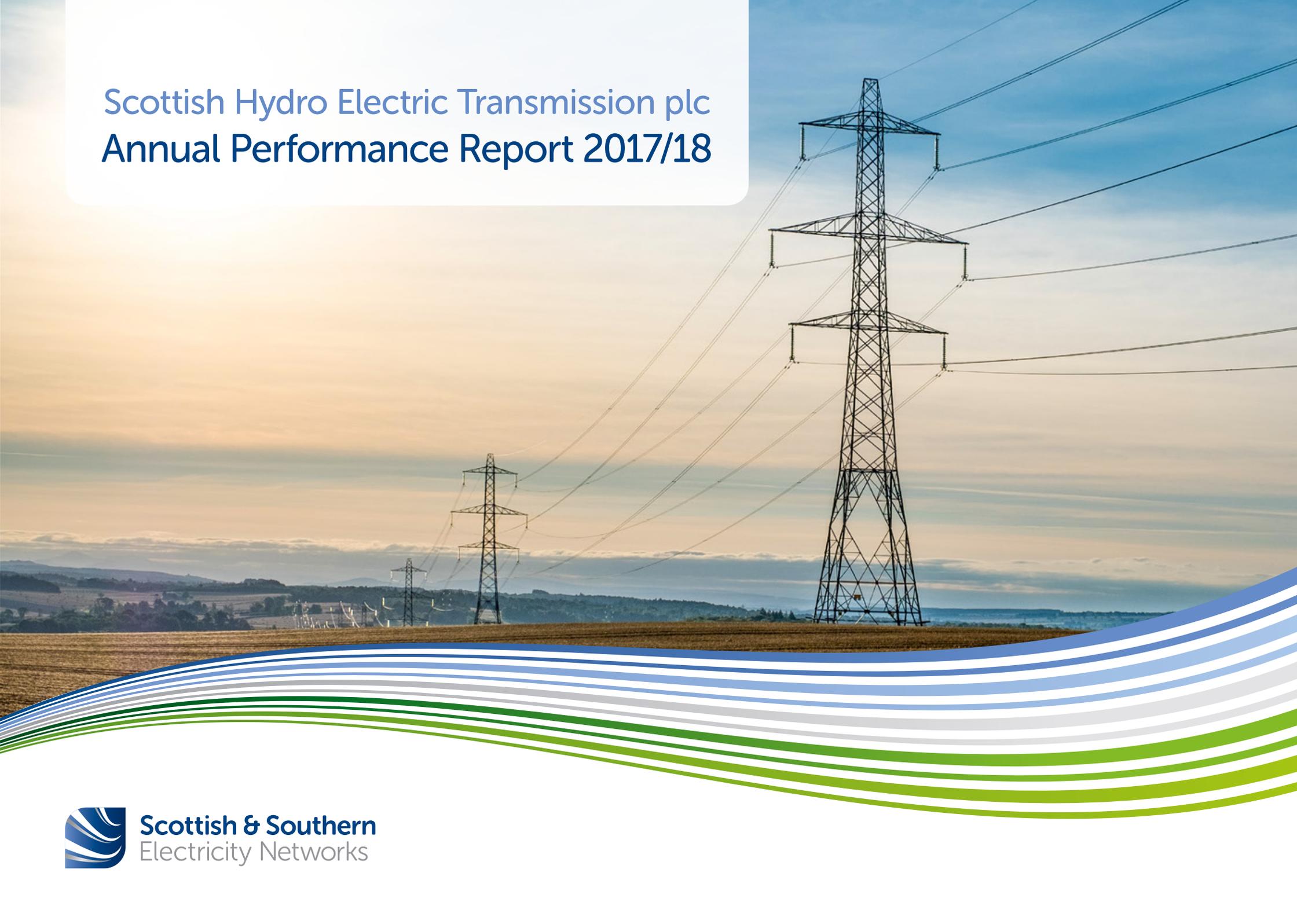


# Scottish Hydro Electric Transmission plc Annual Performance Report 2017/18



# Contents

|     |                                  |    |
|-----|----------------------------------|----|
| 1.  | Executive summary                | 3  |
| 2.  | About us                         | 4  |
| 3.  | Performance highlights           | 6  |
| 4.  | Safety performance               | 11 |
| 5.  | Powering our community           | 14 |
| 6.  | Facilitating generation          | 17 |
| 7.  | Innovating for a smarter network | 23 |
| 8.  | Stakeholders                     | 26 |
| 9.  | Working sustainably              | 29 |
| 10. | Expenditure                      | 32 |





**Dave Gardner**  
Director of Transmission



CONNECTED  
**300MW+**  
NEW RENEWABLE  
ELECTRICITY GENERATION



**+99.9%**  
IMPRESSIVE RELIABILITY OF  
SAFE AND RELIABLE SUPPLY

## Executive summary

I'm delighted to introduce this year's Annual Performance Report which provides a summary of our 2017/18 performance and our progress towards meeting our Business Plan commitments for the current Price Control period, RIIO-T1.

As ever the Health and Safety of our staff, contractors and members of the public remains our number one priority and whilst our overall performance improved during the year, we still have progress to make in meeting our target that all employees and contractors return home safely after a hard day's work.

Beyond health and safety our core purpose is to provide a safe and reliable supply of electricity to the communities we serve. Despite the current period of rapid growth in transmission development, we continue to maintain an impressive reliability of over 99.9%.

A key business focus for us across the RIIO-T1 price control period has been to enable the transition to a low carbon economy. We do this by building the transmission infrastructure necessary to connect and transport renewable energy from the north of Scotland to areas of demand. In 2017/18, we continued to make good progress on our flagship Caithness-Moray project, with the vast majority of all onshore works completed and substantial progress made installing the subsea cable.

We will continue to work with our key contractors in the coming months so that commissioning and energising is successful and the project remains on track for delivery by the end of 2018.

Providing timely connections to the transmission network is also a key responsibility for our business. During 2017/18, we connected over 300MW of new renewable electricity generation to our network, which is now on track to support over 6GW of renewable energy by the end of the price control period, almost double that connected at the start of the RIIO-T1 Price Control in 2013.

Finally, preparations are well under way to gather evidence to support the development of our business plan for the RIIO-T2 price control, which begins in 2021. Our main focus during 2017/18 has been on future energy scenarios across the north of Scotland, with extensive consultation and engagement with key stakeholders helping us identify the likely network requirements for the next Price Control. We will undertake further engagement and consultation with key stakeholders in the year ahead to help us build a credible and evidence-based business plan for submission to Ofgem in 2019.

The importance of gathering the views of our stakeholders also extends to this report and I would welcome any feedback you may have on our performance and priorities or, more generally, our activities as the transmission owner for your area.



# About us

We are Scottish Hydro Electric Transmission plc and we are part of Scottish and Southern Electricity Networks. We are responsible for operating, maintaining and investing in the electricity transmission network in the north of Scotland.

We own and maintain the 132kV, 275kV and 400kV electricity transmission network in our licence area.

Our network comprises of underground cables, overhead lines on wooden poles and steel towers and electricity substations, and it extends over a quarter of the UK land mass across some of its most challenging terrain.

We take the electricity generated from onshore windfarms, hydro power stations and other generators and transport it at high voltage over long distances through our transmission network to areas of demand around our towns and cities.

Our core purpose is to provide the energy that people need in a reliable and sustainable way.

To achieve our core purpose we focus on three key business activities:



**1.** Planning ahead for the future needs of generators and consumers of electricity, and making timely, cost effective investments in network infrastructure.



**2.** Looking after the existing transmission network to maintain reliable supplies of electricity to homes and businesses in the north of Scotland.



**3.** Operating in a safe, sustainable manner that protects the interests of current and future generations.



# Performance highlights

Our Business Plan for the current price control period states that we will deliver outputs across a variety of business activities.

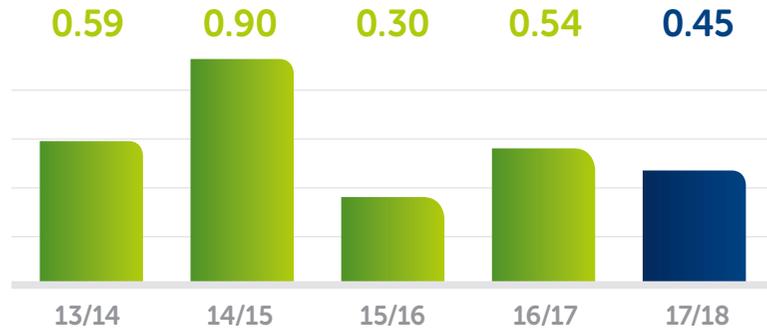


### Safety

## TRIR (Total Recordable Incident Rate)

Target = 0.25

Total number of recordable incidents for staff and contractors per 100,000 hours worked.

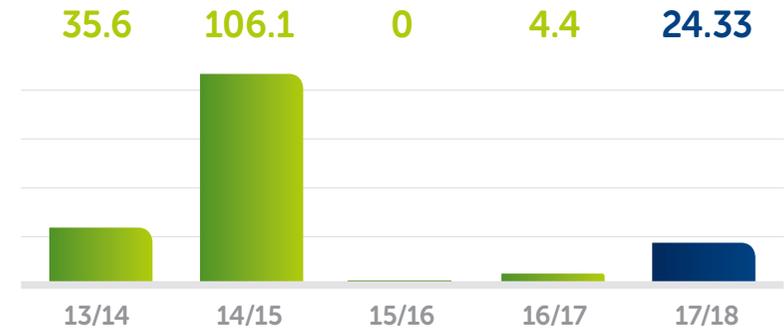


### Reliability

## Energy Not Supplied

Target = <120MWh

The energy not supplied to customers due to incidents on the transmission system. During the year there was only one event resulting in the loss of supply.

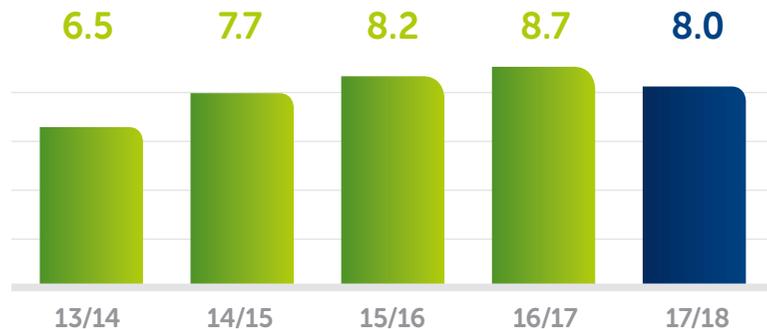


### Customer Satisfaction

## Stakeholder Satisfaction – Survey

Target = 7.4

This is the output of a survey conducted by an external research company with the score solely attributable to responses to the question "How satisfied are you overall with SHE Transmission?"

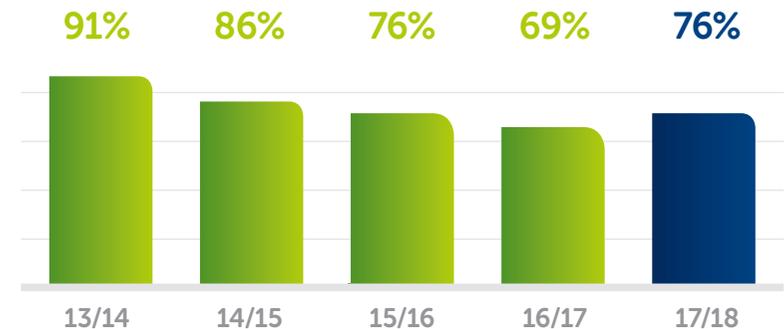


### Customer Satisfaction

## Stakeholder Satisfaction – KPI

Target = 89%

Our performance here is measured against 19 no. measures and aggregated to derive a percentage performance score. We have implemented improvement actions to achieve above target performance by 2019/20.

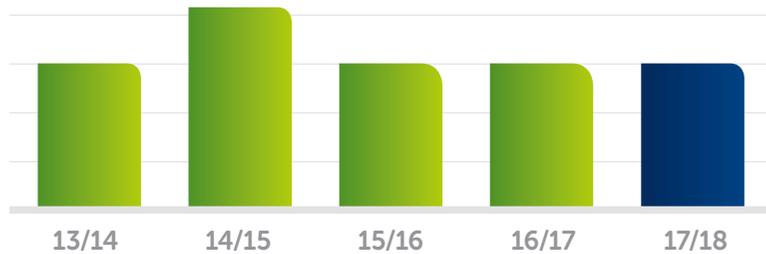


### Stakeholder Satisfaction

## Stakeholder Engagement External Assurance

An external assurance team assesses the extent to which we have implemented our stakeholder engagement strategy and plan. The outcome of this is categorised as Non-Compliant, Compliant or Exceeds.

Compliant Exceeds Compliant Compliant Compliant

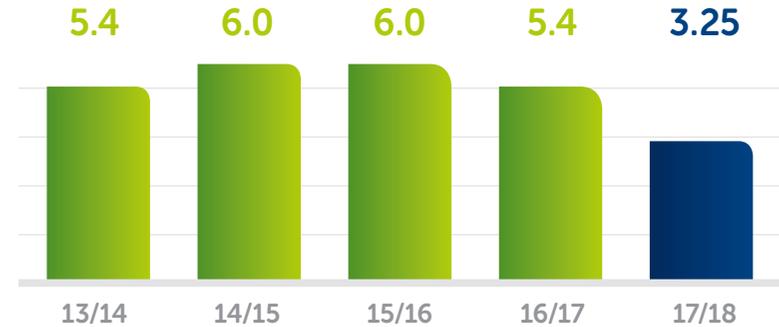


### Stakeholder Satisfaction

## Stakeholder Satisfaction – Panel

Target = 5.0

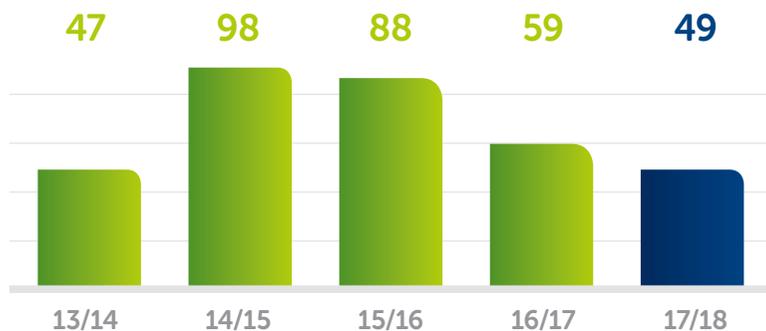
An independent panel assesses our stakeholder engagement activities. An improvement plan has been developed to significantly improve our performance in this area.



### Connections

## Timely Connections

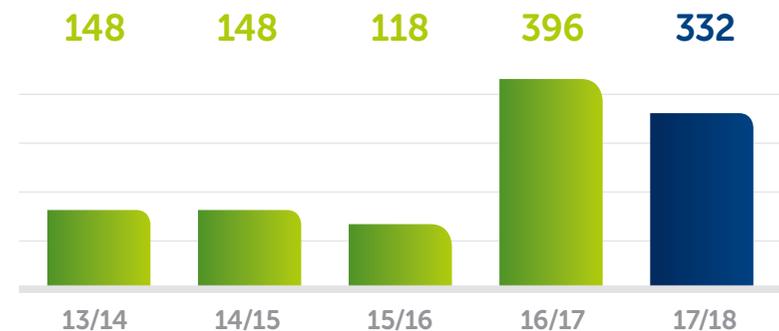
Our target is for all offers for connections to the transmission network to be made to customers within the time periods set out in the industry code. In 2017/18 we made 49 offers all of which met our target.



### Connections

## Generation MW Connected in the year

This measures the new generation connected through the sole use volume driver mechanism.



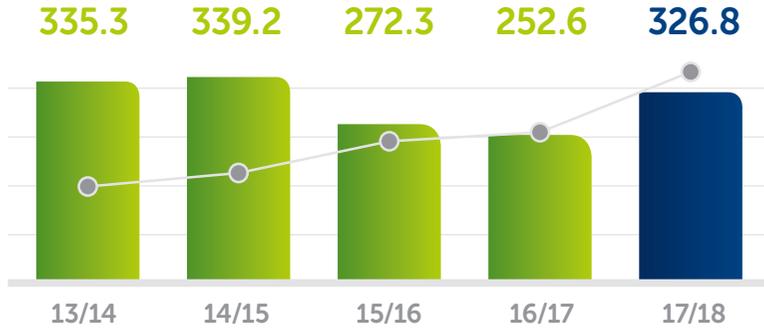
Environmental

SF<sub>6</sub> Leakage (kg)

Target = <340.15kg

This measures the sulphur hexafluoride (SF<sub>6</sub>) leakage from our switchgear. The target increases as the number of assets using SF<sub>6</sub> on our network increases.

● Annual SF<sub>6</sub> Leakage Target

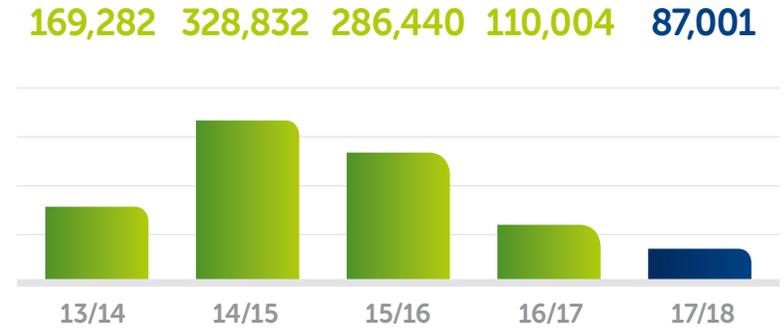


Environmental

Transmission Electrical Losses (tCO<sub>2</sub>e)\*

The electrical losses from our system are measured as the difference between the energy entering our system and the energy received by customers.

\* Tonnes of carbon dioxide equivalent

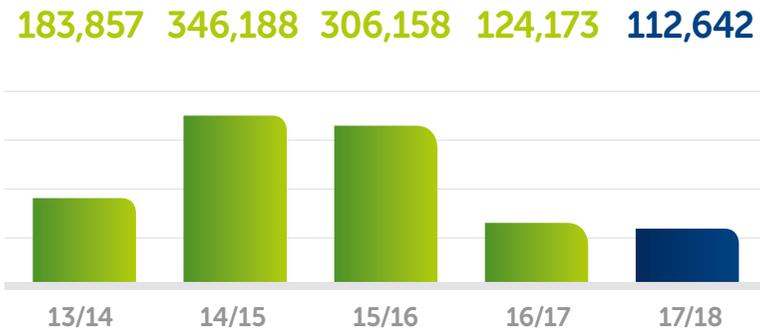


Environmental

Business Carbon Footprint (tCO<sub>2</sub>e)\*

This measures the carbon footprint of the business in delivering our activities.

\* Tonnes of carbon dioxide equivalent



Environmental

Environmental Discretionary Reward (EDR)

Target = Leadership

Assessed by an expert Ofgem panel, we will receive the score for 2017/18 in October.

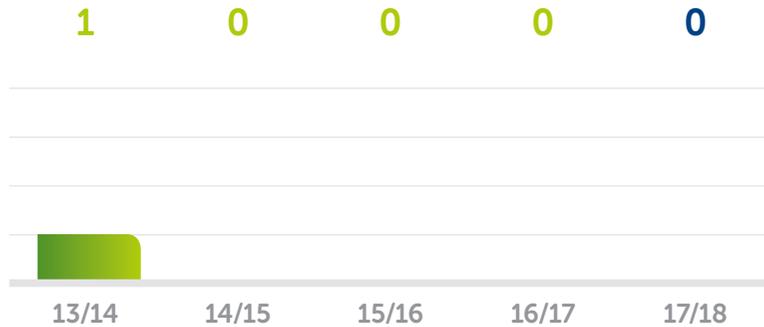


Environmental

**Environmental enforcement/formal warnings**

Target = 0

The number of formal environmental warnings or enforcement action taken against SHE Transmission by a regulator.



**Incentive/Penalty Revenue**

There are 6 no. licence mechanisms that provide the potential for a performance related reward and/or penalty.

| Output                   | Opportunity |         | 2017/18 Performance       |
|--------------------------|-------------|---------|---------------------------|
|                          | Reward      | Penalty |                           |
| Energy not supplied      | YES         | YES     | £0.95m                    |
| Stakeholder Satisfaction | YES         | YES     | -£0.07m                   |
| Stakeholder Reward       | YES         | NO      | £0m                       |
| Timely Connections       | NO          | YES     | No penalty                |
| SF <sub>6</sub> Leakage  | YES         | YES     | £0.01m                    |
| EDR                      | YES         | NO      | Confirmed in October 2018 |

**Return on Regulatory Equity (RoRE)**

9.7%

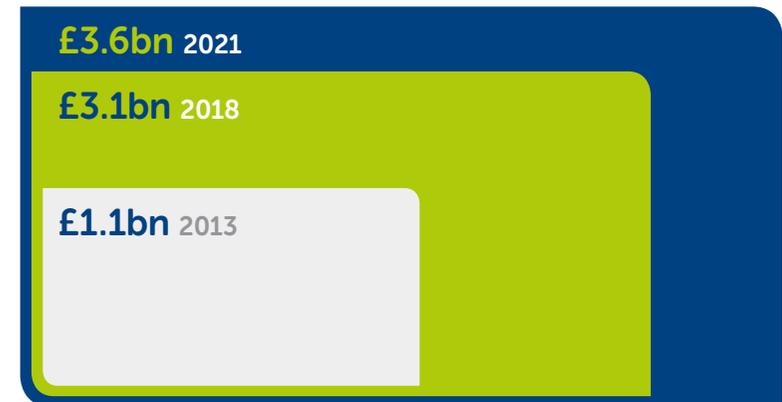
(excluding Transmission Investment for Renewable Generation (TIRG))

**Return on Regulatory Equity (RoRE)**

(8 year average for RIIO-T1)

**Regulated Asset Value (RAV) at end of year**

The RAV is a useful indicator of the growth in the size of our network over the price control period and we are forecasting that by March 2021 it will reach £3.6bn.





# Safety performance

The Health and Safety of our staff, contractors and members of the public remains our number one priority. Our aspiration continues to be for everyone involved in our activities to go home safe each and every day.





Whilst our overall performance improved during the year we still have progress to make to meet our aspiration. Our Total Recordable Incident Rate (TRIR) for 2017/18 dropped from 0.54 to 0.45.

This is a step in the right direction and importantly a clear message that we need to and can do more to drive further improvements.

In 2016 we empowered our workforce to feel more confident intervening where they had safety concerns through the introduction of a safety licence – IF IT'S NOT SAFE WE DON'T DO IT. Since then we have seen an improvement in the reporting of safety, health and environment incidents. This is mainly due to staff having an improved confidence in reporting and enhanced understanding of the process.

Building on this during 2017/18 we increased our proactive encouragement of colleagues and contractors to use the safety licence when faced with safety concerns. Consequently the safety licence has proven popular and this is shown in its increasing use, by employees and contract partners alike. With all stating that they feel more confident to do the right thing regardless of whatever situation they face.

#### Working with Karrdale

In addition to the continued promotion of the safety licence we undertook an exercise right across the Transmission business to better understand the human and organisational factors associated with safety, health and environment performance. Working with an expert external partner called Karrdale we developed and delivered a bespoke training course called Influencing Behaviours for all employees and contract partners. This training focused on human behaviour and how this can affect performance.

All Transmission staff (circa 420 people) and circa 600 of our contractor's employees attended this training and all feedback was positive. The training introduced simple and effective concepts which help people remain mindful of risk and deliver safe outcomes every day. The Influencing Behaviours training will continue on a rolling basis over the next 3 years to ensure this becomes fully embedded in our safety culture.



Total Recordable Incident Rate (TRIR)  
**down from 0.54 to 0.45**

## Utility Week star award Health and Safety Champion: Initiative award



We, as part of the wider Scottish and Southern Electricity Networks, were recognised at the prestigious annual Utility Week star awards ceremony where we picked up the Health and Safety Champion: Initiative award.

The award was presented for the successful introduction of our safety licence,

**“if it’s not safe, we don’t do it”**

and the roll out of the ‘Influencing Behaviours’ training programme across our organisation. Judges commended the nomination as being ‘the standout’ entry in the health and safety initiative category.

Intended to be more than just a slogan, our licence gives individuals at all levels the empowerment and authority to stop a job or activity if they are concerned for their own personal safety and that of others, providing a direct message that safety is our number one value and ensuring we all go home safe at the end of the working day.



Heather Black and Rachel Parry from SSEN collecting the award

Looking beyond 2017/18 we will continue to target further improvements in our safety and health performance.

Our 2018/19 Safety and Health plan reinforces the vision we have ‘to continuously deliver safe outcomes for our people, our customers and our environment’ and building on this moving forward our long-term strategy focuses on three strategic aspects, these are:

-  **1.** Continuous improvement of our processes
-  **2.** Development of our beliefs and behaviours
-  **3.** Improvements in leadership

Our long-term strategy will help develop our culture and move us closer towards our vision for an ever-improving safety and health performance.



# Powering our community

Our core purpose is to provide the energy that people need in a reliable and sustainable way.



**Neil Sandison**  
Head of Transmission  
Control Centre

Powering our community from a network perspective means targeting zero customers off supply, reducing the number of incidents on the network and working to deliver our RIIO-T1 non-load related programme.

To deliver against our core purpose our Operations and Maintenance (O&M) teams have an ongoing programme of maintenance, inspection and testing. Given that our network covers a quarter of the UK's land mass and is typically located in areas of challenging terrain and inhospitable environments, it is testament to their commitment and experience that incidents on our network are very rare and rarer still are incidents resulting in loss of supply to customers.

In 2017/18 there were 85 incidents on our network with one of these resulting in the loss of supply to customers. This incident occurred due to coincident failures of grid transformer control and communications systems at a substation in the Aberdeen area.

Not only is our network located in challenging geographical locations it also dates back in some case over 70 years. The age of our network means we have a need to modernise circuits, plant and equipment and this need is what forms the basis of our non-load related programme. The work in this category can take many forms but is typically related to the reconductoring of existing overhead lines or the replacement of transformers and switchgear at our existing substation sites.

Progress against our non-load related programme is explained below and illustrated in the table to the right. This is followed by an update on the enhanced asset management capability that we are building. Our non-load related programme contains a diverse range of works from switchgear replacement through to reconductoring overhead lines across large distances. The table opposite brings this to life by comparing our business plan output targets against our latest forecast. There are variances between our business plan and forecast outputs across the range of non-load works categories. One such area where there is a significant difference is the 132kV overhead lines work load. We expect to undertake far greater works than planned due to the condition of the assets in question being worse than their original assessment.

Overall Reliability of Supply for the SHE Transmission System during 2017/18 was:

**99.999555%**



**2017/18 Non-Load Expenditure £51.1m**

| Asset Additions       | Business Plan | Latest Forecast | Difference |
|-----------------------|---------------|-----------------|------------|
| <b>275 kV – Total</b> |               |                 |            |
| Circuit Breaker       | 1             | 1               | 0          |
| OHL Fittings          | –             | 52              | 52         |
| <b>132 kV – Total</b> |               |                 |            |
| Circuit Breaker       | 28            | 16              | -12        |
| Transformer           | 16            | 16              | 0          |
| Reactor               | –             | 9               | 9          |
| Underground Cable     | 14.8          | 15.6            | 0.8        |
| OHL Conductor         | 927.2         | 970             | 42.8       |
| OHL Fittings          | –             | 822             | 822        |
| OHL Tower             | –             | 390             | 390        |

Non-load related project

## Fort William – Kinlochleven Fibre Replacement



Due to remote locations of the sites a helicopter was used for the delivery of cable drums and cable bridges

This project required the replacement of an existing telecoms connection between the Fort William and Kinlochleven substations.

The route between the two substations is across very remote and challenging terrain and the successful delivery of these works required some out of the box thinking. The replacement telecoms link consists of:

- 30 spans on the 132kV tower line from Fort William to Lundavra
- 14km ploughed through extremely rough and remote land (mostly following the route of the West Highland Way)
- 1.2km of ducted insulation
- 2.5km on a wooden pole line
- 42 cable bridges over existing waterways and burns.

In order to have the link installed and ready for commissioning in 2018/19, most of the work was carried out over the winter period which in itself introduces challenges and project risks. We completed the construction works on time and the commissioning works are planned to be undertaken in 2018/19.

## Asset management Building the capability

The SHE Transmission Operations Asset Management team has undergone significant restructure and development during 2017/18, with dedicated Asset Engineering, Risk & Strategy and Information & Systems teams established, resulting in a threefold increase in team size.

This has enabled the Asset Management team to support the implementation of the Maximo asset data and workflow management tool as well as the continued close out of the RIIO-T1 Business Plan, preparation for RIIO-T2 and the revised Network Outputs Measures Methodology in collaboration with the other UK Transmission Operators.

Looking ahead, there will be continued investment to ensure that our structure and systems are in place to provide stakeholders with timely insight, intelligence and accurate reporting on asset and network condition, enabling optimum and efficient asset management decisions.

# Facilitating generation

Enabling the transition to a low carbon economy is our strategic priority for the RII0-T1 period and we achieve this by investing in and building the transmission network necessary to connect renewable energy in the north of Scotland.



**Ian Clark,  
Paul Higginbotham  
& Daryn Lucas**  
Lead Project Managers

In April 2013 there was approximately 3,300MW of generation connected to our network. By the end of March 2021 we expect connected generation to have risen to over 6,000MW.

This increase in connected generation is a result of significant investment in our network that will increase the Regulated Asset Value (RAV) of our network from circa. £1.1 billion in April 2013 to a forecast £3.6 billion in March 2021.

Throughout 2017/18 we made significant progress on key projects that contribute to the increase in connected generation. This includes sole use connections for a single connected generator, shared use works for multiple generators or strategic wider works (SWW) projects that provide greater network capacity and resilience to support the continued growth in generation connected to our network.

If a developer wishes to connect to the Transmission Network, then an application needs to be sent to National Grid Electricity Transmission to apply for a Network connection. They then make an application to us asking us to specify the most economic and efficient design for their development and provide costs for the completion of the necessary works.



**49**  
connection offers  
**332MW**  
connected in the year

Following acceptance of a connection offer our Development Team commence work on developing the necessary infrastructure solution to provide the generator with their connection. This includes a variety of activities such as:

- network studies
- option assessment reports covering overhead line, cable route and substations
- site walkover surveys
- environmental surveys
- ground investigation works and marine surveys
- stakeholder engagement and public consultations.

All with the intention of developing the most efficient technical solution balancing the needs of all stakeholders and interested parties. The technical solutions then evolve into construction projects.

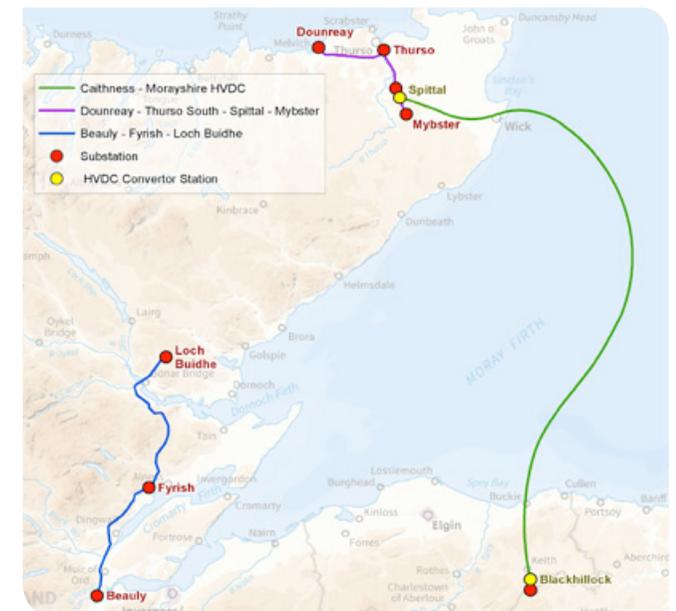
Next we provide an update on our flagship Caithness-Moray SWW project, progress on our development works for Orkney, Western Isles and Shetland projects and two generator connection related projects.

## Strategic Wider Works Project

### Caithness-Moray

The determination by Ofgem of our Costs and Outputs submission in December 2014 for the Caithness-Moray portfolio of projects triggered the commencement of our biggest investment programme to date. The significant works were made up of upgrades to our Transmission network from Dounreay to Beauly, and across to Blackhillock.

By the end of 2017/18 the majority of the new Alternating Current (AC) assets were commissioned and energised with the commissioning of the remaining AC assets and the full High Voltage Direct Current (HVDC) system from Spittal in Caithness to Blackhillock in Moray planned for completion during 2018/19.



Caithness-Moray Reinforcement SWW

### Caithness AC

In Caithness, the new 275kV AC overhead line network was energised in stages from Dounreay to the new 275kV / 132kV / 33kV Thurso South Substation in July 2017; and then on to the new Spittal AC substation which was energised at 132kV and 275kV in March 2018.

The 132kV extension to Mybster Substation and new overhead line circuits to Spittal Substation were fully constructed and the commissioning sequence well underway by the end of the year.

### Ross-Shire AC

To the south, the Loch Buidhe Substation 132kV busbar was energised in August 2017 and the reconductoring of the 275kV circuit from Beauly to Loch Buidhe was completed in readiness for the energising Fyrish and Loch Buidhe Substations in mid-2018.

### Moray AC

To the east, the new 132kV / 275kV / 400kV Blackhillock Substation Air Insulated Switchgear (AIS) and Gas Insulated Switchgear (GIS) assets were commissioned in stages throughout the year, including the replacement of the overhead line to Keith with new 275kV cable circuits. It is one of the largest substations in the United Kingdom and is an integral part of the Transmission network in the north of Scotland.

### Caithness-Moray HVDC

Spittal AC and Blackhillock Substations provide the key interface to the new HVDC link between Caithness and Moray via converter stations at each site operating respectively at 800MW, and 1,200MW in the future. The HVDC connection will provide a critical link for the routing of renewable energy resources from the very north of Scotland to the areas of higher demand in the south.

Construction works continued to progress well on the HVDC part of the Caithness-Moray portfolio. The cable installation works, which were split into three sections; Caithness land, Moray land and Sub-sea were substantially completed during the year with final jointing at the cable landfall locations planned to be completed in the second quarter of 2018. Material progress was made on the civil construction works during the year with electrical installation works planned to commence early in 2018/19.



Caithness-Moray – Spittal Site

The involvement and integration with the local community has been a key contributor to the ongoing successful delivery of the Caithness-Moray works. Almost half of the workforce was drawn from the Caithness, Sutherland, Wester Ross and Moray areas with the remainder of the workforce needing local accommodation during the 3-year build period. SHE Transmission and Contractor staff alike have been involved in community projects ranging from presentations relating to the electricity network and safety to local school children, to repairing community slipways and maintaining school facilities.

Strategic Wider Works Project

# Orkney

Our Orkney project will provide the first Transmission connection (220kV 220MW) to Orkney and we made significant steps forward in developing this project during 2017/18. We undertook a variety of development activities throughout the year culminating in the submission of a Needs Case to Ofgem in March 2018. This coupled with the innovative approach to customer connections we have developed through significant stakeholder engagement means that we are confident of achieving our target of awarding contracts in Q4 2019.

Following submission of the Needs Case to Ofgem we are now working on the Project Assessment with both documents requiring Ofgem approval before we progress to contact award and commencement of construction works as shown in the timeline below:



### Orkney Link

The link will connect Orkney to the UK Transmission network for the first time via 70km of land and subsea cables that connect in to new substations at Dounreay West and Finstown.

### Progress during 2017/18 for this projects included:

- Engagement with stakeholders to consult on proposed routes and site selection options
- Marine surveys along the 53km subsea route between the Caithness coast and Orkney
- Advancing the procurement of construction delivery contractors
- Submission of the Needs Case including the Cost Benefit Analysis (CBA)



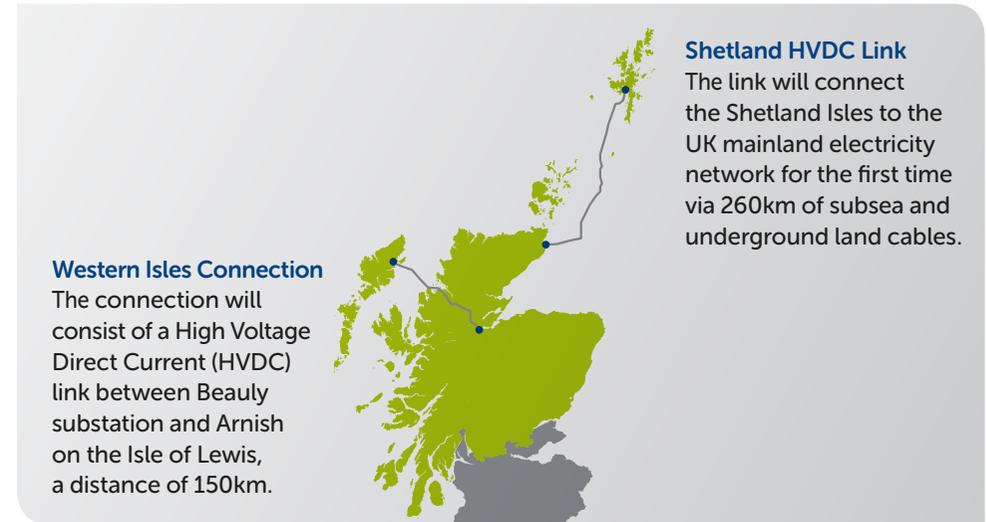
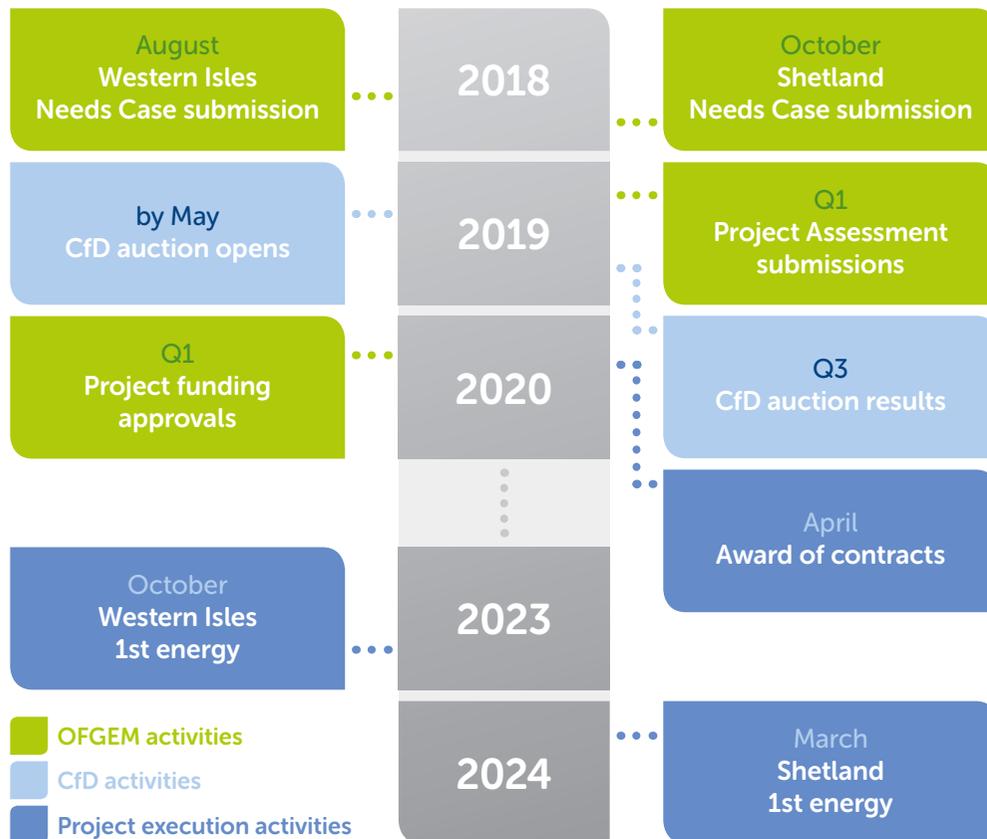
Orkney consultation event

Strategic Wider Works Project

## Western Isles and Shetland

Following the UK Government’s announcement in October 2017 that on-shore island renewable generation schemes would be eligible to compete in the 2019 Contracts for Difference (CfD) auction, SHE Transmission re-commenced SWW projects to consider connections to the Western Isles and Shetland.

Both projects require the submission of a Needs Case and Project Assessment for Ofgem determination in addition to being contingent on the outcome of CfD results for developers on both island groups as shown in the timeline below:



### Progress during 2017/18 for these projects included:

- Re-establishing a project team and re-baselining programmes and costs;
- Engagement with stakeholders including Ofgem, BEIS, the Western Isles Council, Scottish Government and major developers;
- Holding open events in Lerwick and Stornoway (left) to engage with the public and smaller developers;
- Review of on-island supporting works (customer connections and local transmission infrastructure);
- Advancing the procurement of construction delivery contractors; and
- Preparation of Needs Cases including Cost Benefit Analysis (CBA) with the System Operator.



Lead Project Manager Daryn Lucas at Western Isles stakeholder meeting

### Sole Use Project

## Stronelairg Melgarve

Through our connection agreement we committed to provide a connection to the Stronelairg Windfarm (227.8MW) in two phases. Starting with a temporary connection in March 2018 and moving to a permanent connection in October 2019.

To deliver the temporary connection for March 2018 we constructed:

- A new 132kV/33kV Indoor Air insulated switchgear (AIS) Substation with three 120MVA Grid Transformers at Stronelairg
- A new 400kV/132kV Substation with temporary AIS arrangement including one 480MVA Supergrid Transformer at Melgarve
- 10km underground 132kV Cable circuit between Stronelairg and Melgarve
- A new 400kV Overhead Line Terminal Tower at Melgarve to connect the substation to the Beauldy Denny Overhead Line.

Works commenced in October 2016 and with the help of an accelerated construction programme we successfully completed the temporary works ahead of schedule. This was despite working through two winter periods at altitudes in excess of 825m above sea level – see photo on the right of winter weather conditions. This project is one of the largest and most challenging customer connection projects that we have undertaken to date.

The works associated with the permanent connection continue to progress and are on track for completion in October 2019.



Weather conditions on site

### Sole Use Project

## Aberdeen Offshore Windfarm Connection

The scope of this project was to provide a grid connection for the Aberdeen Bay Offshore Windfarm (99MW).

The connection to our network was at Kintore substation and involved the:

- Reconductoring of the Kintore-Dyce circuit
- Construction of a new bay at Dyce substation
- The upgrade of existing OHL from Dyce to Stoneyhill
- Sealing end platform at Stoneyhill including the installation of 7.2km of 132kV underground cable from Stoneyhill to Blackdog where the Developer was constructing his onshore substation.

Our construction works commenced in March 2017 and were completed in March 2018. The windfarm was forecast to energise in summer of 2018 and our final reinstatement works will be completed thereafter.



Official opening ceremony with First Minister Nicola Sturgeon, Energy Minister Paul Wheelhouse and Vatenfall CEO Magnus Hall

## Sole and shared use infrastructure highlights

|   |                        |      |                                  |
|---|------------------------|------|----------------------------------|
| 5 | No. of new connections | 21.5 | Length of OHL (km)               |
| 5 | No. of Substations     | 22.3 | Length of Underground Cable (km) |

# Innovating for a smarter network

During the previous financial year, we published an updated Innovation Strategy which affirmed our adaptability and commitment to value-driven innovation.



**Tim Sammon**  
R&D Project Manager

Our updated innovation strategy described our five focus areas which reflect the sentiment of our stakeholders and our readiness to respond to the changing demands of future requirements, these focus areas being:

1.  
**Asset health and Productivity**
2.  
**Network Reliability/ Availability and Efficiency**
3.  
**Commercial Innovations**
4.  
**Environmental and Safety Impact**
5.  
**Management of losses**

Furthermore through the Energy Networks Association's (ENA) 'Open Networks Project' we are working with all seven of GB's electricity grid operators, respected academics, NGOs, Government and Ofgem to develop industry-wide plans as the UK's energy networks adapt to enable the new energy technologies that generate, consume and manage electricity at a local level.

Some of our innovation projects are funded through the Networks Innovation Competition or the Network Innovation Allowance:

**Network Innovation Competition**  
For large projects

**2**  
projects worked on in 2017/18

**£2,654,061**  
Our spend on the HVDC Centre project in 2017/18

**£1,138,016**  
Our spend on the NeSTS project in 2017/18

**Network Innovation Allowance**  
For smaller innovations

**8**  
projects worked on in 2017/18

**1** new project started  
**3** projects closed

**£787,000**  
spend on our Network Innovation Allowance projects in 2017/18

**Innovation project**

## Managing Losses

In collaboration with Logic Energy we deployed energy monitoring equipment in our Tealing substation to understand heating, lighting and building utilisation and undertake a full energy audit of the site.

Edinburgh Napier University produced a report entitled 'Reducing Energy Losses & Greenhouse Gas Emissions from Substations' based on the data from the Logic Energy sensors.

Potential energy efficiencies were identified including better control of lighting and room heating, reducing internal/external lighting levels, improvement of building fabric and thermal performance and onsite generation.



**Innovation project**

## NeSTS Project Update

The New Suite of Transmission Structures (NeSTS) project is developing new pylons to reduce the environmental impact of overhead lines. Stakeholder inputs have driven the design process, and their positive response to the new designs was reported in 2017.

An overhead line using the new pylons was designed in parallel with a conventional lattice steel line to enable evaluation of NeSTS performance. The results will be reported on in 2018 and will be used to determine the viability of NeSTS designs for future projects.



Innovation project

## Dorenell 132kV OHL

This project was to connect the new Dorenell Windfarm to our existing Blackhillock substation using new innovative composite poles installing 140 of them along a 23km route.

### Benefits of Composite Pole:

- Composite poles are stronger than wooden poles, which allow them to support a larger sized conductor on one overhead line. Wood poles would require two parallel lines. This helps to reduce the visual effects of the overhead line and minimise land take.
- Although they are taller than wood poles at 24m in height (rather than 16m), they will allow for a greater clearance underneath the conductors, allowing for agricultural machinery to continue to operate safely beneath the overhead lines.
- The composite poles allow for a reduced construction programme. For this project the current programme duration is approximately 12 months overall.
- A greater spacing between individual poles can be maintained, at a distance of approximately 180m between poles, compared to 80-100m for wood poles. When combined with the single overhead line design this will reduce the number of poles required for the connection by 75%, greatly reducing the burden upon the land. This will reduce the impact on the land surrounding the overhead line.
- A single line of composite poles has a reduced corridor width when compared to a double line of trident poles.
- The composite poles are easier and less expensive to maintain and have a life expectancy of 80 years rather than 40 years for wood pole, meaning less maintenance visits.

MINIMISES  
LAND TAKE

REDUCED  
CONSTRUCTION  
PROGRAMME

24M POLE HEIGHT  
CREATES SAFER  
OVERHEAD CLEARANCE

75% FEWER POLES  
REQUIRED

LONGER 80 YEAR  
LIFE EXPECTANCY



New composite pole being installed with the help of a specialist Erickson S-64 Air Crane helicopter from the USA



# Stakeholders

Talking, listening and sharing information is at the core of how we operate. Furthermore ensuring that the views of Stakeholders influence our business decisions and solutions is something all at SHE Transmission passionately believe in.



**Alec Morrison**  
Customer &  
Community Manager

As an organisation, customer and stakeholder engagement is the responsibility of all employees, from the Board and senior management to front line development, construction and operational staff.

Whilst this responsibility is not new, we must remain committed to ensuring the views, needs and expectations of our customers and stakeholders continue to shape and influence how we do things.

The following three projects, Orkney Link Project, Future Energy Scenarios and Our Future Approach to Engagement, highlight the breadth and depth of our engagement during 2017/18. These projects demonstrate our strong commitment to engagement and highlight that we are prepared to challenge and adapt our own working practices and procedures to ensure we meet the requirements of our customers and stakeholders.

Engagement project

## Orkney Project

Innovative approach to achieve customer's connections

Orkney is a location rich in renewable resource and has long been established as a suitable location for development of wind and marine generation.

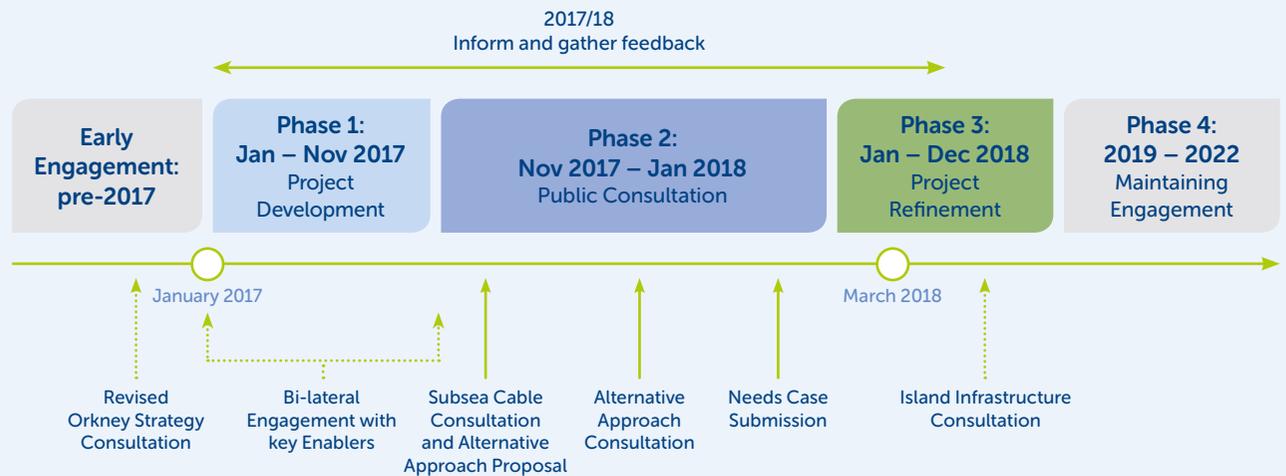
However, barriers to achieving grid connections have prevented customers and stakeholders from harnessing this potential. We listened and worked with local customers and stakeholders to develop innovative solutions

to support the investment case for a 220MW 220kV transmission link that will connect Orkney to the grid network on the Scottish mainland (the 'Orkney Project').

A phased approach was adopted (illustrated below) to ensure all relevant customers and stakeholders were kept informed and feedback gathered and acted upon throughout the development of the project.



### Phased Approach to Stakeholder Engagement



## Engagement project

# Future Energy Scenarios

A network plan for the north of Scotland customer

As we begin planning for our next price control period, RII0-T2, which will begin in 2021, we are mindful of significant uncertainty on some aspects of the future of energy (such as policy, technology, consumer and industry habits) which will influence what network developments are required.

Our response to this uncertainty has been to build a regional picture (as opposed to the national scenarios prepared by the GB System Operator) of the range of possible scenarios based on feedback from our key customers and stakeholders and their ambitions for the future.

During 2017/18 we undertook the following activities:

- Targeted interviews (circa 150) to confirm the need for localised scenarios, identify issues affecting customers and stakeholders and agree best methods for future engagement.
- Broad, public consultations on identified areas of uncertainty with a regional element. We consulted on five papers: (1) North of Scotland Energy Trends; (2) North of Scotland Onshore Wind Repowering; (3) North of Scotland Electric Vehicles; (4) North

of Scotland Energy Efficiency and Heat; and (5) North of Scotland Generation and Storage.

- Reviewed consultation findings (including range of potential outcomes) and proposed scenario development methodology with targeted customers and stakeholders.



We engaged with  
**Circa 150**  
customers and stakeholders

How did we engage with them?



Working papers and blog articles published on website



Via local press articles and energy industry insight reports



Face-to-face and telephone interviews



Workshops in Glasgow and Inverness



Direct emails

## Engagement project

# Our Future Approach to Engagement

A growing voice for customers and stakeholders

Over the last 5 to 10 years, our business has been heavily focused on the delivery of large capital projects, primarily driven by the rise in renewable generation projects seeking access to the GB transmission system in the north of Scotland.

Our success to date has in part been down to establishing and maintaining positive working relationships with our customers and stakeholders. As our network has grown, and customer and stakeholder requirements change, we felt that the time was right to review our current approach to customer and stakeholder engagement, to ensure it remains appropriate and effective going forward. Furthermore we recognise that our performance against a number of Stakeholder metrics has to improve.

# 8.0

Stakeholder Satisfaction Survey

# 76%

Stakeholder Satisfaction KPI's

We have implemented an improvement plan that is intended to deliver target exceeding performance from 2019/20 onwards.

Actions to Improve our Stakeholder Engagement:

- Enhanced Engagement Strategy is produced to outline;
  - (i) why we engage;
  - (ii) how we engage; and
  - (iii) the process of engagement.
- Improved internal governance structure for stakeholder engagement.



# Working sustainably

Sustainability is one of our six core values.



**Christianna Logan**  
Insights Manager

# Our six ambitions

In 2017/2018 we developed a new sustainability strategy with six ambitions which drive our initiatives and which we report against here and in our annual sustainability report. These ambitions cover decarbonisation, social, economic and environmental issues.



## Connecting for society

**332MW**

OF NEW RENEWABLE GENERATION WAS CONNECTED IN 2017/18

**96%**

OF GENERATION CONNECTED TO THE NETWORK IS LOW CARBON

**1,844MW**

LOW-CARBON GENERATION CONNECTED TO OUR NETWORK BETWEEN 2013 AND 2018

**30%**

OF OUR CONNECTION OFFERS WERE PROVIDED BEFORE THE DUE DATE

**tCO<sub>2</sub>**

AN ESTIMATED 3.6 MILLION TCO<sub>2</sub> DISPLACED BY GENERATION

**1,090MW**

A FURTHER 1,090MW IS EXPECTED TO BE CONNECTED IN 2018/19

## Supporting thriving communities

**£223K**

CONTRIBUTION TO THE RESILIENT COMMUNITIES FUND IN THE NORTH OF SCOTLAND IN 2017/18

**AWARDED £26.9M**

TO LOCAL SUPPLIERS AND CONTRACTORS VIA OPEN FOR BUSINESS PORTAL O4B0 ON SHE TRANSMISSION PROJECTS TO DATE SINCE IT OPENED IN 2012



**667.5 hrs**

WAS SPENT VOLUNTEERING

## Growing careers

**31.7%**

SHE TRANSMISSION GENDER PAY GAP FOR 2017/18

**£1M**

OUR INVESTMENT IN LEARNING AND DEVELOPMENT IN 2017/18

**15** 

PEOPLE ON OUR APPRENTICESHIPS AND GRADUATE SCHEMES IN 2017/18

SSE Group has set the following initial gender balance targets for the SSE business, which SHE Transmission will contribute to. The aim is to achieve the targets within three financial years:



**=30%**

OF EXECUTIVE COMMITTEE AND DIRECT REPORTS TO THE EXECUTIVE COMMITTEE TO BE FEMALE

**=25%**

FEMALE MEMBERSHIP OF THE EXECUTIVE COMMITTEE AND SUB COMMITTEES

**=20%**

FEMALE ROLES AT £70,000 OR ABOVE

## Optimising resources

SEEKING TO KEEP RESOURCES IN USE FOR AS LONG AS POSSIBLE, EXTRACT THE MAXIMUM VALUE FROM THEM WHILST IN USE, THEN RECOVER AND REGENERATE PRODUCTS AND MATERIALS AT THE END OF EACH SERVICE LIFE



## Mitigating climate change

**9% DOWN**



OUR BUSINESS CARBON FOOTPRINT IN 2017/18 IS DOWN ON THE PREVIOUS YEAR

**4% BELOW TARGET**



OUR SF6 LEAKAGE IN 2017/18 WAS 4% BELOW TARGET

## Promoting natural environment

**>400**

EMPLOYEES TO TAKE PART IN THE CARE ENVIRONMENTAL PROGRAMME



**Zero**

ENVIRONMENTAL PROSECUTIONS IN 2017/18



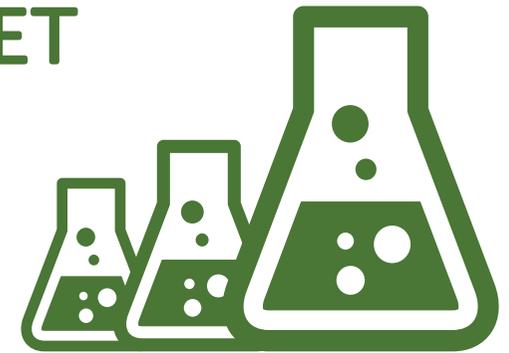
**Finalist**

FOR 2 BIG BIODIVERSITY CHALLENGE 2018 AWARDS



## SCIENCE BASED TARGET

WE HAVE FORMALLY COMMITTED TO SETTING A SCIENCE BASED TARGET (SBT) FOR OUR GREENHOUSE GAS EMISSION WITH THE SCIENCE BASED TARGETS INITIATIVE. WE WILL DEVELOP OUR SBT WITHIN THE NEXT 24 MONTHS





# Expenditure

Our objective with regard to expenditure is to consistently deliver our outputs and obligations across our portfolio efficiently, on time and within the available allowances.



**Amir Aziz**  
Senior Portfolio Analyst  
**Nicol Lumsden**  
Portfolio Analyst

## Performance during the year

The majority of our total expenditure (TOTEX) in 2017/18 continued to be focused on the delivery of large capital projects. These large capital projects being to facilitate increased generation and associated connections to our network (Load Related); or to renew our existing network (Non-Load Related).

| Category                                   | Forecast      | Expenditure   | Delta          |
|--|---------------|---------------|----------------|
| Load Related – Strategic Wider Works (SWW) | 195.0         | 151.2         | -43.8          |
| Load Related – Other                       | 229.6         | 191.2         | -38.4          |
| Non-Load Related                           | 77.2          | 51.1          | -26.1          |
| Operating Costs                            | 31.6          | 32.2          | 0.6            |
| Non-Operating Costs                        | 6.6           | 5.2           | -1.4           |
| <b>Total Expenditure (TOTEX)</b>           | <b>£540.0</b> | <b>£430.9</b> | <b>-£109.1</b> |

All values shown as 2017/18 prices in £m

The table above shows our expenditure forecast for 2017/18 that we made in March 2017 and our actual expenditure for 2017/18. We believe that comparing actual expenditure to forecast expenditure is a better indicator of performance than comparing it to allowances for the same period. This is because our baseline allowances were established in 2012 based on our projected programme of works at that time. This programme of works has and will continue to change for a variety of reasons meaning that a comparison of actual expenditure to baseline allowances for an individual financial year is not a like for like comparison.

### Load Related – SWW:

Actual expenditure in this category was £43.8m lower than our forecast. This was mainly due to the reprofiling of expenditure across the financial years 2017/18 and 2018/19 on the Caithness-Moray scheme. Furthermore, continued efficiencies in the delivery of this scheme contributed to a lower than forecast actual expenditure. These efficiencies coming from our strong project management and focus on eliminating and mitigating the project risks.

### Load Related – Other:

A similar story exists in this category with actual expenditure being £38.4m lower than our forecast made at the end of the preceding financial year. The reason for this is primarily due to re-profiling of expenditure on the Stronelaig and the Knocknagael-Tomatin schemes. In the case of the latter scheme the driver for this reprofiling was the change in completion date. In 2016/17 completion of the scheme was targeted for 2018/19, this end date is now planned for 2019/20, hence the reprofiling of associated expenditure.

### Non-Load Related:

The deferral of some schemes and the re-profiling of others led to our actual expenditure being £26.1m lower than forecast. This was particularly the case on some of our overhead line refurbishment projects that we have deferred due to updated condition assessments which have identified that the condition of the assets does not require works to be undertaken during the RIIO-T1 period.

### Operating Costs:

The expenditure for Operating Costs was broadly in line with last year's forecast.

### Non-Operating Costs:

The expenditure for Non-Operating Costs was broadly in line with last year's forecast.

## Forecast for RIIO-T1

| Category                                   | 2016/17         |                 |                | 2017/18         |                 |                |
|--|-----------------|-----------------|----------------|-----------------|-----------------|----------------|
|  | Forecast        | Expenditure     | Delta          | Allowances      | Expenditure     | Delta          |
| Load Related – Strategic Wider Works (SWW) | 1,472.1         | 1,327.0         | -145.1         | 1,606.7         | 1,437.4         | -169.3         |
| Load Related – Other                       | 1,281.4         | 1,108.6         | -172.8         | 1,433.7         | 1,258.0         | -175.7         |
| Non-Load Related                           | 330.5           | 440.5           | 110            | 326.3           | 425.6           | 99.3           |
| Operating Costs                            | 252.2           | 248.6           | -3.6           | 245.9           | 245.7           | -0.2           |
| Non-Operating Costs                        | 9.4             | 33.0            | 23.6           | 9.4             | 28.4            | 19.0           |
| <b>Total Expenditure (TOTEX)</b>           | <b>£3,345.6</b> | <b>£3,157.7</b> | <b>-£187.9</b> | <b>£3,622.1</b> | <b>£3,395.2</b> | <b>-£226.9</b> |

All values shown as 2017/18 prices in £m

As with our actual expenditure for 2017/18 our current TOTEX forecast for the 8-year RIIO-T1 period is centred on the delivery of large capital projects with 92% of our forecast TOTEX expected to be spent in the Load and Non-Load related categories.

We are forecasting that our TOTEX in RIIO-T1 will be £226.9m less than Allowances. This equates to a forecast underspend of approximately 6%. There are many factors that influence our forecast including our best view on the progression of new connections to our network, the likelihood of major islands schemes progressing to construction and our ability to continue to deliver efficiencies in our large capital project portfolio.

The table above provides our best view at the end of 2017/18 of allowances and expenditure for the RIIO-T1 period and it sets this against our corresponding best view from the end of 2016/17. The following narrative provides explanation of the differences between our current best view on allowances and expenditure. Furthermore, where there has been material change in this best view we set out the reasons for such change.

### Load Related – SWW:

We continue to forecast a significant underspend in this category however there is a correction to our allowances still to be made that will reduce our forecast underspend. In 2017/18 we committed to hand back approximately £60m of our allowance for our Caithness-Moray scheme and whilst this is reflected in our forecast expenditure it is not captured in the allowances. The remaining underspend net of this allowance correction is attributable to the efficiencies that we have created through our SWW projects. Such efficiencies have been realised as a direct result of how we have:

- managed project risk to eliminate risks and to mitigate the impacts of realised risks
- built productive relationships with our supply chain
- continued to build and improve our project delivery capability.

There has been a significant increase in our expected allowances and expenditure from 2016/17 to 2017/18. This is wholly attributable to the introduction of approx. £135m of forecast allowances and expenditure related to our Orkney scheme.

### Load Related – Other:

This expenditure category has the most uncertainty due to its dependency on the progression of new generation which is heavily influenced by UK Government policy. The volume driver mechanism within the RIIO-T1 price control was developed in response to this uncertainty. The volume driver mechanism sets baseline targets for sole-use and shared-use infrastructure and provides the opportunity for further allowances should either baseline be exceeded. We are forecasting exceeding both the sole-use and shared-use baseline outputs as shown in the table below:

| Category                 | Forecast | Expenditure | Delta   |
|--------------------------|----------|-------------|---------|
| Sole-Use Infrastructure  | 1168MW   | 1572MW      | 404MW   |
| Share-Use Infrastructure | 1006MVA  | 4179MVA     | 3173MVA |

Our forecast delivery in the shared-use category has changed materially in the financial year up from 2,518MVA to 4,179MVA. This has led to a significant increase of approximately £150m in both our forecast allowances and expenditure across the 8-year RIIO-T1 period. The net effect of this being that we continue to forecast our expenditure being circa £175m lower than allowances. This is as result of continued efficient project execution by our project teams resulting in cost efficiencies. We do however expect that our allowances will be corrected as part of the works to close our RIIO-T1 and this is likely to result in a reduction in overall allowances in this category.

### Non-Load Related:

Our current best view of expenditure is that we will overspend against allowances by 30%. The forecast overspend is a consequence of delivering additional scope that wasn't included in the baseline business plan. The reason for the difference being that the condition of our some of our assets is significantly worse than our original assessments made before the start of RIIO-T1. For example, we are currently forecasting to replace 390 no. 132kV towers that weren't in our RIIO-T1 business plan. This alone introduces significant additional expenditure whilst not attracting any increased allowances.

### Operating Costs:

Our forecast expenditure in this category is broadly in line with our allowances.

### Non-Operating Costs:

During 2017/18 we introduced a new Work Asset Management (WAM) system called Maximo. The introduction of this system was not foreseen at the time of our RIIO-T1 business plan and not reflected in our allowances. A large part of the forecast overspend against allowances in this category is directly related to this investment in Maximo and other systems such as a replacement for our existing Geographic Information System (GIS).

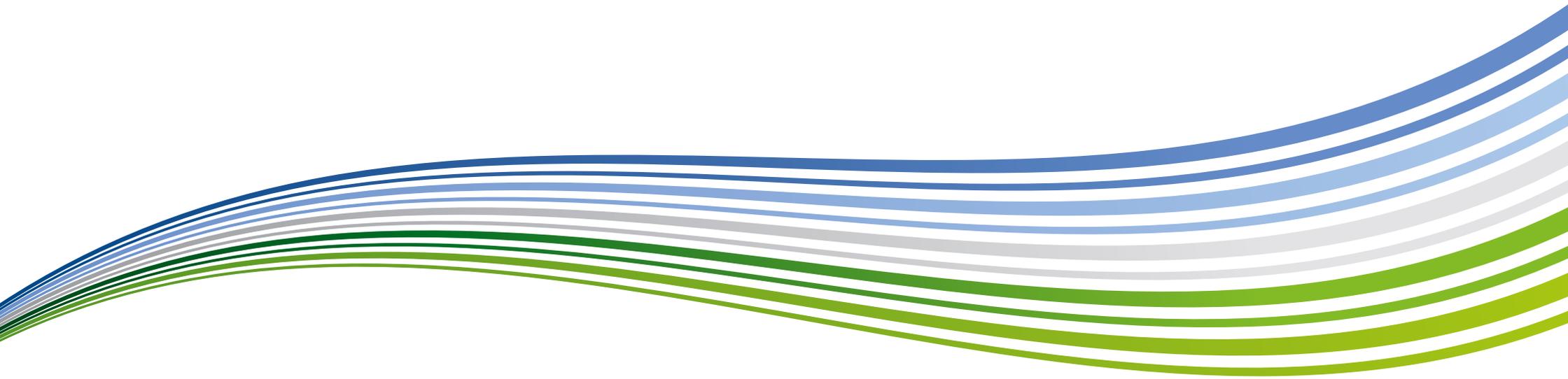
## Incentives

| Primary Output   | RIIO-T1 Target                   | 2017/18 Actual                       | Max Reward £m                                 | Max Penalty £m               | Reward/Penalty in 2017/18 <sup>(1)</sup> | Comments   |
|--|----------------------------------|--------------------------------------|---|------------------------------|--|--|
| Energy not supplied (ENS)  | <120MWh                          | 24.33MWh                             | 1.19  | (8.86)                       | £0.95m                                   | The output has met its target in all years of RIIO-T1  |
| Stakeholder Satisfaction Output                                    | KPI                              | 89%                                  | 2.95  | (2.95)                       | -£0.07m <sup>(2)</sup>                   | Our improvement plan aims to improve our performance in these outputs  |
|  | Assurance                        | Compliant                            |   |                              |  |  |
|  | Survey                           | 7.4/10                               |   |                              |  |  |
| Stakeholder Engagement Reward                                      | 5/10                             | 3.25                                 | 1.48  | N/A                          | £0.00m                                   | Our submission score deteriorated in the year, an improvement plan has been developed to improve our performance |
| Timely connections   | Connection offers within 60 days | 49 Connections made within timescale | N/A   | (1.48)                       | £0.00m                                   | This output has met its target in all years of RIIO-T1   |
| Sulphur hexafluoride (SF <sub>6</sub> ) leakage, <sup>(3)</sup> kg | <340.15kg                        | 326.8kg                              | 0.05  | This is dependent on leakage | £0.01m                                   | It was the first year that this target has been met  |
| Environmental Discretionary Award (EDR)                            | Leadership                       | TBC                                  | £4m annual pot available across all operators | N/A                          | TBC                                      | Confirmed in October 2018  |

<sup>1</sup> Earned in year in nominal price and has two-year lag.

<sup>2</sup> Incentive/Penalty is calculated based on Stakeholder Satisfaction Survey, KPI and external assurance.

<sup>3</sup> <340.15kg is target for 2017/18. The target for SF<sub>6</sub> leakage increases as the number of our network using SF<sub>6</sub> increases.



**Scottish & Southern**  
Electricity Networks

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