# Environmental Report

2020/21

Scottish & Southern Electricity Networks

Powering our community

# Contents

# 1. Introduction

## 1.1. Executive Summary

The aim of this report is to inform stakeholders and members of the public on how we (Scottish Hydro Electric Power Distribution plc and Southern Electric Power Distribution plc) are performing against our RIIO-ED1 environmental commitments and to provide details of the additional environmental work that we are involved in. The second part of this report provides an overview of our latest innovation projects that are paving the way towards an ever-smarter grid, which will be crucial to facilitating the energy system transition , as well as continuing to drive efficiency, improve customer service and enhance the customer experience.

**Business Carbon Footprint**
In 2020/21 our Business Carbon Footprint increased to 84,407 tonnes of $CO_2$ excluding network losses. From this, 51,851 tonnes were the result of diesel used for generation due to four major subsea cable faults. Between 2019/20 and 2020/21 the increase in emissions due to fixed generation was almost 32,880 tonnes of $CO_2$, resulting in 2020/21 being the first year that we have missed our target of 15% reduction from our 2012/13 baseline figure.

**Oil Leakage from Fluid Filled Cables**
Oil leakage from fluid filled cables is known to cause negative environmental impacts. As a result, we made a commitment to replace 21km of fluid-filled cable in our SHEPD network and 55km in our SEPD network over the RIIO-ED1 period. In 2020/21 we removed a total of 0.8km of fluid filled cable across both our networks. This equates to a total of 10.9km of fluid filled cables removed in RIIO-ED1 to date in SHEPD and 24.7km in SEPD. We have achieved almost half our RIIO-ED1 target to date and will continue with our strategy of cable tagging and replacement throughout the rest of the price control period.

**Visual Amenity**
Overhead lines, especially those at higher voltage running through areas of outstanding natural beauty (AONB) are considered unsightly by many. We committed to underground up to 90km of overhead line in designated areas in response to stakeholders' requests. So far, we targeted our funding for AONB and National Parks on our High Voltage network and have dismantled a total 27.2km of overhead line over RIIO-ED1, with an additional 39km of undergrounding projects planned by the end of the price control period. The details of the projects we have planned, and their completion dates are in section 2.2 below.

**Losses**
With respect to losses, we have achieved a saving of circa 43 GWh since the start of RIIO-ED1 by delivering interventions identified in our losses strategy. This includes implementing the following measures:

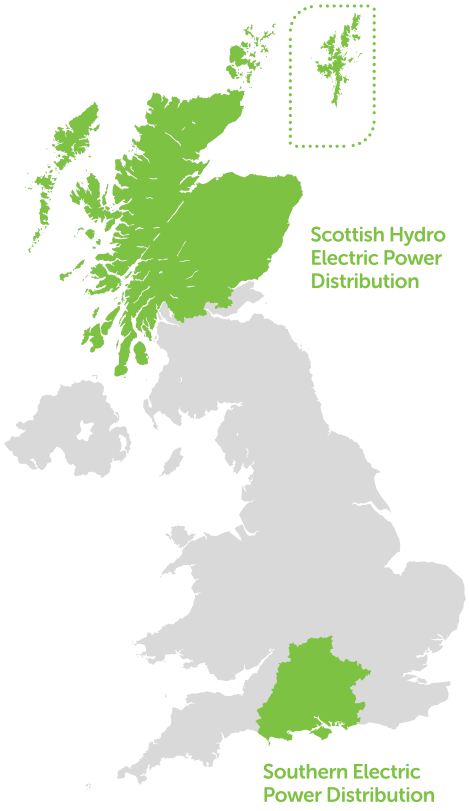
- Installing energy efficient transformers that deliver enhanced losses performance, including replacing inefficient pre-1960 transformers.
- Adjusting the minimum sizing of cables and transformers to reduce losses.
- Upgrading network voltages in specific areas of our network to reduce losses.
- Switching off underutilised plant during periods of low loading.

We have also achieved significant savings from initiatives to reduce non-technical losses, by continuing to refine our processes and better understand and use the data available to us in this area. .

**Innovation**
Our innovation strategy has delivered over £80m of benefits to date in RIIO-ED1, whilst avoiding over 350,000 tonnes carbon dioxide emissions. Our RIIO-ED1 innovation focus areas have been updated to reflect our distribution Strategic Objectives as we move towards ED2. These include an emphasis on delivering a safe and resilient network, providing a valued service for customers, making a positive impact on society and accelerating progress towards Net Zero. We currently have 20 innovation projects targeting these areas, as well as having innovative technologies such as our flexible solutions, thermal imaging cameras and forestry mulchers that have been delivered to BAU.

**Distribution System Operator**
SSEN, in keeping with other DNOs, is transitioning towards a Distribution System Operator (DSO) model. This transformation is one of the biggest challenges currently facing the industry. Our two flagship DSO projects TRANSITION and LEO are already providing insights into the scope of this transition, whilst the learning and outcomes from our various NIA projects including TraDER and MERLIN will further inform industry as it progresses toward DSO. This transition along with the development of new technologies and smart meter data will allow for greater network flexibility to pave the way towards a smarter network.

# Our story in numbers (approximate)




**Almost 3.9m**
customers served by our networks

**3.1m** in southern England

**785,000** in the north of Scotland

**4,000+** SSEN employees working in engineering and customer service teams

**770,000**
Over 740,000 vulnerable households identified through our Priority Services Register

**130,000km**
Over 130,000km of overhead lines and underground cables

**100+**
Over 100 subsea cables, powering island communities

**670,000+**
Over 670,000 calls received from our customers last year

**73**
73 operational premises located in the heart of the communities we serve

**110,000**
Over 110,000 substations

## 1.2. Our Business/Who We Are

### Our business explained

We are Scottish and Southern Electricity Networks (SSEN), responsible for developing, maintaining and operating the electricity distribution networks across central southern England and north of the central belt in Scotland and maintaining the electricity transmission network north of the central belt in Scotland.

Our Networks are two electricity distribution businesses, Scottish Hydro Electric Power Distribution plc (SHEPD) and Southern Electric Power Distribution plc (SEPD), and one electricity transmission business, Scottish Hydro Electric Transmission plc (SHE Transmission). This report relates only to the activities carried out by SHEPD and SEPD.

We have a duty to, not only, efficiently supply electricity to our customers but to also maintain and protect the environment we operate in. This includes:

- Deliberate environmental planning during the design and construction phases of projects.
- Reducing the amount of overhead line in designated areas e.g. areas of outstanding natural beauty (AONB) and sites of special scientific interest (SSSI).
- Reducing our business carbon footprint.
- Reducing the amount of oil leakage caused by our assets.
- Reduce $SF_6$ emissions from our assets.
- Keeping distribution losses as low as reasonably practicable.
- Continuously innovating to reduce our environmental impact.

## 1.3. Purpose of the Report

The purpose of this Environment Report is to provide stakeholders with a transparent and public account of our commitment to addressing environmental matters in RIIO-ED1. This includes, but is not limited to, our role in the low carbon transition. It is intended to provide a holistic overview and clear rationale for our actions and details of actual benefits to customers. It provides an important update on our continuing progress to meet our environmental targets and demonstrates how stakeholders shape this going forward e.g. in areas such as investment in visual amenity projects.

Our RIIO-ED1 environmental commitments are summarised below:

**Visual Amenity**

- Underground up to 90km of OHL in AONB, National Parks & National Scenic Areas (NSA).

**Fluid Filled Cables**

- Replace 76km of fluid filled cable and tag our worst performing circuits.
- Reduce oil leakage by 15% relative to 2012/13 levels.

**Business Carbon Footprint**

- Reduce our business carbon footprint (excluding losses) by 15% relative to 2013/13 levels.
- Reduce the average mileage of SSEN cars by 10%.
- Reduce rate of leakage of installed $SF_6$ by 15% relative to 2012/13 levels.

**Electrical Losses**

- Continue replacing current equipment with lower loss equipment.
- Continue to assess and where appropriate implement technologies designed to reduce losses.
- Better understand the energy use of our customers and work with customers to reduce their overall energy use.
- Use new sources of data to create better models that allow us to analyse and track losses, and target loss reduction.
- Work with Electricity Supply Licensees to detect and prevent fraudulent energy use (theft).

**Security of Supply**

- We will continue to operate standby generating stations to provide security of supply to remote Scottish islands.

# 2. Managing Our Environmental Impact

## 2.1. Introduction

This section details the activities we are engaging in to meet our environmental commitments.

**Visual Amenity:** Undergrounding overhead lines in designated areas including AONB, NSA and National Parks. The removal of overhead lines returns the locations to a more natural state and is led by our stakeholders.

**Oil Leakage:** Many of our assets contain oil, essential for insulation and providing electrical safety. However, oil leakage from these assets can cause environmental harm. As a result, we are tactically reducing oil leakage by replacing specific high-risk assets.

**Business Carbon Footprint:** SSEN operates over a wide geographical area and employs thousands of people. We are committed to reducing our carbon footprint by reducing emissions associated with vehicles, reducing energy usage in our buildings and keeping electrical losses as low as reasonably practicable. We are also committed to minimising the amount of $SF_6$ that leaks from our assets.

**Other Environmental Activities:** SSEN engages in a host of environmental activities. The implementation of innovations with environmental benefits, flood protection, contaminated land clean-up, community fund raising, and employee awareness are just some of the projects we are involved in to help maintain and protect our environment.

## 2.2. Visual Amenity

At the start of RIIO-ED1 we committed to undergrounding up to 90km of overhead line (OHL) in designated scenic areas in Great Britain across both our distribution networks. To date we have completed 11.5km in SEPD and 15.7km in SHEPD. In addition to this we have a further 39km OHL undergrounding projects in progress which are scheduled to be completed by the end of RIIO-ED1.

Work is initiated by interest from our stakeholders. We recognise that our overhead lines can have an adverse impact on visual amenity especially in sensitive environments such as AONB, National Parks and NSA. Some people can find overhead lines unsightly and consider the attractiveness of the landscape reduced by their presence. This might impact on individual wellbeing and local economies if, for example, the primary local industry is tourism. The communities we serve are key stakeholders for our business and therefore, this is an important issue for us.

Both SHEPD and SEPD were provided specific funding by Ofgem for undergrounding of overhead lines in protected landscapes in RIIO-ED1. The work carried out in this area is driven by stakeholder requests, using a nomination scheme. Stakeholders have indicated that undergrounding of existing overhead lines was "important" or "very important" from a visual amenity perspective and supported SSEN's stakeholder led approach to address concerns in these areas.

Funding is specifically targeted at AONB, National Parks and NSA, and applicable for distribution voltages up to 132kV.

Our stakeholders indicated that we should include factors that they considered important to them, such as the historic environment and that these were considered integral to the scheme selection process. This is achieved by using a Visual Amenity Impact scoring model, developed in agreement with the AONB and National Park officials within our Licence Areas. Schemes are nominated by these stakeholders, and then considered and prioritised to ensure consistency in assessment across all SEPD and SHEPD licence areas and delivery of maximum value for money.

The focus has primarily been on High Voltage (HV) and Extra High Voltage (EHV) overhead lines that have a high visual impact on the landscape and have a dominant impact for many viewers. We have therefore, targeted our efforts on the worst affected areas identified using the scoring mechanism. Schemes are co-ordinated with other network investment and maintenance works where practicable to minimise disruption for stakeholders and reduce delivery costs.

Since April 2015 to date we have spent £2.93m (in 2012/13 prices) in locations chosen by our stakeholders and improved our visual amenity by reducing the amount of overhead line in these designated areas by 27.2km.

Details of the schemes are provided in the Tables overleaf.

## Table 2.2a – Undergrounding schemes completed in Designated SEPD areas up to end 2020/21

| Scheme | Designated Area | OHL km Removed | Completion Date |
|---|---|---|---|
| Hungerford | North Wessex Downs AONB | 1.4 | 2015/16 |
| North Lodge to Sunwood Farm, Buriton, Petersfield | South Downs National Park | 0.8 | 2015/16 |
| Thursley Common | Surrey Hills AONB | 0.3 | 2015/16 |
| Tichborne, Alresford | Southdowns National Park | 3.53 | 2016/17 |
| Turville Village | Chilterns AONB | 2.5 | 2016/17 |
| Bignor Park | South Downs National Park | 0.82 | 2019/20 |
| Itchen Abbs | South Downs National Park | 0.2 | 2019/20 |
| Rivar Hill, Shalbourne | North Wessex Downs AONB | 0.39 | 2020/21 |
| Plush | Dorset AONB | 0.19 | 2020/21 |

## Table 2.2b – SEPD Undergrounding schemes in progress

| Scheme | Designated Area | OHL km Planned | Progress | Planned Completion Date |
|---|---|---|---|---|
| PS002791 – Monkton Chilgrove | South Downs National Pack | 1.01 | Execution | 21/22 |
| PS003427 – Winterbourne Near Newbury | North Wessex Downs AONB | 1.6 | Execution | 21/22 |
| PS003301 – Vineyard Hole | South Downs National Park | 1.4 | Execution | 21/22 |
| PS004269 – Church Road | South Downs National Park | 0.92 | Refinement | 21/22 |
| PS002754 – Sherborne | Cotswolds AONB | 1.31 | Refinement | 21/22 |
| PS003052 – South Burley | New Forest National Park | 6.6 | Refinement | 21/22 |
| PS003743 – Franklin Farm | South Downs National Park | 0.87 | Refinement | 21/22 |
| PS004207 – Worth Matravers | Dorset AONB | 0.16 | Refinement | 21/22 |
| PS004373 – Clayhanger | Dorset AONB | 1.9 | Refinement | 21/22 |
| PS004474 – North Cerney | Cotswold AONB | 0.33 | Refinement | 23/23 |
| PS004473 – Kingwood Common | Chilterns AONB | 0.87 | Refinement | 22/23 |
| PS002787 – Godlingston Hill | Dorset AONB | 3.68 | Refinement | 22/23 |
| PS004454 – Valley of Stones Nature Reserve | Chilterns AONB | 3.3 | Refinement | 22/23 |
| PS004391 – Cheselbourne Village | Dorset AONB | 1.81 | Refinement | 22/23 |

## Table 2.2c – SHEPD Undergrounding Schemes completed up to 2020/21

| Scheme | Designated Area | OHL km Removed | Completion Date |
|---|---|---|---|
| Callander | Loch Lomond and the Trossachs National Park | 1.92 | 2017/18 |
| Loch Tummel | Loch Tummel National Scenic Area | 0.27 | 2018/19 |
| Blairauchdar (Blair Atholl) | Cairngorms National Park | 2.33 | 2018/19 |
| | Cairngorms National Park (Glen Muick) | 0.95 | 2020/21 |
| | Cairngorms National Park (Glen Tromie) | 7.96 | 2020/21 |
| | Loch Lomond and the Trossachs National Park (Strathyre) | 2.31 | 2020/21 |

## Table 2.2d – SHEPD Undergrounding Schemes in progress

| Scheme | Designated Area | OHL km Planned | Progress | Completion Date |
|---|---|---|---|---|
| PH003041 – Hoy | Cairngorms National Park | 5.73 | Refinement | 21/22 |
| PH002259 – Kingussie | Cairngorms National Park | 7 | Refinement | 21/22 |
| PH003091 – Auchtertyre House, Crianlarich | Loch Lomond and the Trossachs | 0.5 | Refinement | 21/22 |

As presented in Tables 2.2a and 2.2c, we have completed 16 visual amenity schemes in our SEPD and SHEPD license areas to date, which totals 27.2km of overhead lines removed.

As presented in Tables 2.2b and 2.2d, there are 17 visual amenity schemes in progress in our SEPD and SHEPD license areas which are scheduled for completion by the end of RIIO-ED1. Once these 17 schemes are complete, we will have undergrounded a further 39km of OHL, bringing the forecast total to 66.2km by the end of RIIO-ED1.

We will continue to engage with our stakeholders to ensure that ongoing and forthcoming projects achieve the best outcomes for landscape, biodiversity and communities.

**For further details on Visual Amenity, please see worksheet E1 – Visual Amenity linked to the Appendix of this report.**

## 2.3. Oil Leakage

We have a responsibility to have regard for the environment in the communities in which we operate. An important element of this is that we must ensure that any oil contained in our assets does not cause damage to the surrounding area.

Oil is widely used as an insulating material or cooling medium across a wide variety of electrical equipment including fluid-filled cables (FFC) and some types of electrical switchgear and transformers. We have robust processes in place to maintain and operate these assets such that we ensure that any potential leakage is minimised. If there are any incidents, then we are committed to a fast response and to addressing and resolving any issues to ensure that there is no adverse environmental impact.

Fluid filled cables can leak due to age, wear or third-party damage. If untreated a leak will not only cause potential environmental damage but may result in equipment failure and disruption for our customers.

To mitigate the environmental impact and any associated supply disruption, we employ a pro-active leak location process, known as tagging. This process allows the circuit to remain in service while the leak is being located by dosing the cable system with a fault detection fluid. This method of detection is capable of detecting more than one leak on the circuit at each operation. Once identified, repairs and any necessary remedial works will be carried out using a risk based approach. This process is built in to the routine maintenance process of our FFC assets.

In addition to our pro-active oil leakage strategy, we also have a comprehensive range of specialist equipment to ensure that we can provide a robust response to any oil leakage event. We have also established service agreements with specialist contractors for support in the event of an incident.

### 2.3.1. Oil Leakage performance in RIIO-ED1

In our RIIO-ED1 business plan, we made a commitment to achieve a 15% reduction in oil leakage from FFC relative to 2012/13 levels, and to replace 21 kilometres of fluid-filled cable in SHEPD and 55km in SEPD, totalling 76km across both our networks. We also committed to tag our 25 worst performing circuits on an annual basis.

In 2020/21 for both SHEPD & SEPD, there has been a decrease in the volume of oil used to top up FFC (37% & 29% respectively compared to the previous year).

During 2019/20 SSEN implemented a new strategy for FFC to minimise leakage and achieve our RIIO-ED1 commitments. This has involved a number of internal changes, including: establishing a working group to address FFC leakage; updating and consolidating procedures and policies related to FFC; introducing a more pro-active approach using analytics to better target FFC leakage prevention.

Figure 2.3a shows that the total km of fluid filled cable (FFC) on our network has decreased over the RIIO-ED1 period.

### 2.3.2. SSEN Fluid Filled Cable industry engagement

We continue to engage with other industry stakeholders to share best practices to reduce oil leakage. This involvement includes meetings with other DNOs to share best practices from normal operations and ongoing innovative projects. We hold regular meetings with the Environment Agency and Scottish Environmental Protection Agency (SEPA) to review performance. We will continue this work for the remainder of RIIO-ED1.

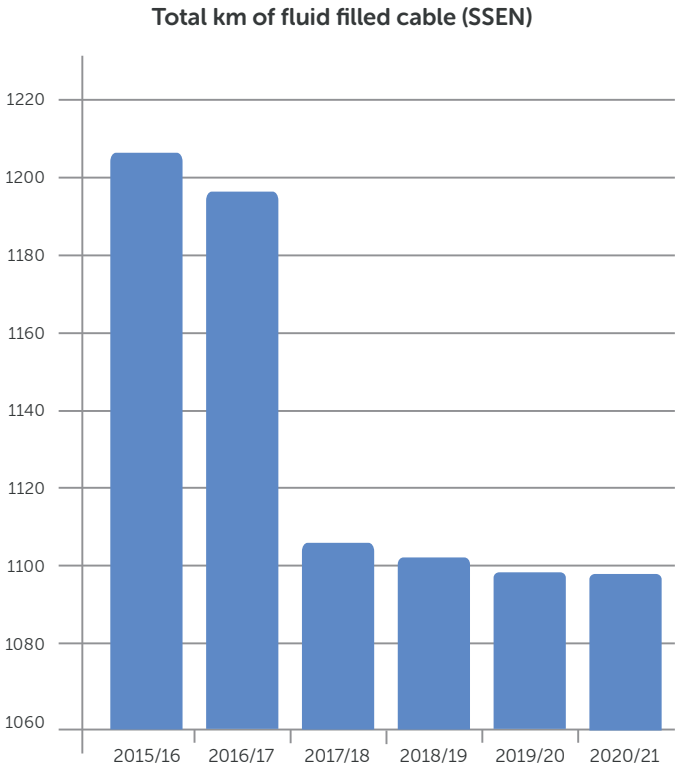
### 2.3.3. Oil Mitigation Schemes

SSEN reports the number of oil mitigation schemes affecting cables and substation plant such as transformers and circuit breakers and the costs associated with these to Ofgem on an annual basis as part of the Worksheet E2 – Environmental Reporting worksheet requirement linked to this report in the Appendix.

Over the RIIO-ED1 period SEPD has spent £3.65 million on 115 oil mitigation schemes, while SHEPD has spent £97k on 13 schemes (in 2012/13 prices).

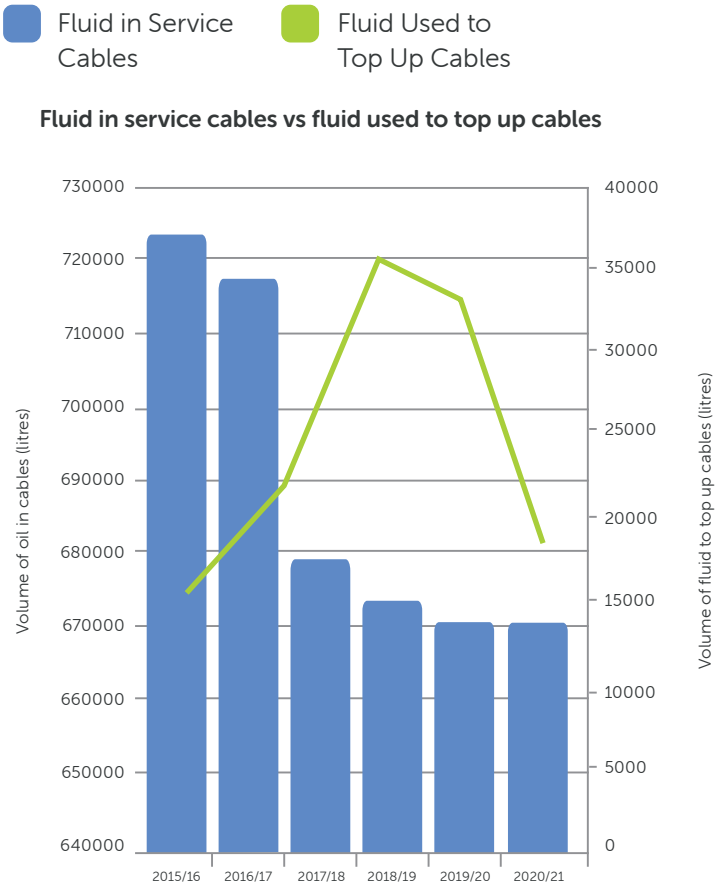
**For further details on Oil Leakage, please see worksheet E2 – Environmental Reporting linked to the Appendix of this report**

## Figure 2.3a
## Change in total length of fluid filled cable over RIIO-ED1 period




The significant drop in FFC between 2016/17 and 2017/18 was mainly due to data cleansing. The subsequent drop of 16km between 2017/18 and 2020/21 is due to removal of FFC and a small amount of (0.67km) data cleansing

## Figure 2.3b
## Oil in service cables vs fluid used to top up cables over RIIO-ED1




The total amount of oil contained in FFC in service has dropped over RIIO-ED1. The fluid used to top up FFC is now on a consistent downward trend, as shown in figure 2.3b.

## 2.4. Carbon Impact and Climate Change

### 2.4.1. Business Carbon Footprint (BCF)

This section details the total Greenhouse Gas emissions produced by SHEPD and SEPD from 2012/13 to 2019/20. The BCF is published as part of our company reporting obligations and reported annually to Ofgem as part of our distribution licence requirements. More details can be found in worksheet E3 attached as an appendix to this report.

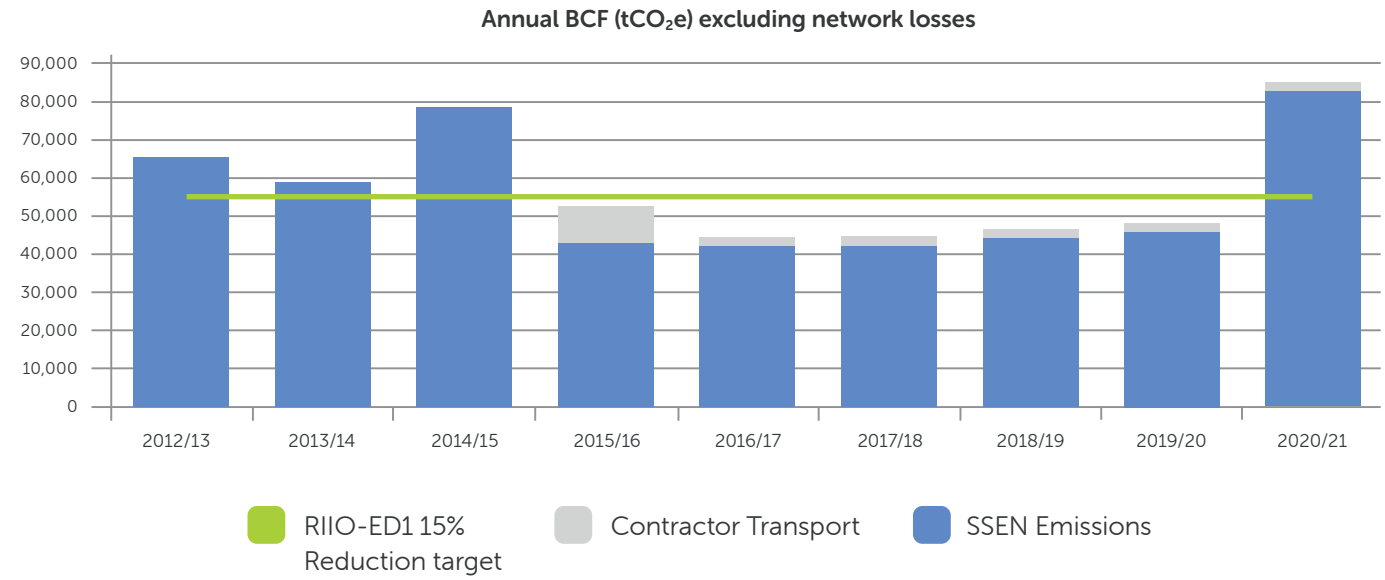
The BCF is an account of the impact that our operational activities have on the environment. We collate the data from across our business using the methodology described within international business carbon footprint standards, the Greenhouse Gas (GHG) reporting protocol and ISO14064-1. We convert our data to equivalent tonnes of carbon dioxide ($tCO_2e$) using conversion factors as provided by the Department for Environment, Food & Rural Affairs (DEFRA) for annual reporting to Ofgem.

The purpose of this Business Carbon Footprint section is to provide a transparent account of the impact that our business activities have on the environment and our commitment to address these impacts. This report documents our energy usage from offices, substations, transport emissions (both operational and business), fuel combustion and the release of greenhouse gases such as $SF_6$. The reported data for operational transport (road) and fuel combustion also takes account of a number of our larger contractor emissions as required in Ofgem's Environment & Innovation Regulatory Reporting Pack.

In 2020/21, the combined total greenhouse gas emissions for SEPD and SHEPD were 549,900$tCO_2e$ (including losses) for the two licence areas. Of our carbon emissions, by far the largest contributor is electrical losses. This accounts for circa 65% of SHEPD's and circa 93% of SEPD's carbon emissions. The other activities that contribute from an SSEN perspective to our environmental footprint are sulphur hexafluoride ($SF_6$) and the emissions resulting from our vehicle fleet, mobile generation and buildings' energy usage.

Our RIIO-ED1 commitment was to reduce our Business Carbon Footprint (excluding Losses) by 15% during the RIIO-ED1 period relative to 2012/13.

## Figure 2.4a – Annual BCF $tCO_2e$ excluding losses




As shown in Fig 2.4a above, our BCF (excluding losses) has increased by 30% from 2012/13. For the RIIO-ED1 period, we have consistently been below target until 2020/21 when four major subsea cable faults in SHEPD led to an almost 270% increase in our emissions from generation compared to 2019/20, due to us having to run diesel generators for extended periods. Fixed Generation in SHEPD accounted for 51,852 $tCO_2e$ in 2020/21 compared with 18,970 $tCO_2e$ in 2019/20.

## Figure 2.4b – Annual BCF including losses

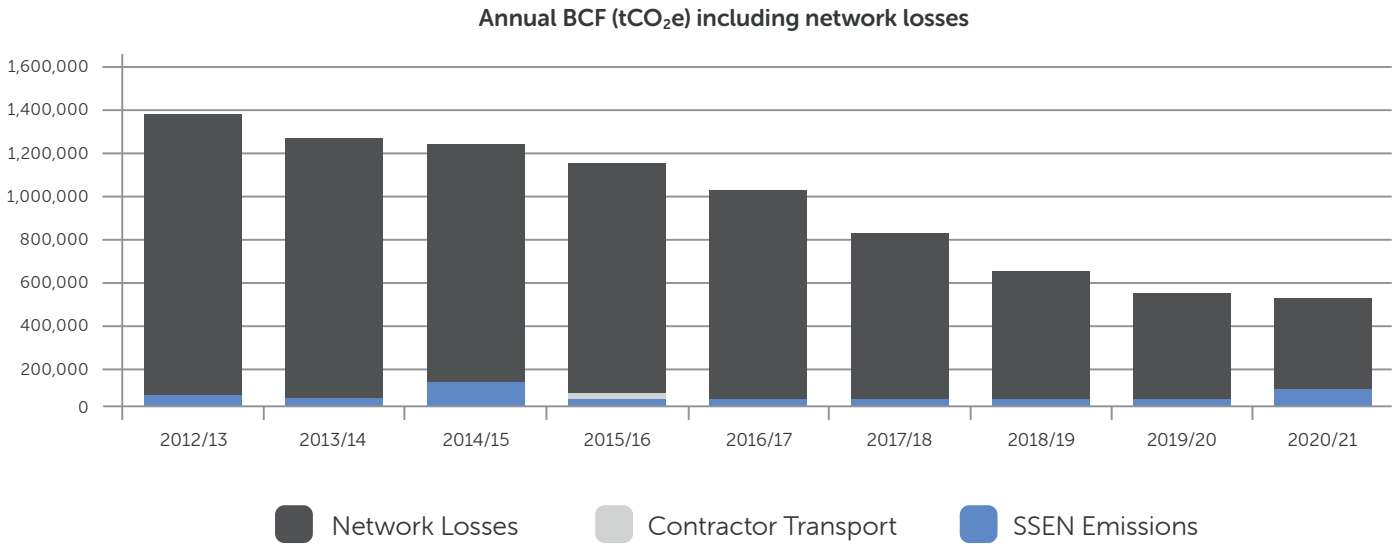



Fig 2.4b shows the contribution that our network losses makes to our overall BCF in relation to our operational emissions and contractor emissions.

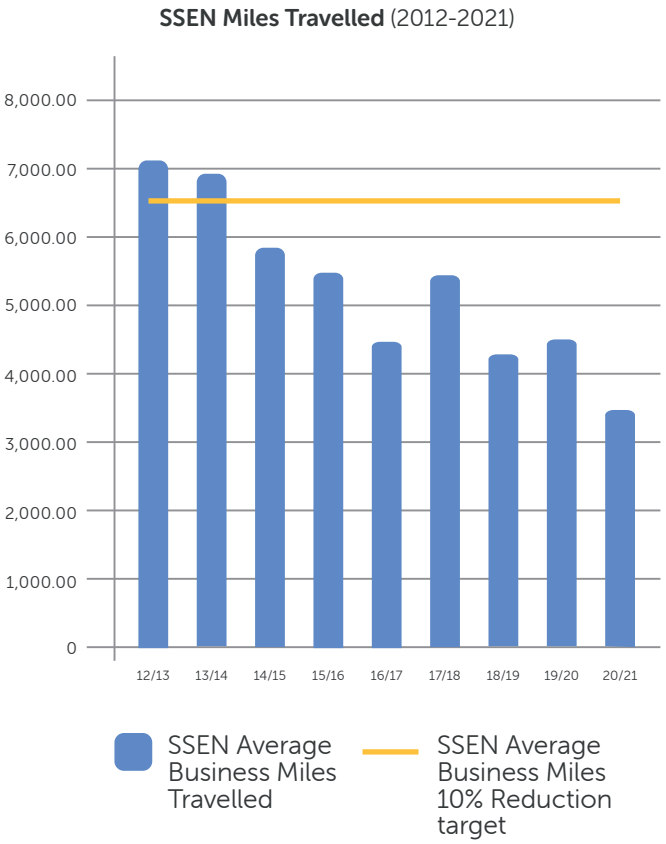
Losses $tCO_2e$ has dropped significantly since 2016/17. This was due to a significant downward change in the factor used to derive carbon impact in this emission category and decrease in network demand. The conversion factor used was updated every year following the latest published figures by DEFRA). In addition to this, we adopt a more pro-active measures to reduce losses e.g. increasing minimum cable size and reducing energy theft as detailed in section 2.4.3.

#### 2.4.1.1. Reducing the average mileage of SSEN cars by 10%

One of the largest emissions is from our vehicle fleet for business transport. Our focus is therefore on reducing the average mileage from our business cars.

Our commitment is to reduce the average mileage of SSEN cars by 10% during the RIIO-ED1 period relative to 2012/13. In 2020/21 our average business miles travelled reduced significantly compared to 2019/20. This is due to the Covid-19 pandemic where travel was restricted and engagements which would have previously taken place in person being conducted virtually with digital technologies such as Skype and Microsoft Teams. Figure 2.4c shows our progress at meeting this target.[1]

## Figure 2.4c
## Annual average vehicle mileage




## Figure 2.4d
## Annual transport emissions

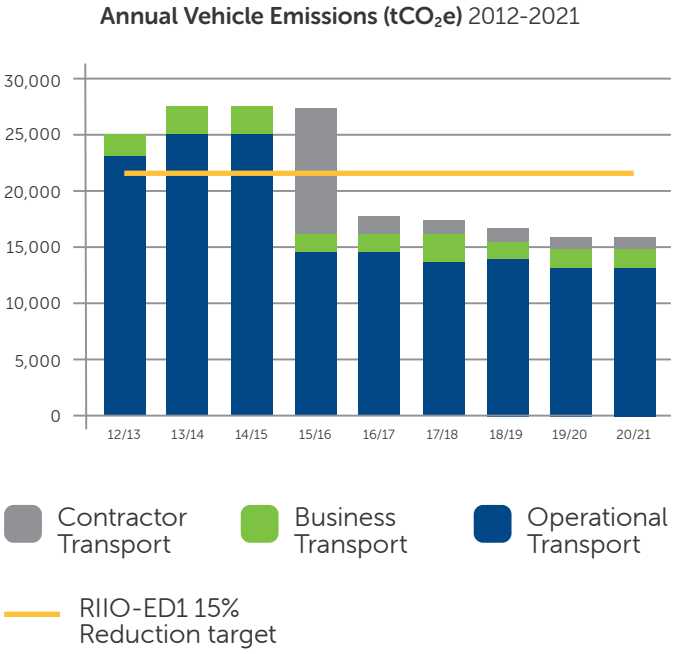



Figure 2.4d is a graph of emissions from business transport and operational transport, which shows that we are moving in the right direction in terms of reducing our $CO_2$ emissions from transport. Our commitment to reduce the average mileage of our business cars was intended to reduce our annual transport emissions. Both our average business car mileage and overall $CO_2$ emissions from transport in 2020/21 show a significant reduction relative to 2012/13. Operational transport emissions increased in 2020/21 due to the impact of the Coronavirus pandemic which meant staff that would have previously travelled together had to move to one-person vehicles to socially distance.

As shown in Fig 2.4d, our contractors' transport emission in 2020/21 shows a downward trend from 2015/16. This is because there has been a shift away from using 'external' contractors in 2016/17, with several core areas being brought into the Networks business. This has led to an overall reduction in fuel consumption in this area, thus reducing $CO_2e$ output. It should be noted here that contractor emissions were recorded as part of operational transport prior to 2015/16. After this point they were recorded separately as shown in the graph.

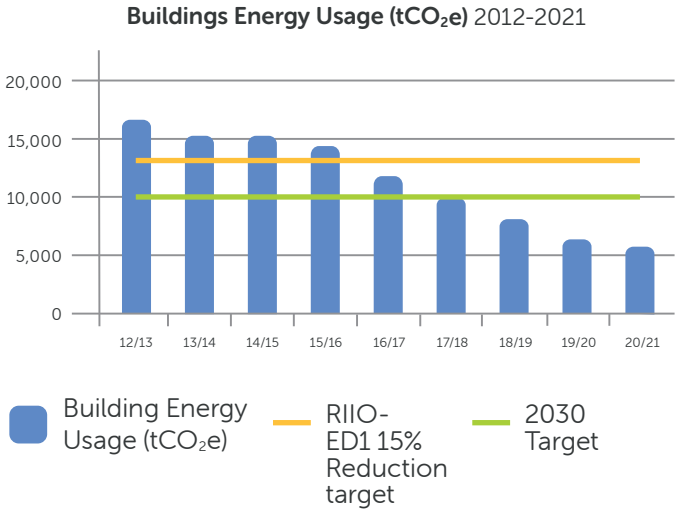
1. Previous reports have focussed on overall mileage instead of average mileage. Our business commitment was to reduce average mileage of SSEN cars through business travel. While the number of business cars has increased, along with overall business mileage, the average mileage per car has decreased.

### 2.4.1.2. Reducing energy consumption in our buildings by 15%

Over the last six years, the SSE Group's non-operational building carbon footprint has experienced a reduction in carbon emissions. It is important to note here that SSEN makes up one part of the wider SSE Group, which is comprised of a number of other energy services businesses. By sharing building space with other SSE businesses, we can keep costs down and reduce energy consumption. To date, investments in a range of energy efficiency projects have been successful in returning financial and carbon emissions savings and enhancing SSE's reputation in meeting our commitment to minimising environmental impact.

For the purpose of reporting Business Carbon Footprint for SSEN, we adopted a recharge model, which is based on number of employees per SSE business. This allows us to report energy consumed in our buildings attributable to SSEN and alongside substation electricity, the total building energy usage is shown in Figure 2.4e. The figure opposite shows we met our target to reduce emissions by 15% from a 2012/13 baseline by the second year of this price control and continue to reduce emissions in this category.

## Figure 2.4e
## Annual building energy usage (SSEN)




## SSE Group Target

SSE Group has an internal target of 5% $CO_2$ reduction per three-year period (up until 2030) based on 2017/18 baseline. This has thus far been achieved, with a 29% reduction in our building's energy use since the introduction of the target in 2017/18. This is now the non-operational building key performance indicator.

One of the core reasons for the large reduction in building energy use has been a move to 'Agile Working', which allows employees more flexibility in terms of working times and locations. We have also moved one of our major office hubs in Reading to a new and significantly more energy efficient building.

In 2020/21 the Covid-19 pandemic lead to the majority of our office-based workforce move to work from home.

This change, whilst vastly reducing the emissions related to employees' commutes, has not caused a significant reduction in our building's energy use. This is due to buildings remaining accessible to approved essential workers, and although power usage from IT and lighting did reduce, the safe operation of these buildings for essential workers required an increase in air exchanges and heating to mitigate temperature drops from these exchanges, which ultimately resulted in increased energy usage of heating, ventilation, and air conditioning systems.

We are continually looking to make our buildings more energy efficient to accelerate our position towards being a Net Zero business. Highlights of our energy efficiency investments throughout RIIO-ED1 are summarised in Table 2.4a below.

## Table 2.4a – SSE Group's Energy Efficiency Performance 2011 to 2021

| Year | Energy Efficiency Investment (per annum) | Reported Annual Carbon Reductions | Energy Saving (annually recurring) |
|---|---|---|---|
| 2012/13 | £1,170,000 | 12,469 | £39,740 |
| 2013/14 | £2,399,000 | 7,819 | £164,492 |
| 2014/15 | £2,360,000 | 35,020 | £632,540 |
| 2015/16 | £3,083,000 | 6,170 | £1,134,412 |
| 2016/17 | £1,568,000 | 2,203 | £229,786 |
| 2017/18 | £2,237,910 | 2,314 | £107,733 |
| 2018/19 | £429,244 | 3,765 | £207,228 |
| 2019/20 | £450,000 | 5,268 | £2,457,580 |
| 2020/21 | £150,000 | 2,074 | £717,189 |
| **Totals** | **£13,697,154** | **77,102** | **£5,690,628** |

During 2020/21, investments in LED lighting at a range of depot sites including Poole, Melksham and Perth Training School totalled £150,000. This will equate to recurring energy savings realised in future years.

**For further details on Business Carbon Footprint, please see worksheet E3 – BCF linked to the Appendix of this report.**

### 2.4.2. Sulphur Hexafluoride ($SF_6$) Emissions

$SF_6$ is an extremely effective electrical insulator that is used in our circuit breakers, switchgear and other electrical equipment. It has significant advantages over alternative materials. It is non-flammable, a critical safety requirement in the high-voltage applications and because of its excellent insulating properties it takes up less volume than alternatives such as oil. However, it is also a very potent greenhouse gas, one kg of $SF_6$ is equivalent to approximately 22,800kg of carbon dioxide.

The total capacity of $SF_6$ used in assets on our network is 28,605kg across our two licence areas as presented in Table 2.4b below.

## Figure 2.4b
## Installed $SF_6$ capacity per Licensee (2020/21)

| Licensee | Installed Capacity (kg) | $SF_6$ Leakage (kg) | Percentage of Bank |
|---|---|---|---|
| SHEPD | 6,034 | 9.88 | 0.16% |
| SEPD | 22,571 | 161.79 | 0.72% |
| TOTAL | 28,605 | 171.67 | 0.60% |

Emissions of $SF_6$ are calculated by combining the volume of $SF_6$ used in routine maintenance and the volume used during fault repair.

During routine substation inspections, all $SF_6$ switchgear, plant and equipment are inspected and all gauges checked to ensure that $SF_6$ pressure is in the normal operating range. Low $SF_6$ gas levels are reported to the Network Management Centre, which will ensure prompt attention.

We take any leakage of $SF_6$ extremely seriously and have detailed policies and procedures in place to manage our relevant assets. We monitor plant leakage rates on a quarterly basis to quickly identify plant items that are becoming problematic and decide on an appropriate course of action for intervention to halt any leakage.

Topping up of $SF_6$ network assets is done in accordance with the BS EN 60376 standard. The quantity of $SF_6$ topped up is recorded in our asset management system upon the completion of the top-up work.

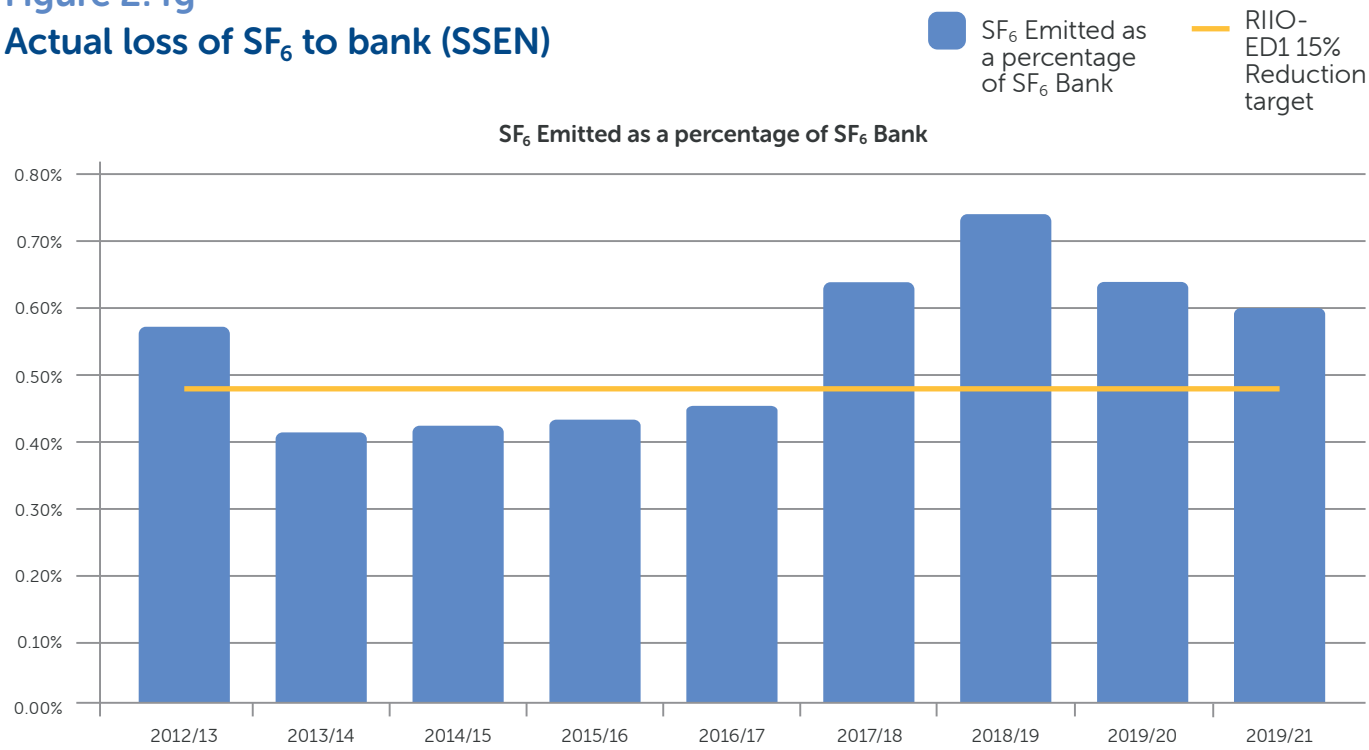
During 2020/21 we have been progressing our new strategy to minimise $SF_6$ leakage from switchgear. This has involved a number of internal changes, including: establishing a working group to address $SF_6$ leakage; utilising a more pro-active approach to the $SF_6$ switchgear repairs process and changes to internal systems to better target leaking $SF_6$ assets for replacement or intervention.

An innovation project was commissioned (NIA_SSEN_0042 – June 2020) looking at opportunities for utilising alternatives to $SF_6$ at medium voltages. The findings have enabled us to work with manufacturers and the ENA to encourage the development of viable alternatives for future use on the network. We also commissioned data analytics to examine the causes of $SF_6$ leakage on existing distribution equipment, the results of which will help us better target improvements in leakage reduction.

Externally, SSEN is taking an active role in addressing the issue of $SF_6$ across the industry and currently chairs Energy Networks Association $SF_6$ Task Force group. The working group was established to input to the EU consultation on Fluorinated gases regulations but is now working to understand the current situation regarding $SF_6$ alternatives and to drive change in this area.

The revised $SF_6$ strategy and associated interventions have led to a reduction in $SF_6$ leakage in 2020/21 compared to 2019/20 levels. Whilst this is not yet meeting our RIIO-ED1 target of a 15% reduction in $SF_6$ leakage (using 2012/13 as a base), we expect the progress made from this increased focus to continue to reduce $SF_6$ emissions in future years.

## Figure 2.4g
## Actual loss of $SF_6$ to bank (SSEN)




**For further details on Business Carbon Footprint, please see worksheets E2 – Environmental Reporting and E3 – BCF linked to the Appendix of this report.**

### 2.4.3. Distribution Losses

This section details electrical losses figures, their impact and what we are doing to keep them as low as reasonably practicable.

#### 2.4.3.1. Overview

Distribution losses are an unavoidable consequence of transferring energy across the electricity network, where they have a significant financial and environmental impact. Losses can either be technical (electricity can turn to heat as it is transported) or non-technical (for instance, due to theft or measurement errors).

#### 2.4.3.2. Losses Strategy

Our Distribution Losses Strategy identifies our approach to ensuring that losses on our network are kept as low as reasonably practicable. Key measures identified include:

- Installing Primary & Grid transformers that meet the EU Eco Directive, including replacing historical high loss transformers on our network.
- Increasing the minimum size of new secondary transformers.
- Increasing the minimum cable size for both LV and HV to the next size up for specific cables.
- Upgrading network voltages in specific areas of our network.
- Switching off underutilised plant during periods of low loading.
- Continuing to develop new methods of managing Non-Technical Losses.

Full details of our Losses Strategy can be found at:
**www.ssen.co.uk/lossesstrategy/**

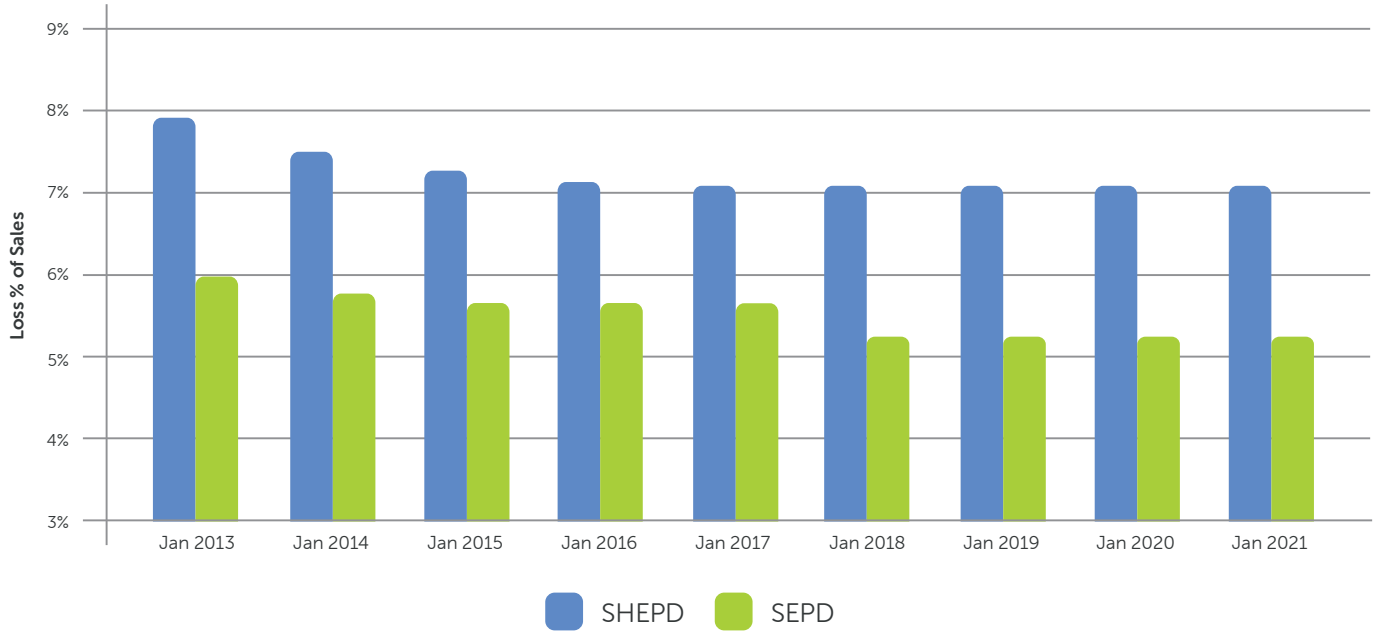
#### 2.4.3.3. Losses Volume

The total amount of electrical losses in 2020/21 was slightly under 2 GWh as shown in table 2.4c. This is calculated by subtracting the number of energy units known to be delivered to customers from the number of units that originally entered our network. Figure 2.4g shows the percentage losses in the networks in relation to total electricity distributed.

## Table 2.4c – Total losses in the network

| Year 2020/21 | Total Distribution Losses MWh | Equivalent $tCO_2e$ |
|---|---|---|
| SHEPD | 478,146 | 111,475 |
| SEPD | 1,518,482 | 354,019 |

## Figure 2.4g
## Percentage of energy losses 2013–2021




From the graph above, there appears to have been a significant reduction in SEPD losses in 2018. However, this is due to a change in the calculation methodology to make recording losses more accurate.

## 2.4.3.4. Losses Strategy in Action

To help ensure we meet our commitment to reduce losses we have been implementing a number of targeted measures outlined in our Losses Strategy. These include:

### 1. Energy Efficient Transformers

We have been installing plant and equipment that delivers enhanced losses performance and meet the EU Transformer Eco Directive Tier 2. This includes replacing inefficient pre-1960 secondary transformers with modern equivalents that perform at much lower losses levels. These interventions have delivered over 28,000 MWh losses savings to date in RIIO-ED1.

### 2. Minimum Sizing of Cables and Transformers

In general terms, increasing the diameter of conductors lowers losses. Therefore, we have put in place measures to increase the minimum size and rating of new cables and transformers. These upgrades are made as part of our asset replacement scheme once the original asset has reached the end of its life, as well as for new connections. Losses savings of over 11,000 MWh have been achieved to date in RIIO-ED1 following cable and transformer upsizing.

### 3. Non-Technical Losses

As losses are proportional to the square of the current, and current is directly proportional to the voltage, increasing network voltages can reduce losses for the same power transfer. As part of our network capacity increase and standardisation, we have been upgrading legacy 6.6kV networks to 11kV in our SEPD region. This has resulted in over 2,300 MWh losses savings to date in RIIO-ED1.

### 4. Switching off Underutilised Plant

As of June 2018, we have been trialling the use of Transformer Auto Stop Start (TASS) technology to switch off one of a number of transformers in a primary substation at times of low demand to avoid the fixed iron losses associated with that transformer. The business case assessment demonstrates that TASS offers a financially viable, as well as technically feasible option for reducing losses at individual substations. Over 100 MWh losses savings were achieved across the two substations during the trial period. Further applications of this technology are being considered in our RIIO-ED2 business plans.

### 5. Non-Technical Losses

Our Network Protection team continues to focus on reducing non-technical losses by addressing MPAN (Metering Point Administration Numbers) discrepancies. In 2020/21 the team investigated 11,487 discrepancies of which, 4627 were confirmed cases of electricity theft. This work has delivered significant non-technical losses savings to date over ED1.

## 2.4.3.5. Losses Reporting Progress

**For further details on losses, please see worksheet E4 – Losses Snapshot linked to the Appendix of this report.**

The tables opposite/overleaf show a snap shot of our losses reduction activities over RIIO-ED1. These benefits have been achieved through our programme of installing lower loss equipment as well as reducing energy theft as described above.

## Table 2.4d – Summary of SEPD Losses Costs and Benefits from Activities in 2020/21 and RIIO-ED1 to date

| SEPD Programme/ Project Title | 2020/21 Regulatory Reporting Year | | | RIIO-ED1 |
|---|---|---|---|---|
| | Distribution Losses Justified Costs | Reduced Losses | Reduced Emissions Associated with Losses | Cumulative Reduced Losses to Data |
| | £k (20/21 prices) | MWh | $tCO_2e$ | MWh |
| **Technical Losses Projects** | | | | |
| LV Cable Asset Replacement | 20.81 | 138 | 32 | 401 |
| LV Cable General Reinforcement | 0.26 | 30 | 7 | 124 |
| LV Cable Other | 104.85 | 1070 | 249 | 3372 |
| HV Cable Asset Replacement | 14.79 | 116 | 27 | 252 |
| HV Cable General Reinforcement | 3.60 | 108 | 25 | 327 |
| HV Cable Other | 41.19 | 865 | 202 | 2452 |
| 6.6kV to 11kV Upgrade | 0.00 | 532 | 124 | 2370 |
| 33kV Transformer Replacements | 1442.80 | 1574 | 367 | 5150 |
| 66kV Transformer Replacements | 0.00 | 98 | 23 | 377 |
| 132kV Transformer Replacements | 1408.21 | 1640 | 382 | 5719 |
| Pre-1960 Transformer Replacements | 0.00 | 204 | 48 | 817 |
| **Non-Technical Losses Projects** | | | | |
| DUOS recovery SEPD – non domestic Other | N/A | 83548 | 19478 | 261500 |
| DUOS recovery SEPD – non domestic Other | N/A | 35864 | 8361 | 131768 |

## Table 2.4e – Summary of Amount of SEPD Losses Activities in Regulatory Reporting Year and Estimate for the Following Regulatory Year

| SEPD Programme/ Project Title | Description of Unit | Volumes in Regulatory Reporting Year | Forecast Volumes for Following Regulatory Year |
|---|---|---|---|
| **Technical Losses Projects** | | | |
| LV Cable Asset Replacement | km | 3.7 | TBC |
| LV Cable General Reinforcement | km | 0.0 | TBC |
| LV Cable Other | km | 18.8 | TBC |
| HV Cable Asset Replacement | km | 5.0 | TBC |
| HV Cable General Reinforcement | km | 1.2 | TBC |
| HV Cable Other | km | 14.0 | TBC |
| 6.6kV to 11kV Upgrade | km | 0.00 | TBC |
| 33kV Transformer Replacements | # | 16.0 | TBC |
| 66kV Transformer Replacements | # | 0 | TBC |
| 132kV Transformer Replacements | # | 5.0 | TBC |
| Pre-1960 Transformer Replacements | # | 1.0 | TBC |
| **Non-Technical Losses Projects** | | | |
| DUOS recovery SEPD – domestic Other | # | 4884 | TBC |
| DUOS recovery SEPD – non domestic Other | # | 294 | TBC |

## Table 2.4f – Summary of SHEPD Losses Costs and Benefits from Activities in RIIO-ED1

| SHEPD Programme/ Project Title | 2020/21 Regulatory Reporting Year | | | RIIO-ED1 |
|---|---|---|---|---|
| | Distribution Losses Justified Costs | Reduced Losses | Reduced Emissions Associated with Losses | Cumulative Reduced Losses to Data |
| | £m (20/21 prices) | MWh | $tCO_2e$ | MWh |
| **Technical Losses Projects** | | | | |
| LV Cable Asset Replacement | 5.0 | 35 | 9 | 89 |
| LV Cable General Reinforcement | 0.02 | 4 | 1 | 12 |
| LV Cable Other | 217.03 | 683 | 175 | 1793 |
| HV Cable Asset Replacement | 6.04 | 37 | 9 | 68 |
| HV Cable General Reinforcement | 0.63 | 15 | 4 | 38 |
| HV Cable Other | 29.04 | 425 | 109 | 1089 |
| 33kV Transformers | 1352.63 | 4116 | 960 | 17007 |
| Pre-1960 Transformers | 0.0 | 195 | 45 | 542 |
| **Non-Technical Losses Projects** | | | | |
| DUOS recovery SHEPD – domestic Other | N/A | 30407 | 8488 | 115975 |
| DUOS recovery SHEPD – non domestic Other | N/A | 14604 | 3405 | 57717 |

## Table 2.4g – Summary of Amount of SHEPD Losses Activities in Regulatory Reporting Year and Estimate for the Following Regulatory Year

| SHEPD Programme/Project Title | Description of Unit | Volumes in Regulatory Reporting Year | Forecast Volumes for Following Regulatory Year |
|---|---|---|---|
| **Technical Losses Projects** | | | |
| LV Cable Asset Replacement | km | 0.9 | TBC |
| LV Cable General Reinforcement | km | 0.0 | TBC |
| LV Cable Other | km | 39.0 | TBC |
| HV Cable Asset Replacement | km | 2.0 | TBC |
| HV Cable General Reinforcement | km | 0.2 | TBC |
| HV Cable Other | km | 9.8 | TBC |
| 33kV Transformers | # | 15.0 | TBC |
| Pre-1960 Transformers | # | 3.0 | TBC |
| **Non-Technical Losses Projects** | | | |
| DUOS recovery SHEPD – domestic Other | # | 1505 | TBC |
| DUOS recovery SHEPD – non domestic Other | # | 77 | TBC |

## 2.5. Other Environment-related Activities

### 2.5.1. Innovation

Environmental benefits are the key driver of a number of projects in our innovation portfolio. Some examples of our innovation projects that deliver environmental benefits are detailed below.

#### 2.5.1.1. Supporting Uptake of Low Carbon Technologies (LCTs)

**E-Tourism (NIA_SSEN_0038):** This project, in partnership with the Scottish Government and other key stakeholders, is exploring potential seasonal and geographical network challenges associated with EV charging points, which may arise from large volumes of EVs being driven by tourists.

A desktop study was undertaken to understand the scale, location and impact on the electricity network of seasonal EV charging and particularly at locations where public transport was limited in the North of Scotland. The study investigated eight use cases which included:

- A Ferry Port
- City Centre
- Trunk roads
- Two Rural tourist attractions
- Rural Village

This allowed SSEN to identify where in these eight use cases the network would need to be either reinforced or managed through flexibility to cope with the seasonal peaks. Key outcomes to date have indicated:

1. Constraints are not expected at primary substation level, but some secondary substations could be constrained.
2. Isolated tourist sites and popular routes are predicted to be the worst affected. This highlights the need for a just and fair transition to ensure those in rural communities are not left behind.
3. The season when highest network demand is predicted depends on the balance between existing network demand and predicted charging demand. This needs to be explored further but could be a significant challenge for the electricity network as transport and heat converge.

The project is also engaging with local community groups, local authorities and other organisations to help them understand the impact that heightened EV tourism will have on local demand, and the potential for them to contribute to solutions.

**Start/end date:** July 2019 – September 2022

For more information see:
**https://www.smarternetworks.org/project/nia_ssen_0038**


**Electric Heat Pathway (NIA_SSEN_0039):** There are over 2.4 million disabled parking badge holders in the UK, with approximately 630,000 vehicles registered through the Motability Scheme – a scheme focused on vehicle leasing for motorists with disabilities and their care providers. Disabled motorists are often overlooked with regards to EV charging. There is a need to investigate and understand the enablers for both public and domestic charging solutions, not just for drivers with a disability but also for a wider range of potentially vulnerable customers such as elderly people or those with chronic illnesses. This project will identify solutions to overcome barriers for EV adoption and ensure 'no one is left behind' in the EV roll out.

**Start/end date:** October 2020 – April 2022

More details can be found here:
**https://www.smarternetworks.org/project/nia_ssen_0039**

#### 2.5.1.2. Reducing Greenhouse Gas Emissions

**Feasibility of Utilising Compressed Dry Air in 33kV Insulated Switchgear (NIA_SSEN_0042):** Sulphur Hexafluoride ($SF_6$) is an extremely potent greenhouse gas, but its insulating properties mean it is used in more than 10,000 items of switchgear on the SSEN network. This project has produced a report appraising new $SF_6$-free 33kV switchgear technologies which will form part of the road map to deliver $SF_6$-free switchgear into BaU, thus aiding the reduction in our operational Carbon Footprint.

**Start/end date:** December 2019 – June 2020

More details can be found here:
**https://www.smarternetworks.org/project/nia_ssen_0042**

#### 2.5.1.3. Adapting to Climate Change

**Informed Lightning Protection (NIA_SSEN_0035):** Lightning strikes are known to cause a significant number of supply interruptions to our customers and damage to the network which is costly to resolve. As our climate changes as a result of global warming, lightning events have the potential to become more frequent and severe. Avoiding the impact that unplanned lightning outages have on our customers is an important issue for SSEN, so we are trialling the use of surge arresters aimed at protecting circuits against lightning strikes. Up to March 2021, 150 surge arresters have been installed in our Southern Network and another 300 are planned to be installed in our Northern Network. The trial will determine the effectiveness of surge arresters to protect against lightning strikes.

**Start/end date:** March 2019 – March 2020

More details can be found here:
**https://smarter.energynetworks.org/projects/nia_ssen_0035**

#### 2.5.1.4. Reducing our use of Creosote

**Environmentally Acceptable Wood Pole Pre-treatment Alternatives to Creosote (APPEAL) (NIA_SPEN0008):** SSEN are collaborating with SPEN on the APPEAL project which is trialling alternative preservatives to creosote for wood poles. Creosote is environmentally hazardous and is about to be fully banned in the UK. This ban will severely disrupt the supply of timber overhead line (OHL) supports (millions in the UK). A small increase in the cost of an alternative preservative will have a major impact on the cost of maintaining the network. The chosen alternative must also be able to protect the poles at least as effectively as creosote to avoid premature failures of our OHL.

**Start/end date:** March 2016 – May 2022

More details can be found here:
**https://smarter.energynetworks.org/projects/nia_spen_0008**

#### 2.5.1.5. Reducing Excavations

**LV Underground Fault Location Technologies (NIA_SSEN_0037):** This project aims to improve the accuracy of low voltage fault location techniques to more precisely pinpoint the location of underground faults. This will reduce the carbon footprint associated with repairs by minimising the need for unnecessary, carbon intensive excavations as part of the fault location process. As well as this it will reduce cable repair times and shorten outages for customers. A range of underground fault location devices have been trialled and data from the field is being collected, analysed and compared with historical records to establish that there are quantifiable improvements in fault location detection. Pending the results of this analysis the business is now looking into larger deployment and use of LV fault location devices.

**Start/end date:** June 2019 – December 2020

More details can be found here:
**https://smarter.energynetworks.org/projects/nia_ssen_0037**

## 2.5.2. Environmental Employee Awareness

Within SSE, there is an internal group that actively promotes environmental activities. Highlights from 2020/21 include:

- SSE as a principle partner of the COP26 climate conference, has launched the 'Pledge to Power Change' which is a platform for employees to commit to and record small changes in their own behaviour which helps drive climate action as a powerful collective. More than 40 Climate Captains across the organisation are leading the Pledge to Power Change Campaign. Each Climate Captain is passionately committed to driving climate action across SSE's workforce.
- The Climate Academy is being established for SSE by Action Sustainability, who are global consultants in sustainable business, to raise employee awareness, knowledge and understanding around climate-related issues. A series of five one-hour long, virtual training workshops and seminars will be open to all employees and cover a range of topics which relate to climate change, including climate basics, Net Zero, climate adaptation, biodiversity and social impact.
- SSE has been enabling its workforce to adopt green transport measures by offering a low-emissions car scheme.
- SSEN have two groups on the social networking platform 'Yammer', which allows colleagues to keep updated with new environmental awareness information about the networks sector.

For more information see SSE's Sustainability Report: **https://www.sse.com/sustainability**

## 2.5.3. Adaptation/flood preparedness

SSEN has invested £12.04m to date in RIIO-ED1 on investigation works and flood mitigation measures in SEPD, with £0.83m also invested in SHEPD over the same period (in 2012/13 prices).

In 2020/21 SSEN completed projects in SEPD to elevate substations, switchgear and associated equipment above the risk of potential flood damage. This included a £4.7m program on Osney Island in Oxfordshire and a £2.9m project in Drakes Way, Wiltshire. The works completed will protect around 35,000 people from potential outages associated with flooding whilst also ensuring power supplies and infrastructure are fit for the future.

With the Drakes Way project, consideration was also taken to keep the site as green as possible, following recommendations put forward by ADAS, the UK's largest independent provider of agricultural and environmental consultancy. A grass mix was planted instead of using stone or shingle to enhance biodiversity and slow water runoff, reducing pressure on the water drainage infrastructure thereby reducing risks of flooding.

More information can be found here:
**http://news.ssen.co.uk/news/all-articles/2021/july-2021/ssen-completes-47-million-osney-island-flood-alleviation-project/**

**http://news.ssen.co.uk/news/all-articles/2020/december/ssen-multimillion-pound-investment-protecting-swindon-power-supply-from-flood-damage/**

Elevated substation at Drakes Way

Wildflowers and grass mix

### 2.5.4. Waste/Landfill/Recycling

As part of the wider SSE Group, SSEN follows the waste hierarchy to reduce, reuse and recycle waste. Recycling facilities are provided at key office locations and operational sites to reduce the amount of consumable waste sent to landfill.

In recent years SSE has been implementing a waste improvement program to improve the management and reporting of its waste performance. In 2020/21, SSE recorded 2,321 tonnes of waste, of which 31% was recycled and 55% used to generate energy from waste.

More detail of SSE's waste disposal methods can be found by accessing our 2021 SSE Group sustainability report: https://www.sse.com/sustainability/


### 2.5.5. Contaminated Land Clean Up

In 2020/21, there were 23 incidents of land contamination in the SEPD licence area costing £201k (12/13 prices) in remedial work. There were no incidents in SHEPD.

**For further details on contaminated land clean up, please see worksheet E2 – Environmental Reporting linked to the Appendix of this report.**

### 2.5.6. Noise Pollution

Ten reportable noise complaints were made in 2020/21, of which six were reported in SEPD and four in SHEPD. These included complaints relating to substation noise or noise from transformers. £66.8k (2012/13 prices) was spent n reducing noise pollution.

**For further details on noise pollution, please see worksheet E2 – Environmental Reporting linked to the Appendix of this report.**

### 2.5.7. Biodiversity

Our distribution network runs through some of the country's most biodiverse environments which support a wide variety of habitats, flora and fauna. As such, our projects are subject to ecological assessments, to ensure negative impacts to sensitive species and habitats are avoided or reduced.

These assessments identify the need for further detailed surveys, consultation or mitigation, as well as identifying opportunities to deliver biodiversity enhancements. If necessary, our projects are redesigned to avoid or reduce ecological impacts, and relevant consents or licences are obtained from Natural England or the Environment Agency. This key work is delivered by our in-house ecologist with support from ecological contractors, helping us to achieve compliance with relevant environmental legislation and good practice.

In 2020/21 surveys to confirm the presence or absence of great crested newts (GCN), dormice, badgers, water vole and bats were completed, allowing us to design and deliver our projects in a way that protects these species. For example, a watercourse crossing for the Hunston to Rose Green 33kV Cable project was redesigned to make use of Horizontal Directional Drilling to avoid impacts to water voles.

Protected species licences from Natural England were obtained, including for badger (Coxmoor Wood – Crookham 33kV Rutter Pole Replacement project) and GCN (Fernhurst to Five Oaks 33kV Rutter Pole Replacement project). Licence applications for dormouse and bats will also be required for projects to be delivered in 2021/22 based on the results of surveys carried out in 2020/21.

Several of our projects require us to work in legally protected sites, such as Sites of Special Scientific Interest (SSSI), which are of national or international importance for wildlife. We work closely with Natural England, NatureScot and other organisations to ensure all works within these sites are designed and delivered appropriately. For example, the Coxmoor Wood – Crookham 33kV Rutter Pole Replacement project required the installation of 1.1km of new cable in Bourley and Long Valley SSSI and the Thames Basin Heaths Special Protection Area (SPA). These works were assented by Natural England following the production of a Habitats Regulations Assessment and a mitigation strategy to ensure the protection of breeding birds and heathland habitat, both of which are vulnerable to disturbance.

Our Major Projects also account for habitats and species of conservation concern that are not legally protected. For example, our Poole – Wareham 132kV Cable Replacement project required a temporary site compound on an urban brownfield site. The site supports a colony of Small Blue butterfly, a species listed on Section 41 of the Natural Environment and Rural Communities Act 2006 as Species of Principal Importance in England. Kidney vetch is the only larval food plant of the Small Blue and so grassland containing this plant were translocated from the footprint of the site compound to an on-site receptor area. This ensured the project avoided causing a net-loss of flora required by the small blue colony.

## 2.5.8. Community Engagement

SSEN has implemented the Resilient Communities Fund which provides financial support for not-for-profit community groups and charities in our electricity distribution network areas in central southern England and the north of Scotland. The fund helps communities to build resilience for emergency events and protect the welfare of vulnerable community members.

The fund originally operated over a two-year period, awarding £1.25m in total to benefit communities in SHEPD and SEPD. In 2016/17, due to the success of the fund, the decision was taken to extend it until 2023.

In 2020/21, the fund was repurposed in response to the coronavirus pandemic to support grass-root communities who each responded in different ways. The fund was able to provide grants of up to £3,000 to Community, Town and Parish Councils particularly for community-based responses to support those who were socially isolating. Within seven weeks of the lockdown starting, SSEN made awards totalling £363,848 to 178 communities, including the Seaboard Centre in Balintore pictured below.

Communities reported that the SSEN funds were essential for their resilience planning and that the speed at which the funds were provided enabled them to mobilise local activity quickly. The flexibility of the fund enabled communities to respond to their specific needs such as supporting volunteer ferry travel on the Isle of Luing and identifying vulnerable residents in Portsmouth. Although every community response was unique, there were notable themes on what communities needed support with: providing meals and materials for the vulnerable; accessing PPE; issuing leaflets and communication; and supporting volunteers.

More information regarding the Resilient Communities Fund is available here: **https://www.ssen.co.uk/Resiliencefund/**

The Seaboard Centre in Balintore was used as a community action hub during the pandemic. It received SSEN funding to support vulnerable residents by preparing hot meals for delivery around Caithness.

# 3. Smart Grids, Innovation and Our Role in the Low Carbon Transition

## 3.1 Introduction

This section provides an overview of SSEN's innovation activities that are intended to drive innovation across a range of challenges associated with transitioning to a low carbon network, whilst continuing to look at innovations that will improve efficiency and maintain network reliability to reduce costs and improve customer service. Progress of our innovation projects that are aligned with our RIIO-ED1 strategy are displayed, along with details of benefits realised to date from technologies that have been successfully implemented into BaU. Progress on Smart Meter deployment and how we anticipate benefits from them is also covered here.

### 3.1.1. Key challenges facing the industry

The energy system is facing an unprecedented change as we transition towards Net Zero. To meet the challenge of Net Zero, we must now go further and faster, especially in decarbonising transport and heating, and our industrial use of energy. To achieve Net Zero will require a huge increase in renewable and low carbon electricity, especially to meet new sources of demand such as electric vehicles and new forms of decarbonised heat. A robust and reliable electrical network will be essential to facilitate this transition and delivering the network capacity required to achieve this will require significant investment either in the form of new flexibility services or traditional investment in assets. Providing this network, whilst maintaining network reliability, resilience, customer service and efficiency is a key challenge facing networks.

There are a number of key topic areas which will need to be addressed, including ever increasing volumes of renewable generation connecting to the network, the widespread adoption of EVs, the decarbonisation of heat, the development of Whole System design and operation, the shift towards DSO and enabling new flexibility solutions. Additionally, customer expectations from the network will change as they become increasingly reliant on electricity for both heating and transport. At the same time, we need to ensure that we can bring efficiency benefits to our existing BaU activities to operate and maintain the network.

### 3.1.2. Our areas of focus

We are committed to creating a more flexible, cost effective and secure electricity network, which adapts and responds to our stakeholders' needs, whilst supporting the delivery of the country's Net Zero targets. This includes:

- Innovation Development and Deployment
  We are currently engaged in a number of large and small scale innovation projects that will deliver a broad range of benefits for our customers. Following an update to our innovation strategy in 2020-21, projects have been aligned to distribution's four Strategic Objectives, identified as focus areas as we prepare for RIIO-ED2 and the transition to Net Zero. Our innovation portfolio has delivered over £80m of benefits to date in RIIO-ED1, whilst avoiding over 350,000 tonnes carbon dioxide emissions.

- Distribution System Operator (DSO)
  SSEN, along with other DNOs, is transitioning towards a Distribution System Operator model which will deliver significant benefits and transform the way we operate. A DSO, as defined by the ENA, is an active distribution system comprising networks, demand, generation and other flexible distributed energy resources to deliver security, sustainability and affordability in the support of whole system optimisation. Our two flagship DSO projects TRANSITION and LEO are already providing insights to help remove barriers to smart technologies, assist in the evolution of a more flexible network as well as helping to facilitate new markets. On top of this we are progressing projects such as, TraDER and MERLIN, which are testing financial markets and flexibility scenarios of a future DSO world.

- Decarbonisation of Transport and Heat
  A key requirement for Net Zero is the decarbonisation of transport and heat. Our Electric Vehicle strategy[2] sets out our principles to support the uptake of 10 million EVs in the UK by 2030. In addition to this, we have a variety of innovation projects focused on the decarbonisation of both transport and heat, including the Skyline NIA project which launched in 2020/21 to provide visibility of the geographical emergence of EV charge points to support DNOs in coordinating the network reinforcements required to support the low carbon transition.

2. https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=19141

- Flexibility Deployment
  Demand to connect small scale renewable generation quickly and on constrained networks is increasing. To meet this demand SSEN is providing flexible connection options to generators via Active Network Management (ANM) solutions. To date in RIIO-ED1, we have enabled over 345MW of renewable generation to connect to our network via these schemes. In 2020/21 our second Constraint Managed Zone (CMZ) contract was implemented in the Western Isles to support the network during a subsea cable fault. This helped ensure power supply to our customers whilst avoiding over 1,500 tonnes of $CO_2$ emissions. A further suite of CMZ solutions have been identified to protect constrained areas of our network.

- Smart Meters
  The number of smart meters on our network continues to rise. We currently have over 220,000 connected across our Scottish network and over 1.1 million connected in our Southern region. It is anticipated that around 3.5 million will be connected by the end of the smart meter implementation programme rollout in 2024. In April 2020 our Data Privacy Plan was agreed by Ofgem. This success, complemented by developments in our ICT systems, will allow SSEN to collect suitably aggregated Consumption Data from smart meters in the future. This is critical in allowing SSEN to realise the benefits associated with smart meter rollout, to provide a more reactive network for the future.

### 3.1.3. Low Carbon Transition

Low Carbon Technologies (LCTs)
The total uptake of LCTs has increased in both our Scottish and Southern Networks in 2020/21 compared to 2019/20. This is due to an increase in EV fast charge points being installed in both regions, with an 8% increase in our SHEPD network and 14% increase in our SEPD network compared to 2019/20. SEPD also saw a 54% increase in Photo Voltaic (PV) installations in 2020/21 compared to 2019/20. Due to improvements in our data capturing system, Heat Pump installations have been captured for 2020/21. There were 79 heat pumps installed in SEPD and 394 in SHEPD.

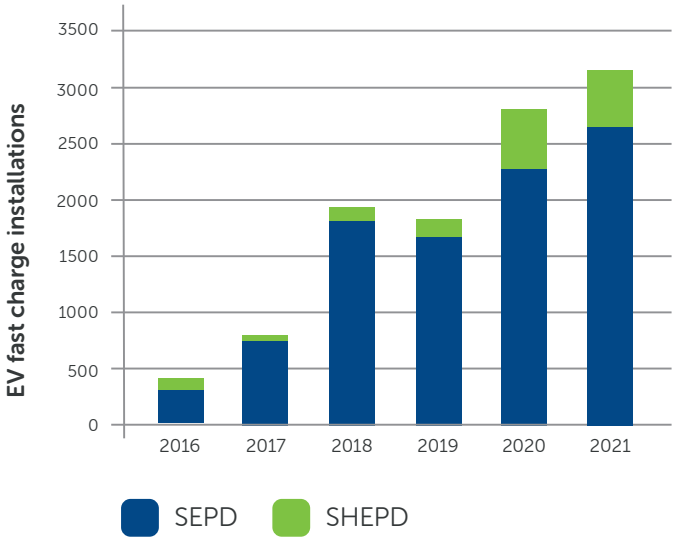
The total amount of distributed generation (DG) added to both our SEPD and SHEPD networks has decreased in 2020/21 compared to 2019/20, with SEPD connecting 160.8MW and SHEPD 71.9MW.

SSEN has worked hard in 2020/21 to promote the delivery of the UK's 2050 Net Zero (2045 in Scotland) ambition through engagement and support at all levels from UK and Scottish Governments, Ofgem, Local Authorities, ENA to trade bodies, third party stakeholders and individual organisations. Looking forward, supporting LCT uptake and achieving both Net Zero and a Green Recovery will remain a high priority for us.

#### 3.1.3.1. EV Charge Points

Electric Vehicle (EV) uptake has increased in RIIO-ED1 as technological improvements to batteries improve vehicle range and prices become more attractive to consumers. A larger number of manufacturers are now offering fully electric and hybrid vehicles which has provided a better choice for consumers and competition within the marketplace. This has been reflected in the volume of charging points installed in 2020/21, with a 14% increase in EV fast chargers on our SEPD network and an 8% increase in our SHEPD network in comparison to 2019/20.

## Figure 3.1a
## Number of EV fast chargers installed ED1




As EVs become more popular and the 2030 UK ban on new petrol and diesel cars approaches, we expect the upward trend in charge point installations to continue as both residential and public chargers become more prevalent on the network. In response to this, SSEN is working to understand the potential impacts EVs have on different components of the network, including entering into a Strategic EV Partnership with the Scottish Government and Scottish Power Energy Networks, as well as progressing our E-Tourism project to explore challenges resulting from increased numbers of tourists driving EVs in rural Scotland.

### 3.1.3.2. Distributed Generation

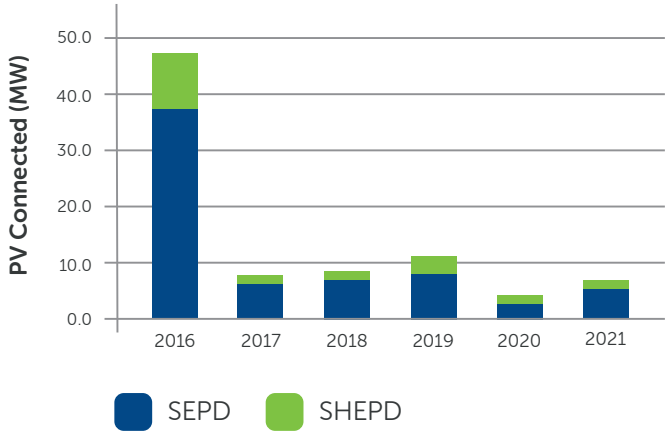
Photo Voltaic

The level of PV installations connecting to our network has remained relatively consistent over the past 5 years, with an average of 2000 new installations per year. There was a slight decline in installations in 2019/20 coinciding with the closure of the Feed-In-Tariff scheme to new applicants as of April 2019. In 2020/21 installations have increased which could in part be due to the Smart Export Guarantee, introduced by BEIS in January 2020, meaning small scale generators are guaranteed a tariff for exports to the grid.

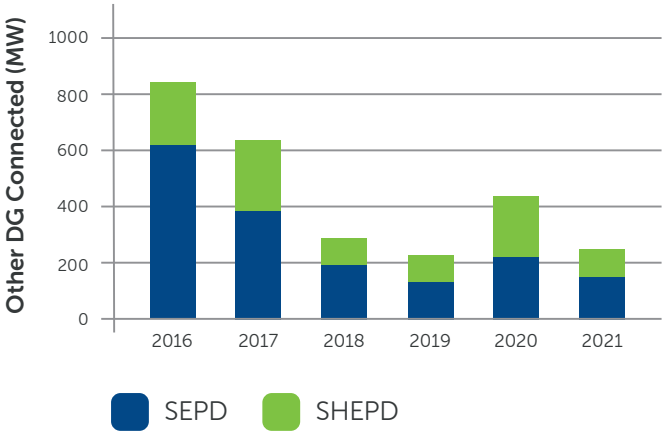
Other Distributed Generation

The volume of distributed generation (excluding PV) connected to our network has also remained relatively consistent over the past 4 years. The spike in connections in 2019/20 is due to a large number of legacy projects being closed that year.

## Figure 3.1b
## MW PV generation connected ED1




## Figure 3.1c
## MW Distributed generation connected (excluding PV) ED1




## 3.2 Progress of our Innovation Strategy

In 2020/21 SSEN refreshed its Strategic Objectives to prepare for RIIO-ED2. These objectives have been developed to allow us to achieve our purpose of **"POWERING COMMUNITIES TO THRIVE TODAY AND CREATE A NET ZERO TOMORROW."** Our new Strategic Objectives are:


SSEN Strategic Objectives

In response to this change, we have recently amended and updated our Innovation Strategy to outline how we will deliver our innovation programme and how we will progress through the remainder of RIIO-ED1 and into RIIO-ED2.

Our previous Innovation Strategy aligned with the RIIO-ED1 primary outputs · **1. Connections · 2. Customer Service and Social Obligation Priorities · 3. Environment · 4. Reliability · 5. Safety**. The following diagram shows how these outputs have been amalgamated into our new strategic objectives in our updated innovation strategy.

Projects and initiatives initiated to date have been specifically selected to ensure we have a balanced portfolio of innovations which target focus areas, whilst addressing stakeholder needs, priorities and delivering value. To the end of 2020/21 in RIIO-ED1 we have had 52 projects funded by the National Innovation Allowance (NIA) which is a total award of £16m, and two funded by the National Innovation Competition (NIC) totalling £20.6m (we have also been partners in a third NIC, Optimise Prime, with UKPN). On top of this we have implemented several innovations into BaU which have fast followed learnings from other DNOs.

A summary of our current innovation portfolio is as follows:

## Table 3.2a – 2020/21 Current Innovation Portfolio

| 2020/21 Innovation Portfolio | RIIO ED1 Primary Output | | | |
|---|---|---|---|---|
| | Safe, resilient and responsive network | A valued and trusted service for customers and communities | Accelerate progress towards Net Zero | A positive impact on society |
| SubSense | x | | | |
| 11kV Power Electronics | x | | | |
| Informed Lightning Protection | x | | | |
| LV Underground Fault Location Technologies | x | | | |
| E-Tourism | | | x | |
| Electric Heat Pathway | | | x | |
| Technical Interfaces to Scale as a DSO | | | x | |
| Merlin | | x | | |
| Feasibility of Utilising Compressed Dry Air in 33kV Insulated Switchgear | x | x | | |
| Whole System Growth Scenario Modelling (Phase 2) | | x | x | |
| Smart Hammer | | x | | |
| Future Fiscal Forecasting | | | x | |
| TraDER | | x | | |
| Local Electric Vehicle Energy Loop (LEVEL) | | | x | |
| Skyline | | | x | |
| Equal EV | | | | x |
| Near Real-Time Data Access (NeRDA) | | | x | |
| Synaps 2 | | x | | |
| Low Voltage Feeder Cable Open Circuit Detection | | x | | |
| Future Control Room | x | | | |

### 3.2.1. Highlights of 2020/21

This year we have completed several trials allowing us to progress our innovation strategy and our pledge for Net Zero. Highlights of these are as follows:

- **SYNAPS 2** – we have launched the second phase of the SYNAPS project in collaboration with UK Power Networks (UKPN). This technology can monitor LV Networks through Waveform Analysis, detecting pre-fault signals to allow a proactive response to a fault prior to fault conditions.
- **Smart Hammer** – we have been testing and refining the X-Model Smart Hammer, which can evaluate the internal condition of wood poles to ensure they are safe for the surrounding community and safe for staff to climb when carrying out work. This tool could also improve asset management by providing a consistent score for asset health, removing subjectivity.
- **Utilising Compressed Dry Air in 33kV Insulated Switchgear** – we have completed a study investigating the use of compressed dry air as an alternative to $SF_6$ on our 33kV network. The outcomes of this could enable us to reduce the environmental footprint of our activities by reducing our $SF_6$ use.
- **Equal EV** – in November 2020 we registered our Equal EV project, making us the first DNO to investigate accessibility of EV charging and options which can improve services for current and future EV owners with disabilities.
- **Wildlife Protection Project** – we have been collaborating with Western Power Distribution to develop a risk assessment based methodology for the implementation of wildlife protection measures.
- **LV Underground Fault Location Technologies (LVUFLT)** – we have completed trials testing the potential use of HV Fault finding acoustic equipment on the LV network. This will lead to more accurate fault location, benefitting customers by restoring power supplies quicker with less disruption.
- **E-Tourism** – we have been progressing our E-Tourism project which aims to improve our understanding of EV charging and the impact on the network during peak tourist season. The outcomes of this project will help us better prepare the network for future EV uptake.
- **SUBsense** – we are investigating the use of acoustic sensing systems to monitor the health of our submarine cables. This could reduce the need for costly divers or Remote Operated Vehicles (ROV's) to assess condition and improve reliability.

A more detailed breakdown of active NIA projects can be found in the 2021 Annual NIA Summary Report located here: **https://www.ssen.co.uk/InnovationLibrary/Distribution**

Our new Innovation Strategy can be found here: **https://www.ssen.co.uk/Innovation**

### 3.2.2. Large Scale Innovation Projects

During 2020/21, we had three large-scale innovation projects in our distribution business. These focus on the transition to Distribution System Operator and creating a smarter, more flexible network which can support the low carbon transition.

#### 3.2.2.1. Resilience as a Service (RaaS) (SEEN007)

**Key activities**

The RaaS innovation project (partnered with Costain and E.ON) seeks to develop a sustainable solution to improve network resilience, particularly in remote and isolated areas.

The aim is to develop and trial a system which can swiftly and automatically restore power to customers in the event of an outage, using services provided by a third party owned Battery Energy Storage System, together with local Distributed Energy Resources. This approach will provide cost effective, local network resilience, which will improve security of supply to customers, whilst reducing the use of carbon intensive, temporary diesel generation which is conventionally used to mitigate fault conditions.

**Expected outcomes**

As well as demonstrating the technical concept, the project will develop the commercial framework for RaaS, evaluating the financial case from a DNO perspective and assessing the investment case for RaaS service providers and options for revenue stacking in other flexibility services markets.

The first phase of the project focuses on site selection, system design and refinement of the business case. This stage will validate whether the concept is technically feasible and financially viable, to inform a decision, to be made in 2021, on whether to proceed with the deployment and operation of a RaaS system for a trial period of up to two years at the chosen site of Drynoch primary substation on the Isle of Skye.

For more information see: **www.project-raas.co.uk**

| **Funding Stream** | **Start/end date** |
|---|---|
| Ofgem NIC<br>£10.2m project | 2020 – 2024 |

### 3.2.2.2. TRANSITION (SEEN005)

**Key activities**
With the widespread recognition that the GB electricity network needs to become more flexible, DNOs will take an increased role in delivering an efficient, coordinated and economical whole system outcome to support the UK's Net Zero targets.

This transition toward the Distribution System Operator (DSO) model is especially significant as the proliferation of low-carbon technologies and solutions become more widespread, allowing households, businesses and communities to engage with the energy system. This includes customers, shifting from merely consuming energy, to producing, storing, balancing and selling energy back to the system. The objective of TRANSITION (partnered with Electricity North West Limited) is to explore the most effective system architecture, tools, platforms and market mechanisms needed to enable this change.

In Autumn 2021 TRANSITION will start the first of its three Flexibility Market Trial periods in Oxfordshire, with the third period ending in Spring 2023. These will physically test the newly developed systems, platforms, and processes, as well as different market mechanisms and approaches, while maintaining market neutrality for all. Participation in the market trials will be from TRANSITION's project partner 'Local Energy Oxfordshire' (LEO) (**https://project-leo.co.uk**) as well as external organisations and businesses.

The trials will increase in their complexity and extent as we go through each of the three trial periods, with different flexibility service being delivered in each one. This includes both services provided to the DNO as well as Peer to Peer Import and Export Capacity Trading between customers.

**Expected outcomes**
TRANSITION is building on the outputs of the ENA Open Networks Project to design, develop, demonstrate and assess the common tools, data and system architecture required to implement proposed DSO models. Therefore, outcomes from the project will influence the development of these models and of zero-carbon smart local energy systems that optimise opportunities for distributed energy resources to provide flexibility to support the network.

The learning and outcomes for the trials will be reported on through a final report in Sept 2023 and disseminated through a range of different communication channels to interested stakeholders.

The TRANSITION project produces an annual report to OFGEM outlining its achievements in the last reporting period and it's aims in the next period, which can be found here: **https://www.ssen-transition.com**

**Funding Stream**
Ofgem NIC
£12.79m project

**Start/end date**
2018 – 2023

### 3.2.2.3. Project LEO

**Key activities**
Project LEO (Local Energy Oxfordshire) is one of the most ambitious, wide-ranging, innovative, and holistic smart grid trials conducted in the UK, and in its first two years significant progress has been made in informing the transition to an energy system that cost-effectively supports the UK's Net Zero ambitions.

Project trials are based around three key themes:

- **Technology** – Project LEO has been carrying out trials ranging from roof top solar and photovoltaic array, to hydro stations on the river Thames and behind-the-meter battery capability at the Oxford Bus Company. Storage technology is being explored through batteries and Vehicle to Grid technology, with demand side response being accessible, initially through the large building stock owned by the University of Oxford and Oxford Brookes, and the local councils. In 2020/21 over 80 low voltage monitors have been installed at key substations to support work on new forecasting systems. These technologies are helping inform decision making and identify potential constraints on the network.
- **Local Markets** – Local electricity markets are being supported through the development of accessible and easy-to-use IT systems. These provide clear information on opportunities for energy services, addressing constraint management and energy exchange between local energy users. These systems are designed to make flexible energy markets accessible, fair, and more transparent
- **Community** – 2020/21 has seen the development of LEO's Smart and Fair Neighbourhood programme. Working with five different communities in Oxfordshire, LEO is co-creating locally relevant trials of different flexibility services. Project LEO is also concerned with ensuring fairness for all electricity market participants. As society progresses towards Net Zero and a more decentralised energy system, it is important that the benefits of the energy transition are shared equitably. These trials are involving a range of energy assets including solar PV panels, wind turbines, electric vehicles, heat pumps as well as exploring the potential power of community led energy planning.

**Expected outcomes**
Project LEO will inform how DSOs function in the future, show how markets can be unlocked and supported, create new investment models for community engagement, and support the development of a skilled community positioned to thrive and benefit from a smarter, responsive and flexible electricity network.

For more information see: **https://project-leo.co.uk**

**Funding Stream**
BEIS Industrial Strategy Fund
£37m project

**Start/end date**
2019 – 2023

## 3.3. Roll out of Smart Grids and Innovation into Business as Usual

### 3.3.1. Converting Innovations into Business as Usual

We have a robust process for selecting innovation projects, assessing their benefits and suitability for BaU rollout, and tracking their performance following dissemination.

The process begins with a brief assessment of an idea's scope to ensure objectives align with our innovation focus areas and challenges. Ideas are also assessed for their Technology Readiness Level (TRL), to ensure we have a spread of innovations at different readiness levels to supply a steady stream of innovations for deployment. Successful ideas then undergo a robust Cost Benefit Analysis (CBA) process to ensure that the proposed initiatives have a positive business case. This will involve making a number of assumptions to predict the future benefits.

Following a successful CBA, an idea is taken on to a project. This commences the trial period, where assumptions are tested to give better information on how the innovation will perform on our network. This includes an ongoing assessment of the potential benefits that the innovation will deliver.

At the end of the innovation trial, the business case is thoroughly reviewed including a further robust CBA based on the learning gained through the innovation project. Only if this proves positive will we decide to implement it into BaU. In many cases, further trials may be necessary to provide the level of confidence required to consider a transition to BaU.

Following BaU rollout, success of the innovation is assessed and tracked to ensure benefits are being realised. We currently have an in-house methodology to track innovation benefits in BaU, but will move to the ENA's Innovation Measurement Framework in RIIO-ED2 following its approval.

**Innovation Fast Follow**

In order to monitor the progress of innovation trials performed by other DNOs, various knowledge sharing workshops, conferences and strategic management meetings take place on a regular basis. This allows us to better understand how innovation is benefiting other DNOs and gain insight on effective deployment of the technology into BaU. We have deployed a number of innovations into BaU following learning from projects completed by other DNOs.


### 3.3.2. Summary of SSEN Innovations that are now Business as Usual activities

#### 3.3.2.1. New Innovations Deployed in 2020/21

SSEN did not deploy any new innovations into BaU in the 2020/21 reporting year. There have however been expansions on innovations that are already BaU as detailed below:

**Constraint Managed Zones (CMZ)**

Constraint Managed Zones use flexible solutions to offer security of supply during times of peak demand, planned maintenance or fault conditions. The CMZ concept, which has been recognised in BaU for a number of years saw a new scheme commissioned in October 2020 to support the network following the subsea cable fault between the Isles of Skye and Harris. The contract sourced renewable generation from hydro generation plants on the island to offset diesel generation used to maintain customer's supply. This setup provided a more environmentally friendly means of supporting the network outage, reducing carbon emissions versus diesel generation alone.

**Benefits**

The flexible services avoided approximately 1,600 $tCO_2e$ in 2020/21 compared to using traditional diesel-based alternatives.

**Future Deployments**

Following on from this success, SSEN has negotiated 14 CMZ contracts that have been agreed to provide network security when required. A heat map has also been developed highlighting constrained areas of our network which could benefit from CMZ services in the future. Opportunities are available on our website for Flexibility Service Providers to review and offer services. More information can be found here: https://www.ssen.co.uk/FlexibleConnections

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

## 3.3.2.2. Further RIIO-ED1 Innovation Deployments

We continue to support the following innovative solutions which have become business as usual over the RIIO-ED1 price control period:

### Active Network Management (ANM) and Flexible Connections

ANM and flexible connections allow generators to connect to constrained networks through releasing flexible generation capacity. SSEN have implemented ANM in multiple locations across our network to help facilitate the connection of distributed generation.

**Benefits**

Significant reinforcement costs have been avoided and 346,094 $tCO_2e$ have been avoided for all ANM projects to date in RIIO-ED1.

**Future Deployments**

In 2020 SSEN re-opened its Orkney ANM scheme for new connections as renewable generation technology has advanced and is now able to take advantage of the remaining headroom on Orkney. In addition to this SSEN will deliver the largest ANM system in the UK through the South West Active Network Management (SWAN) project in Spring 2022. For more details see section 3.3.3.1.

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

These projects have been made possible from learnings derived from our original SHEPD Orkney ANM project. Information on this project is available here: **https://www.ssepd.co.uk/OrkneySmartGrid/**

### LV Automation

LV Automation uses smart fuse and fault location technologies. Smart fuses are installed into substation LV feeder pillars where they automatically switch fuses when one has ruptured. This means customers only experience a brief loss of supply in cases where a fuse change is sufficient to restore power following a fault. The technology also provides a fault location service, which helps our field staff locate underground cable faults quicker than would otherwise be possible.

**Benefits**

There has been an estimated £14.2m gross avoided costs, over 390,000 Customer Interruptions and 54,132,471 Customer Minutes Lost avoided to date in RIIO-ED1.

**Future Deployments**

SSEN will continue to utilise and realise the benefits of LV Automation throughout the remainder of RIIO-ED1.

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

The technology was implemented straight into BaU following learnings from Electricity North West. More information can be found here: **https://www.camlingroup.com/product/bidoyng**

### Live Line Tree Harvesting

SHEPD have use of two Live Line Tree Harvesters. These machines can cut down trees adjacent to live overhead power lines and are far more efficient than hand felling, whilst reducing the risk of injury to tree cutters.

**Benefits**

There has been an estimated £9.3m gross avoided costs, 66,400 Customer Interruptions and 16,565,612 Customer Minutes Lost avoided to date in RIIO-ED1.

This project has also led to 4,558 $tCO_2e$ avoided due to the reduced requirement to run diesel generation.

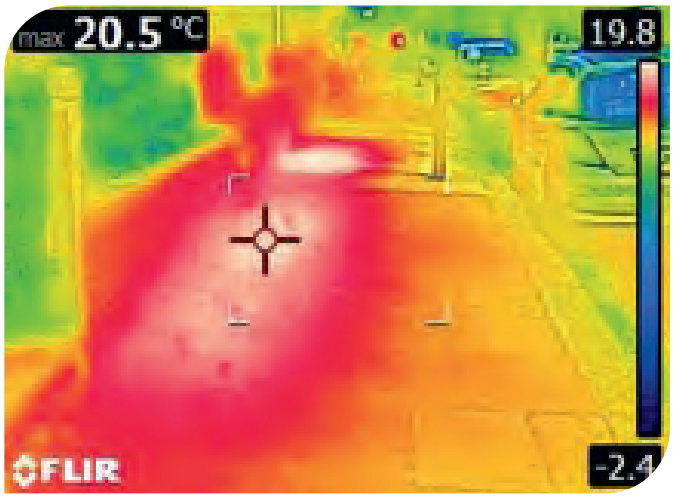
**Future Deployments**

The use of the live line tree harvesters in SHEPD will continue to realise benefits throughout the remainder of RIIO-ED1. In 2020/21 our contractor machine was off-hired due to the Coronavirus pandemic but this remains available to re-hire in the future.

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

The original project was done as an IFI project. More information can be found here: **http://www.smarternetworks.org/project/2007_08**




### Thermal Imaging of Underground Cables (TOUCAN)

TOUCAN was an NIA project that investigated a technical method of using thermal imaging solutions as complementary tools in the context of locating underground cable faults in the power distribution network. Following the success of the NIA project, 201 thermal imaging cameras were procured as BaU in 2018.

**Benefits**

There has been an estimated £655k gross avoided costs, 3,336 Customer Interruptions and 2,183,490 Customer Minutes Lost avoided to date in RIIO-ED1.

**Future Deployments**

SSEN will continue to utilise the thermal imaging cameras and realise benefits throughout the remainder of RIIO-ED1.

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

More information can be found here:
http://www.smarternetworks.org/project/nia_ssepd_0021

### Forestry Mulcher

Forestry Mulcher was a NIA project that investigated the potential improvement of efficiency and safety by using remotely operated vehicles to carry out tasks associated with forestry mulching around overhead lines. SSEN procured two forestry mulchers in 2017 for our SHEPD licence area. In 2020 these were upgraded to newer models which are more reliable, lighter weight and more fuel efficient.

**Benefits**

Approximately £239k in cost reductions have been achieved since this technology was deployed as BaU.

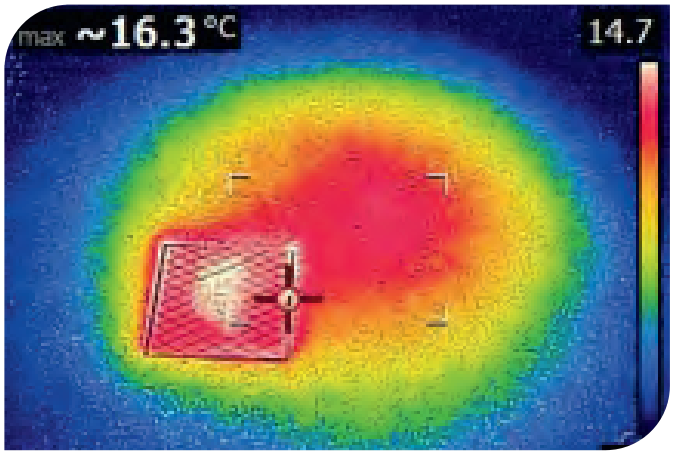
**Future Deployments**

The forestry mulchers will continue to be used in SHEPD throughout the remainder of ED1.

**Innovation Strategic Objectives**

TO DELIVER A SAFE, RESILIENT AND RESPONSIVE NETWORK FOR ALL OUR CUSTOMERS

More information can be found here:
http://www.smarternetworks.org/project/nia_ssepd_0018




### Hybrid Generators

In 2011 SSEN completed an IFI project trialling hybrid generators as alternatives to traditional diesel generation. The original hybrid generators had reliability issues, but following advancements in technology, 5 Hygen MX hybrid generators were procured as BaU in June 2019. Hybrid generators are a combination of a diesel generator and battery storage. The diesel generator charges the battery which can then be used to cover an outage. This setup is more efficient than using a diesel generator on its own, as the battery storage system allows the generator to operate at optimum loading levels. This means there is lower fuel consumption and thus carbon emissions when using hybrid generators, whilst significantly reducing noise and providing better air quality for the customer. The success of the hybrid generators in BaU lead to SEPD procuring an additional 5 Hygen MX hybrid generators in November 2020.

**Benefits**

As the hybrid generators were procured in 2019/20 and 2020/21, the benefits do not yet cover the purchase costs of the machines. 71 $tCO_2e$ has been avoided to date since acquiring the machines.

**Future Deployments**

SSEN will continue to utilise the 10 hybrid generators throughout ED1 and are anticipating further deployments in ED2.

**Innovation Strategic Objectives**

ACCELERATE PROGRESS TOWARDS A NET ZERO WORLD

This project was originally completed as an IFI Project. More information can be found here: https://www.smarternetworks.org/project/2011_14


## 3.3.3 Innovative Solutions for Connections

### 3.3.3.1. Flexible Connections

In some areas of our networks, the network is already at full capacity and it is not possible to connect any further generation without upgrading the existing network. In these cases, customers would typically need to wait for the required reinforcement works to be completed before being able to connect to the network. However, there are a number of alternative options available to customers who are willing to consider a more flexible connection offering which, depending on the circumstance, may allow connection ahead of the required reinforcement works.

SSEN is proud to offer one of the widest suite of flexible connections in the industry, as well as offering flexibility in relation to payment options for connections. The flexible connection offers that we provide include:

**Timed Connections**

The timed export connection offers the customer the possibility of connecting to the network and exporting during certain periods of the day or week. This is an advantage in areas with low levels of generation diversity.

**Intertrip**

Legacy type of flexible connection, offering a simple 'on or off' but extremely efficient option for generation connections where network topography does not offer dual circuit capacity for connections in the event of circuit failure.

**Active Network Management (ANM)**

In areas where there are several, complex constraints affecting a number of customers over a long period of time, full ANM systems will be implemented. The ANM systems continually monitor all the limits on the network in real-time and allocate the maximum amount of capacity available to generation in that area.

In spring 2022 SSEN will deliver the largest ANM system in the UK through the South West Active Network Management (SWAN) project, enabling new generation connections across 60% of its licence area which would not have been possible traditionally due to Transmission constraints. This system will run alongside 4 areas already ANM enabled, including the UK's first and most complex ANM system on Orkney which re-opened in 2020 for new connection applications.

SSEN has also undertaken significant development in its ANM systems within RIIO-ED1, as well as applying efficiencies within the connection processes and informing wider regulatory decisions on ANM implementation. As such ANM connections are now significantly lower in cost and far more timely should connecting customers wish to avoid reinforcement costs related to new connections, examples are available here: https://www.ssen.co.uk/connections/generationandstorage/flexibleconnections

**Single Generator Active Network Management (SGANM)**
SGANM is similar to a full ANM scheme, except instead of managing multiple constraints and multiple generators it manages only one generator and up to two constraints.

**3rd Party ANM**
There are two types of 3rd party ANM connections for the customer to consider – shared capacity and demand management. Both of these are installed and managed by the customer.

**Shared capacity example:** An existing generator may have a contracted capacity of 10MW but only have 6MW of connected generation. Therefore, there is the potential for another generation customer to approach this generator and make use of the spare capacity. The customers will install a system that will ensure the combined export of both generators does not exceed the contracted capacity.

**Demand Management example:** A new 250kW generator wishes to connect to the distribution network. However due to transmission constraint upstream the generator has a limited export of 50kW. The generator develops a proposal to increase the minimum demand by changing gas boilers to electric boilers on the same circuit as the constrained asset. The generator has calculated this will increase the minimum demand by 200kW. The generator must then ensure that when the 50kW limit is breached that suitable demand is brought onto the network.

SSEN will install a fail to safe system so that in the event the customers system fails the generator will be disconnected.

**Contractual Flexibility**
We consider flexibility in contractual terms in circumstances where a transitional solution may be available for a customer. Examples include situations where the local connection works can be completed early, but the full capacity is not available until reinforcement is complete. In this scenario, we can include special conditions within the Connection Agreement which can allow the customer to export some of their full capacity, dependent upon what the current network can accommodate.

**Application Process**
Our flexible connections process is available for generation connections above 50kW where there are thermal constraints leading to significant reinforcement works. In existing network areas where ANM schemes are already in place no other flexible option will be available. The main points of the process:

- You can now apply directly for a flexible connection;
- If you apply for a standard quotation and significant reinforcement works are triggered, we will provide two network studies (standard and flexible) and give you the option to change your connection type;
- This is available for all new generation connection applications.

For more information, such as on how to apply, please visit **https://www.ssen.co.uk/connections/generationandstorage/flexibleconnections**


## 3.3.3.2. Flexible Services

Flexible Services are deployed in areas of existing SSEN network classed as Constraint Management Zones (CMZs). CMZs are geographic regions where network requirements, relating to network security, are met through the use of load variation techniques such as increasing generation or reducing demand. These services are provided to SSEN by a Flexible Service Provider according to contract agreements.

SSEN has been at the forefront of implementing flexible services and currently has 14 live CMZ contracts in place and has recorded over 11GWh of utilisations through Flexible Service Providers since 2019. On top of this we have developed a heat map detailing constrained areas of our network which could be supported by flexible services.A Constraint Managed Zone is a geographic region served

We currently offer four types of flexible service:

- **Sustain** – Sustain (or pre-fault) services will be sought by SSEN to manage networks that are close to capacity, meaning the network will not be able to meet power requirements should an outage coincide with periods of highest demand. Pre-defined services can be procured in advance of an outage that can react by increasing generation / reducing demand at peak times to maintain customer supply during the outage. SSEN will procure these services based on a four-year contract term with the opportunity to extend by one year.
- **Secure** – In the same manner as Sustain activities, SSEN will procure ahead of time the required power injection/demand response services from available distributed energy resource (DER) providers based on network conditions to manage pre-planned outages. This style of service will be appropriate for implementation across wide and locally specific areas, dependant on the maintenance scenarios affecting the network. SSEN will procure these services based on a one-year rolling contract limited to a maximum five-year term.
- **Dynamic** – SSEN will seek to procure Dynamic services ahead of time from providers able to deliver an agreed change in output to avoid, or following, a network fault. For example, in N-1 scenarios, to avoid overloading of the second circuit or to constrain loadings during restoration or repair scenarios.
- **Restore** – SSEN will procure Restore services ahead of time from providers able to either remain off supply, to reconnect with lower demand, regulate frequency and voltage or to generate into a network zone isolated from the main fault to support increased and faster load restoration within a specific network area. SSEN will procure these services based on a one-year rolling contract limited to a maximum five-year term.

The key features of flexible services:

- Utilises a market approach to procure constraint management services.
- Technologically agnostic.
- Open to a full range of market participants.
- Replicable across a range of network scenarios.
- Compatible with flexible connections and other smart interventions.

SSEN has a published procurement and pricing methodology for placing new flexible services. Should services be required, an assessment is undertaken to evaluate which flexible option could deliver the required capacity. In the event of a flexible service being needed, an EU compliant tender is implemented to source suppliers or suitable resources.

SSEN keep a record of all assessments and decisions at all stages and the results of all historic tenders are available in the links below.

**How do people get involved and how can progress be observed?**
Suppliers can provide a service through different alternatives:

- Demand Side Response – this is via a customer or group of customers connected to the appropriate part of the SSEN network, who have the ability to reduce or increase their energy use at specific times in relation to network constraints.
- Distributed Generation – these are technologies connected to the SSEN network which have the ability to increase or reduce the amount of power exported in relation to network constraints.
- Energy Storage – this is via appropriate technologies connected to the SSEN network, which can store or export energy depending on network constraints.

SSEN releases new opportunities as they are identified, these can be found on the Flexible Power website, or on our own SSEN Flexibility Service Calls website:

https://www.flexiblepower.co.uk/locations/scottish-and-southern-electricity-networks/map-application-ssen

https://www.ssen.co.uk/ConnectionsInformation/GenerationAndStorage/FlexibleConnections/CurrentCallsForFlexibility

Owners can register on our Dynamic Purchasing System (DPS) to procure our CMZ services for the SSEN regions, details can be found in the links here:

https://www.ssen.co.uk/connections/generationandstorage/flexibleservices

https://ssen.delta-esourcing.com

Should you have any questions or wish to discuss flexible services please contact the Flexible Solutions Team here: FlexibleServices@sse.com.

### 3.3.4. Smart Meters

Since becoming a Smart Energy Code (SEC) party and live Data Communications Company (DCC) user in December 2017, a dedicated smart meter operational team has been in place to manage the roll-out of smart meters and systems. Ensuring compliance with the Smart Energy Code and preparing and implementing systems and processes to realise benefits from the information and data that smart meters will provide.

Throughout 2020/2021 SSEN have continued to further develop and implement Information Technology (IT) systems and processes to maintain alignment with SEC releases and DCC changes. As the roll-out progresses SSEN continue to be heavily involved with industry forums and collaborative testing, which has included polyphase smart meters and new meter firmware testing with the DCC. This has assisted in the early identification of any issues, alongside progression of these through to resolution. This has allowed SSEN to understand, follow and implement the necessary changes to ensure smart meter data can be used within the business at the earliest opportunity. Through this collaboration, some issues highlighted include communication challenges, reliability of alerts and inconsistent behaviour between smart meter manufacturers.

The ongoing challenges in the GB Smart Meter Implementation Programme (SMIP) have had a knock-on impact on the delivery of a number of functionalities, benefits, and a slower roll-out of second-generation meters in both of SSEN's licence areas, particularly our SHEPD License area. This has meant that the data, which we'll use to improve our network performance and provide a better service to our customers is not yet fully trustworthy and available in the volume required to give detailed information.

One area of benefit which SSEN have been able to progress is the utilisation of outage alerts. SSEN has now enabled the introduction of outage alerts, restoration alerts and the ability to check the supply status of a customer's smart meter from within SSEN's Customer Contact Centre. This allows for key information previously unavailable without smart meters to be utilised in day to day operations. This will continue to provide additional information and benefits as the roll out continues and more smart meters are installed in SSEN's license areas.

Following the success of the integration of smart meter information into the Customer Contact Centre, we now look towards the future and implementation of mass data gathering from smart meters. SSEN have begun work to ensure the systems and infrastructure will be in place to regularly request information, receive the responses and store this data from each smart meter within our license areas. This will then be used for analytics and benefit realisation within the smart meter operational team and the wider business.

It is anticipated that around 3.5 million smart meters will eventually be connected to our networks and whilst is it expected that DNOs will have the means to communicate and gather information from the majority of smart meters, we also believe that there will be a sizeable proportion of smart meters that we will not be able to fully communicate with or receive alerts from. Further information is provided in the following sections.

**Meter Types and Volumes of Meters Installed**

Specifications for two versions of smart meters have been developed by the Smart Meter Implementation Programme (SMIP); these are defined as SMETS1 and SMETS2 meters.

- SMETS1 meters provide a significant amount of smart functionality, however they will not provide the same level of functionality to DNOs as SMETS2 meters and will therefore affect the benefits SSEN expects to realise.
- SMETS2 meters provide additional functionality from that defined in SMETS1; they will be connected to parties including DNOs via the DCC's communications and data infrastructure. These meters will enable SSEN to gain access to the full range of alerts and service requests as defined by the SMIP.

Information relating to the volumes of smart meters installed during 2020/21 is provided in Table 3.3a overleaf.

## Table 3.3a – Volume of smart meters installed during 2020/21

| | SMETS1 | | | SMETS2 | | |
|---|---|---|---|---|---|---|
| Licence Area | Installed in 2020/21 | Total Installed | % Total Penetration (year-end) | Installed in 2020/21 | Total Installed | % Total Penetration (year-end) |
| SHEPD | 7,223 | 200,139 | 25.48% | 30,832 | 64,086 | 8.16% |
| SEPD | 15,312 | 843,360 | 27.11% | 225,442 | 522,401 | 16.79% |

The high total number of installed SMETS1 smart meters compared to SMETS2 meters is due to the initial rollout of SMETS1 meters. From 2020/21 SMETS2 meters should be installed in most properties and this is reflected in the small number of SMETS1 meters installed in 2020/21. It should be noted that due to the level of uncertainty associated with the connection, functionality and accuracy of SMETS1 meters to DCC systems, it is currently difficult to assess the impact that significant volumes of SMETS1 meter installations will have on our ability to deliver DNO smart meter related customer benefits.

**Development of Information Technology and Communications Infrastructure**

SSEN have developed systems to enable data from smart meters to be made available via connection to the DCC's infrastructure. In accordance with our business plan we have connected our IT infrastructure to the DCC and developed our own systems to manage and monitor alerts sent by smart meters directly into our existing outage management system. Significant effort has gone into ensuring that the design of our systems and infrastructure remains compliant with the SEC which is a mandated requirement for all parties who interface with the DCC.

Our expenditure associated with the development of our IT and communications systems and payments made to the DCC during 2020/21 are detailed in worksheet E5 – Smart Metering, they are also summarised in Table 3.3b below.

## Table 3.3b – IT expenditure for Smart Meters during 2020/21

| Licence Area | SM IT Costs (£k) | SM Communication Licence (DCC) Costs (£k) | Elective Communication (DCC) Costs (£k) |
|---|---|---|---|
| SHEPD | 84 | 1,087 | 0 |
| SEPD | 337 | 3,985 | 0 |


**Delivering Value from Smart Metering Data**

In the design of our systems, we considered the need to have access to data that will enable us to use the information that smart meters provide to benefit both customers and the wider business. We split the benefits into a number of categories and provided an estimate of the potential benefit that could be delivered for both the RIIO-ED1 and RIIO-ED2 periods.

In the development of our smart metering business processes and systems, consideration has been made to ensure that maximum benefit can be delivered from how we use data from smart meters. Our efforts throughout 2020/21 are detailed in Table 3.3c opposite.

## Table 3.3c – Progress on delivery of benefits from Smart Metering throughout 2020/21

| Category of Benefit | Work Undertaken |
|---|---|
| Avoided losses to network operators | • Implemented alerts and messaging to and from smart meters to utilise benefits from earlier notification of supply interruptions and the ability to check the supply at a customer's premise.<br>• Stage 2 of our data storage and analytics capability started. This will enable us to retrieve mass volumes of data. This will allow us to proactively invest in our network to avoid future interruptions<br>• Stage 2 of data storage and analytics will allow the retrieval and storage of consumption data which will be aggregated and processed in accordance with our Data Privacy Plan which has been approved by Ofgem. |
| Reduction in CML | • Implemented and integrated IT systems to ensure that power outage and power restore alerts are available for use in appropriate areas of the business. This will allow us to respond more quickly to outages and reduce duration of interruptions.<br>• Integrated our outage management system into our NDAG application so our Customer Contact Centres can receive and respond to power outage and power restore alerts from smart meters.<br>• Continued engagement and collaborative testing with the DCC regarding the future operation of power outage and power restore alerts and polyphase smart meters. |
| Reduction in operational costs to fix faults | • Implemented our NDAG application to ensure that:<br>  • We can check the energisation status of individual customers via their smart meter.<br>  • Power outage and power restore alerts are available for use in appropriate areas of the business. This will allow more accurate identification of the location of faults.<br>• Implemented the integration of our outage management system into our NDAG application to:<br>  • Enable the initiation of supply energisation status checks from relevant locations.<br>  • Receive power outage and power restore alerts from smart meters.<br>• Continued engagement with the DCC regarding the future operation of power outage and power restore alerts. |
| Reduction in calls to faults and emergencies lines | • Implemented our NDAG application to ensure that power outage and power restore alerts are available for use in appropriate areas of the business.<br>• Integrated our outage management system into our NDAG application so our Customer Contact Centres can receive and respond to power outage and power restore alerts from smart meters.<br>• Continued engagement and collaborative testing with the DCC regarding the future operation of power outage and power restore alerts. |

| Category of Benefit | Work Undertaken |
|---|---|
| Better informed investment decisions for electricity network enforcement | • Implemented our NDAG application to enable access to relevant functionality in smart meters including meter configuration and access to appropriate data.<br>• Developed and submitted our Data Privacy Plan to Ofgem for approval to enable access to consumption data, allowing better understanding of utilisation of our network.<br>• Stage one of our data storage and analytics capability to maximise use of data made available by smart meters has been implemented. Stage two will look to deliver the full productionised capability to retrieve mass volumes of smart meter data as the penetration of smart meters increase. |
| Avoided cost of investigation of customer complaints about voltage quality of supply | • Implemented our NDAG application to ensure that voltage related alerts are available for use in appropriate areas of the business.<br>• Implemented integration of our outage management system into our NDAG application to:<br>  • Receive voltage related alerts from smart meters.<br>  • Enable users to request further information from smart meters regarding recorded voltage measurements.<br>• Continued engagement with the DCC regarding the future operation and accuracy of voltage data. At the present time inaccuracies mean the current voltage data cannot be relied upon. |
| Network capacity investment savings from electricity demand shift | • Developing a means to influence suppliers regarding how customer load is controlled. |

**More details on Smart Metering can be found in worksheet E5 – Smart Metering linked to the Appendix of this report.**

**Looking Forward to 2021/2022**

In order to enable delivery of the smart meter related benefits we will continue to:

- Collaborate with the DCC, Communication Service Providers (CSP's) and Smart Energy Code Administrator and Secretariat (SECAS) on key issues impacting power outage and restore alert performance and inconsistent behaviour in smart meters.
- Collaborate with the DCC, ENA and other Distribution Network Operators to identify and resolve functionality and data quality issues with smart meter data through ongoing forums, collaborative testing and projects led by the DCC.
- Monitor and progress our detailed plan on benefit realisation and continue to gain learning from the data we receive from smart meters now and as the roll-out progresses.
- Support the ongoing work associated with the management and replacement of RTS meters and SMETS2.
- Continue working on system implementation into next year, which will see the delivery of functionality for the mass data gathering from smart meters and data analytics.
- Support our vendor in the re-platforming of our key smart meter system to ensure our core infrastructure remains secure, compliant, and fit for the future.

# 4. Conclusion

We continuously review our environmental commitments and look for opportunities to reduce our impact on the environment and deliver the environmental expectations of our stakeholders efficiently.

The progress reported for the sixth year of RIIO-ED1 provides a clear message to our stakeholders that we have a clear programme to deliver environmental benefits and are aware of our responsibilities to our surroundings and our customers. We have made further progress in the last year and will continue to look to the future and pursue solutions that deliver enduring benefits.

# 5. Contact us

For any queries or to request further information, please contact us on:


**Email:** futurenetworks@sse.com
**Phone:** 0345 300 2315
**Website:** https://www.ssen.co.uk
**LinkedIn:** https://www.linkedin.com/groups/8249399
**Twitter:** https://twitter.com/SSEN_FN


# 6. Appendix

| Additional Data | Location |
|---|---|
| Environment Report 2019/20 | https://www.ssen.co.uk/DistributionPriceControlReview/ |
| Environment and Innovation Regulatory Reporting Packs 2020/21 E1-E8 worksheets | |
| Environment and Innovation 2020/21 E4 & E6 CBAs | |
| Environment and Innovation Commentary 2020/21 | |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# 7. Glossary

### Business Carbon Footprint (BCF)
A measure of the total Greenhouse Gas Emissions (in tonnes of $CO_2$ equivalent) resulting from operations on which the DNO has full authority to introduce and implement its operating policy and contractors' emissions.

### Common Distribution Charging Methodology
Used to calculate charges to users who are connected to the LV and HV levels of the network. More details can be located here: **https://www.ssen.co.uk/WorkArea/DownloadAsset.aspx?id=12241**

### Demand Side Response
Demand side response is a scheme where customers are incentivised financially to lower or shift their electricity use at peak times. This helps manage load and voltage profiles on the electricity network.

### Designated Area
Areas in which Visual Amenity Projects may be undertaken, according to the relevant definitions in CRC 3J (Allowed expenditure on Visual Amenity Projects).

### Distributed Generation (DG)
Plant or equipment for the production of electricity that is directly connected to the Distribution Network.

### Distribution Losses
Units lost while being transported through the licensee's Distribution System, either as electricity turns to heat as it is transported through the network or non-technical losses, such as theft or measurement errors.

### Distribution Losses Strategy
The DNO's strategy for designing, building, and operating its Distribution System in a manner that can reasonably be expected to ensure that Distribution Losses are as low as reasonably practicable.

### Environment Report
Standard Licence Condition 47 (Environment Reporting) sets out requirements for the licensee to publish an annual Environment Report about activities that it has undertaken in relation to environmental matters.

### Fluid Filled Cables
Pressurised fluid-filled underground cables, high voltage cables in which the insulting medium is liquid oil as opposed to a solid insulator such as oil impregnated paper or PVC.

### Fluid Recovered
Fluid associated with pressurised fluid-filled underground cables that has leaked from a cable and is subsequently recovered and includes:

- Fluid captured in a container whilst jointing works are being undertaken
- Spoil removed from site because it has become saturated with fluid during a cable leak.

In order to avoid double counting, the volume of fluid used to top up a cable to prevent pressure reaching the Pressure emergency (PE) level prior to jointing or repair should be excluded.

### Fluid Used to Top Up Cables
Fluid pumped into pressurised fluid-filled underground cables and includes fluid used to:

- Bring a circuit back up to pressure from a lower pressure level
- Sustain a circuit fluid pressure from reaching Pressure emergency level prior to jointing or repair of a leak.

### Greenhouse Gas Emission
The release of greenhouse gases into the atmosphere, including carbon emissions. Within the BCF, greenhouse gas emissions, e.g. $SF_6$, are calculated as equivalent carbon dioxide emissions.

### Innovative Solution
- Has been trialled by any DNO as part of an LCNF, NIC, NIA, or IFI innovation project during DPCR5 or RIIO-ED1.
- Was considered a smart solution as part of the RIIO-ED1 smart solutions assessment.
- Involves the application of technology, systems or processes not in widespread use at the beginning of RIIO-ED1 to provide long-term direct benefits to distribution network customers through:
    - Improving the utilisation or provision of network capacity for demand or generation (including demand side solutions),
    - Improving the management of asset condition to reduce lifetime costs,
    - Increasing the DNO's ability to manage network performance, safety or security, or
    - Improving the level of service provided to network customers.

Direct benefits can include improvements in economic performance, environmental benefits, safety, quality of service, reliability, and/or resilience.

### IFI
This acronym stands for Innovation Funding Incentive. This was the funding mechanism that existed for small scale innovation projects pre RIIO-ED1. It has now been replaced with the Network Innovation Allowance (NIA).

### Innovation Strategy
A document published by the DNO that complies with the requirements set out in the Strategy Decision for RIIO-ED1. This requires the licensee to have in place and maintain an Innovation Strategy for demonstrating the role of innovation within the Electricity Distribution Group of which it is a part.

### Low Carbon Technologies (LCTs)
LCTs is the collective term for technologies that are being introduced to the market with the aim of reducing carbon emissions through the more efficient use of energy, the storage of energy in a flexible way or a move from another energy vector such as oil to electricity. Examples include:

- Heat Pumps
- Electric Vehicles
- Domestic Batteries

### Noise Pollution
The activity of investigating reports of noise pollution, and consequential remedial works (if necessary). In this context, noise pollution is defined as levels of noise associated with the normal operational characteristics of electrical distribution assets that may be deemed to be a nuisance and subject to Part III of the Environmental Protection Act 1990 (EPA).

### Non-Technical Losses
Electricity units lost for non-physical reasons, including theft and measurement inaccuracy.

### Oil Leakage
The discharging of insulating oil into the environment because of DNO's equipment and activities.

### Network Innovation Allowance (NIA)
A set allowance per network licensee:

- To fund smaller technical, commercial, or operational projects directly related to the licensee's network that have the potential to deliver financial benefits, and/or
- to fund the preparation of submissions to the Network Innovation Competition (NIC).

### Regulatory Instructions and Guidance (RIGs)
The term RIGs refer to a collection of documents issued by Ofgem to the DNOs to enable them to complete the reporting requirements associated with the RIIO-ED1 price control arrangements. It includes excel reporting packs, instructions and guidance, commentaries and the glossary.

### RIIO-ED1 Business Plan
For SHEPD and SEPD, the document submitted to the Authority and published by the licensee in March 2014 in response to the document entitled "Assessment of RIIO-ED1 business plans and fast-tracking" published on 22 November 2013. This business plan covered the period 1st April 2015 to 31st March 2023.

### RIIO-ED1 CBA Tool
The CBA tool DNOs used when completing their RIIO-ED1 Business Plans.

### SSEH
This stands for Scottish & Southern Energy Hydro. It is the acronym provided to our Scottish network.

### SSES
This stands for Scottish & Southern Energy South. It is the acronym provided to our Southern network.

### $SF_6$
The chemical symbol for Sulphur hexafluoride, a gas that is used as both an insulating and arc extinction medium in electrical plant. The reporting requirement is in respect of fugitive BCF emissions attributed to $SF_6$ lost from electrical plant.

### $SF_6$ Bank
The total mass (in kg) of sulphur hexafluoride held by the DNO for both assets installed on the network and those held in inventory. Each DNO's $SF_6$ bank should be calculated according to the methods set out in ENA Engineering Recommendation S38.

### $SF_6$ Emitted
The total mass (in kg) of sulphur hexafluoride emitted during asset installation (only if gassed by the DNO), service life and decommissioning. Service life emissions include those due to leakage (measured through top-ups); those measured during service activity requiring gassing and degassing; and those due to equipment failure resulting in the loss of all gas contained by the asset. The $SF_6$ emitted value should account for gas recovered. Each DNO's $SF_6$ emitted should be calculated according to the methods set out in ENA Engineering Recommendation S38. DNOs should not assume a percentage leakage rate to determine any element of $SF_6$ emitted and if a DNO does not have measured records of $SF_6$ emitted, this should be highlighted in the accompanying commentary.

### Smart Meter
An Energy Meter that can both send and receive information using an External Electronic Communications Network.

### Tagging
Tagging is the process where the worst performing cables are targeted and injected with radioactive isotopes, which helps to identify leaks, monitor the cables and track their performance over time.

### $tCO_2e$
Carbon dioxide ($CO_2$) equivalent, measured in tonnes. This is a measure for describing how much global warming a given type and amount of greenhouse gas may cause, using the functionally equivalent amount or concentration of carbon dioxide ($CO_2$) as the reference.

### Technical Losses
Electricity units lost owing to the physical properties of the network. This also includes the way the network is configured and operated.

### Visual Amenity Inside Designated Areas
Activity undertaken as part of a Visual Amenity Project funded under the Visual Amenity Allowance funding mechanism described in CRC 3J (Allowed expenditure on Visual Amenity Projects) of the electricity distribution licence which relates to overhead distribution assets located within a Designated Area.

### Visual Amenity Outside Designated Areas
Activity undertaken as part of a Visual Amenity Project funded under the Visual Amenity Allowance funding mechanism described in CRC 3J (Allowed expenditure on Visual Amenity Projects) of the electricity distribution licence which relates to overhead distribution assets which form part of an overhead line which spans the boundary of a Designated Area and is located outside the boundaries of the DNO's Designated Area, for which up to 10% of the Visual Amenity Allowance funding mechanism described in CRC 3J (Allowed expenditure on Visual Amenity Projects) of the electricity distribution licence may be used.

## CONTACT US

Media enquiries should be directed to SSE's Press Office on

**+44 (0)345 0760 530**

Investor enquiries should be emailed to

**ir@sse.com**

Scottish & Southern Electricity Networks