engagement in 2020, EirGrid quickly adapted to new ways of working to continue to engage effectively with our stakeholders during this time. As a result of the challenging environment presented by COVID-19 EirGrid changed and innovated our stakeholder engagement techniques to leverage new engagement channels and tools to interact with stakeholders when face to face interaction was not possible. Since March 2020, EirGrid have been collaborating extensively with the Government, Regulators, ESBN and Gas Networks Ireland to ensure a consistent industry response capability to the pandemic and continue to work together to maintain full services over 2020, now and in the future.

In 2018, the CRU introduced the Networks Stakeholder Engagement Evaluation Panel (NSEE). The panel is composed of representatives from industry, academia and wider stakeholders. The panel 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 7.3 out of a possible 10 by the panel for its activities in 2020, which resulted in an incentive payment of €0.238m. This compares to a score of 7.5 and an incentive payment of €0.254m relating to performance in 2019.

Our commitment to 'Engage for better outcomes for all' has been complemented by the significant work in the development of EirGrid's new Public Engagement Strategy. This strategy recognises the need to continually evolve our engagement with external stakeholders to support the delivery of infrastructure across Ireland and on our path to achieving climate action targets.

EirGrid has also been focused on delivering and enhancing the support to existing and prospective customers, as well as industry stakeholders. In 2020, EirGrid published the "[Engage with Us – A Guide for Customers and Industry Stakeholders](#)" document. This guide was developed to provide further clarity on how our customers and industry stakeholders can have their say and how their insights and feedback are used within EirGrid. In addition, the document contains information on governance and how feedback and insight provided is incorporated into decision making and shared across the organisation.

Building on our efforts in 2019, EirGrid published its Stakeholder Engagement Report for 2020. This report provides information on all areas of EirGrid's stakeholder engagement during 2020, including an overview of how we are working to improve our engagement and the learnings we have identified. The report can be found on the Stakeholder Engagement section of EirGrid's website [here](#).

ESB Networks Stakeholder Engagement

ESB Networks has proudly worked with customers, communities and stakeholders across Ireland for over 90 years. We value the trust that has developed with all of our customers and as the use of the transmission network continues to evolve, we understand the importance of keeping our customers at the centre of everything we do.

Stakeholder engagement is seen as a vital activity at every level of our organisation and, as a strategic priority, is led by the Directors and the leadership team. Our stakeholder engagement team works closely with stakeholder leads across our business, ensuring that engagement forms a core element of our business processes, remains embedded in our business culture, and is seen as a key element of the way we work by each employee within the organisation.

ESB Networks recognises that effective stakeholder engagement is essential for the successful management of our business. ESB Networks' ['Strategic Stakeholder Engagement Framework'](#), sets out our enduring engagement strategy to enable an open and on-going dialogue with all our stakeholders and our ['Strategic Stakeholder Plan for 2020'](#) was published for public consultation from December 2019 until the end of January 2020. As a strategic priority, stakeholder engagement is led by the Directors and the senior leadership team and is seen as a vital activity at every level of the organisation.

2020 was to be a most difficult and extraordinary year for us all as we faced the impact of the COVID-19 global pandemic on our society, our economy and our workplaces. As an essential service provider, ESB Networks focused on ensuring the continuity of a safe and reliable electricity service for our customers and communities, whilst most importantly safeguarding the health and wellbeing of our employees and customers. Following the initial announcement of government restrictions in March 2020, we reached out to critical infrastructure stakeholder groups by providing dedicated points of contact in case of emergency. Having dedicated stakeholder leads across the business via our "Stakeholder Engagement Steering Group" has been key to helping ESB Networks liaise with its stakeholders during this uncertain time. 2020 was a year in which we together with our stakeholders and customers had to adjust to new ways of working, communicating and living. Together we successfully adopted new channels to enable us to work effectively and to continue to collaborate and share ideas, while also supporting each other through this unprecedented period. More than ever we are dependent on virtual tools and new ways of connecting with our stakeholders in the absence of face to face interactions.

During 2020 we have undertaken many new initiatives to improve our pathways to engagement such as the introduction of the Strategic Webinar Series "Powering the Change" to replace a physical annual conference, the rollout of a Stakeholder Newsletter to feature information on key developments and initiatives across the ESB Networks business.

We also initiated improvements to our dedicated Stakeholder and Public Engagement section of our website, where we have added a new consultations/publications section and a forward-looking list of proposed consultations, publications and events to help provide clarity to our stakeholders on the areas for potential interaction over the year.



How we monitor expenditure against PR4 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.

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 2020, which are included in the 2022 revenue allowance.

TAO 2020 allowed outturn and resulting k-factor

2014 Prices € millions	PR4 allowance for 2020 (ex-ante)	CRU outturn allowance for 2020 (ex-post)	Adjustments (ex-post minus ex-ante)
Pass Through Costs			
Local Authority Rates	32.50	29.95	-2.55
CRU Regulatory Levy	1.20	1.16	-0.04
Incentives			
2020 Incentive allowance	2.25	3.20	0.95
Inflation correction			
Difference in forecast and actual inflation for 2020	0.00	-4.78	-4.78
Uncertain Costs – Non Capitalised			
AUoS	-0.50	-0.37	0.13
2021 Allowed Revenue Adjustment	0.00	-39.66	-39.66
2020 Non-Controllable Opex	36.14	32.72	-3.42
Uncertain Costs - Capitalised			
Depreciation	0.00	-1.13	-1.13
Return	0.00	-2.17	-2.17
Total	71.59	18.92	-52.67
Total k-factor adjustment (pre-interest) in 2014 prices		-52.67	

TSO 2020 allowed outturn and resulting k-factor

2020 prices € millions	CRU Tariff Decision for 2020 revenues	CRU approved updated actual costs of 2020
External Costs		
CRU Regulatory Levy	0.945	1.177
DUoS Costs	3.229	2.590
Interconnector Services	0.645	0.434
Inter TSO Compensation	1.500	1.770
CORES0	0.540	0.641
Ancillary Services	3.533	2.759
DS3 System Services	100.000	117.806
TAO Charge	291.010	290.995
EWIC Charge (EWIC TUoS Entitlement)	6.227	6.230
Dublin Security of Supply	21.77	18.335
Allowed TSO Operating Revenue		
Allowed TSO Internal Opex costs	47.109	46.350
Depreciation	8.439	8.303
Return on Stage 1 Working Capital	0.966	2.049
Return on Working Capital (Other)	5.214	5.983
Return on fixed assets in the RAB	3.341	3.287
Approved adjustments		
Adjustments Guarantees of Origin	0.294	0.289
Adjustments Constraints bank fee	0.213	0.210
PR3 Adjustment	-0.708	-0.697
Strategic project Celtic Interconnector	0.594	0.784
I-SEM Adjustment - OpEx	5.034	4.953
I-SEM Implementation - Project Depreciation & Return	18.338	18.042
Unrecovered Stage 1 Costs	3.237	3.185
DS3 System Services Implementation - Depreciation & Return	1.321	1.300
IIDM	0.000	0.747
Incentives		
2020 Incentive allowance	0.000	3.075
k-factor Y-2	-31.084	-30.084
Total (2020 Prices)	499.037	510.511
Total CRU approved updated actual costs of 2020 (2020 prices)	(a) 510.511	
TUoS collected in 2020 (2020 prices)	(b) 516.333	
Total k-factor adjustment in 2020 prices	(b)-(a) = €5.822	

Our Price Review (PR4) ran from 2016 to 2020. The CRU Decision for 2020 Transmission Revenues, which features a breakdown of, and explanation for, the revenue requirements (CRU/19/103) can be found [here](#).

Network Development Costs

As part of the revenue price control the CRU sets a revenue envelope specifically associated with 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, 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 development 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 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. The PR4 programme continued to evolve in 2020, as projects were completed, added or removed. At the end of 2020, the actual outturn programme cost over the full PR4 period was €231m lower than the PR4 allowance of €985M as forecast in 2015. The total regulatory spend for the PR4 period was €754m

On an annual basis we jointly submit detailed reports to the CRU on our network expenditure as required under the PR4 reporting arrangements. 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 the following table:

PR4 TAO Capital Expenditure (Nominal)	2016 €m	2017 €m	2018 €m	2019 €m	2020 €m
Gross Capital Expenditure	161	180	196	154	144
Customer Payments	(9)	(21)	(14)	(26)	(11)
Total Regulatory Spend	152	159	182	128	133

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 the table below:

TAO Regulated Asset Base (RAB) (Nominal)	2016 €m	2017 €m	2018 €m	2019 €m	2020 €m
Closing Net Book Value	2,172	2,281	2,419	2,503	2,556

Day to day expenditure not related to building assets are referred to as Operating Expenditure or Opex. The TAO Opex is shown in the table below:

PR4 TAO Operating Expenditure (Nominal)	2016 €m	2017 €m	2018 €m	2019 €m	2020 €m
Transmission Operations	3	3	3	2	3
Planned & Fault Maintenance	19	18	19	22	19
Asset Management	1	1	1	1	1
Non-Controllable Costs	23	24	26	26	31
Controllable Costs	12	12	11	12	12
Total	57	57	60	63	66

How we ensure safety

EirGrid Safety Statement

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 operates a Health, Safety & Environmental (HS&E) Management System based on the requirements of the International Occupational Health & Safety Standard: OHSAS18001:2007. 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 & control measures are adequate and meet best practice standards.



The EirGrid Health and Safety policy was reviewed and recertified for ISO 45001 (Health & Safety) in July 2020. This policy demonstrates EirGrid's commitment to ensuring compliance with statutory requirements which are associated with its business.

There were no Health and Safety Authority (HSA) reportable accidents in 2020.

EirGrid Response to the COVID-19 Pandemic

At EirGrid, the safety and well-being of the people who work for us is a priority – and was of particular significance this year. As the pandemic hit, we took several important steps to protect our people and to ensure the continued operation of critical systems. From early in 2020, our team closely monitored the developing situation as a notable risk. In the early stages of the crisis, we acted pre-emptively to protect our workforce and our essential operations – even before Government advice was issued. We established a Crisis Management Team to create contingency plans for different potential scenarios, in line with our business continuity protocols.

As operators of essential services, we had a responsibility to keep the power system operating to the highest standard. Running the electricity system required critical staff to work in the Dublin Control Centre. These critical operations then needed to be supported by back-office operations and critical IT services. Finally, we had to ensure that all other staff could continue to work remotely. We implemented additional measures to ensure that critical people who needed to be at our workplaces could do so in as safe a manner as possible. We also needed to ensure that the all-island wholesale electricity market continued to run effectively. Finally, it was vital that critical infrastructure construction continued. We achieved all these goals, enabled by solid processes, stable IT systems and thanks to the goodwill and flexibility of our people.

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 electromagnetic 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 electric and magnetic fields (EMFs) found near electricity lines and cables. Information on the EirGrid website explains the facts about EMF, based on current information from health and scientific agencies.

ESB Networks Safety

Within ESB Networks, safety, health and wellbeing is at the centre of everything we do. We are committed to protecting the safety, health and wellbeing of our employees, contractors, customers, members of the public and others who may be affected by our work activities.

ESB Networks Response to COVID-19 Pandemic

ESB Networks responded to COVID-19 pandemic in line with government measures, continuously balancing the provision of essential supplies with the need to keep our staff and contractors safe and healthy.

Keeping our customers and employees safe

In March 2020, measures were put in place to allow most employees to work from home. For staff that needed to attend sites and offices, a range of procedures were developed, approved, and trained out. These included a COVID-19 Health and Safety Site Plan, COVID-19 Risk Assessment and procedures for (1) working within 2 metres and (2) to outline precautions for meeting customers at their premises. Just before the HSE COVID tracker app was made available in July, ESB Networks developed an app "MyContactLog". All staff are encouraged to log their daily close and casual contacts on this app. This tool has proved invaluable in helping to minimise transmission and therefore help keep our staff, families and our customers safe. Several alerts and communications were issued to staff to ensure that everyone was informed of relevant COVID-19 updates and reminded of the importance of continued adherence to controls. Reporting structures were also put in place to monitor the COVID-19 status of our staff. This was monitored daily and managed at senior level.

Maintaining essential services

ESB Networks provides an essential service and continued to work through the COVID-19 pandemic. Continuity plans were developed across the business to ensure network functions operated as normally as possible even if some colleagues were restricting movements/self-isolating.

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, in 2020 ESB Networks was successfully certified to the new ISO 45001 Occupational Health and Safety Management System standard. This was a significant safety milestone for ESB Networks on our safety journey and further validates ESB Networks efforts and commitment to drive safety performance improvements.

Networks Work Programmes and Critical Safety Processes

The delivery of our public safety work programmes including cyclical hazard patrols and maintenance of overhead & underground networks, and timber cutting continued to be prioritised to ensure public safety. The delivery of these programmes is monitored and reviewed regularly to ensure delivery within agreed cycles.

Our incident recording system recorded and actioned all public safety incidents and provided important information that led to focussed public safety initiatives and campaign targeting key 'at risk' groups. The internal staff monthly safety briefing which is communicated to all staff in ESB Networks provided information on significant public safety incidents to emphasise the importance of public safety and recognise the contribution of staff and contractors in keeping the public safe as well as to continually reinforce the prioritisation of public safety actions.

We continued to implement critical public safety interventions by serving 'stop work notices' where we became aware of unsafe construction work near electricity networks. A Mobile App for 'stop work notices' was launched to allow staff to easily log these positive safety interventions and to indicate if the HSA should be notified if appropriate. As part of our emergency response, where we are notified of low or fallen electricity wires, we continued to implement the remote disconnection of the electricity network, where appropriate, to safeguard the public.

The 'dial before you dig' service provided maps of the overhead and electricity networks to construction companies to support compliance with HSA Codes of Practice in relation to electricity.

Stakeholder Education and Awareness

In 2020, ESB Networks continued to implement the Public Safety Strategy and Action Plan (2017 – 2020), including engagement initiatives across the farm, construction, leisure and DIY sectors.

Our 'Safe Family Farms' partnership with the Irish Farmers Journal continued into its sixth 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. We delivered safety talks to the Teagasc colleges as part of the FBD 'Champions for Change' initiative, in association with the HSA.

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. This was supported by our partners in the ESB Networks-led 'Joint Utility Safety Forum', including Gas Networks Ireland, Irish Water and EIR.



How we manage our environmental footprint

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

In 2020, we achieved our target to ensure this goal is met – energy use in our offices fell by 4% compared to 2019. We continued to co-chair the 'Low Carbon Economy' leaders group as part of our commitment to Business in the Community. This initiative sees participants committing to reduce their carbon emissions by 50% by 2030. Working towards this target, we reported a 22% reduction in emissions compared to 2018. In 2020 we also continued our financial support for the Friends of the Earth 'Hands up for Solar' campaign. This sees schools in Ireland compete to win solar panels.

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.

We also continue to find ways to reduce our own energy use. In 2020, this included installing LED lighting and a new chiller at the main Dublin office. This is expected to deliver a 55% reduction in Total Primary Energy compared to the previous chiller and 54% reduction in carbon emissions. The identification and installation of this class leading, critical core piece of machinery delivers on EirGrid's goal to reduce our own emissions and our foundation standard to embrace change and Innovation to make a real difference.

The sources of energy usage for EirGrid sites are electricity and natural gas. In 2020 EirGrid consumed 3,305 MWh of energy in our six office locations. This energy use can be broken down as follows:

- 2,660 MWh of electricity
- 645 MWh of fossil fuels.

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 2020 EirGrid was awarded the Business Working Responsibly Mark for the fourth time. This is the leading standard for CSR and Sustainability Certification in Ireland.

How we manage our 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 natural habitats, wildlife - especially birds, landscape and cultural heritage.

In accordance with European and National law, we undertake Strategic Environmental Assessments (SEA) of our grid implementation plans every five years. Our current plan and SEA covers the period 2017-2022. The plan integrates [Ireland's Grid Development Strategy](#), the approved [Transmission Development Plan](#) and the [Grid Implementation Plan 2017-2022](#) which includes policies and objectives that guide sustainable grid development. EirGrid adopted the Grid Implementation Plan 2017-2022 and associated SEA documents in 2020.

The Transmission Development Plan (TDP) (2019-2028) was published by EirGrid in July 2020. In parallel the TDP consultation report and an Environmental Appraisal Report (EAR) for this TDP were published.

Aspects of our approach to the SEA of our previous Grid Implementation Plan were considered best practice in peer-reviewed research instigated by the Environmental Protection Agency. We are continuing 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.

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. No projects requiring an EIA have been submitted to date during the current Grid Implementation Plan.

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: www.eirgridgroup.ie.

Minimising our Impact on the Environment During Construction and Maintenance

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

ESB Networks operates an Environmental Management System (EMS) which is externally certified to ISO 14001:2015 Standard. The EMS provides a framework for the operational control of risk, performance management and continuous improvement and is independently audited against the ISO14001 standard each year. In 2020, two external surveillance audits were carried out by ESB Networks external certification body, against the requirements of the ISO 14001:2015 standard. No major non-conformances were noted by the Auditors, from the sampled range of activities within the scope of ESB Networks certification.

Managing the Environment During Construction

ESB Networks has continued to adapt and make continuous improvements within the challenging environment of project planning and consenting while maintaining a focus on timely and cost-effective delivery of projects.

At planning stage 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 of 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 ensuring delivery on planning permission condition requirements. Oversight of construction teams is achieved through the appointment of specialists such as Project Ecologists, Ecological Clerks of Works, Project Archaeologists etc.

Enduring Environmental monitoring

In 2020, ESB Networks had one Local Authority notifiable leak of 635 litres related to the Transmission fluid-filled cables Network which was repaired in 2020 also. You will find details on our repairs on our [website](#).

In 2020, approximately 84.69kgs 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 and it allows the switch gear to work efficiently and safely. There has been a trend of consistent leakage reduction, as we replace and repair our older switch gear. This is included in the national SF6 emission figure submitted by ESB Networks to the Environmental Protection Agency (EPA) annually.



Acronyms

- (ATR) Associated Transmission Reinforcements
- (CAP) Climate Action Plan
- (CEF) Connecting Europe Facility
- (CHP) Combined Heat & Power
- (CIF) Construction Industry Federation
- (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
- (ECP) Enduring Connection Policy
- (EIA) Environmental Impact Assessment
- (EMFs) Electric and Magnetic Fields
- (EMS) Environmental Management System
- (EPA) Environmental Protection Agency
- (ESRI) Economic and Social Research Institute
- (HSA) Health and Safety Authority
- (HS&E) Health, Safety & Environmental
- (HVDC) High Voltage Direct Current
- (I-SEM) Integrated Single Electricity Market
- (JPMO) Joint Programme Management Office
- (MIC) Maximum Import Capacity
- (MW) Megawatts
- (NSAI) National Standards Authority Ireland
- (NSEE) Network Stakeholder Engagement Evaluation
- (OHSAS) Occupational Health and Safety Assessment Series



- (PA) Project Agreement
- (PCI) Project of Common Interest
- (PIP) Project Implementation Plans
- (PR4) Price Review
- (PR5) Price Review
- (PV) Solar Photovoltaic
- (RAB) Regulatory Asset Base
- (RES-E) Renewable energy sources for electricity
- (RoCof) Rate of Change of Frequency
- (RTE) Réseau de Transport d'Électricité
- (SEA) Strategic Environmental Assessments
- (SEM) Integrated Single Electricity Market
- (SF) System Frequency
- (SF6) Sulphur Hexafluoride
- (SML) System Minutes Lost
- (SNSP) System Non-Synchronous Penetration
- (SONI) System Operator Northern Ireland
- (TAO) Transmission Asset Owner
- (TES) Tomorrow's Energy Scenarios
- (TII) Transport Infrastructure Ireland
- (TLAFs) Transmission Loss Adjustment Factors
- (TOL) Technical Operating Limit
- (TOP) Transmission Outage Programme
- (TSO) Transmission System Operator
- (TUoS) Transmission Use of System
- (UR) Utility Regulator
- (QTP) Qualifier Trial Process





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 the below:



Delivering a cleaner energy future

Please contact our Customer Relations Team at:

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Please contact us at:
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