



NETWORKS



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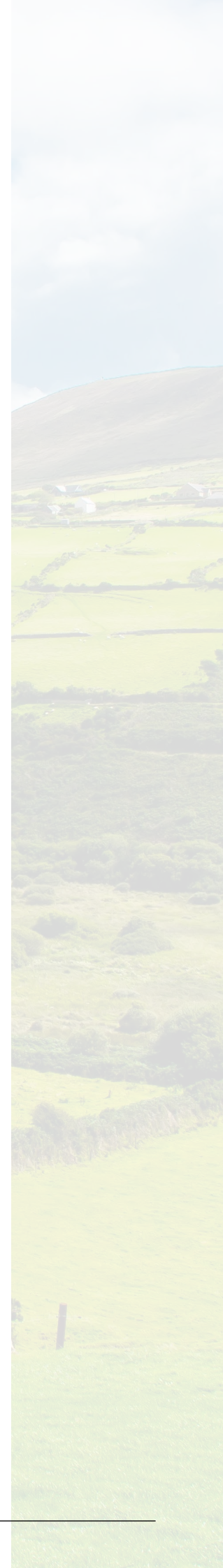
Electricity Transmission Performance Report 2017

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Welcome

Welcome to the first annual EirGrid and ESB Networks' Electricity Transmission Performance Report. This report may evolve over the coming years as we work together to provide customers, industry and stakeholders with clear and accessible reporting of our operation, development and maintenance of the transmission system.

The past year, 2017, has been one of exciting and significant change, including the introduction of a new six-step process for grid development; further work on the implementation of the new Integrated Single Electricity Market (I-SEM) project, including the first capacity auction under the new arrangements; the introduction of scenario planning with "Tomorrow's Energy Scenarios"; alongside a continued focus on safety, reliability and doing the right thing for our customers, stakeholders and consumers.

It was a challenging year in terms of dealing with adverse weather events, connecting an ever increasing number of large energy users to the grid, and ensuring that we are able to handle a continued increase in renewable energy on the system.

We are pleased to report good progress in our introduction of innovative measures, our development of the grid and connecting new customers, plus our work in delivering a reliable network to meet these challenges and performance against incentive targets.

This booklet shows some examples of how we have performed during the year. We hope that you find this document of use and we look forward to working together with you to further develop our plans.

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 see how you can get in touch below.



The current. The future.

Please contact our Customer Relations Team at:
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How to use this document

This booklet will take you through our main activities during 2017, including:

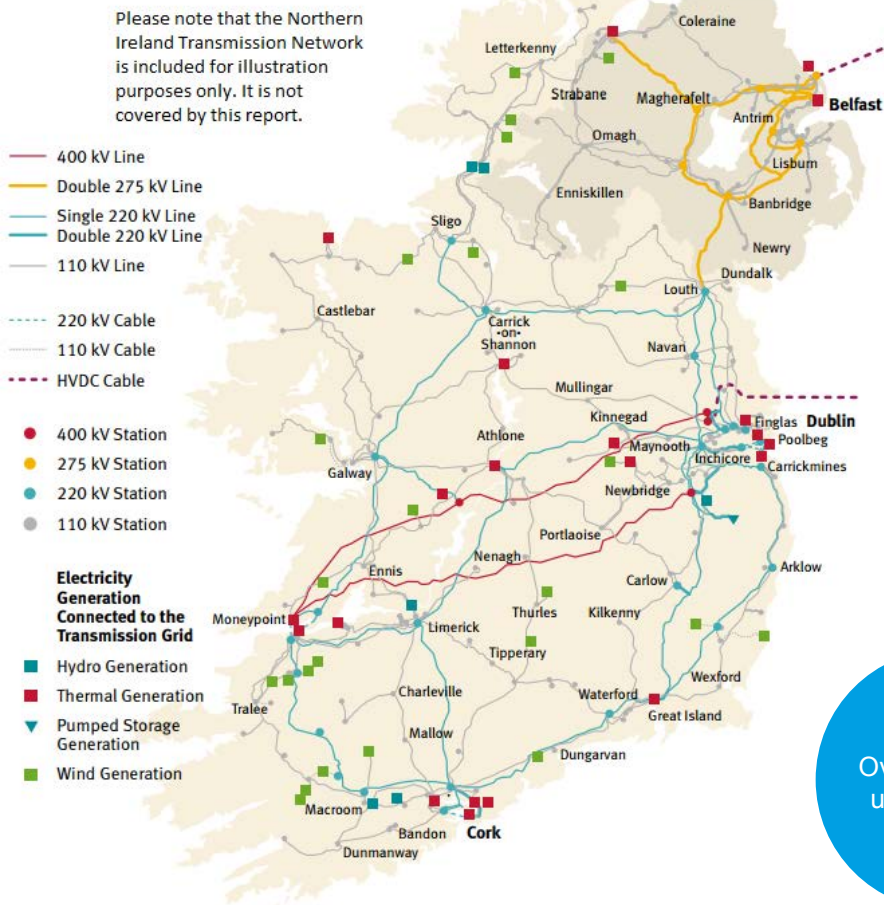
- developing the grid;
- facilitating new connections;
- innovation;
- safety and environment;
- ensuring high levels of transmission system performance;
- making sure the electricity supply is resilient even in extreme weather events;
- tools for managing constraints;
- curtailment volumes and costs;
- how we plan outages to ensure robust security of supply and carry out critical maintenance works; and
- supporting the implementation of the new electricity market.

We also provide links to other documents and data sources where further information can be found.

This booklet is aimed at anyone with an interest in the electricity transmission system, including customers, stakeholders or end consumers. In this document we extensively refer to our customers. A typical transmission connected customer could be a power station, an electricity supplier, or large data centre.

This booklet should be read in conjunction with its companion document the 'Investment Planning and Delivery Report 2017'.

What is the Electricity Transmission System?



160
Almost 160
Electricity
Substations

c. 6,800
Over 6,800 km of
circuits

c. 6,550
Over 6,550 km of
overhead lines

c. 250
Over 250km of
underground
cable

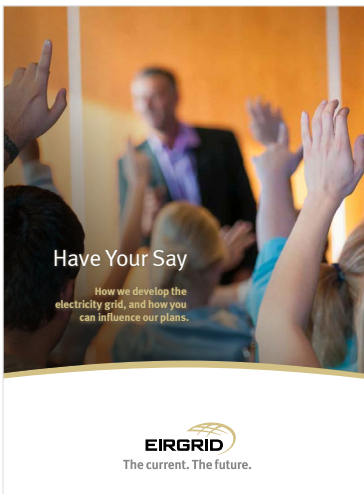
Electricity transmission encompasses the operation, planning and development of the high-voltage network in Ireland predominately assets that operate at 110kV, 220kV or 400kV, ensuring that supply and demand is balanced on a minute-by-minute basis.

EirGrid is the Transmission System Operator (TSO), and ESB Networks is the Transmission Asset Owner (TAO). We work closely to develop, maintain, manage and operate the electricity grid. For further information on the TSO's and TAO's activities in the delivery of the network please see the Annual Investment Planning and Delivery report published on the EirGrid and ESB website. The transmission system is used to move power around the country. It brings power to large data centres, industry and other businesses that use large amounts of electricity, and also powers the distribution network. This supplies the electricity used every day in your homes, businesses, schools, hospitals and farms.

Working closely together we develop and build energy infrastructure when it is needed, and 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 TSO and TAO licences granted by the Commission for Regulation of Utilities (CRU) and by an [Infrastructure Agreement](#) which is a contract between EirGrid and ESB on how to develop and maintain the grid. Efficient operation of the TSO/TAO working arrangements is essential. We can report satisfactory operation of these arrangements during 2017. The operation of a Joint Programme Management Office (JPMO) and other agreed processes are important aspects of TSO/TAO co-operation. EirGrid and ESB continued to effectively operate, review and develop these arrangements during 2017

How we plan, deliver and use the network



In 2017 EirGrid significantly changed the approach to developing the grid of the future. For further information on this please see the 2017 Investment Planning Report published on the EirGrid and ESB website. The new 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.

We acknowledge the challenges faced when building overhead infrastructure. We work closely with landowners and communities to manage these challenges. Further details on the six-step process are available in EirGrid's "[Have Your Say](#)" publication.

We also launched our scenario planning initiative "[Tomorrow's Energy Scenarios](#)" during the year. We ran a broad and inclusive consultation on these scenarios, which represent a considered view of our energy future. These scenarios, and the responses we received, will help us plan the development of the transmission grid.

Steady Evolution
Renewable electricity generation maintains a steady pace of growth. This is due to steady improvements in the economy, and in the technologies which generate electricity. New household technologies help to make electricity consumers more energy aware. This increases energy efficiency in homes and businesses. Over time, electricity consumers gradually begin to make greater use of electric vehicles and heat pumps. This means that, over time, electricity powers a larger proportion of transportation and heating.
Onshore wind generation increases to approximately 5,200 MW by 2030
Ireland's 2030 emissions targets are met
New 700 MW interconnector to Europe is in place by 2025

Low Carbon Living
The economy enjoys high economic growth. This encourages the creation and rollout of new technologies for low carbon electricity generation. There is strong public demand to reduce greenhouse gas emissions. In addition to high carbon prices and incentives for renewables, this creates a high level of renewable generation on the grid. This clean energy then combines with improvements to broadband and transport to drive growth in large data centres.
Coal generation is repowered to Gas and Peat generation is repowered to Biomass by 2025
The total demand for electricity increases by 53% by 2030 compared to today
Data Centre connections reach 1950 MVA in 2030 - most of these are based in Dublin

Slow Change
The economy experiences very slow growth. Investment in new renewable generation is only in established, low risk technologies. Due to poor economic growth, new technologies that could increase the use of renewable generation at household and large scale levels are not adopted. Overall there is little change in the way electricity is generated when compared to today. Domestic consumers and commercial users are also avoiding risk and uncertainty. The only source of demand growth is the connection of new data centres but the level of investment slows down significantly after 2025.
Fossil fuel generation capacity remains over 5,000 MW by 2030
The total demand for electricity increases by 22% by 2030 compared to today
Ireland's 2030 emissions targets are missed

Consumer Action
A strong economy leads to high levels of consumer spending ability. The public want to reduce greenhouse gas emissions. Electricity consumers enthusiastically limit their energy use and generate their own energy. This results in a large number of community led energy projects and a rapid adoption of electric vehicles and heat pumps in the home.
There are almost 560,000 electric vehicles on the road by 2030
17% of residential houses are heated through heat pumps by 2030
Household batteries and solar PV help to increase self-consumption of electricity

In addressing the needs of the system:

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

During 2017 EirGrid and ESB Networks continued to upgrade and strengthen the grid where necessary. As part of this process, several new and upgraded transmission stations and circuits went live.

We partnered with some of the biggest companies in the world throughout the year, to foster jobs and prosperity across the country. In particular, we have worked together to develop and build the infrastructure and systems needed to supply power to new data centres within challenging timeframes. These facilities house networked computer servers that store huge volumes of data, a vital part of the technology infrastructure that underpins our modern life.

As more large energy users such as data centres are built, it will continue to be a challenge to meet increased demand in the coming years. This will significantly change how the network is used and we will continue to seek to improve the capabilities of the system to ensure that a safe, secure supply of electricity is maintained.

In addition, in 2017 ESB Networks and EirGrid introduced a more streamlined process for confirming final plant ratings post upgrades or refurbishment. The intention of this work is twofold:

1. To ensure that plant is not loaded to the extent that it becomes damaged causing potential fault outages and cost to electricity consumers; and
2. To allow quicker verification of Associated Transmission Reinforcement (ATR) works that must be completed before a generator can receive compensation if it is constrained on or off.

Following consultation with the CRU we have agreed to progress certain works in parallel which are typically undertaken sequentially. This will expedite delivery of solutions, while ensuring expenditure is minimised in advance of project clarity and certainty. Two of these innovative projects are 'Series compensators' and 'Static VAR (Volt-Ampere reactive) compensators'.

Our Investment Planning and Delivery Report highlights the work done in 2017.

Highlights:

A selection of 2017 highlights includes:

- A new 110 kV line between Kinnegad and Mullingar was energised in March 2017. This project is a major reinforcement of the transmission network in the Midlands.
- It was the first project where EirGrid awarded grants to local community causes through our Community Support Fund, an initiative that supports local communities near new transmission infrastructure. More information on the Community Support Fund can be found in our brochure [here](#).
- In the South-West, a new 220 kV station was energised at Kilpaddocke in North Kerry in August 2017. This station connects to the existing 400 kV network via sub-sea cables across the Shannon estuary. It makes the connection at the newly refurbished 400 kV station at Moneypoint in Co. Clare, allowing for the transfer of renewable generation from this region to the east of the country on the 400 kV network.
- A new 220 kV station to supply a new data centre was completed in August 2017 at Clonee, Co. Meath. This is the first 220 kV station built by a customer in Ireland.
- Two new 110 kV stations were completed in Galway. They will enable significant renewable generation in the West of Ireland to connect to the transmission system.

France Ireland Interconnector – Investigative works



In 2017 EirGrid, along with our French counterpart Réseau de Transport d'Électricité (RTÉ) progressed investigative works on a potential interconnector between Ireland and France.

This potential project has been identified by the EU as a Project of Common Interest (PCI), meaning it is viewed as a critical piece of work in furthering the integration of the European energy market. If progressed, this would mean that electricity can be exported to and imported from mainland Europe.

This will drive down electricity prices for end users and would offer increased options for market participants in terms of where to buy and sell electricity. An additional interconnector would also increase security of supply; it is proposed that the interconnector would transport 700 MW of electricity, the equivalent of supplying power to around 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. We are pleased to report that we performed well against these targets in 2017.

TSO Incentives and performance in 2017

In 2017 EirGrid's project milestones included targets for the Planning Lodgement, Committed Project Parameter (CPP) creation and issuance to the TAO and Project Agreement (PA). Based on our performance in 2017, EirGrid received a reward of €0.59m against a total potential incentive of €0.67m.

- Planning Lodgement - EirGrid met the programme target of 6 planning lodgements.
- CPP creation and issuance to the TAO - EirGrid issued 10 CPPs against a target of 11.
 - One CPP was delayed as a result of the need for EirGrid to bring forward a revised Capital Approval for the project.
- Project Agreement - EirGrid reached PA with ESB Networks for 15 projects against a target of 16.
 - At the outset of 2017 a potential scope change for one project that could drive the need for a revised PIP and PA for the project was identified. Ultimately it was determined that the nature of the scope change did not drive the need for such changes and as a result EirGrid did reach a revised PA for this project.

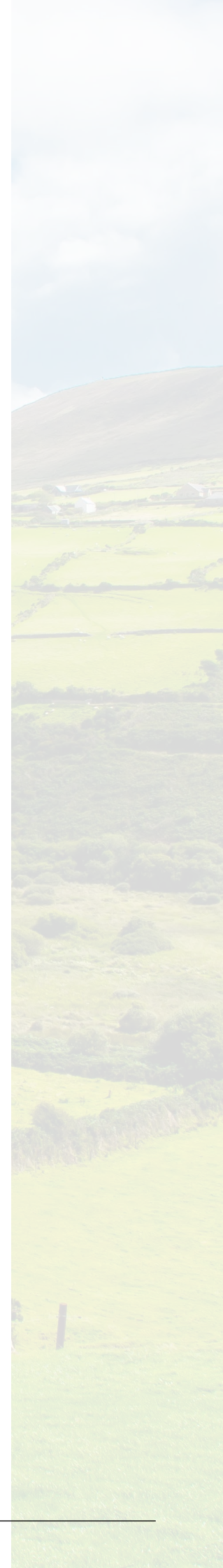
TAO Incentives and performance in 2017

In 2017, ESB Networks achieved its targets that were set by the CRU and received a reward of €2.754m against a total potential incentive of €2.754m. These include the Project Implementation Plans (PIP), the return of agreed TSO/TAO scheduled outages on time, and ESB Networks construction and energisation targets.

- A PIP is issued by ESB Networks and is put in place right through to the delivery of a Project Agreement (PA) with the TSO. In 2017, ESB Networks issued 19 out of a target of 20 PIPs (reduction as per TSO PA incentive above), which resulted in the CRU granting ESB Networks its full share of the related incentive.
- Regarding to outage targets, these targets are designed to improve the availability of existing network by reducing the outage periods for same and providing greater certainty to all parties affected by outages regarding expected commencement and conclusion dates. The TAO is thus effectively incentivised to deliver the required works as set out in the agreed programmes set against standard outage timeframes. In 2017 there were a total of 9,291 scheduled transmission outage days, but the total actual outage days reached 9,024 by years end. Therefore, as the number of outage days was lower than the target (i.e. no overall overrun), the TAO was granted the full related incentive by the CRU.
- Construction and energisation makes up the largest percentage of the TAO targets. The incentive relating to this target is designed to incentivise the delivery of the network by ESB Networks. This incentive is measured by comparing the spend by the TAO against forecast. In 2017, ESB Networks delivered on its transmission construction and energisation plans and was granted the full incentive by the CRU.

New Incentives arrangements

In 2017 the CRU published a Consultation Paper seeking industry and public feedback on a suite of proposed new incentive arrangements for the TSO and TAO. Incentives are an important part of the regulatory framework and we welcomed the opportunity to input into this process. Subject to a final decision published in 2018 the new incentive arrangements would apply from 2018 onwards.



How we performed against Strategic Incentives

We are in a time of unprecedented change on 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 power system while integrating an ever increasing number of renewables. This is supported by our development of a wide variety of innovative projects and the roll out of new system services. The CRU recognised this in its Price Review 4 (PR4) Decision (CER/15/296) through the provision of a €5m allowance for strategic incentives split evenly from 2017 to 2020 (€1.25m per annum).

In 2017 EirGrid achieved an incentive of €1.023m against the target of €1.25m which represents 82% success against the targets. Further details are set out below. In terms of the partially achieved targets, Phase 1 & 2 studies and testing for RoCoF was 65% achieved, which amounts to €97,500 of the €150,000 incentive value. With regard to the target of having the nodal controller trial under way, the TSO achieved all of its targets however there were some delays which meant the trial did not commence until early 2018. The CRU determined that €50,000 of the €75,000 incentive value was a fair reflection of the work that the TSO had carried out.

Target	Incentive Value (€m)	Achieved	Incentive Received (€m)
Rate of Change of Frequency (RoCoF) – Phase 1 & 2 studies and testing.	0.150	Partial	0.098
Distributed Voltage Control – Nodal controller trial under way.	0.075	Partial	0.050
System Non-Synchronous Penetration (SNSP) – Completion of 60% trial.	0.325	Yes	0.325
Increase of SNSP to 60% on an enduring basis.	0.300	Yes	0.300
Decision Making Tools – Specific control room tools deployed in 2017 to be agreed with CRU.	0.100	No	0.000
Distributed Power Flow Control Devices – Pilot trial of router completed and reported.	0.050	Yes	0.050
Initial deployment of Guardian device procured by TAO	0.050	No	0.000
New Technologies – Successful launch of Qualification Trial Process for 2017 – 2020.	0.200	Yes	0.200
Total	1.25		1.023

How we manage system performance

Maintaining transmission system performance to high standards involves significant work. It ensures that the transmission system is operated in a safe and secure manner, maintaining electricity supply for customers and market participants.

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 only to 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.

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 2017, there were 0.3 System Minutes lost on the transmission system. All disturbances were managed through the active participation of transmission-connected customers who have signed up to take part in our Short Term Active Response (STAR) scheme. Under STAR transmission connected customers are contracted to make their load available for short-term interruptions, preventing power outages on the system as a whole. In return for providing this service, payments are made to customers based on the energy they make available for interruption. There were eight interruptions over the course of the year: four interruptions impacted portions of the affected load for between nine minutes and four hours, while four further interruptions lasted less than one second.

For further information see the [All Island Transmission System Performance Report 2017](#)

99.5%
EirGrid maintained system frequency in line with targets 99.5% of the time

0.3
In 2017, there were 0.3 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 while ESB Networks constructs, maintains and operates 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.

Ongoing transmission system maintenance is crucial to ensuring the resilience of the network. Transmission maintenance is undertaken in accordance with the Transmission Asset Maintenance Policy. The 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](#).

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 quarterly basis, or as necessary. The All-Island Generation Outage Plan can be found [on the SEMO website](#). 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 includes all outages of transmission infrastructure which are planned to occur in the year. The 2017 Transmission Outage Programme can be found in the library section of the EirGrid website by searching for 'transmission outage summary 2017'. In 2017 EirGrid developed a dashboard which monitors the percentage of the Transmission Outage Programme delivered in terms of capital projects. The 2017 percentage is 80%, there is no equivalent for 2016.

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 pioneering Delivering a Secure Sustainable Power System (DS3) programme seeks to address this issue. In 2017, there was a significant achievement with an increase in the maximum limit for System Non-Synchronous Penetration (SNSP) to 60%. This means we can securely operate the power system with up to 60% of the energy coming from newer forms of variable, renewable generation. It also allows us to maintain the resilience in the power system that society has come to expect.



Following this achievement we immediately began trialling an increased limit of 65% with an aim to increasing the limit again in 2018. Overall our aim is to have the limit increased to 75% by 2020.

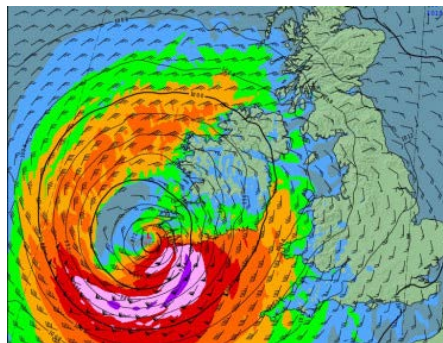
Network Reliance in Action

In 2017 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, our process and procedures ensured that the faults were resolved, with minimal impact to customers.

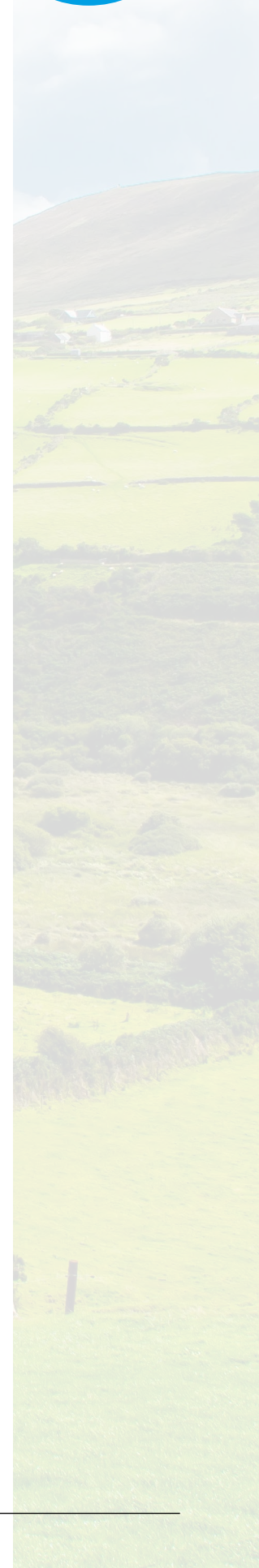
There were two adverse weather events which caused faults on the transmission system in 2017; however there were no power supply interruptions on the transmission system;

- Storm Doris had a level orange weather warning in place for the West and North West. There were 17 faults caused by wind, all of which were cleared in a matter of milliseconds.
- Storm Ophelia had a level red weather warning for the country. There were a total of 18 faults on the system and clearance times for the faults were all within a matter of milliseconds.



Two large generators tripped on the island in 2017. Through the activation of the STAR (Short Term Active Response) scheme, interruptions to load only affected those customers who participate in the scheme and there were no interruptions to the supply of end users because of these events.

For further information on the DS3 Programme see eirgridgroup.com



How we manage Network Constraints

EirGrid implements system operational constraints 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 January 2018, which covers all the operational constraints in place at the end of 2017. The TSO publishes updates to the Operational Constraints monthly and as required if any changes are made. This provides important information to market participants. The TSO can report that all reports for 2017 were published in a timely manner and are available on EirGrid's website.

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.

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 software tool called RCUC (Reserve constrained unit commitment). Using this 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 on actions taken to reduce constraint costs. This is discussed further on the next page.

Information on 2017 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. System Non-Synchronous Penetration (SNSP) limit

In 2017 3.7% of the Total Available wind energy in Ireland of 7,532,359MW was dispatched down. Of that 71.6% related to curtailment volumes which amounts to 198,291MW. This compares to 118,802MW in 2016.

Curtailment levels are affected by a number of factors which vary year to year. The amount of wind installed on the system will have a significant impact on curtailment. In 2017, 517 MW was added to the wind installed capacity in Ireland. This represents a significant increase on the average annual wind connection level of about c.239 MW over the previous 5 years.

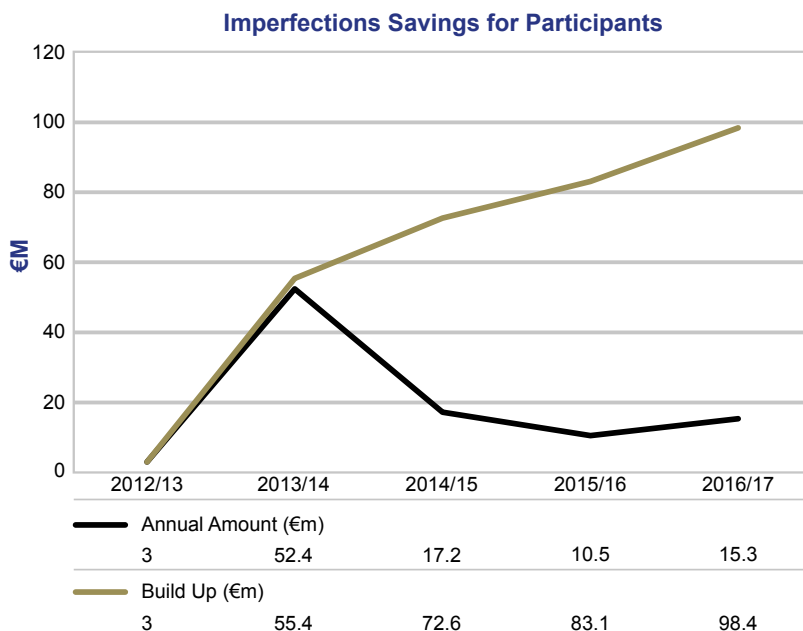
How we manage constraint costs

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 must be 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. 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.

We are incentivised to reduce the imperfections costs. The incentive mechanism takes account of the current industry structure and the degree of control which the TSO has on the cost drivers. The incentive period runs from October to September each year, with the most recent recorded figures being for the 2016-2017 period. In advance of each year the TSOs submit a forecast of the costs for that period. Following the end of the period this forecast is adjusted to ensure the protection of both the TSOs and customers from potential windfall gains or losses, by removing some of the risk for events outside of the TSO’s control such as unforeseen long-term outage of generators or transmission plant or changes in fuel prices, exchange rates, or market rules. The actual outturn costs are then assessed against this adjusted baseline. In total the ex post adjusted baseline for constraint costs in 2016-2017 was determined to be €142.2m, compared to actual outturn imperfections costs of €126.9m. We therefore ensured €15.3m in savings for market participants. The full 2016-2017 Imperfections Incentive Report can be found [here](#). Since the incentive was introduced in 2012, our actions have led to €98.4m in savings for market participants. The year on year build-up of savings, as well as the annual savings figures, since the incentive was started can be seen in the graph below.



2016-17 TSO initiatives to reduce constraint costs

A list of the primary operational initiatives introduced by the TSOs which helped to decrease DBC were as follows:

1. SNSP 55%:

Following a successful trial from October 2015 the Non-Synchronous Generation limit permanently changed from 50% to 55%. This increased limit came into effect on 01/03/2016. Under the incentive arrangements the TSOs are rewarded for the benefits their initiatives bring for a full year. Therefore the reward for this initiative is scheduled to run until 28/02/2017.

2. SNSP 60%:

Following a successful trial from November 2016 the Non-Synchronous Generation limit permanently changed from 55% to 60% on 09/03/2017.

3. Dublin Generation Rules:

From 24/05/2016 the requirement for generation in North and South Dublin was changed to reflect changing generator characteristics. The system stability requirements were also changed. Under the incentive arrangements the TSOs are rewarded for the benefits their initiatives bring for a full year. Therefore the reward for this initiative is scheduled to run until 23/05/2017.

4. Special Protection Schemes (SPS):

The implementation of Special Protection Schemes at Clogher and Mount Lucas has helped reduce DBC. New generation connecting at these locations requires significant transmission reinforcements, with long lead times. The TSOs proposed the installation of these SPS to facilitate access to the transmission system for this additional generation, in advance of the deep reinforcements being completed and thereby lowering constraint costs.

How we minimise the Financial Impact of Transmission Losses on Consumers

When electricity is transported through networks, there are losses, which mean 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.

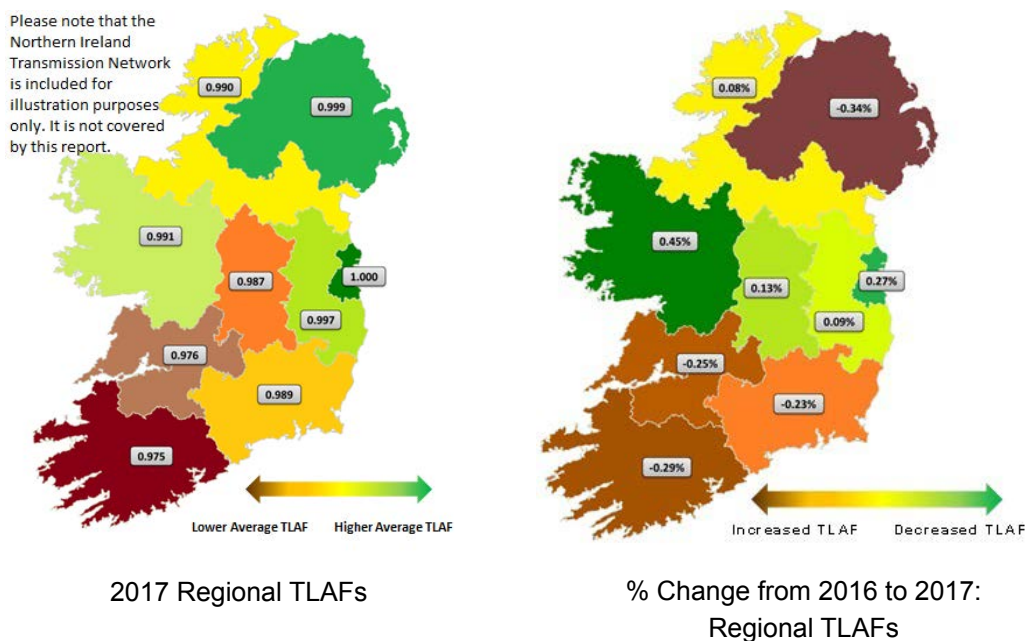
To ensure that the all-island wholesale market is settled correctly, transmission losses are allocated to generators in Ireland and Northern Ireland (including generators connected to the distribution system), using Transmission Loss Adjustment Factors (TLAFs). TLAFs are only applied to generators so 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.

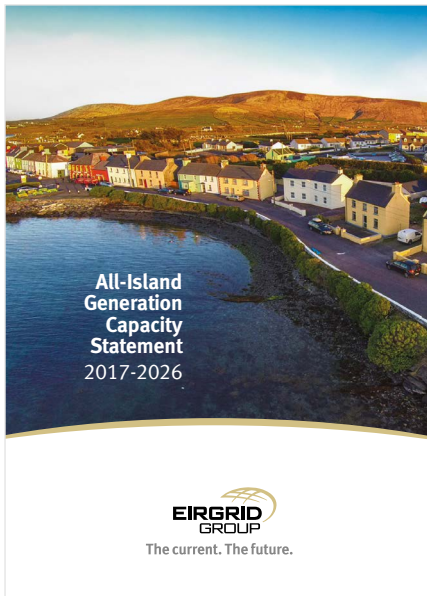
The further power has to flow through the system from where it is generated to where it is needed the greater the potential losses. As a result TLAFs are location specific. The regional TLAFs for 2017 are shown on the map with green indicating a higher and therefore financially better TLAF. The second map indicates the change in regional TLAFs from 2016. These changes are influenced by yearly dispatch, demand and topology changes.

Such signals provide a commercial incentive for generators to make informed decisions concerning their use of the transmission system. This is intended to improve efficiency in respect of both the use of, and investment in, the transmission system, which brings value to end users and market participants.

Further information on the TLAFs and their calculation can be found in the TLAF Methodology Explanatory Paper



How we support market operation

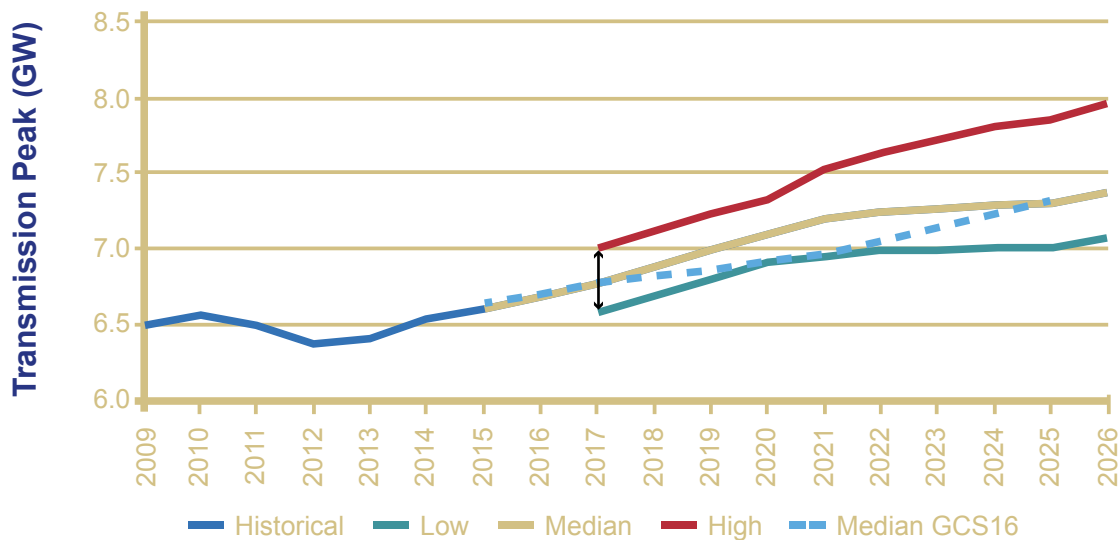


In its role as TSO EirGrid provides critical support in the operation of the Single Electricity Market, and the new Integrated Single Electricity Market (I-SEM) arrangements, which is planned to go live in 2018.

One of our key responsibilities is providing accurate 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 2017 can be found in the [Generation Capacity Statement 2017-2026](#).

This task has become more critical in the new Capacity Market. The aim of the market auction is to secure just enough generation to keep the system within standard. Below is a graph showing the forecast demand under different demand scenarios.

Transmission Demand Forecast – For Capacity Auction Purposes

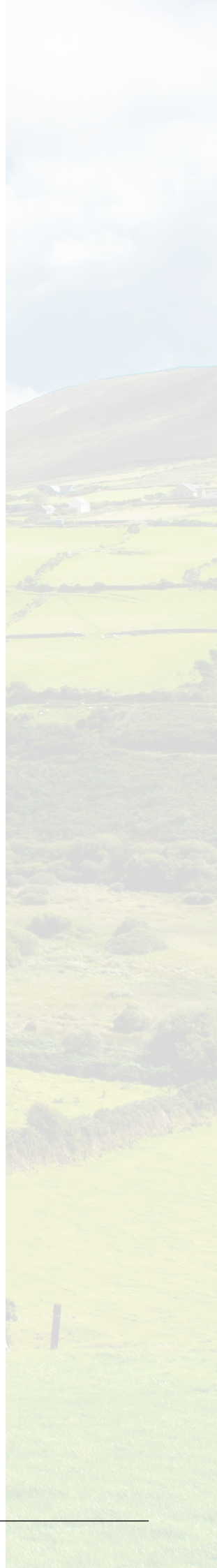


The demand forecast developed here is to be used to ascertain the capacity requirement, towards which the capacity auction is geared. The first capacity auction occurred on schedule on Friday the 15th of December 2017. The auction ran successfully, with 100 capacity market units taking part. Based on the demand forecast in the GCS, there was a total of 7,774MW de-rated capacity successful in the auction.

Throughout 2017 the TSO, along with the market operator, worked to deliver the new I-SEM project. We achieved several key steps towards this goal during the year. A more integrated market will lead to increased competition which should benefit end users by driving down prices.

In particular, this included the start of full market trials in December 2017, along with the completion of a new Trading & Settlement Code and the start of end-to-end testing for the new market systems. We also continued to develop and deliver the complex IT infrastructure necessary to achieve I-SEM.

We also completed the capacity market code in 2017, which is a critical document that sets out the code for the operation of the new market.



How we manage new connections

EirGrid issues connection offers to large scale generators, interconnectors and demand customers, who seek connections 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 2017.

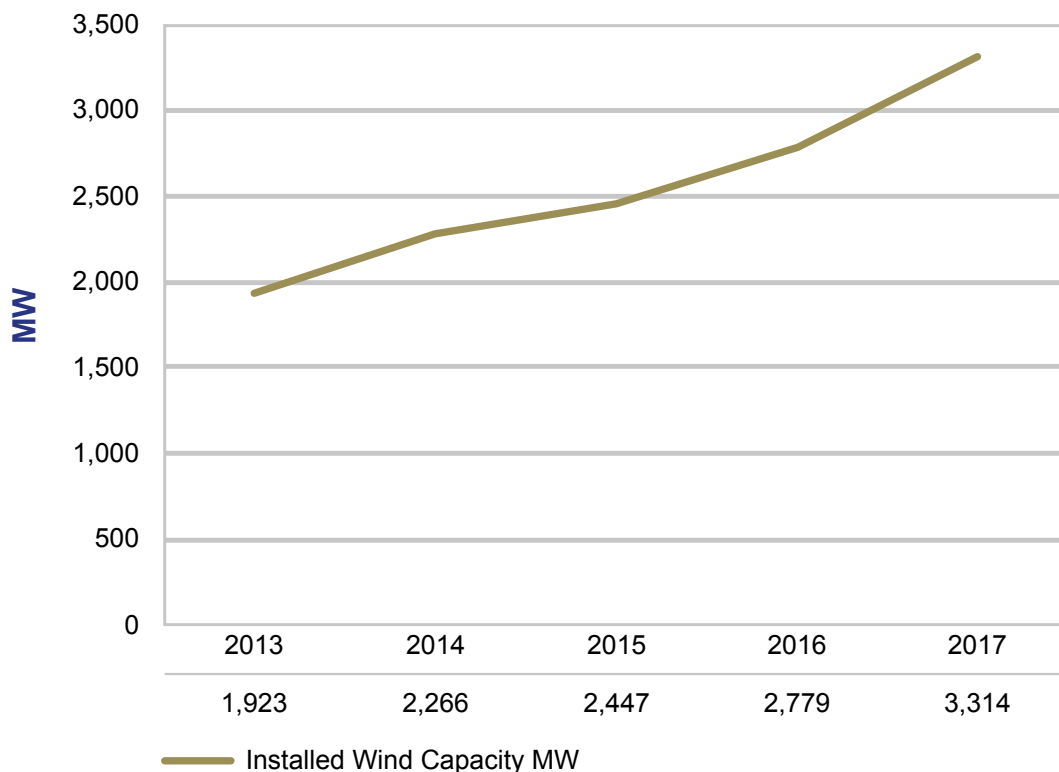
Connecting Generators and Interconnectors

Large generators, typically with a capacity of more than 40 megawatts (MW), connect to the transmission system. Offers are issued to generation companies seeking connection in line with the rules set down by the CRU. We also provide connection offers to the DSO so that generators connecting to the distribution network can export power onto the transmission system. The generators we work with include thermal plants that use fossil fuels, or hydro, Combined Heat & Power (CHP) plants, wind generators or other newer types of generation such as solar power or storage devices.

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

In 2017, EirGrid and ESB Networks facilitated the connection of over 30 new windfarms in Ireland, adding over 500 MW and bringing the total wind capacity connected to over 3,300 MW. This over 500MW is made up of c.220MW of TSO and c.297MW of DSO. In 2016 15 new windfarm connections were facilitated, adding over 200 MW of capacity to the system. A graph charting the increase of installed wind capacity can be seen below.

Installed Wind Capacity Ireland



By the end of 2017 the connection of these new windfarms resulted in the overall generation provided from renewable energy sources reaching 29%. Other sources of renewable energy include biomass, hydro, solar PV and renewable waste. In the coming years, further new wind farms are due to connect at transmission and distribution level in order to meet our 40% RES-E target in 2020. Key stats for Generator/Interconnection Connection Offers in 2017:

	No.	MW
Transmission Generator Connection Offer Agreements Executed	1	80
Total Generator Connection Offer Agreements Executed	46	276
Transmission Generator Connection Offers Issued	5	299
Total Generator Connection Offers Issued	60	614

When an offer agreement is executed this means that the party has signed a connection agreement but have 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.

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 connection offers were issued or agreement executed with interconnectors in 2017; however we do expect to progress two connection offers for interconnectors in 2018.

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 2017 there were nineteen customer sites connected directly to the transmission system. A total of ten transmission demand connection agreements were executed in 2017. Six of these were to facilitate an increase in total energy requirement of the customers. Key stats for Demand Transmission Connection Offers in 2017:

	No.	MW
Demand Connection Offer Agreements Executed	10	362.05
Demand Connection Offers Issued	9	299

Demand Side Units

Demand Side Units (DSUs) do not receive connection offers or agreement. These are registered in the market and are offered system services contracts. In 2017 a total of four new DSUs were contracted, adding 28MW of capacity to the network. This brought the total number of DSUs at the end of 2017 to 19 with a total capacity of 362MW. The table below shows the change from 2016 to 2017, this will be updated annually in future reports.

	2016	2017
DSU Total Capacity (MW) - Ireland	334	362
Total No. of Operational DSU's - Ireland	15	19

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. Innovation is one of our core values and 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.

The Innovation Programme involves the integration of new technologies and services which work well with each other and improve the way we operate the electricity system. The programme will help facilitate a low-carbon energy future, while helping us operate and maintain a safe, secure and efficient power system. The Programme focusses on the following areas; more detailed projects of the programme, stemming from the focus areas, for 2017 can be seen on the next page under 2017 Highlights.

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 and new technology 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.

2017 Highlights

In 2017 there were several successful tests of the **Power Off and Save** pilot project. The objective of the pilot was to investigate if a test group of up to 1,500 residential consumers could significantly reduce their consumption on request to allow for the management of the grid at peak times. This could enable residential consumer participation in forthcoming System Services processes which will give greater control to electricity consumers over their usage and in turn help to drive down prices through increased competition for System Services.

As of December 2017 the Power Off and Save project is still ongoing and the outcomes and learnings remain unclear. A full report will be produced before the end of 2018 and the findings will be reflected in the 2018 Joint Transmission Performance Report. More information on Power Off and Save can be found on the EirGrid website [here](#).

The **Qualification Trials Process** facilitates new technologies to provide System Services on the system. This in turn leads to competitive pressures on the long term costs of System Service provision to the consumer by expanding the range of Service Providers. This will enable safe, secure and resilient power system operation across future energy scenarios, including higher levels of non-synchronous renewable generation. The trial started in March 2017 with twelve providers across the island of Ireland taking part. The outcomes and learnings from the trial were published [here](#) in November 2017.

In total there were 26 learnings from the trial which provide the TSO with more information on the ability of different types of technologies to provide System Services. This in turn gives participants increased certainty on the types of projects they can develop.

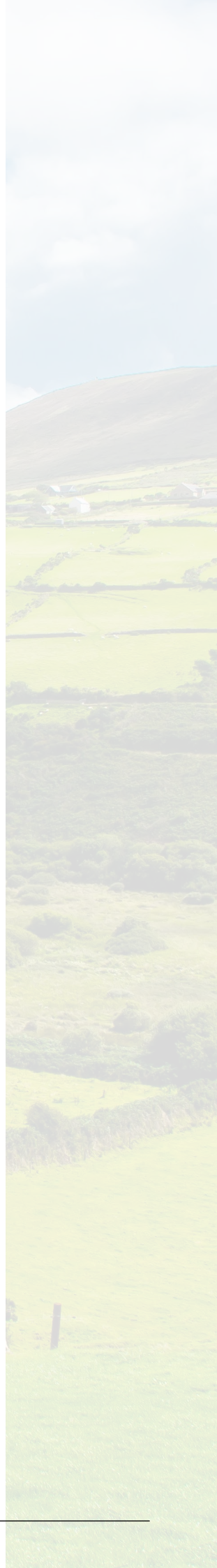
EirGrid and ESB Networks worked with Smart Wires to finish a trial of a new technology called Smart Valve in 2017. This technology changes the amount of power transmitted on a circuit in real time. We were the first in the world to test this concept on a live electricity system. Smart Wires' post trial report states that the trial was a success. Technologies like this help maximise the use of existing transmission infrastructure, thus reducing the requirement to develop new infrastructure and bringing savings for electricity consumers.

In March 2017 EirGrid was a recipient at the **Utility Variable-Generation Group's 2017 Annual Achievement Awards**. The Award was in recognition of EirGrid's contributions to electricity market redesign consideration of a high renewable energy penetration future.

EU-Sysflex, an EirGrid-led project involving 34 organisations from 15 countries, was awarded funding of over €20 million for research into the deployment of renewable energy in June 2017.

One of our innovations is to adapt existing infrastructure to increase capacity without having to add new lines or cables. This is called **voltage uprating**, and we are currently testing a potential increase from 110 kV to 220 kV and from 220 kV to 400 kV.

In 2017 we completed designs for new 220 kV **composite poles** that are now part of our technology toolbox. These poles are made from an advance composite material that combines fiberglass and polyurethane resin. They are lighter than comparable components made from wood, steel and concrete. This allows for lower logistical costs, faster construction timelines, reduced maintenance requirements and longer service life. They also make it easier to uprate from 110kV to 220kV. Before we can start to use these poles they must be proven through type testing. This is scheduled to take place in 2018 and will be followed by a pilot trial that is anticipated in 2019.



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.

As mentioned previously, EirGrid's six-step grid development process was designed with a particular focus on engaging with the public and landowners on grid projects - more often and earlier in the decision-making process.

This year, we opened a new information office in Carrickmacross, Co. Monaghan, while our regional office in Mayo remained open. This gives stakeholders close to significant transmission projects an opportunity to drop in and meet with the project team.

In 2016, we launched a mobile information centre, which we continued to bring to towns and villages across Ireland in 2017. This allows liaison officers to meet with communities and stakeholders. We also participated in a number of events that allowed us to discuss our work with rural, landowner and farming communities.



Our commitment to openness and transparency has been complemented by significant work in bringing forward communications material which is accessible to all. We have introduced a Plain English policy in all of our public facing documents to further this commitment. Our good work in this area was on display in February 2017 when we won the overall Plain English Award from the National Adult Literacy Agency in recognition of our work to make our communications clearer and more accessible.

In addition to a significant effort to better engage with the public, EirGrid's customer team has been actively managing the significant rise in customers over the recent years, particularly in terms of IDA (Industrial Development Agency) associated large energy user investments. EirGrid has proactively put in place Energy Demand Forums for these customers where sharing of challenges and opportunities provides a platform for EirGrid, policymakers and the large energy users.

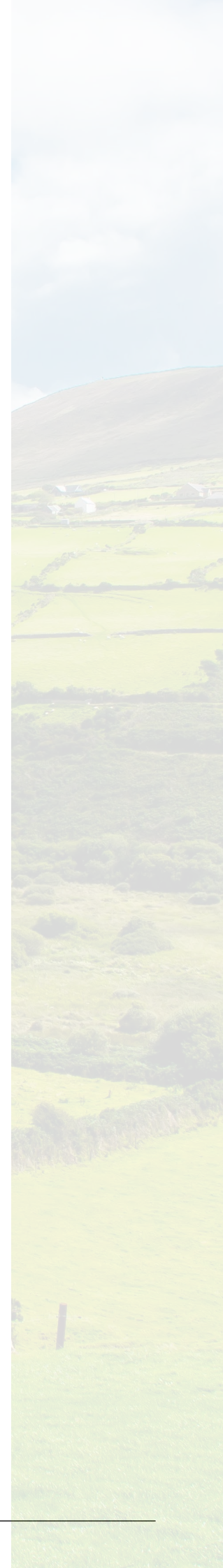
EirGrid has also been progressive in ensuring that there is active engagement with industry to ensure that there is maximum alignment between the TSO and market participants. Key areas where this has taken place in 2017 is on the ongoing DS3 Programme and surrounding the introduction of the I-SEM arrangements in October 2018.

ESB Networks Stakeholder Engagement

ESB Networks has proudly worked with customers, communities and stakeholders across Ireland for the past 90 years.

As the energy sector changes and evolves going forward while transitioning into a low carbon future, we will ensure that the Irish electricity customer will remain at the centre of everything we do. Throughout 2017 in our capacity as Transmission Asset Owner we maintained regular interaction with Landowners, Landowner Representative Organisations and EirGrid regarding land access issues and arrangements. Discussions were also held with local authorities regarding proposed road openings.

Care for safety, the environment and our heritage is foremost in our minds and actions in the work that we do. Throughout 2017 we continued regular interaction with the public, landowners and relevant organisations on these important issues.



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 2017, which will be included in the 2019 revenue allowance.

TAO 2017 allowed outturns and resulting k-factor

2014 Prices € millions	PR4 allowance for 2017 (ex-ante)	CRU outturn allowance for 2017 (ex-post)	Adjustments (ex-post minuse ex-ante)
Pass Through Costs			
Local Authority Rates	26.3	22.24	-4.06
CRU Regulatory Levy	1.2	1.32	0.12
Incentives			
2017 Incentive allowance	2.25	2.75	0.5
Inflation correction:			
Difference in forecast and actual inflation for 2017	0	-4.72	-4.72
Uncertain Costs - Non Capitalised			
AUoS	-0.5	-0.31	0.19
Uncertain Costs - Capitalised			
Depreciation	0	-0.24	-0.24
Return	0	-0.57	-0.57
Total k-factor adjustment (pre- interest)			-8.77

TSO 2017 allowed outturns and resulting k-factor

2014 Prices € millions	2016 Tariff Decision for 2017 revenues (ex-post)	CRU approved updated actual costs of 2017 (ex-ante)
External Costs		
CRU Regulatory Levy	0.99	1.22
DUoS Costs	1.98	1.98
Interconnector Services	0.22	0.78
Inter TSO Compensation	1.28	1.17
CORES0	0.44	0
Ongoing Service Charge	0	0
Ancillary Services	6.79	5.74
DS3 System Services	56.02	51.3
RoCoF Implementation	5.63	2.55
TAO Charge	213.6	213.79
EWIC Charge	18.22	17.8
Allowed TSO Operating Revenue		
Allowed TSO Internal Opex costs	48.91	47.81
Depreciation	7.98	7.8
Stage 1 Side RAB - Working Capital	2.01	3.02
Working Capital (Other)	3.85	3.72
Return on RAB - CapEx non-network	1.36	1.33
Approved adjustments		
Guarantees of Origin	0.33	0.33
Constraints arrangement fee	0.46	0.46
PR3 Adjustment	-0.71	-0.69
Strategic project France-Ireland Interconnector	0.27	0.21
Incentives		
2017 Incentive allowance	0	2.62
2015 Over recovery	-6.44	-6.44
TOTAL	363.19	356.52
Total CRU approved updated actual costs 2017		(a) 356.52
2017 TUoS collected		(b) 370.364
Total k-factor adjustment (pre-interest)		(b)-(a) -13.84

Our current Price Review (PR4) runs from 2016 to 2020. The CRU Decision for 2017 Transmission Revenues, which features a breakdown of, and explanation for, the revenue requirements can be found [here](#). Details on the approved costs for 2017 taking into account this lookback review are published by the CRU as part of the 2019 Transmission Revenues [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 this national transmission grid (network capital works) are the responsibility of ESB Networks as the constructor and owner of the network. 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 regulator being provided via the regulated Use of System Tariffs on an annual basis. In 2017 the actual spend on network capex was €159m, excluding customer contributions, bringing the overall spend during PR4 in 2016 and 2017 to €310m. The approved revenue envelope for PR4 totals €985m. It is important to note that a review of performance of network expenditure is carried out as part of each five year Price Control review against the overall envelope.

On an annual basis we jointly submit detailed reports to the CRU on our network expenditure as required under the PR4 arrangements. Expenditure in relation to the network is covered in more detail in our Investment Planning and Delivery Report.

How we ensure safety

EirGrid Safety Statement

In line with its strategy, vision and values, safety is never compromised during any activities undertaken by EirGrid or on its behalf. To achieve this EirGrid has implemented and maintains an Occupational Health and Safety management system externally certified to BS OHSAS 18001 *Occupational Health and Safety Management Systems - Requirements*.



With the active support of the executive team and senior management team and ongoing dialogue with staff, consultants, contractors and other relevant parties, EirGrid maintains the highest standards of occupational health and safety.

There were no HSA (Health and Safety Authority) reportable accidents in 2017.

Electric and Magnetic Fields (EMFs)

The main safety risk with high-voltage electricity transmission is accidental electrocution – and this is a very low risk. To protect against this risk, EirGrid transports energy on wires carried by poles and pylons, or buried underground in cables. 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 EMFs, based on current information from health and scientific agencies.

ESB Networks Safety Statement

Management and employees within ESB Networks are committed to ensuring their own health and safety and that of others. ESB Networks is committed to achieving an incident and accident-free workplace by protecting the safety, health and welfare of employees, contractors, visitors and the public. ESB Networks is committed to complying with legal health and safety obligations and with codes of practice; and continually improving and implementing the highest health and safety management standards. This policy declaration is communicated to employees, displayed in key locations in ESB Networks and communicated to contractors. To ensure that safety, health and welfare are managed to the highest standards,

ESB Networks maintains a full Safety Management System in line with the international Occupational Health and Safety Assessment Series (OHSAS) 18001:2007, which is certified by the National Standards Authority Ireland (NSAI). With the full involvement of all our employees, ESB Networks aims to promote an open and positive safety, health and welfare culture. This is reinforced through strong and visible leadership and by striving to achieve an incident- and accident-free workplace.

ESB Networks Work Programme

ESB Networks maintenance and renewal programmes, in particular ‘hazard patrols’, have an important and positive impact on public safety. The delivery of these programmes is monitored and reviewed regularly. Every month the public safety team analyses public safety incidents, including those involving fallen wires. Learnings from these incidents are included in a monthly safety briefing and are used to communicate with the public. Examples of important public safety processes are:

- “Stop work notices” which we implement when we see someone working unsafely near overhead electricity wires;
- Our ‘dial before you dig’ help desk, which provides map records of where cables are located; and
- Covering electricity wires with shrouding so that customers can safely carry out work on their houses.

Stakeholder Education and Awareness

2017 marked the third year of ESB Networks’ ‘Safe Family Farms’ partnership with the Irish Farmers Journal. Weekly editorial safety pages and online articles, online videos and full-page public safety advertisements at key times of the year raised awareness of electrical safety and farming.

ESB Networks has also joined the Construction Safety Partnership Advisory Committee. As part of Construction Safety week, we implemented initiatives to provide safety information to the construction industry, including thousands of Construction Industry Federation (CIF) members, and others in the construction and related industries.

Public Safety Information Campaign

ESB Networks’ Public Safety Advertising Campaigns - ‘Are You Sure It’s Safe?’ and “Stay Safe, Stay Clear” - continued throughout 2017, reminding the public of the need to be aware of the dangers of electricity. Awareness figures for the TV campaign reached 92%, compared with 88% in 2016. Radio safety messaging highlighted the dangers of electricity when carrying out farming, construction, leisure and gardening activities.

We continued to sponsor the ‘weather forecast’ on RTE Radio 1, and this provided a relevant and engaging platform to raise awareness of electricity safety.

In response to specific public safety incidents and near misses, we provided information to the GAA and bodies involved in sailing, fishing and gun clubs.

Storm Ophelia

The safety and wellbeing of our ESB Networks staff and customers during Storm Ophelia was our primary concern with daily morning safety briefings for front line staff, and a text alert system pushing key safety information out to field staff. Tailored briefings were provided for all contact centre staff.

Our TV and radio public safety media campaign, including the sponsored time on RTE Radio 1 Weather, social media, and search advertising delivered critical public safety messages. This campaign generated 30 million views and touchpoints, with 13 million TV views, 3.8 million radio listeners. Our partnerships with The Irish Farmers Journal, Agriland and Independent Farming contributed to our safety messages achieving a wide reach.

How we manage our environmental footprint

The Irish Government has set a target of an energy efficiency improvement of 33% by 2020 across the public sector, under the National Energy Efficient Action Plan 2014 and SI 426/2014: 'Energy Efficiency Regulations'. These regulations and targets apply to EirGrid and ESB Networks. We are committed to playing a leading role in enabling Ireland's transition to a low carbon future.

In 2017 EirGrid consumed 3,779 MWh of energy in our Dublin offices and business continuity centre. The latter is an off-site location with a fully functional backup of the national control centre. This energy use can be broken down as follows:

- 3,011 MWh of electricity, and
- 768 MWh of fossil fuels.

Year-on-year, we have achieved an energy reduction of 5% for our Dublin sites. We continue to find ways to reduce our energy use. In 2017, this included installing a "free cooling" system in our IT server rooms. This system uses naturally cool air from outside the building to operate in a more energy efficient manner. Thanks to all our energy saving initiatives, we are on target to achieve the 2020 public-sector target.

During 2017, ESB Networks made significant efforts to ensure effective management of our environmental responsibilities. To the end of 2017, ESB Networks delivered an improvement of 31.6% over baseline and against the 33% target; this represents an overall energy savings of over 22.5 GWhs annually.

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.

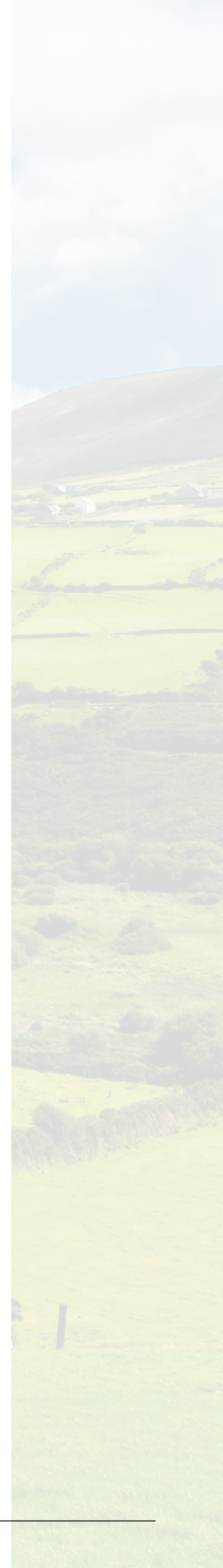
In accordance with European and national law we undertake Strategic Environmental Assessments (SEA) of our grid implementation plans every five years. Our current plan and SEA covers the period 2017-2022. The plan integrates [Ireland's Grid Development Strategy](#), the approved [Transmission Development Plan](#) and the EirGrid policies and objectives that guide sustainable grid development. The scope of the SEA for the 2017-2022 Plan was determined in 2017 following engagement with stakeholders. The aim at the end of 2017 was to go out for public consultation on this in 2018.

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 were submitted in 2017.

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.

Acronyms

- Combined Heat & Power (CHP)
- Commission for Regulation of Utilities (CRU)
- Committed Project Parameter (CPP)
- Construction Industry Federation (CIF)
- Demand Side Units (DSUs)
- Economic and Social Research Institute (ESRI)
- EirGrid is the Transmission System Operator (TSO)
- Electric and magnetic fields (EMFs)
- Environmental Impact Assessment (EIA)
- ESB Networks is the Transmission Asset Owner (TAO)
- Health and Safety Authority (HSA)
- Industrial Development Agency (IDA)
- Integrated Single Electricity Market (I-SEM)
- Joint Programme Management Office (JPMO)
- National Standards Authority Ireland (NSAI)
- Occupational Health and Safety Assessment Series (OHSAS)
- Price Review (PR4)
- Project Agreement (PA)
- Project Implementation Plans (PIP)
- Project of Common Interest (PCI)
- Rate of Change of Frequency (RoCof)
- Réseau de Transport d'Électricité (RTE)
- Reserve constrained unit commitment (RCUC)
- Secure Sustainable Power System (DS3)
- Short Term Active Response (STAR)
- Single Electricity Market (I-SEM)
- Special Protection Schemes (SPS)
- Strategic Environmental Assessments (SEA)
- System Minutes Lost (SML)
- System Non-Synchronous Penetration (SNSP)
- Transmission Loss Adjustment Factors (TLAFs)
- Transmission Asset Owner (TAO)
- Transmission System Operator (TSO)
- Utility Regulator (UR)
- Volt-Ampere reactive (VAR)





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 see how you can get in touch below.



Please contact our Customer Relations Team at:
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