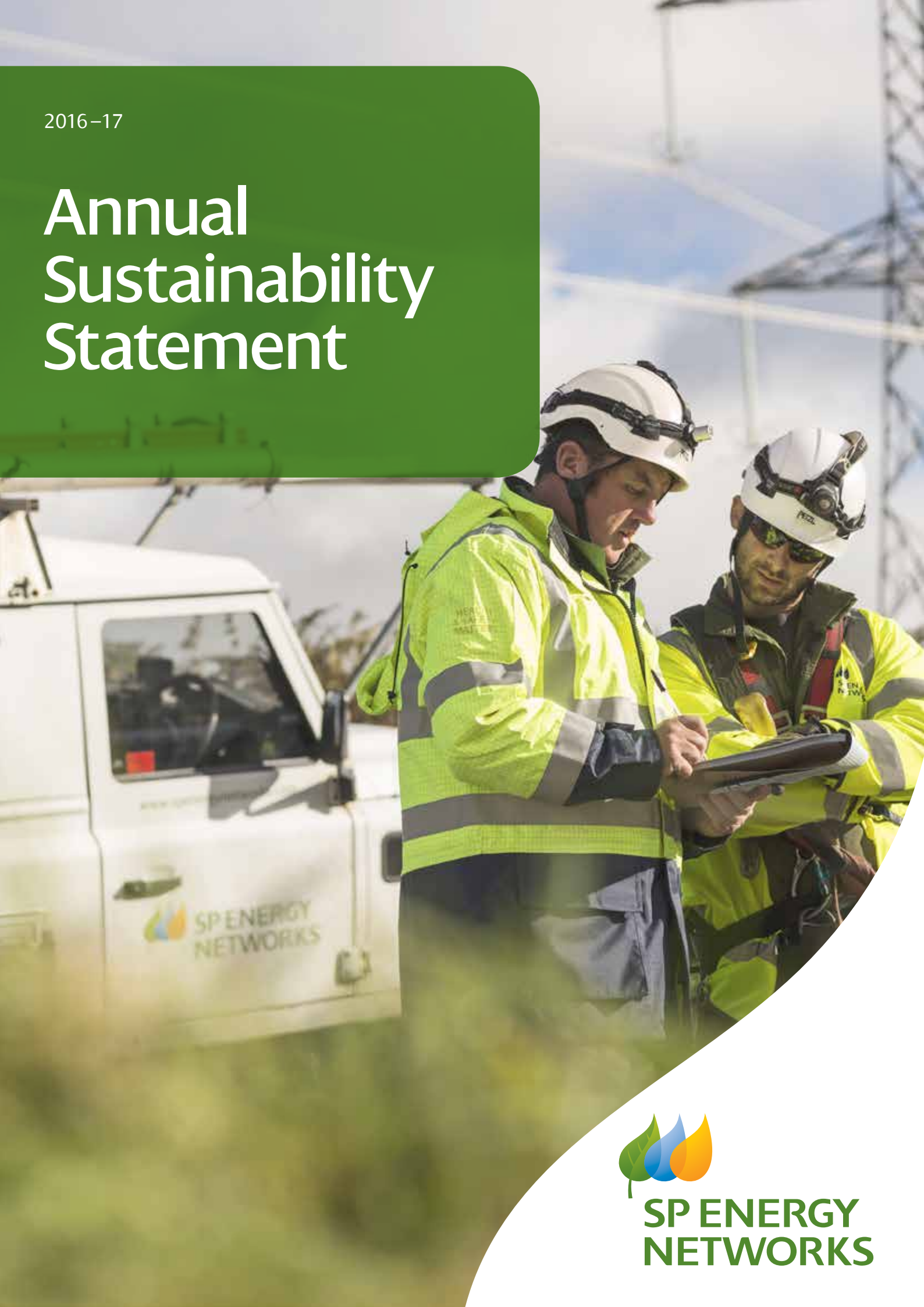
2016–17

Annual Sustainability Statement



SP ENERGY NETWORKS

Contents

In our 2013–14 Annual Statement we announced our Sustainability Drivers. As part of the development of our Sustainability Strategy and our response to stakeholder consultation, in the last year we have redefined these Drivers and introduced icons to facilitate their communication.

- Sustainable society
- Carbon and energy reduction
- Climate change resilience
- Water efficiency and protection
- Raw material optimisation
- Land and biodiversity improvement
- Waste management and minimisation

Welcome to the SP Energy Networks Transmission Annual Sustainability Statement 2016–17

SP Energy Networks (SPEN) is the owner and operator of the Transmission network (TO) in central and southern Scotland.

We are responsible for:
- Providing a safe, reliable and economic transmission system for current and future network users; and
- Delivering a sustainable, low carbon energy system.

Our operating area covers just over a quarter of Scotland's area, however, to date SPEN has approximately 56% of Scotland's transmission connected renewable generation. Through adopting a more sustainable approach, we believe we can manage the network more effectively for customers and the environment, year on year.

The role of the electricity transmission sector is key to facilitating the connection of low carbon technologies and developing the network sustainably. Our stakeholders require support to play their part in the drive towards the decarbonisation of many sectors including the electricity market. This is critical to meeting both the UK and Scottish Government climate targets for 2020 and beyond. We are working with our stakeholders to facilitate low carbon generation connections in a cost effective and efficient manner by leading advances in technology and rolling out successful innovations to 'business as usual'.

By collaborating with stakeholders we are identifying improvements to our processes and approach to low carbon generation, strengthening our focus on ease and speed of connection. This year we have drafted our *SP Transmission – Getting Connected Guide* which we are now consulting with stakeholders. We are upgrading the network with novel systems to enable connections, avoiding expensive reinforcements and shortening connection timescales. We are working together with other transmission operators to develop new grid network monitoring systems to ensure the security of electricity supply that is particularly critical for vulnerable customers across the wider network.

During 2016, following stakeholder consultation, we developed our Sustainability Strategy which was agreed by the Executive Team in December. Goals have been set for 2023, 2030 and 2050 and we identify objectives to reduce our direct and indirect environmental impacts. Over the course of the year we worked to improve the quality and completeness of our data to allow us to track and report our progress towards these Goals. The continuous improvements made to our Environmental Management System (certified to ISO14001) ensure that we have robust processes in place to drive improvement.

In this, our fourth annual sustainability statement, we provide examples of initiatives which are driving our sustainable business activities during 2016–17 and form part of our longer term strategic plan. These initiatives highlight the work we are undertaking to enable the connection of low carbon technologies, deliver network improvement projects and manage the network and its impacts, and how this work is driven by our seven Sustainability Drivers. These are central to enabling us to do our part in delivering the low carbon energy system required to limit temperature rise to 2°C compared to pre-industrial levels as agreed at the 2015 United Nations Climate Change Conference. We have reached the mid-point for RIIO T1 and with planning for the next price control period now on the horizon, the projects we outline here will deliver the foundation for RIIO T2 (2021–2029).

Last year, our stakeholders told us they would like to see the inclusion of data for a clearer picture of how we are performing. The Ofgem timetable for this statement requires us to publish before the end of an operating year and therefore we cannot include up to date data, however, we include last year's external SP Energy Networks Transmission Business Carbon Footprint table (Appendix 1). Notwithstanding this constraint, we are working on our data quality and completeness and aim to publish data on our environmental impacts in our next Statement.

We welcome feedback on the content of the report and hope that it provides you with useful information on our activities.

Scope

The Environmental Discretionary Reward (EDR) Scheme is a key incentive under the Ofgem Price Control Process for Electricity Transmission 2013 to 2021 (RIIO-T1).

We fully support the objectives of the EDR Scheme and have chosen to make a submission for the 2016 to 2017 period. We welcome the opportunity to demonstrate the progress we are making towards delivering a low carbon energy system and the high standards of environmental management we are seeking to achieve.

This report is the SPEN annual executive statement for the EDR Scheme and is intended to be suitable for a non-technical reader.

The scope of this document is to update on our sustainability strategy, explore some of the initiatives on which we are leading and explain how they are being shaped by our Sustainability Drivers.

For 2021

we are making progress towards delivering a low carbon energy system and high standards of environmental management

Who we are

SP Energy Networks (SPEN) is responsible for the transmission of electricity in central and southern Scotland. SPEN is part of the Iberdrola Group – a Dow Jones Sustainability Index and Global 100 listed company. Our role is to maintain, operate and invest in our transmission network to secure a safe, reliable and economic service for current and future users.

2 million

We supply approximately 2 million customers and covering an area of approximately 22,950 square kilometres.

The SPEN transmission network comprises approximately 4,000 circuit kilometres of overhead lines, 320km of underground cables and 140 substations operating at 400, 275 and 132kV. We supply approximately 2 million customers and covering an area of approximately 22,950 square kilometres. We are connected to Scottish Hydro Electric Transmission plc (SHE Transmission) system to the north, to the National Grid Electricity Transmission (NGET) system to the south, and to the Northern Ireland Transmission system via a subsea HVDC interconnector. 2017 will see the completion of the western link HVDC to connect Hunterston in our operating area to Deeside close to the Welsh & English border.

The SPEN transmission area is crucial to the delivery of the Government's renewable energy objectives due to its location in an area of outstanding renewables resource and its position between the SHE Transmission to the North and NGET areas to the South. We therefore have a unique role in connecting renewable generation and bulk transfer of renewable energy from the SHE Transmission and SPEN areas into England and Wales. Our activities therefore benefit stakeholders well beyond our licence area.

SPEN also own and operate the distribution network in Central and Southern Scotland, and the distribution network in Merseyside, the Wirral, Cheshire, North Shropshire, Mid and North Wales. These operations are not considered in this document.

Our sustainability strategy

Last year we reported on plans to develop our Sustainability Strategy with stakeholders. Since then, we have established our Sustainability Stakeholder Working Group and launched Sustainability Strategy consultation via our new online community.

Our Executive Team agreed our Sustainability Strategy in December 2016 and we are currently consulting with external stakeholders. Our ambition is to assist the UK in its transition to a low carbon future by facilitating the transition to a low carbon energy system and reducing our own impacts, whilst delivering our regulatory, legal and business plan commitments.

This year we relaunched our Sustainability Drivers; we will be reporting on the same issues, realigned to seven Drivers which influence our network and business practices.

The Drivers allow SPEN to lead technical innovation and collaboration to identify solutions to these priority issues. As a result, innovative projects are already using cheaper, safer alternatives and reduced quantities of materials to mitigate future waste disposal and accidental releases to the environment. Within the report we highlight nine initiatives that have been initiated or further developed in the past year, and show which Drivers have influenced each of these initiatives.

From Ofgem consultation for final proposals for electricity System Operator incentives, April 2017

In the Strategy, we identify key metrics and objectives under each Sustainability Driver which we will use to track our progress towards becoming a more sustainable business.

For example:

Carbon and Energy Reduction
- Reduce carbon footprint by 15% by end 2023 (excluding network losses)
- Reduce substation energy use by 25% by end 2023
- Reduce business travel by 15% by end 2023
- Investigate alternatives to SF6

Climate Change Resilience
- Preparing network for changing load patterns

Land and Biodiversity Improvement
- Improve biodiversity in areas in which we operate – by delivering project specific improvements, seeking to eradicate invasive species and by capturing biodiversity data in our GIS

Waste Management and Minimisation
- Divert 95% of waste from landfill by end 2023

Water Efficiency and Protection
- Have zero water pollution incidents
- Produce Pollution Prevention Plans for Grid substations

Raw Materials Optimisation
- Establish baseline raw materials usage
- Introduce life cycle analysis to SPEN processes

Sustainable Society
- Reduce supply chain environmental impacts e.g. introduce supplier sustainability audits
- Facilitate low carbon connections
- Incorporate Natural Capital assessment in our processes where beneficial

Although primarily focussed on environmental sustainability, with a 'sustainable network' as the goal, our strategy considers social and economic impacts.

Enabling the connection of low carbon technologies

The key uncertainty facing our network – and how we develop it economically and efficiently – is the changing generation landscape, the scale, timing and location of new generation and the timing of generation closures.

Not responding quickly enough risks delaying the connection of new generation and the transition to a low carbon energy sector. But building too much or too far ahead of time leads to higher customer bills. We have an ongoing role to help to strike the right balance. This means active scenario planning, and where necessary taking decisive action to modify our investment plans.

How we seek to manage these uncertainties

There are a wide range of our established activities that contribute to managing uncertainty:

- **Scenario planning:** We contribute key information to Government's Future Energy Scenarios, National Grid's annual Electricity Ten Year Statement, and we update our own forecasts for new connection to capture new information.
- **Developing strategic investment options:** We work jointly with National Grid and SSE Transmission to develop and specify Strategic Wider Works proposals.
- **Optimising investment needs:** We apply the Security and Quality of Supply Standard, a common and rigorous set of standards to identify what is required in any set of circumstances.
- **Minimising investment costs:** We manage the cost of any necessary investment down to the minimum efficient costs, including by developing and deploying innovation.

Connection Leaflet

Our stakeholders told us that they would find it useful to have a guide to how the connections process works at Transmission level. We listened and created a Connections Guide we presented a draft proposal at our SPT Annual Connections Summit and recorded the feedback which we have incorporated into our final version due to launch in March 2017.

Transmission and Distribution (T&D) Interface

We are working on many fronts to bring innovation to achieve low carbon connections, not only in technology but in policy and commercial processes. An example of this in the T&D interface area. We have developed a new Statement of Works process in conjunction with our colleagues in SP Distribution (SPD) which, has the potential to deliver efficiencies and benefits for the end customer. We are currently piloting our proposals with SPD across four Grid Supply Points (GSPs). Similarly, we have worked with SPD to develop a Queue Management policy and are now engaging with NGET with the aim of developing a common policy which will be available for transmission connected customers and for distribution customers impacted by transmission queue access. This policy seeks to deliver a framework which will allow shovel ready consented projects to advance to connection and allow the network companies to deliver timely efficient reinforcements for those parties.

Enabling the connection of low carbon technologies:

Load Management Schemes

Project Background

One of SP Transmission's key objectives is to facilitate the connection of renewable generation. In our area this consists primarily of on-shore wind generation and much of our investment is related reinforcing the network in areas with a rich wind resource. However, the time that this takes to deliver, due to construction time, necessary periods of consenting and stakeholder engagement and system access restrictions, can often be significant. Allowing generation to connect to the system in advance of these reinforcements has the potential to cause unacceptable overloading of the Transmission system.

SPEN has devised a novel system of wide-area load management schemes to release capacity to generators on a 'non-firm' basis, constraining the generation exporting on to the network when it is necessary to remove overloads from the system. The complex nature of the interconnected transmission system has required the latest generation of system control and protection technology to be employed to monitor a large number of circuits. We expect to be load managing 621MW from these windfarms by 2021 spanning a geographical area from Stranraer to Berwick.

Current Status

To date (since 2016), a total of ten Load Management Schemes (LMS) have been commissioned. The first four schemes were commissioned in 2016/17, facilitating the early connection of 222MW. These have been installed on Grid Supply Point transformers, 132kV circuits and supergrid transformers, and have facilitated a total of 222MW of generation to connect during this period.

Timescales for Completion

A further 399.6MW of generation is contracted to connect, facilitated by these Load Management Schemes in the forthcoming years.

Sustainability Drivers

Carbon & Energy Reduction and Sustainable Society

This project is critical in supporting the target of producing 15% of the UK's energy from renewable sources by 2020. Releasing transmission network capacity ahead of reinforcement work, and in some cases avoiding reinforcements altogether, enables a greater amount of electricity generated by wind to access the market. This improves security of supply and reduces the periods of constraint of low-carbon generation, the associated costs which are borne by the consumer to a value of around £850million annually.[2]

By advancing the connection dates for renewable generators, this project also contributes to the reduction and stabilisation of the levelised cost of energy. This is calculated by summing the cost of building, operating and decommissioning of the plant over its lifetime against the total electricity generated by the asset.

By allowing 222MW of generation to connect early so far these schemes have the potential to displace approximately 1 million tonnes of CO_2 compared to generation from a traditional mix of generation methods. For those generators who are now able to avoid reinforcement, the carbon savings are realised from avoiding new construction or upgrades to the network and further transport of materials to facilitate their projects.

Land & Biodiversity Improvement, Raw Material Optimisation, Waste Management and Minimisation

By deploying Smart technology, the constraints on the transmission network can be significantly relieved, often without new overhead line build, thereby maximising the benefit and reducing use of concrete, steel, aluminium, copper and plastics, visual intrusion and construction impacts from downtakings and excavation.

1 Assuming capacity load factor of 29.1% for Scottish windfarm sites https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/556690/Regional_spreadsheets__2003-2015__-_number_of_sites.xls and grid emissions costs from generating electricity in Scotland of 271g CO_2e/kWH http://www.gov.scot/Resource/0046/00469235.pdf

2 From Ofgem consultation for final proposals for electricity System Operator incentives, April 2017

Enabling the connection of low carbon technologies:

VISOR

Project Background

Within our 2016 Annual Sustainability Statement, we reported on VISOR (Visualisation of Real Time System Dynamics using Enhanced Monitoring) our flagship collaborative Network Innovation Competition (NIC) project between system designers, operators, developers and researchers. The project demonstrates the first Wide Area Monitoring System (WAMS): a nationwide IT infrastructure combining synchronised measurements from all three GB Transmission Owners (TOs). VISOR is truly revolutionising the real-time monitoring of the transmission system; providing GB-wide real-time visibility of dynamic system behaviour, enhancing network resilience, increasing network capacity and delivering savings to customers. The improved understanding delivered by VISOR can allow additional network capacity to be released; reducing the investment required in new transmission assets. The improved system visualisation also helps protect against catastrophic events that could result in a complete or partial blackout of the GB system.

Current Status

The WAMS infrastructure has been deployed successfully over the last 3 years and concludes in 2017. Many of the planned monitoring and analysis capabilities are already in use.

Timescales for Completion

The 3-year project completes in 2017 and can be broadly separated into two stages, which overlap to a degree:

The first involves delivery of the monitoring, communication and computing infrastructure – including a suite of WAMS analysis & visualisation applications.

A second 18-month period involves the staged deployment, demonstration and evaluation of additional new WAMS applications. This has a focus on leveraging data from the new WAMS to provide tangible improvements in the reliability and efficiency of the GB network and related benefits to GB customers.

Sustainability Drivers

Carbon and Energy Reduction

The mapping of energy use hotspots was a key consideration for SPEN. VISOR sought to address the issues by revolutionising the real-time monitoring of the GB system to highlight the opportunities to reduce both operational and capital expenditure and increase the resilience of the power system against high-impact, low-probability events that can cause plant damage or even blackouts as we move toward a low carbon future.

Sustainable Society

This collaboration between three GB TOs (SPEN, National Grid, and SHE Transmission) sets a precedent for cross-company coordination by developing infrastructure and applications to meet the needs of the future GB network. The key aspect of the WAMS infrastructure is that it allows new real-time visibility of the system dynamics across "power transmission boundaries" between SPEN-NGET and SPEN-SHE Transmission. VISOR WAMS provides necessary situational awareness to reduce risks of loss of supply for SPEN customers, creating a socially sustainable community in the SPEN transmission areas and beyond.

Raw Material Optimisation and Land & Biodiversity Improvement

The project is underpinned by a ground-breaking data acquisition infrastructure consisting of new monitoring units, data centres and dedicated servers, communicating via a new high-performance communication link between the three TOs. One of the key outcomes from VISOR will be getting the most out of existing assets, avoiding the cost, visual impact, land use and large quantities of concrete, steel, aluminium, copper and plastics that would otherwise result from new transmission lines.

Enabling the connection of low carbon technologies:

Novel conductor materials

Project Background

In 2016, we reported on plans to re-conductor two 275kV overhead line routes in the south-west of Scotland using a new High-Temperature Low-Sag (HTLS) conductor system. The system has been designed to operate at higher temperatures than conventional conductors to offer greater transfer capacity. The HTLS technology has directly replaced 'Zebra' and 'Rubus' conductors without the need for tower reinforcement. The two routes are the Kilmarnock South to Coylton 15.5km double-circuit (known as the XY Route), and the Coylton to Mark Hill 49.5km single-circuit (known as the YY Route). Coupled with the over-arching 'South West Scotland' project, the work is expected to increase the total export capability from Coylton to the wider 275kV and 400kV network and contribute 1.7GW by 2021 (and 2.1GW by 2023) of additional renewable generation to the GB system, representing 40% of the onshore wind generation in Scotland. This work has been completed in 2016, 8 years earlier than the business as usual alternative of developing new routes and constructing new towers and lines.

Current Status

The XY & YY route was completed at the end of 2016.

Sustainability Drivers

Carbon and Energy Reduction

The South-West of Scotland has witnessed a remarkable rise in onshore wind development that requires upgrade of the existing transmission network to connect, in some cases this was double the generating capacity that the RIIO-T1 baseline plan forecast. The upgrades will deliver network reinforcement more effectively and efficiently through utilising the HTLS technology to deliver necessary reinforcement. This enables more cost effective grid connections for renewable generators and avoids constraints during high wind periods.

Land and Biodiversity Improvement

Traditional reinforcement would require the installation of new towers alongside existing towers or new routes. Both options would bring with it associated environmental effects through disturbance of land and the habitats and activities that occupy it, by Using HTLS, we avoid these effects.

Raw Material Optimisation

By using new conductors on existing towers, no new overhead line routes, towers or foundations are required, thereby avoiding the greenhouse gas and other emissions from mining, processing and transport of steel or concrete. Existing access roads can also be utilised and additional low carbon connections are made possible significantly earlier than would otherwise be the case. To put into perspective the savings in raw materials, there is an estimated reduction of over 4,000 tonnes of steelwork and over 8,500 tonnes of concrete by avoiding construction of 44 single circuit towers and 150 double circuit towers.

2.1GW

network contribution by 2023

Enabling the connection of low carbon technologies:

Phoenix

Project Background

Phoenix, which seeks to develop and demonstrate the deployment of a new technology - "hybrid synchronous compensator" or H-SC. This technology will allow greater use of renewable power from windfarms, solar arrays and batteries whilst maintaining security and stability of supply against a background of recent and planned closures of conventional generation plants.

Through the trial, the project will address the over-arching technical, engineering, commercial challenges that currently perceived as the main barriers for wider scale adoption. A successful pilot and subsequent roll-out of H-SC's will have substantial environmental benefits for our customers as they offer an economical replacement for the stability and security offered by large conventional synchronous generators as we move to a lower carbon supply of electricity.

Current Status

The project is currently in the project administration stage and is scheduled for kick-off in mid-2017.

Timescales for Completion

The project is funded under Network Innovation Competition and scheduled to run for four years, from 2017 to 2021, with the live trail due to run between 2019-2021.

Sustainability Drivers

Carbon and Energy Reduction

Phoenix will facilitate Carbon reduction targets by enhancing network strength and stability to ensure renewable energy sources can be securely accommodated and fully utilised to backfill the services traditionally obtained from large synchronous generators coming offline from the network. Additionally, the deployment of such devices is likely to further reduce the associated carbon emissions and costs by reducing the need for "must run" thermal generation – a practice that is currently essential to acquire auxiliary system support services particularly in times of light load.

Raw Material Optimisation and Waste Management & Minimisation

The decommissioning of numerous coal-fired power stations across the UK presents an opportunity to divert potentially reusable assets from waste streams. There also exists the opportunity to reuse a portion of the retired power station and some of the existing equipment to operate as a Synchronous Compensator.

Land and Biodiversity Improvement

A site previously used for power generation is also an ideal candidate for reuse in our sector, the proximity to the network avoids many issues that arise when considering an alternative green field site. Phoenix will not only evaluate the commercial mechanisms to facilitate future rollout but also conduct an assessment of potential locations for future installations that will include the use of existing generation sites.

Sustainable Society

This collaboration between SPEN and the System Operator represents a strong commitment from both parties to respond to the changing energy landscape and deliver solutions to meet the needs of all stakeholders. By collectively delivering a work package dedicated to explore viable future commercial mechanisms by which Synchronous Compensators can compete into today's energy market will ensure suitable and sustainable options are developed that facilitate widespread rollout for a wide array of stakeholders.

15%

This project is critical in supporting the target of producing 15% of the UK's energy from renewable sources by 2020

Enabling the connection of low carbon technologies:

FITNESS

Project Background

'Project Fitness' (Future Intelligent Transmission Network Substation) aims to deliver a globally innovative state-of-the-art digital substation design. This will use digitised measurement for protection, control and monitoring instead of traditional copper wiring and conventional measurement equipment. £8.3m of funding has been awarded by Ofgem for the project, which is being delivered in partnership with GE Grid Solutions, ABB, Synaptec and the University of Manchester. If the pilot is successful and adopted across the industry, by end of RIIO T2, FITNESS would result in a 10% reduction of substation new-build and replacement costs resulting in a saving of between £71m and £107m.

Current Status

Engineering design for the installation site was completed in 2016. Detailed designs of system architecture of both bays have been agreed between ABB, GE and SPEN, and are due to be tested in an LV laboratory environment in Q2 2017, followed by HV testing later in 2017/2018.

Timescales for Completion

The project is funded under Network Innovation Competition and scheduled to run for four years, from 2016 to 2020, with the first digital bay installed in 2018.

Sustainability Drivers

Carbon and Energy Reduction

A positive indirect benefit of project FITNESS is the reduction in need for system outages which are often required to be planned up to seven years in advance. Project FITNESS will enable new connections to be provided more quickly and at a reduced cost to meet the UK 2020 renewable energy targets. The projected system availability improvements translate into a carbon saving of between 40.5 and 129.5 thousand tonnes of CO_2 per year by 2030, depending on level of uptake, and based on increased amount of wind generated.

Land and Biodiversity Improvement

A vast number of copper wires can be replaced with a single optical fibre to communicate the same information via a digital signal, this reduces the trenching, clearances and insulation requirements of the substation. The use of optical fibres reduces the number of substation cubicles, as fewer cables require connection within panels.

In addition, digital equivalents of current and voltage instrument transformers are inherently safer so clearances to other equipment is reduced. FITNESS is demonstrating a method of mounting these new smaller and light-weight 'Non-conventional instrument transformers' directly onto the circuit breaker using brackets.

Overall, the FITNESS infrastructure is an estimated 10% smaller than traditional substation design, resulting in a noteworthy reduction in footprint requirements.

Raw Material Optimisation and Waste Management & Minimisation

In conjunction with the substitution or reduction in quantity of raw materials used, reducing the time spent onsite during construction and maintenance can mitigate environmental and social effects. The end of life decommissioning is also less intrusive, with fewer materials to treat and dispose. FITNESS will deploy smaller, lighter, safer equipment, with greatly reduced reliance upon raw materials compared to conventional 275kV substations:

- **For transformers, a 25% of reduction of steel and the removal of dielectric oil**
- **For relays, a reduction of 90% of the use of low voltage transformers and a reduction of 50-60% in most components**
- **For civil works, a 50% reduction in Polypropylene, Fibreboard, PVC and Gravel**
- **For wiring, a reduction of 70% of copper wiring (Copper, Aluminium and Propylene)**

£71-£107m
saving

Managing the network and its impacts

In managing the day-to-day operation of the transmission network, SPEN has progressed several initiatives to improve upon the business as usual approach. These have been developed as a direct result of our Sustainability Drivers: to facilitate the switch to a low-carbon economy, to reduce the direct environmental effects of our infrastructure locally, and of our activities globally through avoidance of greenhouse gas and other emissions.

Examples of these initiatives include:
- Network Loss Reduction
- Leakage and Waste Reduction
- Promoting Biodiversity
- Peat Management

We employed sustainable procurement methods to consider the lifetime impacts when replacing infrastructure that would cut electrical losses and reduce the electricity demand. We are continuing our focus on reducing landscape and visual effects and enhancing local biodiversity in tandem with one another. We are replacing oil filled equipment throughout our network and we are seeking to minimise our usage, and leakages of, SF6.

SPEN has initiated two pilot projects in the 2016-2017 reporting period, results from the pilots will be included in the 2018 Annual Statement.

The first is the Kilgallioch Environmental Product Declaration (EPD). EPD is an independent verification of the estimated carbon dioxide equivalent cost of the construction, operation and decommissioning of the whole Kilgallioch windfarm. The project is a collaboration with ScottishPower Renewables and the SPEN focus is on the infrastructure used to connect the windfarm to the electricity network. It is hoped that a successful pilot would enable SPEN to drive improvements to project design through engagement with the supply chain with the aim of reducing CO_2 emissions.

The second pilot project is a collaboration between SPEN, the Scottish Wildlife Trust and Aecom to undertake a Natural Capital assessment. Natural Capital is a new and developing method of measuring the value of the environment and ecosystem services. The project will look at SPEN assets within the Cumbernauld Living Landscapes area, with the aim of identifying risks and opportunities in how SPEN manages and develops its assets.

Potential to store **400** tonnes of CO_2 per year

Managing the network and its impacts:

Network Loss Reduction

Project Background

Last year we reported on reducing the losses experienced on our network, this year we provide a progress update. During the transmission of electricity some energy losses occur before it can be used, most often these losses are in the form of heat. These losses are based on metered data and calculated by the difference between energy flowing into and out of our network. The total losses on our transmission network, for the period between 1 April 2015 and 31 March 2016 were 395 GWh[2], representing an operational cost of approximately £23.7m[3]. This could power approximately 119,700 family homes per year. Our goal is to minimise the amount of wasted energy being transmitted from large generators over our network assets and ultimately supplying towns and cities with cost efficient electricity. The main factors which influence transmission losses are an increasing power load across our network, the impact of embedded generation and changing load characteristics. Despite increasing the connection of renewable generation in Scotland, we are reducing losses year on year. To increase the capacity of our network to accommodate increasing generation, we are working to improving the overall performance of our network and where it is economic and efficient to do so, we are employing technological advances. We are using enhanced monitoring systems to conduct analysis on our substation energy consumption with a view to reducing this element of losses by controlling the internal environment housing our electrical assets. By reducing our losses, we can reduce the associated environmental impact and the cost burden to customers from electricity that is generated and lost before it can be utilised.

Current Status

Currently in the final stages of construction, commissioning of the western link is estimated to reduce network losses by approximately 10%. Once operational SPEN will be conducting detailed analysis on performance of the new subsea cable. Transformer replacement and overhead line re-conductoring is ongoing across the SPEN transmission licence area and the sustainable procurement aspects highlighted are embedded in these activities. Our next steps are to analyse the data gathered over the last year with a view to improve the performance of our substation energy use and understand the more sustainable energy-saving measures.

Timescales for Completion

The results of the pilot study on substation energy use will be available in 2017 and the programme for more energy efficient transformer replacement and re-conductoring of overhead lines will continue throughout the RIIO-T1 period.

Sustainability Drivers

Carbon and Energy Reduction

One way to reduce network losses is to upgrade transformers. Although reducing network losses alone would not fulfil an economic case for renewal, SPEN capitalises the cost of network losses when considering whole life costs of a planned upgrade. This incentivises suppliers to design more efficient systems, and enables SPEN to consider sustainability during the procurement process. On top of the obvious environmental benefits, the newly replaced Sighthill 275/33kV transformer[4] is estimated to achieve an annual saving of approximately £26,000 in operational costs due to avoided losses. This sustainable approach of comparing lifetime costs has also been adopted in the planned re-conductoring of overhead lines to identify replacement equipment which reduce network losses.

Our substations use some electricity to power protection and control equipment, battery chargers, cooling systems, lighting and heating, but presently this energy use is not metered. Last year we reported on our planned pilot project to monitor a number of substation sites in order to understand how much of our overall losses can be attributed to substation demand. We are currently conducting detailed monitoring on our equipment which is expected to conclude at the end of March 2017. We anticipate the report from this project will indicate whether the cost of installing energy metering at all our transmission substations would justify the cost savings and environmental benefits that could be obtained by monitoring the energy consumption of each site more carefully.

2 The level of Transmission Losses from the licensee's Transmission System, measured as the difference between the units of electricity metered on entry to the licensee's Transmission System and the units of electricity metered on leaving that system as per licence condition 2K.4 (a)
3 In assessing the financial value of losses we have assumed £60/MWh, which is the value generally used in our cost benefit analyses
4 Sighthill SGT2 has been replaced by a 180 MVA unit with two 33 kV secondaries rated at 90 MVA each.

Managing the network and its impacts:

Leakage and Waste Reduction

Project Background

Transmission assets traditionally use air or oil as an insulator for equipment. Advances in technology have identified Sulphur Hexafluoride (SF6) Gas as a safer and more cost efficient electrical insulator, which also occupies a smaller area of land during operations. For example, the footprint required for gas insulated switchgear, such as SF6, can be reduced by as much as 85% of the area required for air gas insulated switchgear. However, SF6 is a potent greenhouse gas and accidental leaks or leaks caused by maintenance activities contributes to our carbon footprint. As part of the Iberdrola Group, SPEN shares the commitment to becoming Carbon Neutral by 2050, and we are committed to reducing our carbon footprint by 15% by 2023 (not including network losses). Therefore we must manage the inclusion of SF6 on our network to reduce leakage. The onus is on SPEN to minimise the likelihood of leakages and to develop alternatives to SF6 by working closely with suppliers.

Current Status

We are working with suppliers to enable the progression of viable alternatives to SF6 by considering a wide range of factors. In the meantime we are on track to be well below the industry limit of 0.5% for SF6 leakage.

Timescales for Completion

Ongoing benefits will be delivered by using the whole life cycle approach. For example, we expect to see improvements in our oil leakage rates and impacts following recent business decisions including: review of bund provision and condition around substations and updates to drainage plans at substation locations so leaks can be detected quicker and environmental effects can be avoided.

Sustainability Drivers

Carbon and Energy Reduction

By considering whole life cycle of assets to understand leakage and losses risk we procure, measure and monitor assets to optimise the management of SF6 across the network. To ensure the reduction of leakage of SF6 gas we work with our suppliers to develop equipment which out performs industry standards. In our daily operations, we employ a rigorous approach to the measurement and monitoring of leakages of SF6 and close the loop back to our asset management policies to inform replacement priorities.

Waste Management and Minimisation, Water Efficiency & Protection and Land & Biodiversity Improvement

One litre of oil could render one million litres of water undrinkable and affect all life dependent on it. The importance of reducing negative impacts on water quality, levels of land contamination and adverse impacts on biodiversity due to oil leakages has influenced the decision to upgrade to SF6. The gradual renewal of the network to remove oil filled equipment will remove these risks to water.

Raw Material Optimisation

The SF6 leakage rate between April 2016 and December 2016 is estimated to be (0.60% (estimated to be 438.51kg in total for this period). To fully calculate the impact of proposed SF6 gas during procurement we adopt a life cycle approach. Deployment of SF6 equipment is considered against proposed alternatives using a range of factors including:

- potential risks for leakages and losses,
- the anticipated gas loss rates, with associated penalties,
- equipment required to maintain gas on the network,
- overall electrical losses, and
- financial cost.

The selection made is based on the best possible balance between these factors.

In last year's statement, we reported on our innovative pilot project where a low SF6 version and an alternative gas were in the final selection process. We are pleased to confirm the alternative gas option, g3, was selected. When compared to SF6, g3 has a 98% lower global warming potential. Works to install g3 will begin onsite in Summer 2018.

Additionally, we are installing low SF6 equipment at another of our substations which utilises approximately 35% less SF6 gas. This project is due to start site at the beginning of 2018.

Through these types of projects, SPEN is leading innovation through the procurement process and ensuring our suppliers are engaged in the drive for environmental sustainability led innovation to meet our climate change ambitions.

Managing the network and its impacts:

Promoting Biodiversity

Project Background

The South West Scotland Scheme involves the construction of five new substations and four overhead line routes in remote rural upland agricultural or forestry locations to enable the connection of low-carbon generation from windfarms.

This year, SPEN have been presented with a CEEQUAL Award for Sustainability Performance. As part of the wider works planned for the South West Scotland Scheme, we commissioned our delivery partner Iberdrola Engineering and Construction (IEC) to address issues surrounding the improvement of biodiversity in the areas we are effecting during construction. In order to tackle invasive non-native species discovered on site IEC worked with SEPA to develop an approach and plan for dealing with American Signal Crayfish during the works, this is now being used as good practice by SEPA and issued to other construction companies in the area.

Last year, we reported on our peat management project forming part of the construction works conducted at Dunhill and Blackhill Substations imminently due to start on site. During the construction of the substation at Dunhill and Blackhill, an estimated 200,000m3 of peat, the same volume as 80 Olympic size swimming pools, will be excavated and replaced with suitable engineering material. An innovative project, developed in collaboration with the Scottish Mines Restoration Trust will see this peat diverted from landfill to be used in the restoration of abandoned opencast coal mines.

Current Status

The planning of the restoration works is well underway. Methodologies for transporting the peat and storage before its use have been put in place and the eventual profiling of the restored sites has been agreed. Site investigations are due to begin shortly to determine the peat resource present.

Timescales for Completion

The main works will be due to start in spring 2017.

Sustainability Drivers

Land and Biodiversity Improvement

The abandonment of the opencast coal sites caused a legacy of a scarred landscape unable to be enjoyed or used by the public, and offering limited biodiversity potential. Through the restoration of the mines, bog habitat can be recreated, adding to the percentage of this internationally important habitat located in Scotland, and benefiting moorland birds and plant life.

Sustainable society

The diversion of a large volume of peat from landfill disposal to be used in a landscape and biodiversity restoration of a stalled space is a success of sustainable development. It shows the benefits in engaging stakeholders and informing stakeholders of our long-term plans, which then enables stakeholders to suggest viable alternatives. During the South West Scotland project, a monthly environmental co-ordination meeting has been held, with an invite extended to all stakeholders for inclusive engagement on project issues such as the peat management project with Scottish Mines Restoration Trust. These invitees includes: all contractors, Local Authority Planning officers, SEPA, SNH, Fisheries Trust, Raptor Groups, Scottish water client and developers such as the peat management project with Scottish Mines Restoration Trust.

Climate Change Resilience and Water Efficiency & Protection

Peat and peaty soils in Scotland store the equivalent quantity of carbon of 180 years of Scottish greenhouse gas emissions at current emission rates. Healthy peat bogs continue to act as carbon sinks whilst degraded bogs release carbon. By providing the peat resource to the mine restoration scheme, bog habitat can be recreated, ensuring the peat removed from the substations continues to act as a carbon store. Peat bogs absorb atmospheric pollutants and water, acting to improve water quality downstream and slow down watershed in upland areas, reducing instances of flooding.

Waste Management and Minimisation

During construction, peat would typically be classed as waste and as such would have to be disposed of to landfill. SPEN contracted delivery partner Iberdrola Engineering and Construction to undertake an assessment of alternatives to mitigate the environmental impact of sending the peat to landfill. Through engaging with the Scottish Mines Restoration Trust and working with the Scottish Environment Protection Agency and the local council, a positive plan to avoid landfilling was developed, thereby saving at least 200,000m^3 of carbon rich peat from entering the waste stream.

Managing the network and its impacts:

Peatland Management

Project Background

In Last Year's annual statement we reported on the Green Networks Project that was part of our work on the Beauly/ Denny connection. This year, we will introduce another project that has resulted from our work in Dunipace, Denny. To facilitate the connection of the new Beauly Denny overhead line to the existing network a new 275/400kV substation was required near Dunipace, Denny. The substation is in an area where a number of overhead transmission lines converge and therefore forms a key hub in the existing electrical network. SP Energy Networks recognises the potential impact of developing the site in such a sensitive locale.

Current Status

Management plans are in progress for each site and works on sites are due to commence in early 2017. As part of our biodiversity strategy we are looking at how our network plans relate to the draft Scottish Government Climate Change Plan target to increase peatland restoration to 20,000ha annually from 2018.

Timescales for Completion

It is estimated that the our restored peat bogs will once completed (by end of 2019) have the potential to store over 400 tonnes of CO_2e per year along with 200 million litres of additional water and provide internationally rare habitat for over 650 different species.

Sustainability Drivers

Land and Biodiversity Improvement, Climate Change Resilience and Water Efficiency & Protection

The land at Denny forms part of a habitat of raised peatland. The peatland is teeming with invertebrates, plants, mosses, fungi, birds, mammals, amphibians and reptiles. It is also hugely important for carbon storage and flood prevention roles.

Healthy peat bogs act as carbon sinks whilst degraded bogs release carbon. Restoring bog habitat will store carbon, absorb atmospheric pollutants and water. This slow down watershed, improves water quality and potentially reduces flooding.

SPEN undertook an innovative process of peat deposition to ensure that peat removed from the site, to facilitate the substation would be used to improve habitat and deliver an overall ecological benefit on the remaining area of mire.

Sustainable Society

In meeting our commitments to mitigate the impact of developing the site SPEN has worked in partnership with our stakeholders (SNH, Scottish Government, Falkirk Council, Buglife, Callander Estates, Forestry Enterprise Scotland) to deliver off-site habitat improvement across 10 sites in the Falkirk Council area. This project addressed a requirement to deliver 58ha of lowland peat bog restoration. By working with our stakeholders SPEN has managed to far exceed requirements, and commenced work on over 190ha of peat bog restoration.

Potential to store **400** tonnes of CO_2 per year

Appendix 1

SP Energy Networks Transmission Business Carbon Footprint

	2012/2013	2013/2014	2014/2015	2015/2016
Buildings Energy Use	474.95	271.01	371.00	263.76
Operational Transport	296.96	287.69	417.00	322.27
Business Transport	-	5.69[5]	126.00	126.84
Fugitive Emissions	6,926.22	17,435.05	11,819.00	10,050.92
Losses	203,363.60	226,473.10	194,119.00	182,749.93
Total BCF (excl. losses)	**7,698.14**	**17,999.45**	**12,733.00**	**10,763.79**
Total BCF (incl. losses)	**211,061.74**	**244,472.55**	**206,852.00**	**193,513.72**

5 We initiated data collection at the end of this reporting year.

List of Acronyms

EDR	Environmental Discretionary Reward
FITNESS	Future Intelligent Transmission Network Substation
g3	Green Gas for Grid
GB	Great Britain
GW	Gigawatt
GWh	Gigawatt Hour
HTLS	High Temperature Low Sag
HVDC	High Voltage Direct Current
IT	Information Technology
kV	Kilovolt
MVA	Megavolt Ampere
MW	Megawatt
MWh	Megawatt Hour
NGET	National Grid Electricity Transmission
NGO	Non-Governmental Organisation
NIC	Network Innovation Competition
Ofgem	The Office of Gas and Electricity Markets
PVC	Poly Vinyl Chloride
RIIO-T1	Revenue = Incentives + Innovation + Outputs (Transmission period 1)
SF6	Sulphur Hexafluoride
SHE Transmission	Scottish Hydro Electric Transmission
SPEN	ScottishPower Energy Networks
SPG	Stakeholder Partnership Group
TO	Transmission Operator
VISOR	Visualisation of Real Time System Dynamics using Enhanced Monitoring
WAMS	Wide Area Monitoring System

Further information

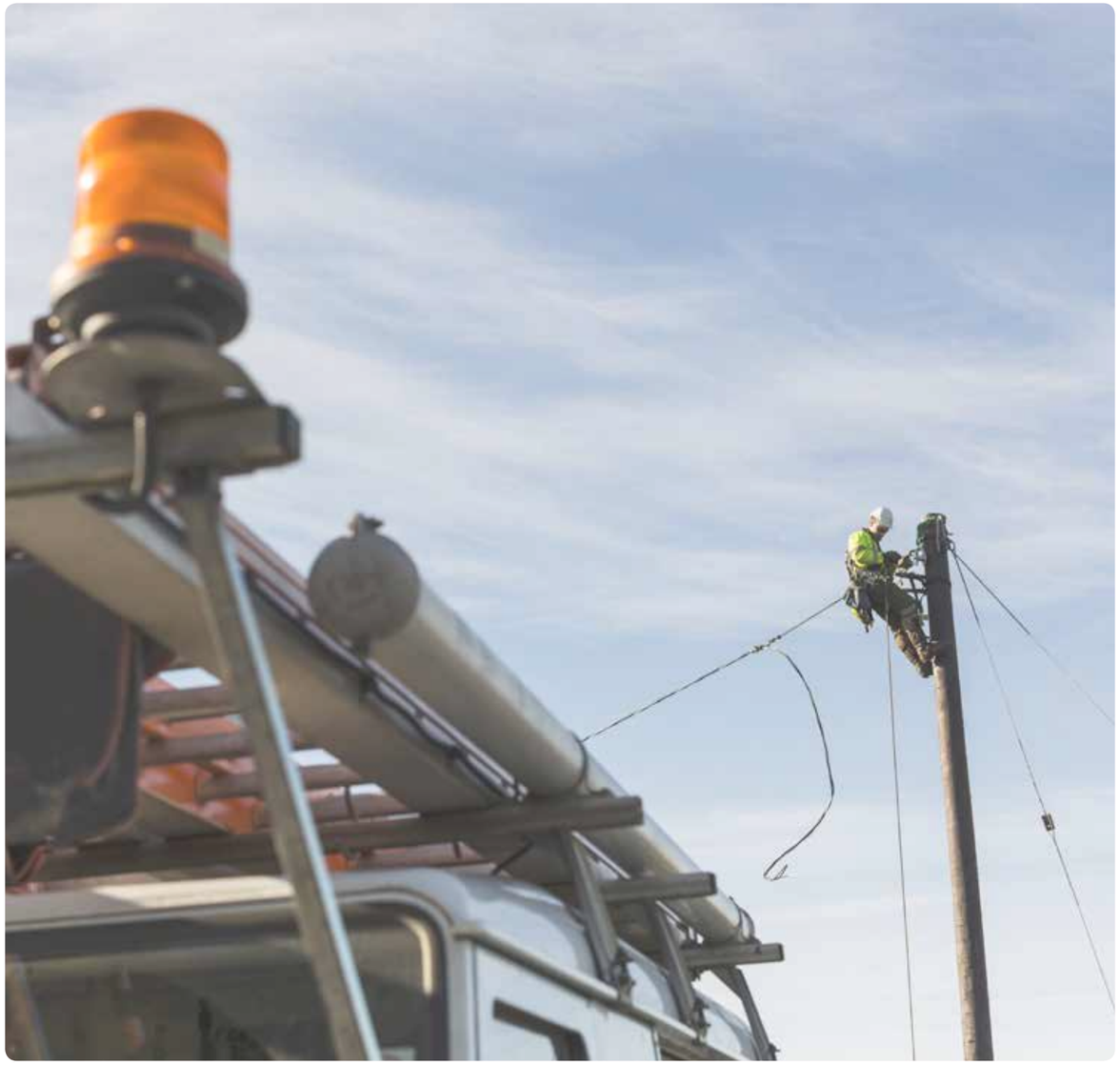
If you would like further information on SP Energy Networks please visit our website: **www.spenergynetworks.co.uk**

Information on our key initiatives can be found here:

FITNESS:
www.spenergynetworks.co.uk/news/pages/sp_energy_networks_successful_in_ofgem_innovation_competition.asp

VISOR:
www.spenergynetworks.co.uk/pages/visor.asp

Information on RIIO-TD1 can be found on the Ofgem website here: **www.ofgem.gov.uk/network-regulation-riio-model/network-performance-under-riio**



Consultation and feedback

We would be delighted to receive any comments, suggestions or questions on the content of this Annual Sustainability Statement, in particular:

How useful did you find the content of the Annual Sustainability Statement?

What was the most useful part of the statement to you?

Is there anything you would like SP Energy Networks to focus on more within the Annual Sustainability Statement?

Do you think SP Energy Networks is doing enough to facilitate the transition to a low carbon future?

Do you think SP Energy Networks is doing enough to manage its impact on the environment?

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