Transmission Annual Sustainability Statement

2017-18

SP ENERGY NETWORKS

Contents

This is the SP Transmission Annual Sustainability Statement for 2017-18, which provides an overview of strategy developments, describes our performance against key metrics, and gives examples of activities carried out to support the transition to a low carbon economy and manage the environmental impacts of our transmission network and operations.

This report conforms to the requirements of the Executive Level Annual Statement (ELAS), submitted as part of Ofgem's Environmental Discretionary Reward (EDR) Incentive for regulatory year 2017-18.

Ofgem's annual EDR Incentive encourages Transmission Operators (TOs) 'to achieve high standards in environmental management as well as to help move the industry towards a low carbon energy system, where it can do so effectively while providing value for money to consumers'.

Our Sustainable Business Strategy is underpinned by seven key drivers, developed in collaboration with stakeholders. Throughout this document, the link between significant outcomes and sustainability drivers will be made clear by the use of one or more sustainability driver icon.

Sustainable Society
Carbon and Energy Reduction
Climate Change Resilience
Water Efficiency and Protection
Raw Materials Optimisation
Land and Biodiversity Improvement
Waste Management and Minimisation

Foreword

Frank Mitchell, CEO, SP Energy Networks

The crucial role that the electricity transmission sector plays in reducing the potential impact of climate change – both in terms of enabling decarbonisation, and in the ways in which we reduce the direct impacts of our network and business – underpins decision making at all levels of our organisation.

My Executive Sustainability Steering Group (ESSG) integrates sustainable business and environmental practices throughout our operations by refining business strategies, progressing collaborative pilot projects and agreeing internal and external funding mechanisms to increase the speed and breadth of our response.

We are proud to align with our parent company's industry-leading sustainability credentials, using continued insights from stakeholders, customers and supply chain to find innovative and collaborative solutions and sharing our experiences to drive benefit across Iberdrola's international operations.

Understanding and planning for the future needs of our network and customers is more important now than ever, as global momentum for sustainable development and the need for interconnectivity and flexibility in networks both increase. In addition to the business-as-usual and innovative initiatives described in this report, ongoing areas of focus include influencing post-Brexit environmental policy, collaborating industry-wide to understand how energy networks and markets need to evolve, and securing the regulatory settlements needed to support the low carbon transition.

I am proud of the outcomes that our integrated approach is delivering, driven by our Sustainable Business Strategy. We will build on this in the coming year by mapping our activities against the detailed objectives in the 2015 United Nations Sustainable Development Goals to provide a common language for collaboration and performance evaluation.

Colin Taylor, Director Processes and Technology

SP Energy Networks is committed to delivering the low carbon transition in the UK and we are proud to be playing a valuable part in Iberdrola's global leadership on climate change. We are working extensively with our stakeholders, collaborating to achieve common goals and addressing complex sustainability issues. Innovation and stakeholder engagement are key to our success.

Since its establishment in March 2017, our Sustainability Stakeholder Working Group (SSWG) has given valuable focus and guidance. The Group has challenged us to deliver a clear, bold vision for a sustainable future, underpinned by comprehensive strategy and detailed plans. Their insights are helping us to remove barriers to sustainable practice, invite new and innovative collaboration and enable communities to maximise benefit from local resources.

The development and launch of our Sustainable Business Strategy in 2017 has underpinned our comprehensive approach to enabling the low carbon transition and optimising the impact of our operations, supporting effective decision making and guiding the prioritisation of activities.

The coordinated implementation of this strategy is now our key focus, resulting in the range of outcomes described in this report and the development of further activities needed to take the 'Big Leaps' required to deliver our vision of a sustainable networks business.

SP Energy Networks is committed to delivering the low carbon transition in the UK and we are proud to be playing a valuable part in Iberdrola's global leadership on climate change.

Welcome to the SP Transmission Annual Sustainability Statement 2017-18

In this, our fifth annual sustainability statement, we provide an overview of our sustainability performance and examples of the specific initiatives driving progress as part of our longer term strategic plan.

This statement highlights our work to enable the connection of low carbon technologies, deliver network improvement projects and manage the network and its impacts, and shows how our progress is driven by our seven Sustainability Drivers.

These initiatives and drivers are central to doing 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.

Having now passed the mid-point for RIIO-T1, we are already planning for the next price control period. The projects we outline here will deliver the foundation for RIIO-T2 (starting 2021).

Who we are

SP Transmission is the Transmission Operator (TO) that delivers electricity to homes and businesses in Central and Southern Scotland as one of three network operation licences held by SP Energy Networks.

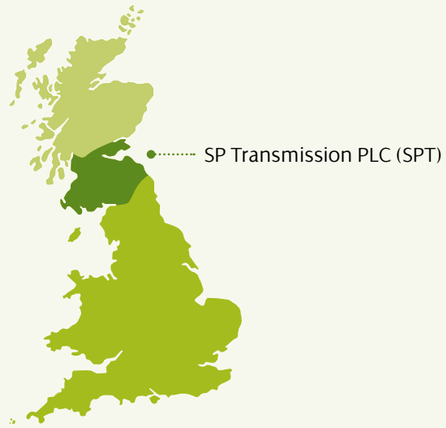
We are responsible for:

- 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 SP Energy Networks has 50% of Scotland's transmission connected renewable generation.

By adopting a more sustainable approach, we are managing the network more effectively for customers and the environment, year on year.

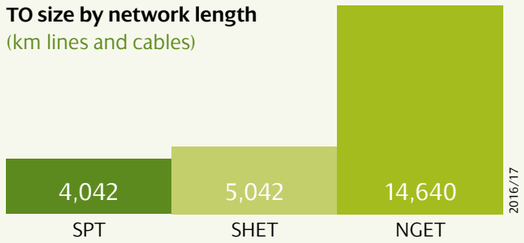
Area of operation



Company size

SP Transmission is third in terms of the size of our network, but not the size of our ambition, when comparing all three electricity TOs. We play a critical role in providing security of supply across GB and in facilitating the connection of new renewable energy.

TO size by network length
(km lines and cables)



Our role

The role of the electricity transmission sector is key in facilitating the connection of low carbon technologies and developing the network sustainably. We stand ready to facilitate the Government's low carbon aspirations, whilst meeting high standards in environmental management and delivering long term value to consumers.

We stand ready to facilitate the Government's low carbon aspirations, whilst meeting high standards in environmental management and delivering long term value to consumers.

Critical to meeting both UK and Scottish Government climate targets for 2020 and beyond, stakeholders require sufficient network capacity and flexibility to be able to play their part in the drive towards the decarbonisation of many sectors including the electricity market, transport and heat.

We are therefore working with our stakeholders to facilitate low carbon generation connections in a cost effective and efficient manner by leading advances in technology and bringing successful innovations into business as usual.

This collaboration is enabling us to identify and deliver improvements to our processes and approach to low carbon generation, strengthening our focus on ease and speed of connection.

External influences

During the last year, our strategy has been influenced by a number of external factors, specifically international and national policy developments and from engaging with, listening to and acting upon the suggestions of our stakeholder community.

These include but are not limited to:

- **The international fight against Climate Change** – including ongoing support for the 2015 Paris Agreement in Bonn 2017 and participation in the Talanoa Dialogue.
- **International support for Sustainable Development** – Incorporating the United Nations Sustainable Development Goals in our published Sustainable Business Strategy.
- **UK Government policy** – the removal of financial support mechanisms for onshore wind resulting in a reduction of forecasted connections to 1.7GW from a previous position of over 2GW for the year, and incorporating the spirit of the Industrial Strategy and Clean Growth Strategy 2017 into our business strategy and innovation activity.
- **Scottish Government Policy** – Including the Scottish Energy Strategy and Climate Change Consultation and Low Emission Zones.
- **Significant developments in the regulatory environment** – and the ongoing development of the RIIO-2 framework to apply from 2021 onwards.
- **Reacting to large scale thermal plant closures** – both historic and planned station closures.
- **Interaction with the SO, other TOs and DNOs** – including the Future Energy Scenarios, participation in the Electricity Networks Strategy Group (ENSG), planning for the Distributed System Operator role, the Electricity Networks Association and the Environmental Discretionary Reward (EDR) Practitioner Group.
- **Collaboration with other industry groups** – including the Scottish Infrastructure Circular Economy Forum (SICEF).
- **Focussed stakeholder engagement** through the Sustainability Stakeholder Working Group, Stakeholder Panels and a wide range of interactions with renewable generators and our Supply Chain.

We are working with our stakeholders to facilitate low carbon generation connections in a cost effective and efficient manner.

Strategic developments

Drawing on these external influences, we have published a number of important documents in 2017-18 on the road to becoming a leading Sustainable Networks Business. In doing so we have applied both a UK focus and an energy networks focus to engage with internal staff and with our stakeholders, recognising that action is more likely when people understand how goals, objectives and actions relate to them and what their individual actions can deliver.

These key updated documents include:

- April 2017 SP Energy Networks Sustainability Policy.
- September 2017 SP Energy Networks Sustainable Business Strategy.
- October 2017 SP Energy Networks Environmental Management System (EMS) to ISO14001:2015.
- March 2018 SP Energy Networks Approval for Internal Sustainability Fund and External Collaboration Fund to contribute to delivery of SP Energy Networks Sustainable Business Strategy.

In the coming year, key areas of focus will include:

- Detailed mapping of our activities against United Nations Sustainable Development Goals.
- Influencing post-Brexit environmental, energy and sustainability policy.
- Influencing regulatory policy for the RIIO-T2 price control, due to commence in 2021.
- Influencing the output of the industry-wide Open Networks project as it seeks to redesign energy networks and markets for the smart energy future.

Initiatives

We deploy a wide range of technological, commercial, process and innovation solutions to deliver the evolving aims of our strategies.

We have developed new technology and skills to stabilise the network and support the low carbon transition:

- Shunt Reactors – used in transmission systems to stabilise voltage during load variations.
- Series Compensation – Reduces line voltage drops and limits load-dependent voltage drops.
- Long-distance interconnectors – such as HVDC Western Link, a joint venture collaborative subsea cable project with National Grid.
- High temperature low sag conductor.

We have amended our processes and policies to support and accelerate the transition:

- Transmission Economic Connections Assessment (TECA).
- Active Network Management.
- Queue Management.
- Streamlined Statement of Works.

We have identified and are taking forward new globally leading innovative solutions to support the transition, enabling a greater penetration of low carbon generation in the near and medium future:

- Project Phoenix – Hybrid-Synchronous Compensator (H-SC).
- Load Management Schemes (LMS).
- Generation Export Management System (GEMS).
- Green Economy Fund.

We have developed and implemented innovative solutions to reduce the environmental impact of our operations:

- Project FITNESS – Digital Substations.
- Life Cycle Assessment (LCA).
- Natural Capital Assessment.
- Emissions Reduction.
- Network Loss Reduction.

Key outcomes:

32%
Reduction in total Transmission Business Carbon Footprint since 2013/14

41%
Increase in transmission connected onshore wind capacity since 2013

43%
Increase in waste being diverted from landfill since 2013/14*

*Transmission major projects

Scope of this document

This report is the SP Transmission Annual Sustainability Statement for 2017-18 and includes:

- an update on our Sustainable Business Strategy and performance,
- an exploration of some of the initiatives on which we are leading, and
- an explanation of how they are being shaped by our Sustainability Drivers.

It conforms to the requirements of the Environmental Discretionary Reward (EDR) Scheme, 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 2017-18 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.

Intended audience

This document is intended to be suitable for a non-technical audience, to enable the widest possible range of interested stakeholders to understand the progress we are making in efficiently developing our network to support the low carbon transition, and achieving neutral or positive environmental and social impacts.

Stakeholder feedback

Each year, we provide a draft of this statement to a wide range of stakeholders for their comment before we finalise it. This year, stakeholder feedback has been overwhelmingly positive, with stakeholders commenting that they appreciate the inclusion of more data in easy to read graphs, that the document covers all the main areas expected, that target timelines are appropriately aligned with external strategy, and that they find the document easy to read and understand.

Feedback we have implemented from this year:

- Providing headline text and greater use of headers in each section.
- Adding our vision statement.
- Including a section describing the purpose of the document.
- Describing SP Energy Networks in terms of business values and aims as well as assets.
- Including more data on performance in the reporting year.
- Clarifying where this document sits in our suite of annual sustainability-related reports.
- Including a matrix of all projects as a reference point, supported by a more detailed appendix.
- Providing detail on our Sustainability Drivers throughout.
- Providing information on how our strategy relates to the United Nations Sustainable Development Goals.
- Providing context on how our strategy relates to that of Iberdrola Group.
- Showing the next steps for strategy and initiatives.

We also engage with stakeholders on a regular basis to continue to refine our strategy for sustainability and identify opportunities for collaboration. See pages 6 and 7 for details of the changes this engagement has brought about to our strategy in 2017-18. All SP Transmission Engagement outcomes are summarised in our report, **Making a Difference: Highlights of our activities and outcomes following stakeholder engagement** and in our **Engagement Actions and Benefits table**.

Greater visibility of data

Our stakeholders told us they would like us to include more data, but we weren't previously able to include the full year of data due to this report deadline coming before the official submission some of our key annual data returns.

In response to this feedback, we worked with Ofgem and the other TOs to adjust the reporting timeline, meaning that this year for the first time, we are able to provide a greater range of data from the recently completed regulatory year for our stakeholders.

In 2018-19, we will seek to collaborate with our TO peers to align reporting to enable readers to compare our performance like-for-like.

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

Other sources of information

This document forms part of a suite of interrelated strategies and stakeholder facing performance reports. These are mapped below with links to their locations.

Consumer Vulnerability Strategy	Stakeholder Engagement Strategy	Sustainable Business Strategy	Innovation Strategy	Connections Strategy	Other business strategies
Distribution Stakeholder Engagement Report – Part 3	Distribution Stakeholder Engagement Report – Parts 1 & 2	SPEN Environment & Sustainability Report (planned for 2018)	Network Innovation Competition Reports	RIIO-T1 Business Plan	Other performance reports
	Transmission Stakeholder Engagement Reports	Transmission Annual Sustainability Statement	Network Innovation Allowance Annual Report	Incentive on Connections Engagement Reports	
		Distribution Environment & Innovation Report	Smarter Networks Portal	Transmission Losses Report	
Distribution & Transmission Annual Reports					

The example projects featured in this report represent part of a broad portfolio of initiatives in progress to enhance the sustainability of the SP Transmission network and the services it provides.

	Initiative	Sustainable Society	Climate Change Resilience	Carbon and Energy Reduction	Water Efficiency and Protection	Raw Materials Optimisation	Land and Biodiversity Improvement	Waste Management and Minimisation
Included in Sustainability Annual Report	Phoenix – System Security and Synchronous Compensators (Page 22)	✓		✓		✓	✓	✓
	Load Management Schemes (Page 23)	✓		✓		✓	✓	✓
	Generation Export Management (Page 24)	✓		✓		✓		
	Green Economy Fund (Page 25)	✓	✓	✓		✓		
	FITNESS (Page 27)	✓		✓		✓	✓	✓
	Life Cycle Assessment (Page 28)	✓		✓	✓	✓	✓	✓
	Natural Capital Assessment (Page 29)	✓					✓	
	Emissions Reduction (Page 30)			✓	✓	✓	✓	✓
	Network Loss Reduction (Page 31)			✓				
Innovation Project	SIARA – System Integrity and Restorative Actions	✓	✓	✓		✓	✓	✓
	Distributed Ledger Technology-enabled Distribution System Operation (Phase 1)	✓		✓		✓	✓	✓
	FUSION	✓		✓		✓	✓	✓
	LV Engine	✓		✓		✓	✓	✓
	Innovative Approach for Transmission Harmonics Issues	✓		✓		✓	✓	✓
	Introduction of Environmentally Friendly Alternatives to SF6			✓		✓	✓	✓
Other Projects	System Resilience Initiatives	✓	✓	✓				
	Whole-system Energy Planning	✓	✓	✓		✓	✓	
	Strengthening the Consumer Voice	✓						
	Statement of Works Process Improvement			✓				
	Queue Management Improvement			✓				
	Transmission Economic Connections Assessment (TECA)	✓		✓				
	Open Networks Project	✓	✓	✓		✓		
	Climate Change Risk Assessment	✓	✓					

Our responsibilities

The SP Transmission network is a crucial enabler of the UK's renewable energy objectives.

Opening up renewable energy to the rest of the UK

Our location in an area of exceptional renewables resource and our position linking SHE Transmission to the North and NGET areas to the South, means that we provide a key link. We import renewable energy from the SHE transmission area in the North of Scotland for over 260 days, and export energy to meet demand in England for over 331 days in an average year.

We export energy to meet demand in England for over 331 days in an average year.

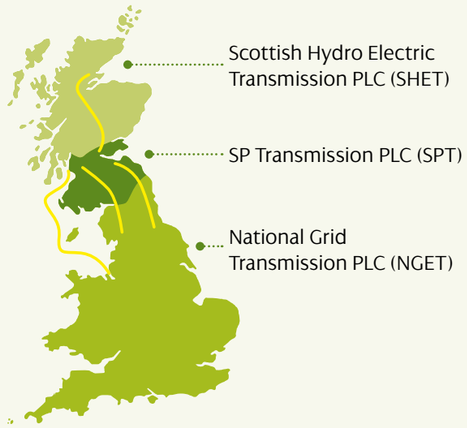
Providing a reliable, adaptive service

Our network provides vital reliability and security of supply, adapting to the accelerating rate of change in energy production and use.

In recent years, the capacity of generation directly connected to the SP Transmission network has reduced by 31%, due to the closure of coal fired power stations (Cockenzie -1,200MW and Longannet -2,400MW) being only partially offset by an increase in onshore wind capacity (+1,400MW).

In the same period, generation connected to the distribution network in the same territory has risen by 178% (from 900MW in 2010 to 2,500MW in 2017), further underlining the transition from traditional one-way generation-demand flows towards a far more liquid and flexible market, where demand and generation offset one another at a much more local level than before, and visibility of true power flows becomes more challenging.

Interconnections and other UK TOs



Our activities and assets

- Supply around 2 million customers.
- Cover an area of approximately 22,950km^2.
- Comprise 4,000km of overhead lines;
- 320km of underground cables; and
- 140 substations operating at 400, 275 and 132kV.

SP Energy Networks 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. The environmental aspects of these licence areas are discussed in our annual ED1 Environment and Innovation Report.

Supporting long term decarbonisation goals

Driven by more efficient technologies, processes and increased domestic and on-site generation, domestic demand has decreased by 6.4% and industrial and commercial demand by 16.6% since 2010 in Central and Southern Scotland.

As focus on decarbonisation of transport and heat intensifies, reliance on electricity is likely to increase. Irrespective of overall demand profiles, more individuals and businesses will use electricity exclusively for all of their heat and transport needs.

We engage with a wide range of stakeholders and work together with our network peers to understand the demands that these changes place on UK networks, and invest wisely to improve performance, ensure security of energy supply and facilitate the connection of low carbon technology.

Managing the network and its impacts

Whilst providing the capacity, flexibility and security of supply to realise this fast-approaching energy future, we are working with our supply chain to efficiently manage existing and new network assets in ways that achieve neutral or positive environmental and social impacts.

We operate and maintain linear infrastructure which may be routed through, or adjacent to, a wide range of culturally or environmentally sensitive landscapes and structures, ranging from pristine to degraded habitats. While we provide the network connections and services that customers require, we recognise the need to minimise any negative effects these activities could have on the environment and communities.

Throughout the life of our assets, we not only meet the requirements of government policies and legislation but strive to better them by integrating fair and responsible environmental practices with socio-economic considerations.

Throughout the life of our assets, we not only meet the requirements of government policies and legislation but strive to better them by integrating fair and responsible environmental practices with socio-economic considerations.

Our vision

Our vision is to be a sustainable networks business:

- Efficiently managing and developing our network in support of the low carbon transition; and
- Achieving neutral or positive environmental and social impacts.

We aim to be a leader in this area. Our actions to become a sustainable network operator will drive our supply chain and support our customers and communities to become more sustainable.

Our **Sustainable Business Strategy** has been developed through two years of collaboration with our stakeholders, and is regularly updated in response to internal and external policy developments as described on pages 6 and 7.

Our 'sustainable business' model will be characterised by:

Consideration of environmental, social and economic costs and benefits in decision making;

Collaboration with stakeholders; and,

Transparency in decision-making process and reporting of performance.

Our sustainability drivers

Our sustainability drivers were refined and relaunched in 2017 to enable SP Energy Networks 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 into the environment.

We continue to work with stakeholders to further refine these drivers as our approach matures.

The delivery of each driver is supported by key objectives and metrics, used to track progress towards becoming a more sustainable business.

For example:

Sustainable Society
- Reduce supply chain environmental impacts e.g. introduce supplier sustainability audits.
- Enable the connection of low carbon technologies.
- 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.

Climate Change Resilience
- Preparing the network for changing load patterns.

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 Sulphur Hexafluoride (SF6).

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 SP Energy Networks processes.

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

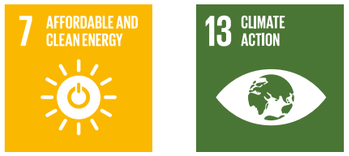
Waste Management and Minimisation
- Divert 95% of waste from landfill by end 2023.

Commitment to the United Nations Sustainable Development Goals

Our sustainability drivers and commitment to the United Nations Sustainable Development Goals (SDGs) complement the ambitions of our parent company, Iberdrola Group, a globally leading utility with a sustainable business model at the heart of its decision making processes.

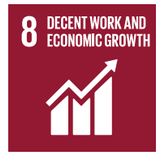
Our Group website gives details of **Iberdrola's leading sustainability agenda** and our Group **strategy for contributing to the goals**.

We have identified two Main Focus goals:



Four Direct Contribution goals:

And recognise our indirect contribution to the 11 remaining goals:



Driving our contribution to the SDGs

Our contribution to the SDGs is reliant upon implementing a robust Sustainable Business Strategy and driving progress through effective performance evaluation and governance. It is for this reason that we have chosen to develop our strategy, governance and data to maturity before embarking on the task of mapping our strategy and evaluation metrics against the 232 unique SDG indicators. We will start this detailed mapping exercise in 2018-19, guided by our Strategic Stakeholder Working Group.

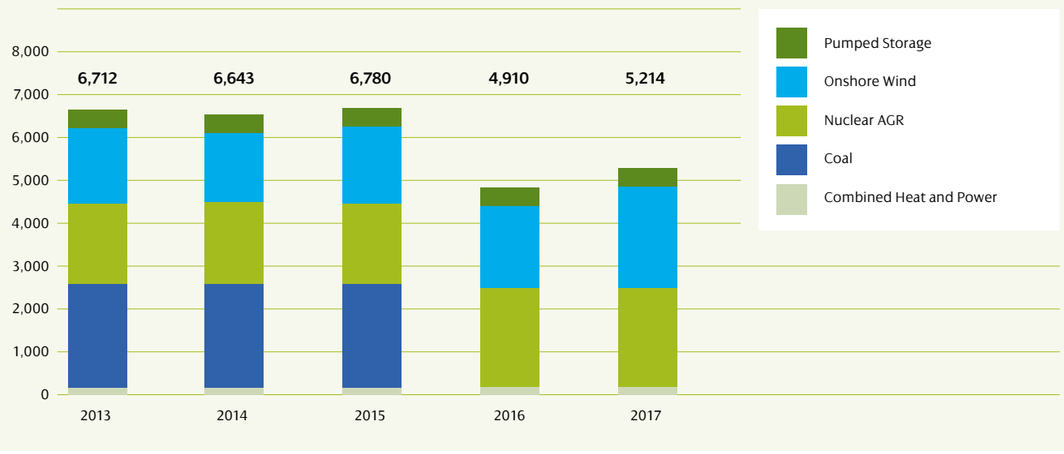
Our contribution to the SDGs is reliant upon implementing a robust Sustainable Business Strategy and driving progress through effective data and governance.

Performance 2013-2018

The following pages provide transmission-specific data on our top metrics: **Connections, Business Carbon Footprint, Waste and Water.**

Connections

Transmission Connected Generation Capacity (MW)



SP Transmission has enabled an increase of 41% in transmission connected onshore wind capacity since 2013, using both traditional and innovative approaches. Coupled with the removal of coal plant, this has nearly doubled the proportion of renewables capacity as part of the overall transmission connected portfolio from 28% in 2013 to 53% in 2017. Forecasts suggest that transmission connected wind generation (on and offshore) will increase by a large amount in the next few years, at which point renewables may make up close to two thirds of the overall transmission connected mix in the South of Scotland.

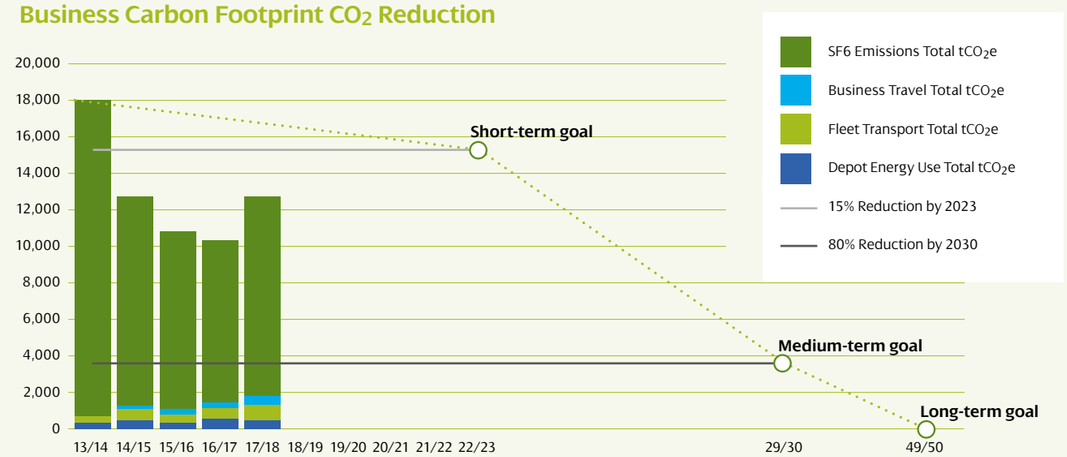
In the same period, generation embedded in the distribution network in the South of Scotland has increased by 222%, making up 34% of overall generation capacity in 2017.

The initiatives described later in this document are representative of how our sustainable business and connections strategies are driving forward innovative solutions to enable the unprecedented decarbonisation of our energy generation mix.

The proportion of renewables capacity as part of the overall transmission connected portfolio has nearly doubled from 28% in 2013 to 53% in 2017.

Business Carbon Footprint

Business Carbon Footprint CO_2 Reduction



We have achieved a 32% overall reduction in Business Carbon Footprint since 2013. By 2015, we had reached our 2023 target of 15% reduction, and we are currently 13% ahead of our incremental target of 6% annual reduction to 2030.

In 2016-17, we re-baselined our emissions reduction trajectory to reach a stretching target of 80% reduction by 2030, in line with our target of carbon neutrality by 2050. This is now our primary focus. Although we are already within our 2023 target, we have made the decision not to reduce our 2030 target. The main reason for this is that the installation of new, lower-loss Sulphur Hexafluoride (SF6) insulated equipment may negatively impact the overall leakage rate until the widespread introduction of equipment using alternative insulating medium becomes economically and operationally viable.

SF6 emissions dominate the overall business carbon footprint. Our approach to reducing these emissions is to:

- Reduce leakage on existing equipment, targeting the leakiest where it is economically reasonable to do so;
- Collaborate with manufacturers of new SF6 equipment and share best practice industry-wide to minimise leakage; and
- Work with manufacturers, innovators and industry peers to develop economically viable alternatives to SF6.

SP Energy Networks is leading the introduction of viable alternatives to SF6, resulting this year in the successful installation of a Green Gas for Grid (g3) insulated asset on our network (see Emissions Reduction on page 30 for more information).

Measures to address existing plant leakage and the deployment of alternatives currently cost more and will continue to cost more in the medium term. Our ability to meet our challenging business carbon footprint targets will therefore be dependent on securing funding from Ofgem in the forthcoming RIIO-T2 price control and beyond.

The market by which these technologies may become cost-competitive, will, to a large extent, be influenced by legislative and regulatory developments. We are fully involved in influencing legislation and regulatory policy to provide the market stimulation and funding required to address this industry-wide issue.

In 2017-18, an overall increase in SF6 emissions was caused by one specific asset on our network, whose annual leakage rate, although still well within its design rating, increased from 1.06% to 1.74% in the period. Overall, our SF6 emissions are well within target, at 10,488 tCO_2e against a target of 17,829.

As SP Transmission staff are co-located with the rest of SPEN's workforce and use some of the same facilities, Business Travel, Fleet Transport and Buildings Energy use are apportioned based on staff numbers. In October 2017, our Transmission licence incorporated staff from Iberdrola Engineering and Construction, increasing Transmission staff numbers by 185%. This new apportionment accounts for the raised footprint in these categories in 2017-18, when in real terms the carbon intensity of these activities decreased in the period.

Waste

Major Projects Waste to Landfill Reduction

Efficient waste management – where we value resources both financially and environmentally – is a key element of our vision of sustainability. In order to drive this vision, we have set ourselves the challenging goals to divert 95% of waste from landfill by 2023, to recycle or reuse 100% waste by 2030, then move to zero waste in 2050.

To meet these targets, we are focusing on ways to avoid, reduce, reuse and recycle our waste. Key to this is ensuring that the many inputs of data required become more robust year on year. Our approach is therefore two-fold – working with our own staff and supply chain to gain better insights into the quantities, types and treatments of waste resources; and collaborating to develop ways of reducing waste and improve the ways in which waste resource is then processed.

The rapid increase in percentage of waste diverted from landfill in 2015 is due to improvement in the recording of waste streams in that year.

Since 2014, waste diverted from landfill has increased from 7% to 50%, and we are just ahead of the required 10% annual improvement to meet our 95% target.

We have set ourselves the challenging goals to divert 95% of waste from landfill by 2023, to recycle or reuse 100% waste by 2030, then move to zero waste in 2050.

Water

Climate change models forecast reduced summer rainfall putting pressure on scarce water resources. In addition, transporting and treating water to potable standards is costly and uses energy. Our targets are to reduce water use by 10% by 2023, 25% by 2030 and 50% by 2050 (against a 2013-14 baseline), but due to the greater potential impact of our carbon and energy reduction and waste management and minimisation targets, we prioritised our programme to focus on those impacts more closely in 2017-18.

Key to this is ensuring that we work to improve the completeness and accuracy of water use data year on year.

There are several ways in which we are proactively reducing water usage, including the design specification of new or refurbished operational buildings, and by interrogating data to identify and rectify issues.

The water-efficient design of our new state-of-the-art headquarters building is enabling a 40.53% improvement in water use, through water meters with pulsed output, leak detection and sanitary shut-off systems.

The interrogation of water data from our Bonnybridge depot indicated a sharp increase in usage. On investigation, it was found that this increase had been caused by a hidden leak, and rectification of this issue resulted in a 92% reduction in usage.

The water-efficient design of our new state-of-the-art headquarters building is enabling a 40.53% improvement in water use.

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 strike the right balance. This means proactive scenario planning, and where necessary taking decisive action to modify our investment plans.

How we seek to manage these uncertainties

A wide range of our established activities contribute to managing this uncertainty:

- **Scenario planning**: We contribute key information to the Government's Future Energy Scenarios and National Grid's annual Electricity Ten Year Statement, and we update our own forecasts for new connections 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, developing and deploying innovation where required.

We are using innovation to accelerate the UK's low carbon transition.

Flexing investment plans to provide capacity where and when it's needed

Our commitment to the facilitation of low carbon connections has led to us creating a Transmission Economic Connections Assessment (TECA) Steering Group, to review and adjust our best view of the contracted generation background to 2021 and to evaluate timely delivery of reinforcement works. This regular assessment activity is resulting in more accurate projections of renewable development in Scotland, and feeds into our plans on an annual basis, ensuring our investment best meets the needs of users and customers year on year.

Making it quicker and easier to connect low carbon technologies

We are working on many fronts to use innovation to make it quicker and easier to connect low carbon technologies to the network. This innovation comes not only in terms of innovative technology but in innovative approaches to policy and commercial processes.

One example of this is our revised process with our distribution business, which provides visibility of the transmission impact upfront rather than the standard practice which means that renewable developers may need to wait up to 12 months. We have now trialled this at four strategic Grid Supply Points, selected on account of different issues raised by users, in order to maximise the benefit of the learning. This leading approach has, to date, accelerated 20 connection offers by 12 months.

Similarly, we have continued our work on queue management, aimed at removing blockages caused by stalled renewables projects to the benefit of construction-ready projects. Our approach seeks to ensure effective queue management and minimises contracted queues being established if projects are not advanced enough. We have now led the development of a common policy and publication of a new GB roll-out plan for queue management, working with all network companies and the System Operator through the Open Networks project. The revised approach has resulted in more effective queue management with a reduction in speculative projects 'reserving capacity'.

Minimising the need for costly and time consuming network reinforcement

When the Transmission network is already operating at capacity, it means new renewable developments can't connect, which can be really frustrating to users of the system. In response, we have been working with renewable developers over the past several years, using new innovative technology to enable them to connect to the network now, on the agreement that their assets can be switched off if the system reaches capacity. The resulting 'Accelerating Renewable Connections' approach minimises the need for reinforcement, significantly speeds up connection and reduces costs for both developers and customers.

This year, users explained that the way the system was operating was providing a 'hard trip' for them, which had the potential to damage some of their equipment. Responding to this stakeholder feedback, we developed a new process for the design of our accelerated renewable schemes, providing a new facility where the developer gets a signal, to give them time to ramp down their turbines. By allowing 228MW of generation to connect early so far, these accelerated schemes have the potential to displace approximately 1 million tonnes of CO_2 when compared to the mix of conventional generation methods.

The following pages discuss further key strategic initiatives to enable the connection of low carbon technologies:

- Phoenix
- Load Management Schemes (LMS)
- Generation Export Management (GEMS)
- Green Economy Fund

Enabling the connection of low carbon technologies:

Phoenix

Project Background

Phoenix seeks to 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. The project will develop and demonstrate the deployment of a new technology, the Hybrid-Synchronous Compensator (H-SC).

Through the trial, the project will address the technical, engineering and commercial challenges that are currently perceived as the main barriers for wider scale adoption of renewables. In collaboration with the UK System Operator, the project will carry out analysis on the impact of installing synchronous condensers at various locations and their impact on the performance of the UK electricity system.

Phoenix will enable future installations and essential network services to be provided for GB System Operators, Transmission Owners and Distribution Network Operators, whilst also considering how the wider market could be structured to deliver the services including inertia and short circuit level.

The successful pilot and subsequent roll-out of H-SCs will provide substantial environmental benefits for our customers, offering an economical replacement for the stability and security provided by large conventional synchronous generators, such as coal and gas power stations, as we move to a lower carbon supply of electricity.

Current Status

The project started in mid-2017 and to date has agreed partner modelling requirements and responsibilities, selected an installation site and carried out early knowledge dissemination activities.

Timescales for Completion and Next Steps

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

Sustainability Drivers

Carbon and Energy Reduction

The project aims to minimise carbon footprint and continue creating a sustainable network for customers, enabling a saving of just over 62 thousand tonnes of carbon – equivalent to the electricity use of over 6,000 homes.

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 those large synchronous generators recently closed or planned for closure.

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 project will release 662MW additional network capacity, greatly reducing raw material and waste impacts due to substantially reduced need for network reinforcement while enabling more Distributed Energy Resources – such as solar arrays and windfarms – to connect and flow through the network.

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 retired power stations and some of the existing equipment to operate as a Synchronous Compensator.

Land and Biodiversity Improvement

Sites previously used for power generation, or close to the existing network, are also ideal candidates for reuse in our sector, as 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. Phoenix will aid the transition to a future GB transmission network that can benefit from clean energy resources without compromising the security and quality of supply to the customers. The project will enhance system stability, helping to reduce power cuts, and supporting the prosperity of an increasingly electrified economy. The joint project will explore future commercial mechanisms by which Synchronous Compensators will be able to compete to provide sustainable electricity network services on the open market. It will reduce the electricity network operating costs, effectively financially benefitting customers.

Enabling the connection of low carbon technologies:

Load Management Schemes (LMS)

Project Background

One of SP Transmission's key objectives is to facilitate the connection of renewable generation. In our area this consists primarily of onshore wind generation and much of our investment is related to reinforcing the network in areas with a rich wind resource. However, the time that this takes to deliver, due to necessary periods of stakeholder engagement, consenting, construction 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. These have been installed on Grid Supply Point transformers, 132kV circuits and supergrid transformers, and have facilitated the early connection of 222MW of generation during this period.

Timescales for Completion and Next Steps

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

Sustainability Drivers

Carbon and 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 of which are borne by the consumer to a value of around £850m 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 and 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, 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:

Generation Export Management (GEMS)

Project Background

A Strategic Wider Works Project in Dumfries & Galloway was proposed as part of the SP Transmission 2013-2021 Business Plan, but partly due to changes to onshore generation incentives, it was subsequently found that any investment over and above a minimum scheme would be uneconomic. Taking into account future energy scenarios, it was found that a minimum scheme could enable more than 95% of generation to flow through the system unconstrained.

In 2016, SP Transmission took the decision to progress a minimum scheme, now known as the Kendoon to Tongland Project. As this scheme means that the transmission system in South West Scotland will be operating beyond its capacity in the coming years, there is a need to develop non-build solutions to actively manage the flow of energy on the network to facilitate future generation connections and ensure that the system is not exposed to unacceptable overloads.

Current Status

Principles and high level functional requirements have been developed in collaboration with National Grid Electricity System Operator (NGESO), SP Distribution and the South West Scotland developer community. NGESO have submitted a planning request to develop the Generation Export Management System (GEMS) and collaborative work is currently underway to develop a detailed functional specification for the proposed system.

Timescales for Completion and Next Steps

The project is scheduled from 2017 to 2022 – with scheme scoping in 2017-18, design and tender in 2018-19, scheme development in 2019-20, implementation and testing in 2021 and operational go-live planned for 2022.

Sustainability Drivers

Sustainable Society

Currently only larger generators are able to take part in the national electricity balancing market. Under GEMS – an evolution from load management schemes – generators of all sizes will not only be able to connect sooner and more economically, but to also take part in a balancing mechanism by agreeing for their systems to ramp up or down to balance the network. This means that smaller enterprises will be able to access new markets, increasing the potential for greater local benefit from local renewables resources.

Raw Materials Optimisation

GEMS will enable more efficient utilisation of the energy network in the South of Scotland, reducing the need for new overhead line build, and thereby reducing the use of concrete, steel, aluminium, copper and plastics, visual intrusion and construction impacts.

Carbon and Energy Reduction

GEMS will enable renewable generation to connect sooner, and access to the additional revenue from selling balancing services has the potential to make a greater number of renewables projects viable, helping to increase the overall proportion of renewable generation in Scotland.

Enabling the connection of low carbon technologies:

Green Economy Fund

Project Background

The Scottish Government's ambitious drive to a low carbon economy will ultimately require a transformation in all forms of transport and heating. This is dependent upon the key infrastructure that the energy network provides.

Through Strategic Panels, our Strategic Stakeholder Working Group and our Stakeholder Conference, stakeholders told us that there was a need for a fund to support communities in moving towards a green economy, whilst also preparing the energy network. 75% of conference attendees said they would consider partnering with us to deliver a sustainable community project.

In response, SPEN pledged to voluntarily contribute up to £15m (since extended to £20m) over a two-year period to support initiatives that will enable communities and businesses to develop their ideas and to fund the implementation of those ambitious projects that support Scotland's low carbon future, helping accelerate existing ideas and potentially supporting projects that may not otherwise occur.

This fund aligns with the Scottish Government's £60m Low Carbon Innovation Fund, designed to help deliver the ambitious low carbon transport and heat goals set out in Scotland's Energy Strategy. Initiatives seeking shared or full funding will be required to demonstrate that they have green credentials and are targeted at areas that may ordinarily struggle to access funding. Lessons learned from projects supported by the fund will, in turn, be shared with other communities to ensure others can benefit.

The fund will support a wide range of different activities that can be seen to impact the SP Energy Networks network in some direct or indirect way, and all projects must demonstrate a measurable social or environmental impact.

Current Status

The fund was launched in March 2018. The first Expression of Interest period closed at the end of July 2018, resulting in 36 responses, amounting to over £20m in funding requests.

Timescales for Completion and Next Steps

August 2018 – review of expressions of interest and invitations for formal applications, supported by information and advice workshops. September 2018 – expression of interest round 2 commences. October 2018 – independent funding panel to assess round 1 applications. November 2018 – round 1 awards made. All successful projects must complete within 2 years of funding being granted.

Sustainability Drivers

Carbon and Energy Reduction

The fund seeks to encourage the development of renewable and low carbon innovative solutions, and to build the infrastructure and the learnings needed for the changes in heating and transport expected over the next decade. It aims to promote the uptake and infrastructure provision of Electric Vehicles or other low carbon solutions, and to provide data for more accurate assessment of the future impact of the low carbon economy.

Sustainable Society

A key aim of the fund is to stimulate economic activity and create low carbon jobs in Scotland, whilst supporting the Scottish Government's ambitious energy strategy and the UK's drive to a low carbon economy. It encourages work within specific communities in our operational area in Scotland, supporting both rural and urban areas of fuel poverty in addressing heat, transport and energy issues. It aims to provide access to funding for projects that may ordinarily struggle to obtain funding, such as installing energy saving or renewable energy measures that cannot be funded elsewhere. Projects that engage vulnerable customers with energy issues and refer them for support, or that provide training and education on energy that is targeted at supporting vulnerable customers will also be considered.

Climate Change Resilience and Raw Materials Optimisation

The fund will consider projects which enable customers and communities to become more resilient, such as the creation of local energy solutions to match generation and demand. It also encourages innovative solutions with the potential to better utilise existing assets and reduce reliance on raw materials.

Managing the network and its impacts

Our network provides reliable, stable energy to around 2 million customers, and enables low carbon uptake over an area close to 23,000km². Our assets and the activities we carry out to maintain them have an impact in terms of the raw materials used, waste, biodiversity and water. It's essential that our business culture and processes adapt to manage our network and its impacts.

While it's key that we facilitate the society-wide switch to a low-carbon economy, this must not happen at the expense of the natural environment and local communities in which we operate. It is therefore vital that we reduce the direct environmental effects of our infrastructure locally, and of our activities globally through avoidance of greenhouse gas and other emissions. We develop and deliver a range of initiatives in direct support of these aims.

How we manage our impact

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

- **Waste management and minimisation:** Managing the materials required for network construction and operation as we move towards our target of zero waste.
- **Land and biodiversity improvement:** Influencing, supporting and aligning with local and national strategies for environmental protection and enhancement, incorporating the principles of natural capital assessment as we move towards our aim of protecting and enhancing natural assets.
- **Climate change resilience:** Understanding the potential impact of climate change and proactively developing our network to adapt to its effects.
- **Sustainable society:** Working in collaboration with national and local stakeholders to understand their needs and to maximise the positive social and economic impacts of our operations on communities, including education, skills and employment.
- **Raw materials optimisation:** Working to progressively embed the principles of a circular economy and efficient use of resources in our business.
- **Improving network efficiency:** Reducing the electricity lost as it is transmitted through our network.
- **Net positive impact:** Incorporating stakeholder engagement into all levels of decision making, in line with our aim to provide net positive impact on the environment and the communities in which we operate.

The following pages discuss further key strategic initiatives to reduce the impact of our network and operations:

- FITNESS
- Life Cycle Assessment (LCA)
- Natural Capital Assessment
- Emissions Reduction
- Network Loss Reduction

While it's key that we facilitate the society-wide switch to a low-carbon economy, this must not happen at the expense of the natural environment and local communities in which we operate.

Managing the network and its impacts:

FITNESS

Project Background

Project FITNESS (Future Intelligent Transmission Network Substation) will enable new connections to be provided more quickly and at a reduced cost to meet the UK 2020 renewable energy targets. The use of digital technology will significantly reduce the raw materials, land, biodiversity, safety and social impacts of substations.

The goal of FITNESS is to enable GB Transmission Owners (TOs) and Distribution Network Operators (DNOs) to apply a digital substation design approach to future load and non-load related investment. Digital substations are based on concepts of standardisation and interoperability, and enable replacement of many kilometres of copper wiring with digital measurements over a cost effective fibre communications network. FITNESS provides much greater flexibility in building, instrumenting, maintaining, modernising and controlling future substations.

This project 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 in 2026, 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 system architecture designs were agreed in 2017 and offline system integration & verification testing completed in Q1 2018. System site trials are underway and due to complete in 2020.

Timescales for Completion and Next Steps

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

Sustainability Drivers

Carbon and Energy Reduction

A positive benefit of project FITNESS is the reduction in need for system outages which often need 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 and potential biodiversity impact.

Raw Material Optimisation and Waste Management and Minimisation

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).

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. End of life decommissioning is also less intrusive, with fewer materials to treat and dispose of.

Sustainable Society

Reduced outage time and constraints coupled with greater operational flexibility will enhance system availability and efficiency, meaning that homes and businesses can benefit from fewer power cuts, and that renewable generators can connect sooner and generate with fewer constraints, increasing the potential proportion of renewable energy available for use.

Customers and members of staff will benefit from enhanced safety, due to reduced overall hazards, more compact and self-contained substation design and reduced time on site. The FITNESS approach will deliver a 10% reduction of substation new-build and replacement costs and 4-5% reduction of constraint payments, effectively financially benefitting customers.

Managing the network and its impacts:

Life Cycle Assessment (LCA)

Project Background

The application of the life cycle approach enables SPEN to understand the lifetime environmental impacts of assets and smooth out the potentially higher initial capital costs of lower impact novel solutions by offsetting these costs against for example, reduced running costs over the asset lifetime. This approach assesses the lifetime costs and impacts of assets, including maintenance, repair, lifespan, leakages, losses and end of life disposal. The options are ranked best to worst in terms of the life costs, the capital cost to buy and the overall electrical losses (where applicable). The selection made is therefore based on the best possible balance of these three factors.

One goal is to better understand the environmental impacts of the construction, operation and eventual decommissioning of grid connection works in order to understand where our most significant impacts lie, and to prioritise action to reduce these impacts. During 2017 SPEN completed a Life Cycle Assessment project in collaboration with Iberdrola Corporate Sustainability Team and IHOBE.

The project aimed to measure the impacts across four key criteria – photochemical oxidation, global warming potential, eutrophication potential and acidification potential – expressing these impacts against kW of generated and distributed energy.

Current Status

The pilot project has been completed and areas for action identified. SPEN is currently assessing funding and collaboration options to progress these actions.

Timescales for Completion and Next Steps

Further discussions in 2018 will seek to identify funding and collaboration opportunities. The eventual implementation timelines will be dependent upon which funding stream is available.

Sustainability Drivers

Carbon and Energy Reduction

The pilot delivered an environmental footprint of the network connection for a new windfarm, the carbon aspect of which is expressed as a CO_2 per kWh generated/distributed figure. Project findings indicated that in terms of global warming potential, 35% of our impact came from the raw materials and manufacturing of the transformer and underground line and 34% of impact came from materials and machinery use during site construction.

The successful delivery of this pilot has enabled SPEN to identify the carbon cost of its activities and has highlighted the key components and activities which contribute to the carbon footprint, allowing us to start to target those aspects to achieve reductions.

Raw Materials Optimisation, Waste Management and Minimisation, Land and Biodiversity Improvement and Water Efficiency and Protection

Raw materials represent 64% of total SPEN impact across all four categories (global warming, eutrophication, acidification and photochemical oxidation), with transformers, underground line and wiring and earthing the most prominent elements. Site construction follows at 23%, primarily made up of substation construction and machinery impacts across all categories.

In response to these results, we are collaborating with suppliers of priority plant types to support collection of quality data and action to reduce their environmental footprints.

With regard to construction wastes, we have been working to take this forward via our membership of the Scottish Infrastructure Circular Economy Forum (SICEF). We are founding members of this group, which first met on the 30th March 2017, and has since discussed Materials as a key area for action. Based on this discussion, we are currently working with a supplier to develop a future collaboration proposal focussed on optimising our approach to materials and waste related to temporary roads required for transmission connections projects.

Sustainable Society

Several actions identified by this project have the potential for significant benefit to society through enabling our supply chain to provide more sustainable solutions.

These actions include:

- Development of a simpler LCA tool that will enable calculation of environmental footprints of our various activities and projects without the significant cost of external consultants and large, specialised data processing software;
- Collaboration with key suppliers to encourage them to take action in this area; and
- Supporting suppliers via the development of methodologies and approaches to allow them to prioritise areas for action in a simple, cost effective way.

Managing the network and its impacts:

Natural Capital Assessment

Project Background

Our vision is to have a net positive impact on the environment and the communities in which we operate. We aim to protect and continually enhance the biodiversity around our assets and support national and local strategies, incorporating the principles of Natural Capital Assessment in our decision making processes to ensure that levels of natural assets are at least protected, if not enhanced.

The construction and management of our substations, underground cables, overhead lines and the wood poles or steel towers carrying these lines have a direct relationship to the surrounding locale, its biodiversity and the livelihoods dependent on its ecosystems. Improving our interactions with our surroundings is of increasing importance, and we will facilitate this by building relationships with our local stakeholders. That way we can develop a better understanding of their needs and those of the local environment, while increasing their awareness of our network and the steps we need to take to plan, maintain and repair our assets. We recognise the unique potential of our overhead linear infrastructure and large numbers of substation assets in supporting long-term UK biodiversity aims, and envisage working with stakeholders to realise the associated benefits.

SP Energy Networks, the Scottish Wildlife Trust and Aecom are conducting a collaborative Natural Capital pilot project within the Cumbernauld Living Landscape (CLL) area. The Scottish Forum on Natural Capital is also providing input into the project at the scoping, implementation, and communication stages. The pilot is enabling SWT to share lessons learned and promote natural capital actions to businesses within the CLL area and across Scotland through the Scottish Forum on Natural Capital.

Our involvement in the pilot project is motivated by a desire to:

- Better understand the existing natural capital value of our landholdings;
- Understand ways in which this value can be protected and increased;
- Understand the ways in which SPEN depends on natural capital; and
- Enhance the evidence base used when making investment decisions about restoring or improving natural capital and ecosystem service provision.

Current Status

In 2017-18, we completed the phase 1 pilot study and shared our experience with other stakeholders at the Natural Capital World Forum. The implementation of Phase 2 would deliver a tool that would value SPEN impacts and dependencies on priority ecosystem services. The tool could be used by non-technical experts to support investment decisions on how we design mitigation options where required, and how we maintain our existing operational sites.

Timescales for Completion and Next Steps

We are currently engaging with National Grid to understand how their self-developed Natural Capital tool works and whether it is commercially feasible to access their tool, further develop it with Aecom (who partner both NGET and SPEN on Natural Capital), and collaborate to develop a standard methodology for the power sector that can positively influence decision making. From the point at which a tool becomes available to us, we estimate a timeline of 1-2 years for Phase 2 implementation.

Sustainability Drivers

Land and Biodiversity Improvement and Sustainable Society

The pilot identified four priority ecosystems: Global Climate Regulation, Hazard Regulation, Recreation and Wild Species Diversity. No material ecosystem dependencies were identified in the exercise, though there are reputational and financial dependencies in SPEN minimising or avoiding impacts on each ecosystem applicable in the study area.

Through discussion between the steering group partners it was noted that the size of the study area, and the ecosystems present within it, did not fully predict the impacts and dependencies that SPEN may have in its activities elsewhere. A subsequent piece of work highlighted that in the wider licence area, SPEN would have impacts on Crops and Timber ecosystem services as a result of its business activities, and minor dependencies on each.

Managing the network and its impacts:

Emissions 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 requires a smaller area of land. 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 insulated switchgear. However, SF6 is a potent greenhouse gas (22,800 x more potent than carbon dioxide), and accidental leaks or leaks caused by maintenance activities, however small, therefore contribute significantly to our business carbon footprint. In addition, the fleet transport and business travel necessary for the operation, reinforcement and maintenance of our network also represents significant emissions impacts.

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 and 80% by 2030 (not including network losses). Therefore we must manage the inclusion and maintenance 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. We are also committed to reducing fleet and business travel impacts through a number of initiatives.

Current Status

We are working with suppliers to enable the progression of viable alternatives to SF6 by considering a wide range of options, including trialling the alternative gas option, Green Gas for Grid (g3), which has 98% lower global warming potential than SF6. We have implemented a new vehicle management system on all fleet vehicles. This identifies speed, mileage and idling and encourages more efficient driving, leading to reduced emissions. In 2017, we launched a six-month trial of five Nissan E-NV electric fleet vehicles across several of our sites to understand how these vehicles will perform in operational use when compared to diesel vehicles. Our staff are encouraged to use our electric pool cars when making business journeys, supported by electric charging points at key depots.

Timescales for Completion and Next Steps

In last year's statement, we confirmed the alternative gas option, g3, was selected after our innovative pilot project to assess new gas insulation options. This year saw the successful installation of g3 insulated equipment at Kilmarnock South substation. The next step is to use this trial to gather key supporting evidence for the business case to move away from the ongoing installation of new SF6 equipment. Our vehicle management system is already delivering significant emissions reductions, as well as robust data. The next step is to use this data to develop further initiatives for reducing the emissions of our fleet operations. In the coming year, we will install electric vehicle charging bays at five more key sites, and we will continue to encourage employees to use electric pool cars and consider electric car ownership.

Sustainability Drivers

Carbon and Energy Reduction

By considering the 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. Our SF6 emission levels for 2017/18 were 460kg, well below our overall target of 782kg. The installation of g3 insulated equipment reduces our overall bank of SF6, thereby reducing emissions caused by leakage or during maintenance. Since the implementation of our new vehicle management system, our operational fleet vehicle annual diesel CO_2 emissions have reduced by 7.4%.

Water Efficiency and Protection and Land and Biodiversity Improvement

While leakage from SF6 insulated assets has a CO_2 emissions impact, the decision to upgrade to gas insulated switchgear has been influenced by the importance of reducing negative impacts on water quality, levels of land contamination and adverse impacts on biodiversity due to leakages from traditional oil insulated assets. The gradual renewal of the network to remove oil filled equipment will remove these risks to water, land and biodiversity. The footprint required for gas insulated switchgear, such as SF6, can be as much as 85% smaller than that required for air insulated switchgear, greatly reducing impacts on land and biodiversity across the whole network.

Raw Material Optimisation and Waste Management and Minimisation

The move away from oil or air insulated assets to SF6, then to low-or no-SF6 alternatives as they become available, represents a progressive effort to optimise the use of raw materials, both in terms of the production and decommissioning impacts of these insulating mediums, as well as in terms of a reduction in the overall asset footprint.

Managing the network and its impacts:

Network Loss Reduction

Project Background

Each year we report on efforts to reduce transmission energy losses experienced on our network. Energy losses are best described as the electricity created by large power stations, windfarms and other generators which is lost during the transmission of that electricity to where it is required. Most often these losses are in the form of heat from power cables and other infrastructure. Measurements of 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 2017 and 31 March 2018 were 530,000MWh. Energy loss on the SP Transmission network, as a percentage of the total energy transmitted, was 2.12% for the year up to March 2017[1].

The main factors which influence transmission losses are the increasing power flows across our network, the impact of embedded generation, and changing flow characteristics. With increasing renewable generation connections in Scotland leading to increased peak network transfers, this has the effect of creating greater losses, and is the largest contributor to the losses on our network. Against a background of increased network transfers, achieving a reduction in total network losses would not be economic or efficient. However, we are working to reduce the losses associated with each unit of energy transmitted across the SP Transmission network by considering losses and wider environmental impacts carefully when evaluating options for transmission reinforcements or asset replacement.

In 2017, we began an innovative project using enhanced monitoring systems to determine the baseline level of energy usage of a number of trial substations in the SP Transmission licence area. The aim was to highlight inefficient energy use and to enable the development of a plan for substation energy efficiency. By efficiently minimising our losses contribution in this way, we can help reduce the associated cost burden to customers from electricity that is generated and lost before it can be utilised.

Current Status

We are currently in the final stages of commissioning the Western Link, which uses DC technology to transfer large amounts of power with lower losses than would be incurred with conventional AC circuits. Once fully operational, SPEN will be conducting detailed performance analysis of the new subsea cable. Transformer replacement and overhead line re-conductoring is ongoing across the SP Transmission licence. We have concluded the 12 month monitoring period on our innovation project and are building the models which will highlight how substation energy use could be improved to help reduce losses.

Timescales for Completion and Next Steps

The innovation project on substation energy use aims to be completed by July 2019. 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

Although power generation in Scotland is largely low carbon, there remains an environmental impact of transmitting energy created from burning fossil fuels, exacerbated when it isn't delivered to customers as planned. Although reducing network losses alone would not fulfil an economic case for renewal of older and more inefficient transformers, SPEN counts the financial cost of network losses when considering whole life costs of a planned upgrade. This procurement consideration incentivises suppliers to design more efficient systems and helps deliver a more sustainable outcome.

When the Western Link HVDC interconnector is fully commissioned, it will connect Hunterston in the SP Transmission area to Flintshire Bridge in the National Grid transmission area with a rated capacity of 2,250MW. When operating at rated current, the total losses of the link would be in the order of 45MW, which is significantly lower than the losses of an equivalent AC circuit of the same capacity and length. It is difficult to predict the total losses of the link, e.g. over a year of operation, as these will depend on the operating point of the link, the number of other components (such as harmonic filters and/or reactors) switched in.

The Western Link is designed to minimise losses over and above the loss reduction that can be achieved by using HVDC technology instead of an AC interconnector. A good example is if the HVDC station control system detects that a shunt reactor and a harmonic filter (that is not required for harmonic performance) are switched in at the same time, it will switch out both devices to reduce losses. Although the reactive power control system will primarily control harmonics and system voltage, it will manage losses if there is an opportunity to do so.

1 spenergynetworks.co.uk/userfiles/file/SPT_Losses_2017_Report.pdf

List of acronyms

AC	Alternating Current
BCF	Business Carbon Footprint
CLL	Cumbernauld Living Landscape
DER	Distributed Energy Resources
EDR	Environmental Discretionary Reward
ELAS	Executive Level Annual Statement
EMS	Environmental Management System
ESSG	Executive Sustainability Steering Group
FES	Future Energy Scenarios
FITNESS	Future Intelligent Transmission Network Substation
g3	Green Gas for Grid
GB	Great Britain
GEMS	Generation Export Management System
GW	Gigawatt
H-SC	Hybrid-Synchronous Compensator
HVDC	High Voltage Direct Current
IT	Information Technology
kV	Kilovolt
LCA	Life Cycle Assessment
LMS	Load Management Schemes
MW	Megawatt
MWh	Megawatt Hour
NGESO	National Grid Electricity System Operator
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-2	Revenue = Incentives + Innovation + Outputs (regulatory framework for period 2)
RIIO-T1	Revenue = Incentives + Innovation + Outputs (Transmission period 1 2013-21)
RIIO-T2	Revenue = Incentives + Innovation + Outputs (Transmission period 2 2021-26)
SDG	Sustainable Development Goal
SF6	Sulphur Hexafluoride
SHE Transmission	Scottish Hydro Electric Transmission
SICEF	Scottish Infrastructure Circular Economy Forum
SPEN	ScottishPower Energy Networks
SPT	SP Transmission
SSWG	Sustainability Stakeholder Working Group
TECA	Transmission Economic Connections Assessment
TO	Transmission Operator

Further information

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

Our Sustainable Business Strategy:
spenergynetworks.co.uk/userfiles/file/SP_Energy_Networks_Sustainable_Business_Strategy_2018.pdf

Information on our Innovation Strategy and projects:
spenergynetworks.co.uk/pages/innovation.aspx
smarternetworks.org

All annual reports, including our Transmission Annual Report:
spenergynetworks.co.uk/pages/stakeholder_reports.aspx

Our Green Economy Fund:
spenergynetworks.co.uk/pages/green_economy_fund.aspx

Information on the industry-wide Open Networks Project:
energynetworks.org/electricity/futures/open-networks-project/

Information on policy development for the forthcoming RIIO-T2 price control:
ofgem.gov.uk/network-regulation-riio-model/network-price-controls-2021-riio-2/what-riio-2-price-control

If you would like to be informed of forthcoming engagement opportunities, please register as a stakeholder:
spenergynetworks.co.uk/pages/register_as_a_stakeholder.aspx

Consultation and feedback

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

Does the statement show a strong link between external influences (national and international policy, market developments) and our actions?

Does it give a clear indication of our role in facilitating decarbonisation and the impacts we are enabling?

Does it give a sense that our actions are part of a holistic strategy that is renewed regularly?

Is there anything you would like us to focus on more within the statement?

Is it easy to navigate/read?

Do you think we are doing enough to facilitate the transition to a low carbon future?

Do you think we are doing enough to manage our impact on the environment?

Please email us at:
stakeholderengagement@spenergynetworks.co.uk

Or write to us at:
SP Energy Networks
Ochil House
Technology Drive
Hamilton International Park
Blantyre
G72 0HT

SP ENERGY NETWORKS