



## Summary

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Our objective is to reduce our impact on the environment and deliver the environmental expectations of our stakeholders.

To attain this goal, we have defined five areas of focus for the period 1 April 2015 to 31 March 2023 (the RIIO-ED1 period):

### **Business activities**

By the end of the RIIO-ED1 period we will:

- Reduce the energy consumption in our buildings by 15%.
- Undertake no more than 0.5 business flights per employee per year.
- Reduce the average mileage of SSEPD cars by 10%.
- Reduce rate of leakage of installed SF6 by 15%.

Our progress against these targets will be tracked and reported annually in SSEPD Environmental Impact Report.

### **Oil, including fluid-filled cables**

By the end of the RIIO-ED1 period we will:

- We will replace 76 kilometres of fluid-filled cable and “tag” our 25 worst performing circuits on an annual basis during the RIIO-ED1 period resulting in minimum 15% reduction in oil leakage.

### **Electrical losses**

By the end of the RIIO-ED1 period we will:

- Continue with our successful programme of replacing current equipment with lower loss equipment on an end-of-life basis, and with optimal configuration of the network;

- Continue with our programme of implementing a range of technologies designed to reduce losses as part of our normal business processes on the lower voltage networks (11kV and below). Use innovation to increase the range of technologies available for standard implementation;
- Better understand the energy use of our customers and work with customer to reduce their overall energy use, especially at peak times, taking advantage of smart metering as part of this process;
- 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); and
- Fully utilise the data we control to address omissions, under reporting and abuses.

### Visual amenity

By the end of the RIIO-ED1 period we will:

- Work with stakeholders to underground 90km of overhead line in Areas of Outstanding Natural Beauty, National Parks and National Scenic Areas.

**Commitment 2 – We will work with communities to reduce the visual impact of up to 90 kilometres of overhead lines in National Parks, Areas of Outstanding Natural Beauty and National Scenic Areas.**

### Standby generation on Scottish Islands.

Throughout the RIIO-ED1 period we will:

- Continue to provide standby generation on the Scottish Islands.

All of these areas of focus will help us to meet our objective of reducing our impact on the environment and delivering the environmental expectations of our stakeholders.

## Summary of our plans...

Our **objective** is... to reduce our impact on the environment and deliver the environmental expectations of our stakeholders.

During the RIIO-ED1 period our **targets** are:

Business activities	<p>Reduce the energy consumption in our buildings by 15%.</p> <p>Undertake no more than 0.5 business flights per employee per year.</p> <p>Reduce the average mileage of SSEPD cars by 10%.</p> <p>Reduce zero landfill from offices and depots.</p>
Oil, including fluid-filled cables	<p>Replace 76 kilometres of fluid-filled cable, and tag the 25 worst performing circuits on an annual basis, resulting in 15% reduction in fluid leakage.</p>
Electrical losses	<p>Continue replacing current equipment with lower loss equipment.</p> <p>Continue implementing a range of technologies designed to reduce losses.</p> <p>Better understand the energy use of our customers and work with customer to reduce their overall energy use.</p> <p>Use new sources of data to create better models that allow us to analyse and track losses, and target loss reduction.</p> <p>Work with Electricity Supply Licensees to detect and prevent fraudulent energy use (theft).</p> <p>Fully utilise the data we control to address omissions, under reporting and abuses.</p>
Visual amenity	<p>Work with stakeholders to underground 90km of overhead line in Areas of Outstanding Natural Beauty, National Parks and National Scenic Areas.</p>
Standby generation on Scottish Islands	<p>Continue to provide standby generation to Scottish Islands.</p>

## Regulatory policy

In March 2013, Ofgem published its [strategy decision](#) for the RIIO-ED1 period. The decision includes:

- A new reputational reporting requirement on broad environmental impact encompassing business carbon footprint, noise, waste and water.
- To introduce a new licence requirement to reduce electrical losses.
- Continuation of the current non-mandatory scheme to put underground overhead lines in designated areas.

Ofgem expects all electricity distribution network licensees to reduce their business environmental impact and contribute to meeting GB's environmental goals.

The proposals described in this paper are aligned with the regulatory policy, without exception.

An explanation of how our proposals meet regulatory policy requirements is provided in the Appendix - Regulatory policy.

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## Introduction

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*Our decisions and actions are ethical, responsible and balanced, helping to achieve environmental, social and economic well-being for current and future generations.*

Distributing electricity to our customers' homes and businesses unavoidably results in an environmental cost.

We produce greenhouse gases such as carbon dioxide from our power stations, buildings and vehicles, and some of our assets contain substances, such as sulphur hexafluoride (SF<sub>6</sub>) and oil, that have the potential to cause environmental damage. Electrical losses, which are losses of electricity from the network caused by conversion of electricity to heat, theft of electricity, or measurement errors, also form a significant part of our environmental impact.

Also, some people feel that our equipment, particularly overhead lines, can have a detrimental impact on the visual amenity of the surrounding landscape.

### How we manage our impact on the environment

SSEPD is a company that is built to last, and we realise the importance of conducting our business in a sustainable manner. As part of the SSE Group our defined core purpose is “to provide the energy people need in a reliable and sustainable way”. Sustainability is one of our six core values (alongside safety, excellence, service, efficiency and teamwork; see our [About electricity distribution networks: now and in the future paper](#)), and environmental wellbeing is an essential element of our activities.

We keep our values close to our day-to-day operations, and make sure that the values match the way we do things. Our sustainability value was last reviewed in April 2013 through consultation with SSE staff. The revision takes a ‘triple bottom line’ approach which balances environmental, social and economic factors, and developments in the field of sustainability, states that “Our

decisions and actions are ethical, responsible and balanced, helping to achieve environmental, social and economic wellbeing for current and future generations”.

The SSE Group prioritises the sustainable management of our environment impact at Board level. SSE employs a Group Safety, Health and Environment (SHE) Manager who is responsible for establishing, implementing and maintaining the SSE Group SHE Policy, which is formally adopted by the SSE plc Board. This policy sets out SSE’s intentions and principles in relation to its overall SHE performance and provides a framework for action. For further information, you can read our paper entitled [Be Safe](#).

The Group SHE Manager uses the Safety Management Standard (SMS) to implement the policy, providing standards, systems and procedures for every area of SSE’s operations for guidance of and use by all staff, including those defining how to minimise and manage the environmental impact of our operations. The heads of each business, including SSEPD, are in turn responsible for ensuring the rollout of and engagement with the content of the policy among their staff, contractors and, as appropriate, wider stakeholders.

How we carry out our business on an individual level is also underpinned by our **Safety Family** programme, which seeks to influence behaviour at the levels of ‘Manager’, ‘Supervisor’ and ‘Everyone’. The four sets of behaviours that the Safety Family is built on – Standards, Communication, Risk Management and Involvement – are the key elements of a robust safety and environmentally-aware culture and have a strong impact on our attitude towards and practice in relation to the environment.

In addition to being good practice for an ethical company, managing our environmental impact makes good business sense. We are able to save money on energy, water and waste disposal, and on office and operational supplies. Our working environments are likely to be healthier and safer, and we are more likely to be able to attract and retain like-minded people.

We manage our environmental impact by:

- Promoting our core value of sustainability.

For example, we ensure staff are aware of the energy they use and encourage them to actively reduce this through our campaigns such as

- ‘War on Watts’, which rewards reduction of CO<sub>2</sub> resulting from energy consumption across different sites on a league table basis;

- green commuting initiatives including Cycle2Work, car-sharing, addition of electric vehicles (and charging points) to our fleet, and annual no-fly months, when flying is prohibited; and
- achieving Carbon Emissions Management And Reduction Scheme (CEMARS) certification with Achilles, following an audit which encompassed all of SSE's operations.

- Looking after our assets.

In particular, ensuring that they are maintained, refurbished and replaced as required, which has allowed us to mitigate our environmental impact. For example, through our asset replacement programme we have reduced the volume of oil leaked by 15% since 2010.

- Acting in an environmentally conscious way and finding innovative responses to our problems.

Encompassing all of things we do from ensuring that items of plant due for removal are replaced with lower loss equipment, to how we recycle waste. In considering innovative solutions, our screening criteria include the assertion that any idea should “maintain and improve safety, health and environmental performance”. Our [Innovation](#) for the RIIO-ED1 period will help us reduce our environmental impact in a safe way (**Figure 1**).

- Seeking and then acting on the views of our customers.

Our customers’ views on the environment and the actions they expect us to take to manage our impact on the environment change by location and through time. Our approach is to work with our customers to understand their concerns and take actions where we can. For example, building on customers’ views to prioritise which overhead lines to underground for visual amenity purposes, and allowing our [customers’ environmental priorities](#) to shape our annual Environmental Impact Report.

**Figure 1 Excerpt of Innovation Top 20 for the RIIO-ED1 period**

Selection of 'Top 20' Innovations	Impact
Demand-side response - automatic commercial DSR	Reducing peak demand in order to defer or avoid network reinforcement.
Demand-side management - thermal energy storage (domestic and commercial)	Active management of demand in order to create sources of controllable demand on our network.
Network operation - power flow control	Optimisation of power flow in LV circuits using various technologies (primarily power electronics-based), in order to create additional distributed generation connection capacity
Active network management - community demand management	Enable controllable community-level demand to be matched with controllable generator output in a given network zone.
Static synchronous compensators (STATCOMs)	Improve voltage stability, regulation and power flow management on our network, particularly in areas where new large-scale distributed generation is seeking to connect.
Active network management - generator constraint management	Provide automated real-time control of generators within controlled network areas, accelerating connection of large-scale renewable generation to the network while deferring or avoiding requirement for disruptive (and potentially carbon intensive) conventional network reinforcement.
Advanced distribution automation - network reconfiguration	Self-healing distribution automation system to reduce network restoration times, thereby reducing customer minutes lost (CMLs) and customer interruptions (CIs).
Bidirectional hybrid generation plant (HV connected)	<p>Mobile hybrid generator which combines containerised diesel generator and containerised battery unit. Intended to supply customers in remote locations or temporary situations, such as during maintenance work or storm disruption.</p> <p>Will give capability to supply load from battery during periods of low demand (quieter operation and reduction in local emissions);</p> <p>May enable embedded renewable generators to continue exporting electricity under network conditions that would otherwise have led to those generators being tripped; and</p> <p>Generator can charge battery as well as supplying load - as a result, generator load factor can be increased significantly. Generating same amount of energy (kWh) at higher load factor increases fuel efficiency of generator, reducing CO2 emissions from diesel consumption.</p>
Wood pole alternative	Anticipation of possible regulatory restriction or ban at the European level during RIIO-ED1 on use of creosote as a wood preservative, including its use in distribution wood poles – making business ready.
Real-time circuit thermal rating	Accelerating the connection of large-scale renewable generation to the distribution network, while deferring or avoiding the requirement for disruptive (and potentially carbon intensive) conventional network reinforcement.

SSEPD has an important role in facilitating wider government-mandated environmental targets, and has a detailed investment programme for network reinforcement which will facilitate the connection of distributed generation - largely renewable - across the SEPD and SHEPD areas. During the RIIO-ED1 period we will be investing £4 million and £25.49 million respectively in these areas. You can read more about our plans for connections in [Get connected](#).

### **What our customers think about how we should manage our environmental impact**

To a significant extent how we manage our environmental impact is driven by requirements to comply with legislation and thresholds set by statutory bodies. We have specific policies and practices, and nominated responsible individuals, to meet these requirements.

In addition to our statutory environmental regulators, we know there are a wide range of customers with interests in the environment, and to whom we can provide a high level of service as we carry out our operations in the environment. These include (but are not limited to):

- General public and customers,
- Environment Agency (EA),
- Scottish Environmental Protection Agency (SEPA),
- Scottish Natural Heritage (SNH),
- National Park Authorities,
- National Association for Areas of Outstanding Natural Beauty,
- Natural England,
- Historic Scotland,
- English Heritage, and
- Local community groups and environmental campaigners.

In this paper, as throughout our Business Plan, where we refer to customers we include all stakeholder groups.

During our focused programme of engagement between summer 2012 and March 2013, our customers gave us some key messages on managing our environmental impact.

The environment is extremely important to some of our stakeholders. As part of our street and telephone survey, carried out during June and July 2012, we asked how important the environment was to respondents. On a scale of 1-10 (where 1 was not at all important; and 10 was very important), the mean score given was 8.47. This was confirmed by responses to Our First Consultation with 93% of respondents agree that our Business Plan should focus on these priorities: a reliable supply of electricity; a safe supply of electricity; value for money; good customer service; and that our activities are not carried out at the expense of the environment (7% disagree).

During Our Second Consultation, most stakeholders commented positively about our proposals to measure and reduce our business environmental footprint including: *“Reducing the environmental footprint of your key infrastructure and activities makes good business sense, and it will also benefit your customers and stakeholders, and generally help raise awareness of this issue”*.

Stakeholder views around what aspect of the environment should be considered differed. Participants at our Focus Groups on the environment identified a range of approaches including the need to think about the environment as an eco-system where everything is linked *“Conservation should stand alone [as a criterion]... natural value of an area... biodiversity... affects on eco systems... eco-services ...view everything together... ecosystems are interdependent... they produce our air... if you change the hydrology of an area, you change the site... conservation should take top priority”*.

When we asked if we should be incentivised to be greener, one respondent picked up on the environmental footprint of our business: *“Great idea... but what would they [SSEPD] have to do to become ‘greener’... would need to know the caveats... the landscape is important, but it’s not just about undergrounding and it’s not just about one [type of] area... need to consider other things... [for example] transport [how goods transported etc., use of company vehicles]”* - encompassing how SSEPD, as a whole, works logistically.

Another identified the need to consider the biodiversity or amenity value of landscape when considering areas for undergrounding: *“Designated sites are funny things... any area, or SSI, can be ‘designated’ for [specific feature] lichens, birds... but often it is the sites adjacent [to the ‘designated’ sites that are of greater environmental importance ...”*. It was suggested that these areas also be considered: *“It should not just be based on lines on a map”* i.e. exclusively the

'designated' area. With another participant saying: *"The area may not have a special designation but may be important to a specific population" (e.g. access to the environment)*".

All of the environmental Focus Group respondents thought we should eliminate all oil and SF6 leaks. The facilitator noted that participants were in agreement that the *"... application of the "precautionary principle"<sup>1</sup>, suggested that eliminate all leaks was a prudent approach"*.

The majority of respondents (92%) to Our Second Consultation supported our community-led approach to address concerns around visual amenity (8% didn't). Two customers commented:

*"the stakeholder-led approach to address concerns around visual amenity and applauds SSEPD's ambitions to be the industry leader in this area. As demonstrated by the supporting example, stakeholder engagement should specifically include liaison with environmental specialists and protected landscapes partners to ensure that the allocation of funds for projects will achieve the best outcomes for landscape, biodiversity and communities."*

*"... SSE[PD]'s stakeholder led approach to addressing concerns around visual amenity is proportionate and appropriate ..."*

Commenting on the content of our Environmental Impact Report at our Deliberative Stakeholder Events in March 2013, one respondent said: *"Transparency of information and progress is key to providing customers with reassurance. They want to know that they pay a sustainable and ethical provider when it comes to the environment"*. Another said: *"It's really a good thing, but reporting needs to be exacting so it can be used for business performance, environmental factors alone are not enough, if it's for sustainability its' got to be made into a business benefit"*. A third commented: *"Have a broader approach to your Carbon Footprint, putting all this [slide] information in the return is fine but think outside the box too. Include all the other activities undertaken by SSEPD which have an effect on the environment"*.

Stakeholders also expressed interest, to a lesser extent, in contaminated land clean-up, noise pollution, tree cutting and flood mitigation.

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<sup>1</sup> The precautionary principle is used in policy development and enables rapid response in the face of a possible danger to human, animal or plant health, or to protect the environment. In particular, where scientific data do not permit a complete evaluation of the risk, recourse to this principle may, for example, be used to stop distribution or order withdrawal from the market of products likely to be hazardous. (reference: [http://europa.eu/legislation\\_summaries/consumers/consumer\\_safety/l32042\\_en.htm](http://europa.eu/legislation_summaries/consumers/consumer_safety/l32042_en.htm))



Overall stakeholders believe that SSEPD has a role to play in preserving and protecting both the environment we work in, and the environment more generally. Whilst some stakeholders raised concerns about the potential costs of different initiatives the overwhelming weight of opinion was that our environmental proposals should be pursued.

### **Understanding and acting on our customers' views during the RIIO-ED1 period**

We have reflected on the views of our customers and the priority they have placed on certain issues in the creation of the targets set out in the following sections.

In order to achieve our goal of being more responsive to customers' views on appropriate management of our environmental impact, we will need to achieve a high level of regular engagement and level of service with our stakeholders on an ongoing basis. For example, we will require their active participation in determining the best options for our undergrounding programme and their support in driving these innovative projects forward. You can read more about how we engaged with our stakeholders in [What you said](#).

In order to demonstrate our commitment to continual improvement in managing our environmental impact, we will publish an annual Environmental Impact Report which will be available online to all stakeholders. The first report will cover the year 2014/15, and be published in summer 2015.

This report will set out our progress against the targets set out in this document, will discuss other environmental issues of importance to our stakeholders, and will describe some of the activities we have undertaken during the year. In particular, we will explain how our actions have delivered the service our customers expect, where we have been innovative, and how we have maintained a focus on efficiency and delivering value. It will also detail how we have responded to customers' views and how our strategy has evolved as a consequence.

## Impact 1

### Business Activities

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*Our plans reduce the environmental impact of our business activities during the RIIO-ED1 period, including a 15% reduction in business miles and a 15% reduction in SF<sub>6</sub> leakage rates.*

The environmental impact of SSEPD's business activities comprises six main areas:

- Buildings energy usage (electricity usage and fuel combustion in our buildings, including substations);
- Operational transport (transportation used in day to day operation of the business);
- Business transport (that undertaken by staff travelling to locations other than their normal place of work, or moving between sites for purposes such as meetings);
- Fugitive emissions (greenhouse gas emissions );
- Fuel combustion (mobile plants and stand-by diesel mobile generators); and
- Electricity losses.

Collectively these are our Business Carbon Footprint (BCF), which is measured in terms of associated greenhouse gas emissions. BCF is a measure of the carbon dioxide (CO<sub>2</sub>) emissions produced by in a year (**Figure 2**).

By far the largest contributor to SSEPD emissions is electrical losses, accounting for around 50% of SHEPD's, and around 72% of SEPD's BCFs. Given the magnitude of this, we consider the impact of electrical losses, and what we can do to manage their environmental impact separately.

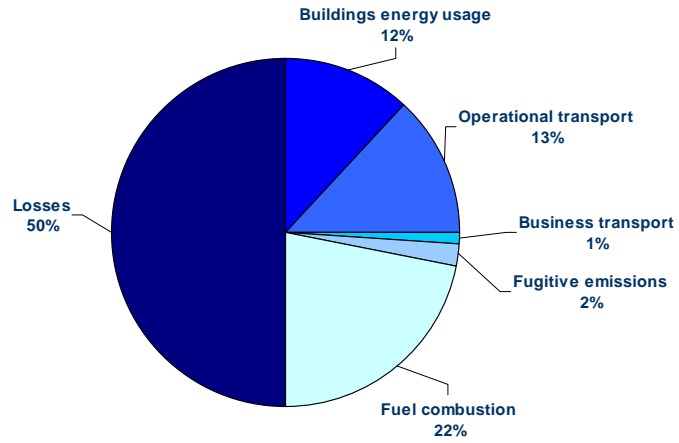
The significant difference in the proportions of fuel combustion in SHEPD and SEPD is due to SHEPD's geography, climate and differences in the network: SHEPD has a number of fixed diesel

stations (SEPD has none), and also uses mobile generators more often and for longer periods, the environmental impact of which has a significant impact on its BCF.

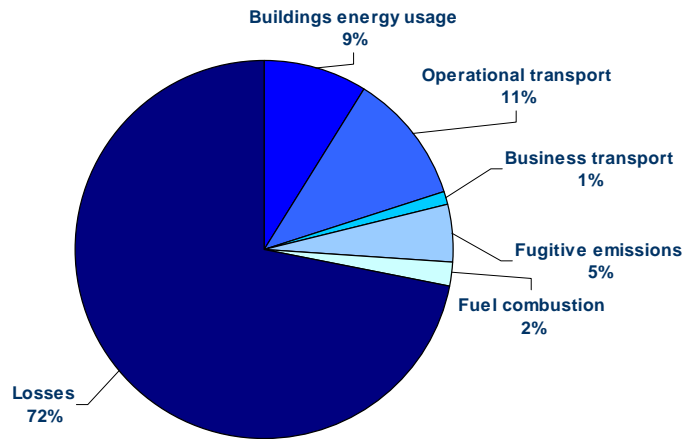
This section is about the environmental impact of our day-to-day business activities and our plans to manage these environmental impacts during the RIIO-ED1 period. Our target is to reduce the Business Carbon Footprint of our business activities by 15% during the RIIO-ED1 period, on a like-for-like basis and excluding exceptional events.

**Figure 2 Components of BCF 2011/12**

### Business Carbon Footprint - SHEPD



### Business Carbon Footprint - SEPD



## Our obligations

SSEPD must adhere to EU, UK and Scottish environmental legislation. The most significant of these is the greenhouse gases (GHG) legislation<sup>2</sup> produced in response to the Kyoto Protocol, first put into force in 2004 and extended in 2012 to the year 2020. The greenhouse gases produced in SSEPD's activities are monitored and reported as its BCF.

Resulting EU targets from the Kyoto Protocol and its subsequent extension currently stand at a reduction target of at least a 20% reduction in GHG emissions below 1990 levels by 2020. When broken down to a country by country basis within the EU, the reduction target for the UK stands at 34% below 1990 levels by the year 2020.

The main enforcement schemes in place to achieve these targets are, in the case of the UK, split into three categories:

- The EU Emissions Trading Scheme<sup>3</sup> (EU ETS) whereby power generation and energy intensive industries are incentivised to reduce GHG emissions through cost pressures associated with buying EU ETS permits;
- The Climate Change Levy (CCL)<sup>4</sup> and Climate Change Agreements (CCA)<sup>5</sup>, a combination of taxes on fuels used by business consumers, and exemptions from this tax, provided that prescribed efficiency targets are met; and
- The Carbon Reduction Commitment (CRC), a levy imposed on the energy use of buildings of private and public institutions not covered by the other GHG related legislation.

Of the schemes listed above, the legislation that directly applies to SSEPD includes the CRC, which charges for the GHG emissions produced as a result of energy consumption in our buildings.

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<sup>2</sup> The Greenhouse Gas Emissions Trading Scheme Regulations 2012:  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/42946/5219-si-greenhouse-gas-emissions-trading-regs.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42946/5219-si-greenhouse-gas-emissions-trading-regs.pdf)

<sup>3</sup> EU Emissions Trading Scheme: [http://ec.europa.eu/clima/policies/ets/index\\_en.htm](http://ec.europa.eu/clima/policies/ets/index_en.htm)

<sup>4</sup> Climate Change Levy: <http://www.hmrc.gov.uk/climate-change-levy/index.htm>

<sup>5</sup> Climate Change Agreements: <https://www.gov.uk/government/policies/reducing-demand-for-energy-from-industry-businesses-and-the-public-sector--2/supporting-pages/climate-change-agreements-ccas>

SSEPD, as part of the SSE Group, must produce an annual audited report on carbon emissions under the CRC. This report can be viewed within the SSE Annual Report and is available online<sup>6</sup>.

European legislation affects our vehicle fleet. As of 2009, EU legislation was put in place to set mandatory limits on the CO<sub>2</sub> emissions of the fleets of new cars and vans being manufactured, with limits being set at 130g/km for cars by 2015, and 175g/km for vans by 2017. This drive to improve the energy efficiency of vehicles available on the market directly impacts the emissions from our vehicle fleet in the future as older vehicles are replaced with more fuel efficient alternatives.

Other legislation that impacts on the BCF is the EU Fluorinated Gas Regulations, which sets out our obligations in respect of sulphur hexafluoride (SF<sub>6</sub>). SF<sub>6</sub> is an extremely effective and efficient electrical insulator (we use it in circuit breakers, switchgear and other electrical equipment) and has significant advantages over alternative materials. It is non-flammable, a critical safety requirement in the high-voltage applications for which we use it, and because of its effectiveness it takes up less volume than an equivalent insulating volume of an oil alternative, making it very efficient. However, it is also a greenhouse gas, and one tonne is equivalent to approximately 23,900 tonnes of carbon dioxide. These Regulations<sup>7</sup> set down the rules for appropriate handling, transport, and recovery of SF<sub>6</sub> in a way that minimises its release.

In June 2013, the Environment Committee of the European Union adopted a report which directs a 2018 assessment of whether effective, reliable alternatives to SF<sub>6</sub> exist in order to allow for its replacement at reasonable cost in new medium-voltage switchgear. The report also allows for the European Commission to take a decision, post-2018, on whether a ban on SF<sub>6</sub> should be implemented.

Other important areas of environmental impact are noise, water and waste. No specific external legislative or regulatory requirements or monitoring currently govern our management as a network business of these issues; however, we comply with broader legislative requirements recognising our responsibility to minimise and, where possible, reduce noise, water usage and waste to landfill.

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<sup>6</sup> SSE plc Annual Report:  
[http://www.sse.com/uploadedFiles/Controls/Lists/Reports\\_and\\_Results/SSEplcAnnualReport2013.pdf](http://www.sse.com/uploadedFiles/Controls/Lists/Reports_and_Results/SSEplcAnnualReport2013.pdf).

<sup>7</sup> European legislation on SF<sub>6</sub>: [http://ec.europa.eu/clima/policies/f-gas/index\\_en.htm](http://ec.europa.eu/clima/policies/f-gas/index_en.htm)

SSEPD is following the SSE Group targets relating to reducing water consumption, which is to ensure that SSE's Water Standard is achieved at 95% of Group sites (fitting low flush toilets, low consumption tap fittings, water-saving urinal systems, low consumption shower heads, rain water harvesting equipment, and recording monthly water readings), and that zero waste is sent to landfill by 2016.

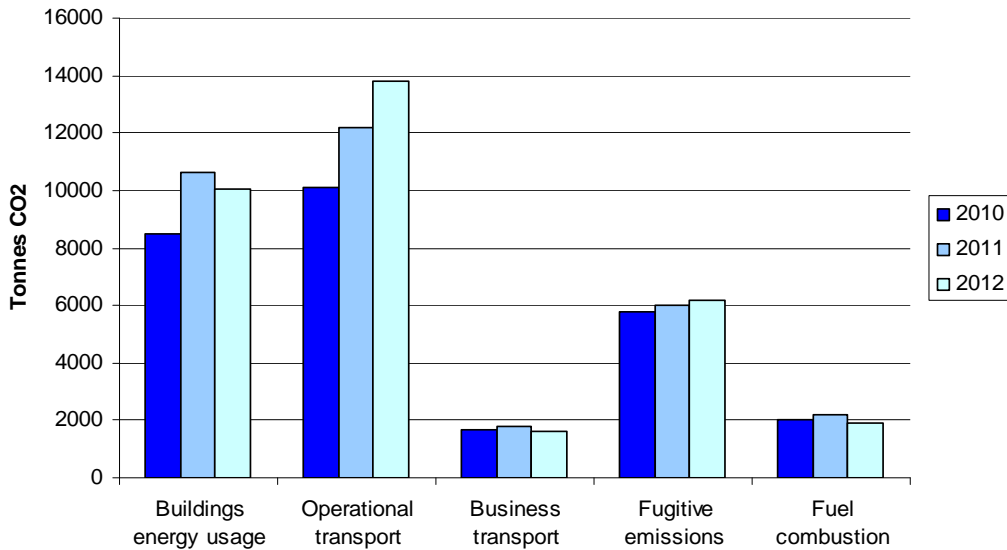
Noise is unwanted sound and when it reaches certain levels and intensities can become annoying, leading to stress and possible physical and psychological health problems. Noise nuisance is the adverse impact on a person's ability to enjoy their amenity, either within or outside their residence because of the unwanted noise. Noise nuisance is governed in England by The Clean Neighbourhoods and Environment Act 2005 and in Scotland by The Environmental Protection Act 1990, both of which require SSEPD to mitigate any noise emitted from our assets exceeding statutory levels. For example, where appropriate we would replace an old, noisy transformer with a new, quieter one.

### **Historical approach and performance**

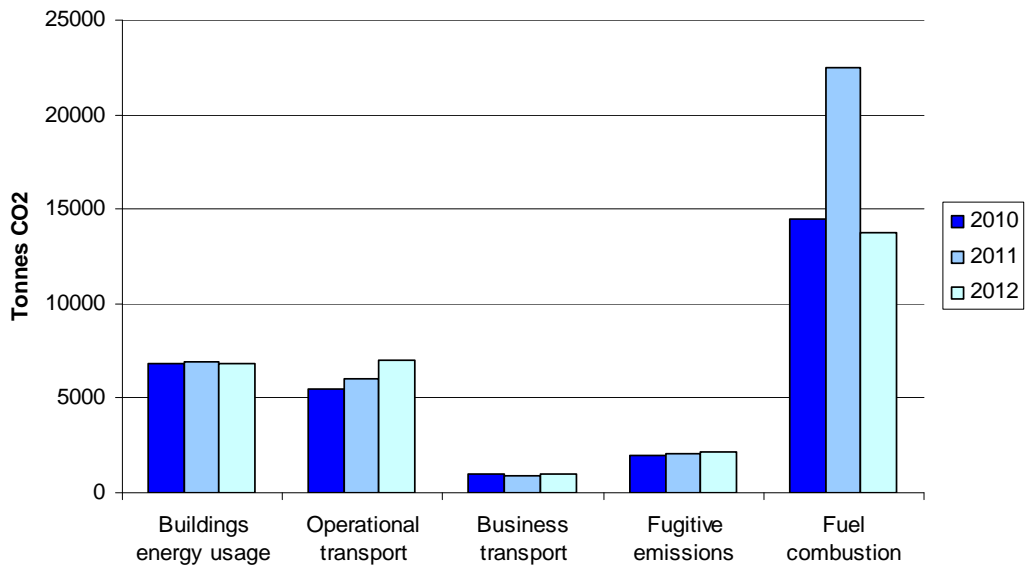
We have collected comparable information on our Business Carbon Footprint since 2009/10 (**Figure 3**).

#### **Figure 3 Historical BCF (excluding losses)**

**Historical BCF Performance - SEPD**



**Historical BCF Performance - SHEPD**



Historical emissions have been largely consistent in buildings energy use, business transport and fugitive emissions.



Year-on-year variation in fuel combustion is largely due to the operation of a number of small, diesel-powered generators in our SHEPD area. These are used to provide a supply of electricity to customers in some of our more remote locations. When we experience an extreme weather event, we sometimes cannot safely get electricity to these customers through our network and instead we use these generators as a temporary measure to 'keep the lights on'. To a large extent this variable is out of our control, and will increase or decrease in relation to extreme weather events and network disruption. This is clearly evidenced in 2011 when severe weather events in the SHEPD area resulted in the increased utilisation of our fixed diesel stations and resultant increases in fuel combustion can be clearly seen.

### Drivers for change

The primary driver of our environmental activities is our core value: Our decisions and actions are ethical, responsible and balanced, helping to achieve environmental, social and economic well-being for current and future generations. This value means that we take the environmental consequences of our actions into account before doing something, and will seek to minimise our impact on the environment wherever possible. We view legislative requirements as a minimum standard, and will seek to go beyond these when we can.

However, we recognise customers' concerns that environmental costs must be balanced with the societal cost of rising electricity bills. During our Street and Telephone Survey, carried out during June and July 2012, 47% of respondents said that we should put more effort into reducing the overall environmental impact of operating our electricity networks. Efficiently reducing our carbon footprint was one of the ways they thought we could do this. In Our Second Consultation our stakeholders made positive comments around our proposals to measure and reduce our business environmental footprint where it was efficient to do so: *"Reducing the environmental footprint of your key infrastructure and activities makes good business sense, and it will also benefit your customers and stakeholders, and generally help raise awareness of this issue"*.

## Our plans for the RIIO-ED1 period

Efficiently managing our carbon footprint is a long term process and not a short term goal. This is inherent in our core value of operating efficiently and safely to achieve growth while making decisions and taking actions that are ethical, responsible and balanced, helping to achieve environmental, social and economic wellbeing for current and future generations safeguarding the environment and protecting our customers.

To this end, and based on implementing the actions described in this paper, we have set specific long term targets for the business (**Figure 5**), and our performance against these targets is a measure of our overall annual performance.

By the end of the RIIO-ED1 period we will:

- Reduce the energy consumption in our buildings by 15%.
- Undertake no more than 0.5 business flights per employee per year.
- Reduce the average mileage of SSEPD cars by 10%.
- Reduce rate of leakage of installed SF<sub>6</sub> by 15%.

## Delivering on our Commitments

Feedback from our stakeholders has told us that they expect us to find new, innovative ways to manage our impact on the environment and reduce our impact where it is cost effective to do so. We do not underestimate the task of achieving the goals we have set ourselves and in considering options to improve the management of the environmental impact of our business activities, we have been conscious of the need to balance cost and benefit.

There are several methods which we are considering to reduce our BCF. These include:

- reducing the amount of SF<sub>6</sub> that is leaked.

This can be achieved by targeting our replacement projects. Initial stakeholder engagement favoured replacement of all SF<sub>6</sub> assets with an alternative. However, we have discounted this as an option for now as there is no viable alternative currently on the market. In the short term

even if there was such an alternative available, the cost of replacing all of our SF<sub>6</sub> assets with SF<sub>6</sub> removal as the sole driver would be prohibitive.

In the meantime we are actively exploring the possibility of more efficient, safer, insulation materials to replace SF<sub>6</sub> through our internal innovation team, as well as looking at techniques to reduce leakage from existing plant. We monitor plant leakage rates on a quarterly basis to quickly identify plant items that are becoming problematic and decide on a course of action for intervention to halt SF<sub>6</sub> loss. Depending on plant type, condition etc. this will be either a refurbishment or replacement solution. In the long term, we are also looking at other innovations which could result in reduced SF<sub>6</sub> emissions, such as changes to our commercial arrangements, advanced tools, systems and devices, and changes to the equipment and methods we currently employ. We are trialling various SF<sub>6</sub> leak detection devices to allow us to more efficiently identify problems and provide solutions, thereby minimising SF<sub>6</sub> losses. We have also invested in new gas handling equipment, meaning that whenever an SF<sub>6</sub> top up is required there is effectively zero gas lost during the whole procedure.

- reducing how much diesel is consumed by our fixed and mobile diesel generators.

The volume of diesel consumed is largely determined by frequency of running and this is dependent on operational requirements. Practically, achieving this would be difficult without reducing reliability to customers in remote locations.

- reducing the energy consumption in our offices and depots.

This is achievable through an ongoing engagement with, and education of, staff and the continuation and expansion of initiatives such as “War on Watts”.

- reducing the emissions generated by business travel.

This can be achieved through increasing the utilisation of telephone and video conference facilities and Telepresence suites already available, and encouraging frequent contacts (ENA, universities, Ofgem, etc) to install equivalent facilities.

Our internal [Innovation](#) team are also investigating technologies that may also benefit our BCF in terms of reducing the fuel we burn in our mobile diesel generators, as well as the vehicle fuel used in driving to and from them when refuelling. We are currently researching Bidirectional Hybrid

Generation Plant (Figure 4); a mobile hybrid generator comprised of a diesel generator and battery unit to supply customers during an outage for maintenance or following storm conditions. This will increase our level of service to customers, lower fuel consumption and noise levels, and has long-term potential for the battery to be charged by distributed generators.

**Figure 4 Bidirectional Hybrid Generation Plant**

We believe that reducing our BCF is not a short term programme and we accept that we do not have all the answers yet; we are committed to exploring ways of reducing our impact on the Environment beyond the boundaries of RIIO-ED1. We will continue to engage with our Stakeholders on the matter of BCF and will adjust our plans and goals in line with their feedback and expectations.

**Figure 5 Business activities targets**

Target	2012/13 performance	2022/23 target
Reduce the energy consumption in our buildings by 15%	18,352 tCO <sub>2</sub>	15,599 tCO <sub>2</sub>
Undertake no more than 0.5 business flights per employee per year	673 flights / 3,500 employees	Maximum 1,500 flights / 3,500 employees
Reduce the average mileage of SSEPD cars by 10%	5,773,172	5,195,855
Reduce rate of leakage of installed SF <sub>6</sub> by 15%	1.5%	1.27%

All of these targets will be tracked and reported annually in SSEPD Environmental Impact Report.

Taken together, we believe that these proposals are consistent with our objective of find new, innovative ways to manage our impact on the environment and reduce our impact where it is cost effective to do so.

### Risks and uncertainties

While we will endeavour to meet the objectives and targets identified in this document, we recognise that there are factors outside of our control which may impact on our ability to do so. These are summarised in **Figure 6**.

**Figure 6 Business activities - risks and uncertainties**

Risk	Impact	Mitigation
Exceptional failure of switchgear	Large SF6 leakage	Asset maintenance policy
Exceptional weather event	Increase in fuel consumed by fixed diesels	None
Legislative change: tightening / change of vehicle emissions targets	Requirement to refit fleet or purchase new vehicles	Plan ahead, e.g. make purchase of low emissions vehicles standard
Legislative change: tightening / change of building regulations	Refit of buildings required	Plan ahead and contribute to the legislative change programme to ensure cost benefit
Legislative change: restriction / prohibition on use of components containing SF6	Unable to install new SF <sub>6</sub> plant	Investigate alternative insulating materials

We cannot predict where and when we will have an extreme weather event and, as a result, where we will need to use our diesel-powered generators. It is a situation out of our control and could have a significant impact on our carbon footprint depending on the severity and duration of such an event. We are required to include this as part of our carbon footprint report; what we will also do is compare our annual improvements without the impact of these events so that our customers can see the improvements we have been making every year to our normal operational activities which are largely within our control.

There are also upcoming or potential changes to legislation which influence what we do, or which may do so in the future. As mentioned previously, EU legislation implemented in 2009 set mandatory limits on the CO<sub>2</sub> emissions of new cars and vans. These limits look set to tighten in the future, with recent legislation revising the mandatory targets to 95g/km for cars and 147g/km for vans by 2020. This trend will no doubt continue, with talks already underway to identify suitable lower targets past 2020. This drive to push the vehicle industry to produce more fuel efficient (and increasingly electrified) vehicle models will present us with the opportunity of purchasing more fuel efficient models and thus further reducing the environmental impact of our operations.

Also ahead of us are changes to building regulations. The legislation currently in place, which states that all homes constructed from 2016 have to be carbon neutral, may be extended to all newly constructed buildings from 2019. This would impact us when we are looking to construct new substation buildings, depots or offices and, therefore, meeting such a directive will see a likely decrease in energy use in our buildings. This could also mean, however, that new buildings would, at least at first, be more expensive, both to construct and to maintain, and may also take longer to build.

The European Parliament has agreed, as of June 2013, that although there will be no current amendments to existing legislation which would prohibit us from installing new medium voltage assets containing SF<sub>6</sub>, they will direct a review of the effective alternatives to SF<sub>6</sub> by 2020. If there is found to be effective, reasonable cost alternatives at that time, the European Commission have the power to implement a ban on SF<sub>6</sub> if they deem it appropriate. Whilst this would not affect existing plant, it may mean that we would have to install more switchgear containing oil, which in itself could pose a high environmental risk. Whilst oil is the next most cost-efficient alternative, the lifetime costs could be as much as ten-times that of SF<sub>6</sub>. We are actively pursuing alternatives to SF<sub>6</sub> and oil filled switchgear in the meantime.

## Requirements under our electricity distribution licence

There are no specific requirements under our electricity distribution licence in relation to BCF, and Ofgem is not proposing any for the [RIIO-ED1 period](#). Annual reporting requirements will be continued to maintain a reputational incentive on DNOs.

## Conclusion: our outputs and expenditure on business activities

### What we are going to do

By the end of the RIIO-ED1 period we will:

- Reduce the energy consumption in our buildings by 15%.
- Undertake no more than 0.5 business flights per employee per year.
- Reduce the average mileage of SSEPD cars by 10%.



- Reduce rate of leakage of installed SF6 by 15%.

Our progress against these targets will be tracked and reported annually in SSEPD Environmental Impact Report.

#### **How much this is going to cost**

No specific costs are identified to achieve the targets above. In the main, these are 'spend to save' initiatives whereby investment now (for example, in new telepresence facilities) will be recouped by savings later (thus, use of telepresence means less business travel costs). Our SF6 target will be achieved through the targeted network replacement, refurbishment and maintenance programme described in [A reliable supply of electricity](#).

## Impact 2

### Oil, including fluid-filled cables

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*During the RIIO-ED1 period, we will replace 21 kilometres of fluid-filled cable in our SHEPD area and 55km in SEPD coupled with tagging our 25 worst performing circuits on an annual basis resulting in a reduction in our oil leakage of at least 15% relative to 2012/13.*

This section looks at how we manage the environmental impact of the oil we use in some of our fluid-filled cables (FFC) and other assets such as electrical switchgear and transformers.

In all these assets, the key purpose of the oil is to provide an insulation medium sufficient to prevent the electricity running through these assets shorting to earth, which would damage both the assets and wider network. Oil is also very important in the case of transformers, and some circuit breakers, in providing a medium capable of conducting the excess heat (via radiators) away from the plant where the build-up of heat could otherwise damage or severely reduce the working lifespan of the equipment.

The number of assets owned by SSEPD that contain oil are shown in **Figure 7**.

**Figure 7: SSEPD assets that use oil**

Asset Type	At 31 March 2012, number of assets / km of cable containing oil
Transformers	114,257
Switchgear	53,287
Oil Filled Cables	1,018 km

The greatest environmental impact of these types of asset is the potential for oil to leak. As we describe below, there are stringent regulations around managing oil leakage. In this section we

consider our approach, how we have performed in the past, why we're doing things differently and what we're going to change.

## Our obligations

Under the Electricity Act 1989 we have a responsibility to have regard for the environment and, inherent in that, we are obliged to ensure that any oil contained in our assets does not cause irreparable damage to the surrounding area.

These requirements are prescribed by our statutory environmental regulators, and overseen by the Environment Agency and the Scottish Environmental Protection Agency. If we fail to meet our obligations, we could be prosecuted under legislation such as The Groundwater (England and Wales) Regulations 2009 or The Water Environment (Groundwater and Priority Substances) (Scotland) Regulation 2009.

As set out in the Energy Networks Association (ENA) Operating Code for fluid filled cables<sup>8</sup>, SSEPD falls under differing obligations that are dependent on the volume of the spill and the area in which the spill has occurred. The areas can be separated into the categories of sensitive and non sensitive area: sensitive areas being the zones containing major aquifers, areas where the groundwater table is less than 10m from the surface, all source protection zones, and any location that is within 50m of a watercourse.

When it comes to reporting leaks from cables, the rules are different for each of these areas. For sensitive areas, all leaks that are above 40 litres/month need to be reported as soon as confirmed, and for non-sensitive areas the requirement for immediate reporting once confirmed is 100 litres/month. For both of the cases mentioned above, there is a requirement for such a leak to be given immediate attention without delay, while leaks falling underneath this criteria needs to be remedied within two months.

## Historical approach and performance

As our asset fleet ages, it is more likely that its insulating fluid, such as oil, will begin to leak. To date our programme of replacement has been built around network reliability and safety, and we

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<sup>8</sup> [www.energynetworks.org/modx/assets/files/electricity/she/environment/fluid\\_filled\\_cables/ea\\_ena\\_joint\\_guidance\\_01\\_071001.pdf](http://www.energynetworks.org/modx/assets/files/electricity/she/environment/fluid_filled_cables/ea_ena_joint_guidance_01_071001.pdf)

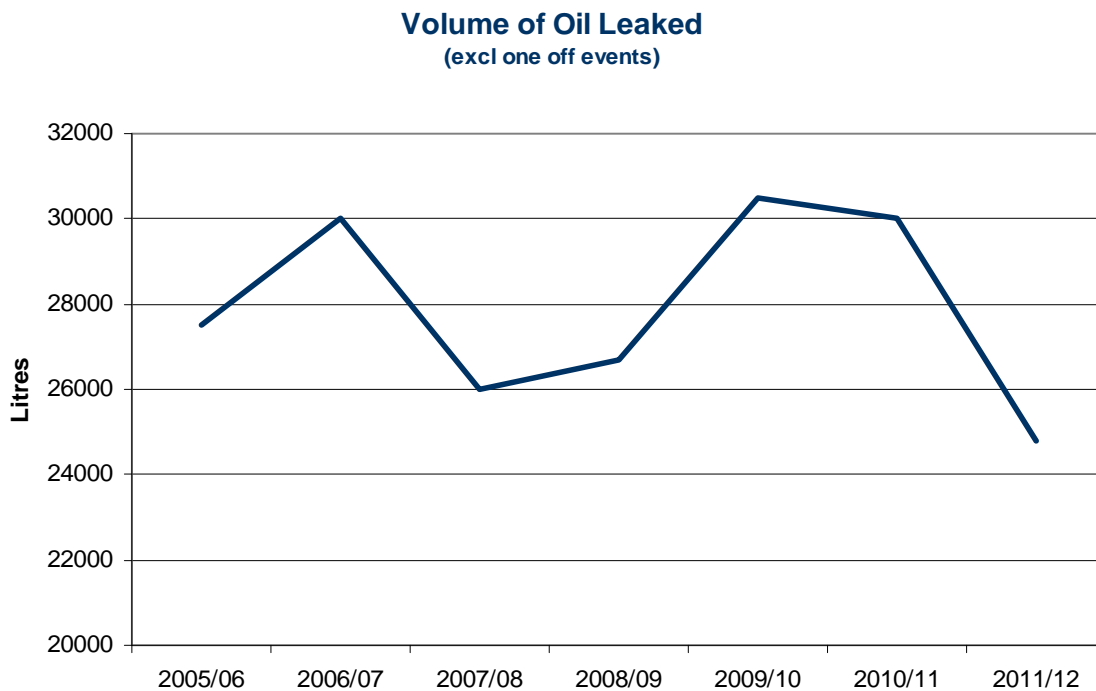
have reacted by safely replacing or refurbishing those that are leaking heavily or are in an environmentally sensitive area.

We also keep oil in other areas, such as in other assets, like transformers, or in tanks in substation. We risk assess these assets and take action where we feel it is necessary.

Under our Safety Management Standard (page 9), we maintain detailed procedures for testing, handling, operating and maintaining assets which contain oil, such as transformers, switchgear and cable, oil storage and appropriate disposal, handling of oil itself, and the management of spills.

Historically, we have recorded and reported the amount of oil that has leaked on an annual basis (Figure 8). In 2007/2008 a third-party’s ship’s anchor damaged the fluid-filled submarine cable from Poole to Portland resulting in a significant leakage of oil. If we included the figures from this event in the graph below it would show a large peak for the year. To give an accurate reflection of our performance for “normal” events that we can influence we have removed this event from the chart.

**Figure 8 SSEPD oil leakage**



## Drivers for change

We are not aware of any plans to change legislation on this issue in the near future that would be reason we needed to change our approach or operational practices.

However, we recognise the environmental impact of oil leakages and, in our initial consultation, our stakeholders told us they would like to see us reducing or eliminating all oil leaks, for example by replacing our fluid-filled cables with a modern, innovative equivalent. We cannot efficiently replace assets that are in good health solely because they contain oil, as this will lead to an unnecessary increase in customers' bills, which stakeholders have also told us they want to avoid. Instead, we have considered alternative solutions in order to address stakeholder concerns, which were supported by over 75% of stakeholders questioned, provided that it is done on a cost efficient basis. You can read more about how we engaged with our stakeholders in [What you said](#).

## Responding to change: options considered

Our stakeholders expect us to find new, innovative ways to manage our impact on the environment and reduce our impact where it is cost effective to do so. In considering options to improve the management of the environmental impact of our business activities, we have been conscious of the need to balance cost and benefit.

We have considered two different options to manage the environmental impact of oil on our underground cable network:

- We could simply replace our worst performing circuits with new non fluid filled cable, or
- We could maintain our current practice of replacing or refurbishing poorly performing fluid filled cables or those that are installed in environmentally sensitive areas, albeit with an innovative tweak for managing the rest of our fleet.

If we implement option 1 and replace the top 10 worst performing circuits, we estimate we can cut the level of leakage by 24%.

In our SHEPD area we have selected option 1 as our preferred option for managing what is a limited fleet of FFC's. The opportunity to remove these assets from the system and make a significant percentage reduction in the volumes of FFCs on our network is a good one.

In our SEPD area our FFC fleet is significantly larger with over 12 times the length of cable as employed in SHEPD. Applying Option 1 in our SEPD area would come at significant cost and would not, we feel, deliver best value for our customers. We cannot however ignore the issue of FFCs or our stakeholder feedback on the subject and so we have looked to Innovation to seek a manageable solution. We have trialled a technique whereby we “tag” oil filled cables, enabling a hugely improved leak location time and subsequent improvement in repair times. For a significantly reduced investment we estimate we can achieve a similar reduction in leakage level as a simple replacement program.

We will also continue to identify the risk posed by oil in other assets and in tanks, to determine the environmental sensitivity of the area and take intervention where appropriate. Our substation assets are at lower risk of suffering oil spills because they are relatively static, monitored environments, in many cases with bunds built around major oil-containing components, and do not suffer from third party interference.

We are undertaking projects through the Innovation Funding Incentive to develop new tools to monitor the condition of switchgear such as fuses, switches and circuit breakers in our substations. These innovative tools (including Partial Discharge mini-monitors) mainly involve monitoring partial discharge activity in switchgear. Partial discharge refers to an electrical discharge that occurs across a portion of the electrical insulation in switchgear. It can occur under normal working conditions where the condition of insulation has deteriorated with age or has been aged prematurely by over-stressing. Partial discharge can ultimately lead to the failure of the insulation.

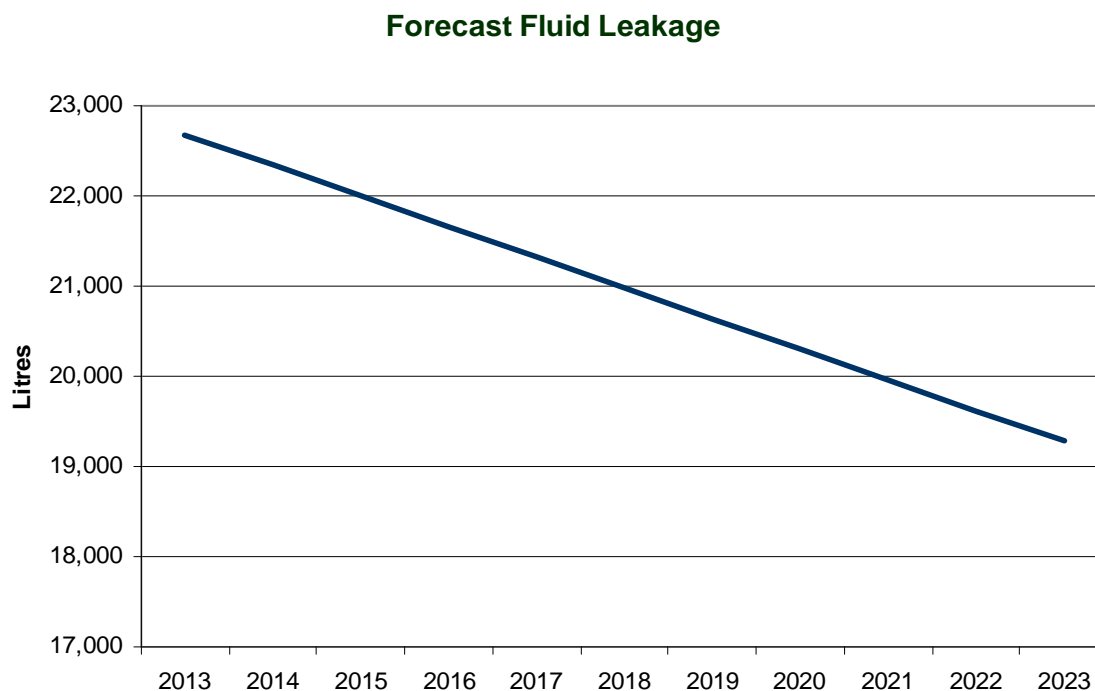
Condition monitoring improves our confidence in the reliability and safety of our substations. In addition, detecting partial discharge through this monitoring could indicate the leakage of insulating transformer oil, allowing us to act promptly to minimise oil leakage and reduce our overall oil leakage rates.

### **Our plans for the RIIO-ED1 period**

In order to maintain a reliable network whilst protecting the environment and our customers, we will replace 21 kilometres of fluid-filled cable in our SHEPD area and 55km in SEPD. Our replacement plans in SEPD are driven by our plan to “tag” our 25 worst performing circuits on an annual basis,

monitoring their performance and designing a solution to rectify any issues. These solutions will be circuit dependant and will result in either cable replacement or refurbishment. There are cables which are not suitable for tagging and this has resulted in our policy of replacing cables of 500m or less overall length and those cables which are assessed to be unsuitable for tagging due to their poor environmental or network performance. The “tag” is a permanent addition to the fluid in a cable, and by tagging our 25 worst performing circuits on an annual basis will result in a majority of our cable circuits being tagged over a period time, improving leak and fault detection times across our whole fleet. We are confident to state that during the RIIO-ED1 period this will result in a minimum 15% reduction in oil leakage, shown in Figure 9.

**Figure 9 Forecast leakage from FFC during the RIIO-ED1 period**



**Risks and uncertainties**

The main risks and uncertainties associated with our plans, and the actions we intend to take to manage these, are described in the table below.

Risk	Impact	Mitigation
Third party damage to FFC	Large oil leak	Making third parties aware of the risk and responding quickly to faults. On going program of tagging cables to speed up repair times and reduce fluid loss.
Supply chain access to replacement cable	Delay to investment programme	Planning and framework agreements
Cable not on replacement list begins to leak heavily	Large oil Leak	Flexible replacement programme



## Requirements under our electricity distribution licence

There are no specific requirements under our electricity distribution licence in relation to oil, and Ofgem is not proposing any for the [RIIO-ED1 period](#). Annual reporting requirements will be continued to maintain a reputational incentive on DNOs.

## Conclusion: our outputs and expenditure on business activities

### What we are going to do

We will replace 76 kilometres of fluid-filled cable in our license areas and tag our 25 worst performing SEPD FFC circuits on an annual basis during the RIIO-ED1 period resulting in a reduction in our annual oil leakage of at least 15% relative to 2012/13.

Our progress against this target will be tracked and reported annually in SSEPD Environmental Impact Report.

### How much this is going to cost

Our target will be achieved through the targeted network replacement, refurbishment and maintenance programme described in [A reliable supply of electricity](#).

## **Impact 3**

### **Electrical losses**

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*We will continue to drive reductions in electrical losses through our best practice procurement strategies while using new sources of data to better track and target loss reductions, and by making network improvements deploying the best technologies to drive further savings.*

Electrical losses are the difference between the amount of electricity that comes into our network from embedded generators and the national transmission system, and the amount that is taken off the network by customers. These losses can either be technical (as electricity can turn to heat as it is transported) or non-technical (for instance, due to theft or measurement errors). Electrical losses are included in our BCF because they represent fuel consumed and emissions produced in the process of electricity generation, which are then lost from the network before reaching the paying customer.

In this section we will discuss our current best practice procurement strategies and how they are driving down losses, further we will look at what we propose to do to more accurately measure and efficiently reduce the level of losses on our networks in the future.

#### **Our obligations**

Under Section 9 of the Electricity Act 1989, we are required to operate and maintain an efficient and economic network. Part of this means ensuring that we minimise electrical losses.

## Drivers for change

We are committed to doing our bit to ensure the targets set for Climate Change and Energy as part of the EU's 2020 vision are achievable. These targets commit the EU to a reduction in greenhouse gas emissions of 20% from 1990 levels, generating 20% of energy from renewable sources and achieving a 20% increase in energy efficiency. On the back of these EU targets the UK Government has placed legally binding restrictions on the volume of greenhouse gases that can be released by the UK over a 5 year period. This creates a carbon budget that has to be achieved and will result in trade-offs between different industry sectors.

Energy use is the single biggest factor which can influence losses. The transition to a low carbon economy and the roll-out of smart meters, currently scheduled to be completed by 2020, presents an opportunity for significant change. Alongside this we are developing a number of innovations to make further improvement to technical losses. Clearly, to maximise these benefits there is a dependency on the roll-out of [smart metering](#) and access to the right levels information.

A reduction in losses will require less energy to be generated for the same amount of consumption by a customer. Therefore an electricity supplier has to purchase less electricity and this will result in a reduced electricity bill to the customer. Having to generate less electricity will also enhance a sustainable future due to a mix of renewable and non-renewable fuels for electricity generation.

## Historical approach and performance

Currently, around 7% of the electricity distributed on our networks is reported as losses; however this varies every year depending on customer demand (

Figure 10). We calculate and report on losses in order to monitor the changing levels.

The total amount of electrical losses on our network 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. Whilst this value is a good guide to overall performance, it has a number of limitations. For example, today's domestic metering does not record when energy is used in between each reading – this means it is not possible to completely align measurements of energy entering and leaving our network. Similarly, this sum is complicated by uses of energy which are not metered, including fraudulent use (theft).

Technical losses result from the electrical performance of our network. There are two distinct parts to these losses: fixed losses and variable losses.

Fixed losses are incurred by a network being energised and are independent of any load on that network; these losses are calculated from manufacturers or standard loss information for a particular asset on an asset by asset basis for transformers and on a per km rate for conductor (overhead and cable).

Variable losses are formed from a complex interaction of actual customer demand, maximum customer demand, customer load profile and system load profile. These are, with the exception of maximum customer demand, real time measurements of energy leaving our network that cannot be completely aligned with measurements of the energy entering our system due to current metering practices and technologies. Elements such as fraud and other non metered energy use further complicate the losses calculation.

Variable losses are governed by the electrical law  $P=I^2R$ , meaning losses increase in proportion to the square of current (or load) being drawn. For example, if energy use triples, then losses increase nine times. Or, to put it another way, most losses result from the use of energy at peak times.

Technical losses are also a function of the resistance of the network and this in part is dependant on the length of circuits. It is primarily this feature that results in losses depicted in

Figure 10 being higher in SHEPD than SEPD. Whilst there is less electrical demand on our network in SHEPD, energy has to be transported over a far greater distance.

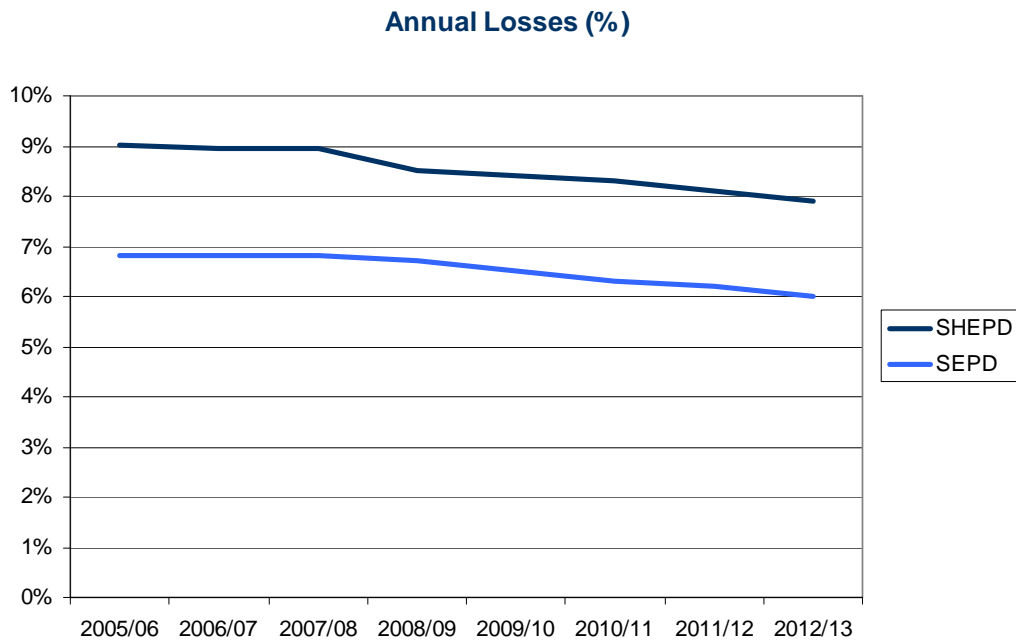
Energy not directly related to the transportation of electricity through our system is also consumed in our substation buildings and their associated equipment. Energy is consumed by the following systems:

- Battery Charging
- Transformer Cooling (fans and pumps)
- Protection and Control Systems
- Substation auxiliary supplies – heating, lighting and security systems.

By far and away the greatest consumption is generated by heating systems within our buildings. Means to limit this necessary use of energy form part of our innovation strategy.

The way in which we manage our network can also help to reduce losses. Firstly, we have worked to ensure the measurements of energy entering and leaving our network are as comprehensive as possible using the metering data available at present – this helps to ensure the calculation of losses is as accurate as it can be. Secondly the way in which we plan, operate and maintain our network can help reduce losses. For example, when we replace or install equipment we choose modern, low loss apparatus. Likewise the physical configuration of our network is designed to maintain network voltages, and hence losses, at an optimum level.

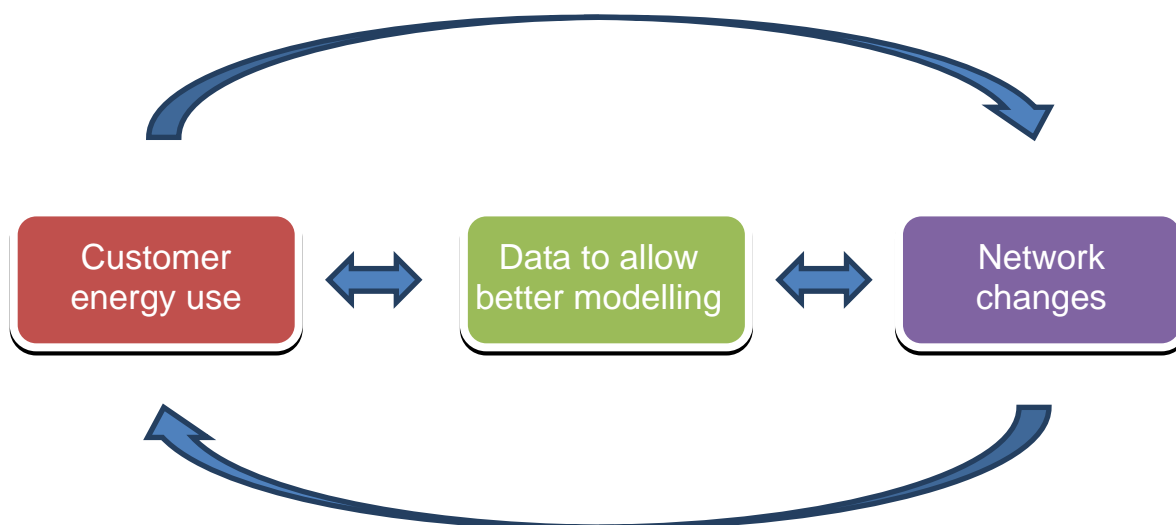
Figure 10: Annual electrical losses



## RIIO-ED1 – taking the next steps

Our approach to improving network losses comprises three interlinked aspects (**Figure 11**).

**Figure 11 Managing electrical losses**



### Customer energy use

Basic analysis indicates that if a customer reduces their consumption by 1.7%, their associated network losses would reduce by 3%. However this scale of reduced consumption may require noticeable changes to the customer's ordinary pattern energy use. Alternatively, better targeted energy use reductions could deliver similar benefits without the need for a continuous change.

For example, if all customers on a local network reduced their peak time needs by around 0.25kW (6%) for the busiest third of the year (around 1% of the time) the losses related to that network would reduce by 3% overall.<sup>9</sup> Whilst this topic is a current area of innovation and the benefits remain to be demonstrated it is clear that the way in which customers change their energy use will have a direct bearing on network losses.

<sup>9</sup> Based on an aggregation of 30 arbitrarily selected domestic profiles with reductions of 6% to the top 99<sup>th</sup> percentile of half-hourly energy use (i.e. 6% reductions 125 times a years for 175 half-hours in total)

Access to smart metering information will allow us to understand our customers' requirements far better than has ever been possible before. Through innovative projects such as the New Thames Valley Vision, which monitors customer energy usage and behaviours, we expect to learn what levels of energy our customers require, how this might change in the future, and the right levels of information that we need in order to benefit our customers.

The advent of smart metering may also allow customers to take better control of their energy - reducing overall use and also avoiding times of peak demand. Our innovative projects, including SAVE (Solent Achieving Value from Efficiency) are exploring the role of a network operator in delivering energy efficiency measures to benefit customers, increase spare capacity and reduce losses.

We will develop methodologies that better understand customer energy usage and gives customers better information on how this can be used on a commercial basis to reduce their bills. By using less energy, or perhaps using the same energy but at a different time, customers could save money and reduce losses. Our joint Tier 1 project with EA Technology, My electric avenue, could we envisage be expanded later to give customers control of the commercial aspects of deciding when is an appropriate time to charge their electric vehicle.

### **Data to allow better modelling**

Our understanding of losses to date has been based on the accountancy-style principles outlined in earlier paragraphs, which is somewhat crude and does not facilitate carrying out detailed network design. It also does not lend itself to the establishment of a proper baseline for losses.

We have developed engineering models which combine network characteristics and energy distribution information to validate and augment the basic losses calculations. Going forward, these models will be enhanced to include operational data from our SCADA (communication) systems and smart metering data to give a more comprehensive picture of how the rate of energy use changes throughout the year.

We believe that by using the much improved Smart Meter derived data, and combining this with innovative engineering models developed over the next few years, we will be in a position to establish a much more reliable baseline for losses across our networks.



Clearly this exercise will be hastened by DNOs sharing both their engineering skills and their new data. We will be proposing that the companies consider a joint innovation project to share data, develop smarter algorithms for losses modelling and provide a robust platform for consistent measurement of loss reduction schemes based on new technology, better operational practices and non technical solutions.

## Network changes

Our existing strategy is to replace existing capacity at end of life and create new capacity using lower loss equipment and optimal network configuration (where safe and economically efficient to do so), and this remains very successful.

Our planning and procurement strategies ensure that for transformers we acquire the lowest loss unit that is financially viable for each installation. We insist that manufacturers tender for contracts providing a full life cost for each unit based upon price, capitalised losses and delivery costs. Delivery costs are vital to the calculation as lower loss units are generally heavier (due to increase in metal volume to reduce resistance) and this will have an impact on the delivery method, route, any remedial works required to facilitate access. This approach ensures the selection of the lowest loss unit suitable whilst still delivering best value for the customer in the longer term.

A similar approach is taken with cable and overhead line conductor. Here the selection of cable is governed by the required load, but factored in to that calculation is the additional costs of the next cable size up vs. losses savings over a set time period. Again this ensures the selection of the lowest loss practical solution while delivering best value for the customer.

This strategy has been very successful, delivering potential losses savings in the 12/13 financial year of 95.7GWHrs across the SSEPD license areas.

Alongside this we will continue to develop and implement, where appropriate, a range of innovative solutions which build on new sources of data and new technologies. The new data that will become available through the implementation of the [Smart Meter programme](#) does come at a cost. The new Smart Meters are estimated to increase the energy consumption directly related to metering supplies (gas and electric) by 250%. It is estimated that in the SSEPD license areas alone this will amount to an additional 150GWHrs of losses per annum. We believe that this energy losses cost will be worth it in terms of the losses reductions that we believe it will facilitate.

Many of our innovations focus on the low voltage (LV) and 11kV network. Around 40% of technical losses are associated with the local LV network and around 30% are associated with the 6.6 and 11kV networks<sup>10</sup> - this is in part due to the relative volume of the network, but also the volatility of

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<sup>10</sup> Figures supplied by Botley Wood Grid Supply Point. Note: distribution of losses will vary with network, geography and energy use.

energy usage at this level. Outlined below is a selection of some of our innovation work which illustrates the loss reduction benefits that could be brought into business-as-usual.

At the low voltage level, many of our networks do not have balanced loads, which is often a direct consequence of how and when our customers use their energy. By permanently re-jointing the network to improve balance, power peaks - and therefore losses - can be reduced. Normally, this imbalance is small and re-jointing would produce little or no benefit. However, for around 7% of sites there is potential to reduce network losses by 10% or more.

The actual reduction in losses is dependent on the configuration of loads and network characteristics and also requires tools to identify the phase-distribution of loads along a cable. One such tool we have under trial is the Origo field based detector, which sends a signal along the power cable that can be detected in the premises to determine the phase the property is connected to. We expect tools like this to be a very helpful in optimising network development.

Even on a well balanced network, at any given time one phase might have more load than the other. In these cases permanent network reconfigurations would not be able to improve losses. However improvements may be possible through the addition of power electronics on the low voltage network. The Energy Storage and Management Units (ESMUs), under trial with the New Thames Valley Vision project, enable dynamic balancing across phases with the potential for over twice the loss reduction that traditional reinforcement could achieve.

Through the introduction of the power electronics in ESMUs we are exploring how harmonic voltages can be reduced to prevent waste heat dissipation and how reactive power can be used to improve voltage regulation to reduce losses that result from excessive currents. Likewise the application of StatCom equipment is being explored to similarly improve voltage regulation at higher voltages.

Today's networks are designed to manage security of supply first with subsequent optimisation to improve network losses. Active Network Management, such as the scheme installed on Orkney ANM, manages security of supply whilst increasing the connection of local generation. Our encouragement of local generation reduces the distance (and hence losses) of supplying electricity to customers over distance. We are also exploring the role that local generation can have in providing reactive support to the network, with associated improvements to network losses.

Building on our existing Isle of Wight Intelliteam distribution automation and our ANM experience, the WINS (Isle of Wight Integrated Network Solution) will test our ability to improve the visibility of network assets, enable active network switching and will specifically optimise the network to minimise losses whilst permitting the connection of embedded generation.

### Commercial Improvements

There are two methodologies that we are progressing in ED1 that we believe will also help to reduce losses

- **MPAS Data** – The Meter Point Administration Service (MPAS) allows each DNO to keep supply point information about every customer in the UK. If this information is out of date or perhaps even non-existent the losses data will be wrong and usually reported as too high. We believe we should work closely with the MRA and suppliers to ensure the accuracy of this information. Formal contacts should be established across the industry to ensure this happens.
- **Unmetered Supplies** – Many supply points in the UK are unmetered. For example traffic lights, street lights and bus shelters can all be unmetered with usage being on an estimated basis and hence often wrong. Growing networks of street lights, can for example go unreported to DNOs, and lead to losses being under reported. Improvements in this area are driven by cooperative working with Local Authorities, motorway and trunk road operators, and developers. Our recently developed IT systems for managing this data, together with increased staffing levels, will we believe help to reduce our overall level of losses.

### Theft

Theft remains a significant contributor to reported network losses. DNOs have acknowledged this issue and have tried to work with suppliers to address the problem. The introduction of smart meters will, we believe, present a huge opportunity to address this problem in a more holistic way.

In order for smart meters to be introduced safely and efficiently it will be important for suppliers and the DNOs to establish close collaborative partnerships. These partnerships must be widened to ensure that the data rich benefits of the smart meters are exploited to identify energy theft early.

### **Our plans for the RIIO-ED1 period**

In managing electrical losses, our plans are to:

- Continue with our successful procurement strategy of considering whole life costs of an asset, including losses. This results in us replacing current equipment with lower loss equipment on an end-of-life basis, and with optimal configuration of the network;
- Continue with our programme of implementing a range of technologies designed to reduce losses as part of our normal business processes on the lower voltage networks (11kV and below). Use innovation to increase the range of technologies available for standard implementation;
- Better understand the energy use of our customers and work with customer to reduce their overall energy use, especially at peak times, taking advantage of smart metering as part of this process;
- 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); and
- Fully utilise the data we control to address omissions, under reporting and abuses.

### Risks and uncertainties

The main risks and uncertainties associated with our plans, and the actions we intend to take to manage these, are described in the table below.

Risk	Impact	Mitigation
Delay to smart meter roll-out; and/or insufficient data resolution not permitted from smart meter data	Insufficient data to establish better models	Not wholly within our control – engage at a national level
Energy reduction measures are not considered within the scope of a Network Operator	Cannot support customer choice to help reduce network losses	Explore the role that a Network operator has in supporting energy efficiency
Unable to establish necessary data exchanges with Supply Licensees for sharing information regarding energy loss	Unable to reduce fraudulent energy use	Work at national level to implement the relevant data flows.
Insufficient innovation in new loss reduction technologies	Restrained to existing range of tools and technologies resulting in slower improvements to network losses	Maintain a broad portfolio of innovations and work to take on innovations through to business readiness.

## Requirements under our electricity distribution licence

Ofgem is proposing the following obligations for the [RIIO-ED1 period](#):

- A new licence obligation to act to keep losses as low as possible - We will review the new licence obligation to determine what is required to be delivered to ensure compliance in a timely manner for the start of the RIIO-ED1 period.
- Publish a Losses Strategy Statement which will be reviewed annually - We will develop a Losses Strategy Statement, seek Ofgem approval of form and/or content as required, and publish on our website in a timely manner for the start of the RIIO-ED1 period.
- Each DNO to undertake an annual audit of losses reduction activities - We will undertake an annual audit of losses reduction activities towards the end of the year. This will then be used as part of the annual review of the Losses Strategy Statement to determine any updates required for the following year's Statement.
- DNOs to share industry best practice - This can best be facilitated by all DNOs meeting periodically under the auspices of the Electricity Networks Association and each reporting on their practices.

Annual reporting requirements will be continued. Ofgem is also proposing a discretionary reward where DNOs can put forward evidence of the work that they have done to manage losses on their network with the opportunity of financial rewards for excellence.

## Conclusion: our outputs and expenditure on business activities

### What we are going to do

We will be carrying out a programme of activities to reduce losses over the ED1 period as noted below.

- Customer Energy Use – Develop ways to help customers reduce losses and energy bills
- Data Modelling – Use data provided by smart metering and our own R&D projects to develop a robust baseline for losses measurement and mitigation.

- Network changes – Continued application of our best practice procurement strategy, proven to drive down losses, but with a clear focus on identifying and adopting new technologies to accelerate the reduction in network losses and to develop strategies to optimise the operation of our networks to reduce losses.
- Commercial Improvements – We will improve our internal processes and develop more robust relationships with our customers and partners.
- Theft – The introduction of Smart Meters is an opportunity for DNOs to work with suppliers to reduce losses and improve network safety. We will form new and enduring relationships with suppliers to help us reduce network losses.

### **How much this is going to cost**

Our losses reduction strategy will be implemented through normal business processes, with the selection of network development proposals made to best meet our customers' interests, when considered holistically. The development of new technologies will be completed under our innovation programme.

## **Impact 4**

### **Visual amenity**

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*Through consultation with local communities, we will identify up to 90km of overhead line that can be put underground to improve visual amenity in designed areas. We expect to spend up to £15.1 million on this.*

Our distribution networks consist of overhead lines, substations and, on a number of Scottish islands, small power stations that provide back-up generation. We recognise that this equipment can impact on visual amenity particularly, although not exclusively, in Areas of Natural Beauty (AONB), National Parks and National Scenic Areas (NSA). In particular, some can find overhead lines unsightly and consider the attractiveness of the landscape reduced by their presence. This might impact on individual wellbeing and also local economies if, for example, the main industry is tourism. As we always aim to provide a high level of customer service, this is important to us.

In the following section, we provide further information on how we will continue to review the impact of existing equipment on the visual amenity of the area they are located within; our approach to identifying where it may be appropriate to take mitigating actions; and the role that our customers, local communities and interested stakeholder groups can play in shaping proposed developments.

#### **Our obligations**

Schedule 9 of the Electricity Act 1989 requires electricity distribution networks to have regard to the preservation of amenity and fisheries, and to do what reasonably can be done to safely mitigate the effects of necessary activities (including overhead lines).



Our Schedule 9 Statement sets out how we carry out our duties with regards to the environment. It states that we recognise the need to reconcile the provision of a secure, efficient and economic electricity supply with the obligation to reduce, as far as reasonably practicable, any adverse environmental effects arising from the presence or operation of their assets and are committed to making available the specialist skills and facilities to address present and future concerns.

### Historical approach and performance

Historically, we have relied on stakeholders such as National Park Authorities and local communities to identify assets of concern and assist us identifying solutions. However, there have been only a small number of projects taken forward by this approach to date. During the past three years we have put underground 3.06km of overhead line at a cost of £0.52m. Our customers tell us that lack of awareness of the available funding, and lack of resources have limited their ability to fully engage in this area.

### Drivers for change

There is no specific legislative or planning requirement to put overhead lines underground. Rather the driver for this activity is the concern of our customers about the effects of overhead lines on visual amenity.

There is a strong opinion amongst some customers that we should be doing more work in this area. During Focus Group consultations, there was a universal perception that putting assets underground was either 'important' or 'very important' for visual amenity. During Our Second Consultation, the majority of respondents support our community-led approach to address concerns around visual amenity. One key stakeholder responded that it:

*“supports the stakeholder-led approach to address concerns around visual amenity and applauds SSEPD's ambitions to be the industry leader in this area”*

Other stakeholders wished to ensure that factors important to them, such as the historic environment, were considered as part of the assessment of the project. Similarly, some customers wanted us to extend the funding to Sites of Special Scientific Interest (SSSIs) and other designated lands, and to include options such as screening of assets.

### **Responding to change: options considered**

We have looked at the responses of our customers and considered what changes we might make in the future. Continuing as we are now is an option, but it is not one we are keen to pursue as we would likely see the same low level of engagement. We know there is a high level of interest in improving the visual amenity of our assets and we need to find an efficient way to turn this interest into involvement.

Addressing the issues that have been raised, our preferred option is to introduce targeted stakeholder engagement, such that we will work closely with our customers, local communities and interested stakeholder groups to identify existing equipment where there is or may be an impact on visual amenity. We will endeavour to develop proposals that will enhance the visual amenity of the affected area and deliver a high level of customer service. In order to achieve this, we will take the following steps:

- Strategic steering groups comprised of both SSEPD staff and key external stakeholders;
- A Project Manager will be provided for each potential project, who will liaise with customers, local communities and stakeholder groups as appropriate;
- Developed options to enhance the visual amenity will be shared with interested parties through a public consultation process; and
- Regular reports on our progress will be published and made available as part of our annual Environmental Impact Report.

We are determined to meet our customers' expectations in this area and will work hard to establish a successful and efficient system, offering best levels of service to stakeholders, to enable all parties to prioritise undergrounding projects. To do this, we are setting out a clear methodology for the assessment of options to address a visual amenity concern.

Our methodology will be based on the impact the project may have on:

- the visual appearance of an area;
- archaeology or wild lands;
- local wildlife, flora and fauna.

- historic or heritage areas; and
- local tourism.

Other relevant factors will be considered on a case-by-case basis. Options developed will be appropriate to each site, and where concerns are identified, we will endeavour to provide a service and solution that addresses the concerns expressed, whilst balancing any competing priorities as set out above. We will explain the decision we make and continue to keep our approach under review to ensure it meets the needs of our customers, local communities and key stakeholders.

This methodology will be written in consultation with our key stakeholders during 2014 and will be published prior to the commencement of the RIIO-ED1 period in April 2015.

### Our plans for the RIIO-ED1 period

Following this process, we anticipate that we will aim to underground a total of 90 kilometres of existing overhead line (48km in SHEPD and 42km in SEPD), at a maximum cost of £15.1 million (£5.5m in SHEPD and £9.6M in SEPD),. However, we may do more or less than this depending on the response of stakeholders.

### Risks and uncertainties

The main risks and uncertainties associated with our plans, and the actions we intend to take to manage these, are described in the table below.

Risk	Impact	Mitigation
Lack of stakeholder knowledge	Low identification of schemes	Strategic steering group and education of key stakeholders
No viable options for addressing visual impact	Damage to reputation with community	Sharing information and engagement in process

### Requirements under our electricity distribution licence

Ofgem introduced a non-mandatory scheme for overhead lines to be put underground in 2005. This scheme allows funding for projects in designated areas: AONB and NPs. It is proposed to

continue with this scheme for the RIIO-ED1 period, and extend the scope to include NSA in Scotland.

## **Conclusion: our outputs and expenditure on business activities**

### **What we are going to do**

Through consultation with local communities, we plan to put underground up to 90km of overhead line during the RIIO-ED1 period to improve local visual amenity.

Our progress against this target will be published in our Environmental Impact Report, which will be available online to all stakeholders. This report will describe the activities we have undertaken during the year. In particular, we will set out the areas where stakeholders have expressed an interest in a visual amenity project being undertaken, our progress on that project and the options being considered. The report will also explain how we have delivered the service our customers expect, where we have been innovative and how we have maintained a focus on efficiency and delivering value.

### **How much this is going to cost**

This will depend on the level of uptake by stakeholders, but will be a maximum of £15.1 million.

## Impact 5

### Standby generation on Scottish Islands<sup>11</sup>

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

On the west coast of Scotland and the Scottish islands, we distribute electricity to some very remote areas. A number of these remote communities are supplied by a single, long overhead line, which typically goes through rough, uninhabited countryside some distance from roads, or goes underwater as a single cable. A lot of these types of lines provide electricity to some of our Worst Served Customers (WSC)<sup>12</sup>.

There are two consequences of this:

- There is more likely to be more and longer faults which affect customers. The lines carrying the electricity are subject to lots of environmental factors like wind and snow, and the lines are usually located in places where it takes a longer time for our operational staff to get to the problem.
- There is no alternative supply of electricity. Because the electricity has just a single route of supply, there is no alternative supply in the event of a fault.

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<sup>11</sup> Note our Business Plan does not consider Lerwick Power Station on the Shetland Islands as we are required to make a submission to Ofgem on the future security of supply on Shetland by 31 July 2013.

<sup>12</sup> Worst Served Customers (WSC) are defined by Ofgem as customers who experience an average of four interruptions on the High Voltage network per annum over a three year period. The number of WSC in our SHEPD area varies from year to year but based on the last three years we currently have about 10,500 customers in this category.

To combat these two consequences, a number of islands are equipped with diesel power stations to act as a back-up source of electricity in case there is a fault. These are known as standby generators.

## **Our obligations**

Diesel generation stations were established before the use of subsea cables, and under the distribution network planning standard P2/6 we are not obliged to provide additional sources of supply. Rather we continue to use the power stations as a cost-efficient alternative to investment in additional submarine cables.

Some obligations are in place. Due to the ageing plant within most of the standby generation stations we currently have, meeting emissions control levels continues to be a challenge, and is becoming increasingly more difficult as the focus on environmental compliance increases.

The largest station within the embedded generation portfolio, Battery Point in Stornoway, is the only station that currently requires a licence to operate based on its thermal input capacity being more than 50MWth. This falls within the Pollution Prevention and Control (Scotland) Regulations 2012 which incorporate the requirements of the Industrial Emission Directive (IED). Within Scotland, SEPA manage compliance of the licence, which includes emission testing of the engines. The smaller stations do not require a licence at present, however there is a risk in the future that legislation will change.

There are also other types of regulations which we must ensure we abide by. These include The Fire Safety (Scotland) Regulations 2006, and The Pollution Prevention and Control (Scotland) Regulations 2000, for example. These heavily influence our plans for standby generation.

## **Historical approach and performance**

We have seven standby generation stations in the following locations:

- Bowmore on the Island of Islay
- Tiree
- Kirkwall on the Orkney Islands

- Barra
- Loch Carnan on South Uist in the Western Isles
- Battery Point and Arnish near Stornoway in the Western Isles

These can be seen in **Figure 12**.

**Figure 12 Location of standby generation stations**

We also operate a power station in Lerwick on the Shetland Islands. For more information on Shetland, please see our paper entitled [Efficiently managing risk](#).

Our seven standby generation stations vary in size, age, and the amount of time they are needed for (**Figure 13**).

The ages of the stations vary considerably with the larger stations such as Battery Point, Loch Carnan, Kirkwall, Bowmore and Tiree having the oldest plant and the newer built stations such as Arnish and Barra having more modern high speed engines. The oldest embedded asset dates back to 1954 and the youngest engine was purchased in 2012.



**Figure 13 Characteristics of embedded power stations**

Station	No of engines	Average commissioning date of assets
Battery Point PS, Stornoway, Isle of Lewis	8	1964
Arnish PS, Stornoway, Isle of Lewis	7	2006
Loch Carnan PS, Isle of South Uist	5	1972
Barra PS, Isle of Barra	3	1997
Kirkwall PS, Isle of Orkney	4	1973
Tiree PS, Isle of Tiree	4	1977
Bowmore PS, Isle of Islay	3	1975

We have numerous maintenance and management procedures, all of which are kept on our internal document library. They are all accounted for in a manual which is used to cover all maintenance and management procedures. We make sure all the processes are followed and are regularly reviewed, whenever required and usually at least once a year.

We have found that the standby generation stations have provided the supply we have required. The power stations at Bowmore and Tiree have had three separate instances of running for long durations as a result of a submarine cable failure. In 2009, both Bowmore and Tiree ran for least six months simultaneously whilst the submarine cable repairs to both islands were completed. Tiree ran again 24/7 from the start of February 2013 till the end of April 2013 for another submarine cable fault.

### Drivers for change

Main driver for change is a combination of age of assets and resulting environmental compliance issues. However, our main obligation in relation to standby generation is the continue to run it in order that it continues to supply our customers, so we must do what we can to operate the assets effectively, cost-efficiently and in accordance with our sustainability core value.

Of our standby diesel generation stations, only Battery Point on the Isle of Lewis is subject to SEPA emissions monitoring due to the fact that it generates more than 50MWth which is SEPA's threshold, and the other stations are below this threshold. As mentioned above, this falls within the

Pollution Prevention and Control (Scotland) Regulations 2012 (PPC 2012) which incorporates the requirements of the Industrial Emission Directive (IED).

We are not expecting significant further legislative change during the RIIO-ED1 period. However, there is the possibility of SEPA invoking 'best available techniques reference documents' which would require us to demonstrate we are applying 'best available techniques' in line with similar industries. Should this be the case, a considerable amount of capital expenditure would be required. We aren't aware of this going ahead, but it remains a risk.

### **Responding to change: options considered**

We have considered a number of options including replacing all stations, continuing to operate as we currently do with refurbishment and maintenance when required, and finally we considered the option of doing nothing.

Replacing all stations is not a feasible option due to the high costs associated. As these stations are not used all the time, this option did not pass our internal process for selection. The cost of doing this far outweighed the benefits of replacement.

When considering the option to do nothing we found that these stations would require decommissioning which we found was a large cost in itself. Also, it would be of significant detriment to customers to select this option as there would be no security of supply. To ensure the current security levels would require significant investment in new submarine cables, and associated onshore reinforcements, which is not cost effective.

We also considered continuing as we have previously, making sure we operate, maintain and refurbish the stations to a high standard. This is the most beneficial to customers as it is the lowest cost option while also giving the biggest operational benefit. If there is a lack of supply in these remote locations, there will still be a back up power supply for customers to utilise.

### **Our plans for the RIIO-ED1 period**

Our plans for RIIO-ED1 are to continue providing the standby generation service as we have done so far. We will operate and maintain the standby generation assets and also invest in other

activities to reduce the overall number and duration of interruptions, which can be seen in [A reliable supply of electricity](#).

## Risks and uncertainties

The main risks and uncertainties associated with our plans, and the actions we intend to take to manage these, are described below, along with the type of project it involves and the cost associated.

### Building infrastructure

Investment is required for the building infrastructure e.g. investment to maintain sound roofing, new plaster on the walls, new windows for the machine hall areas, lighting upgrade within halls, shot blasting and painting of support structures for chimneys and tanks, maintenance of access roads, upgrade drainage systems etc.

Routine assessment within an annual program of building improvement works. Additional investment is required as a one-off to raise the buildings to an acceptable standard to house the engines and the many ancillary services that are required in a power station.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Oil storage containment systems

SEPA and our own internal environmental risk standards require that all oil storage systems including pipe work are regularly tested and recorded. To date, work has been required at several sites to ensure that the integrity of the bunds is sufficient to meet the requirements of the Oil Storage Regulations.

The annual assessment of bunds should be completed by a civil team on a rolling programme to identify any issues. Staff at the stations are predominately electrical and mechanical therefore require specialist support from the central civil team to provide a planned programme of civil structure asset integrity.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Cooling systems, towers and seawater pumps

Cooling of the stations is now provided with plant that is ageing and, in some cases, it is difficult to source suitable spares. Current cooling systems at some of the stations are labour intensive to maintain. The systems should be regularly reviewed to ensure that they are sustainable and efficient as this has a direct impact on the availability of the machines to reach maximum MW output. Pipe work should be included.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

#### [Availability of strategic spares for the engines](#)

The strategic spares stored at the stations have been reduced as a result of the station operating as stand-by only. The costs associated with strategic spares for engines of this age are normally difficult to source and often involve bespoke manufacturing solutions.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Check synchronising systems

The check synchronising facilities available vary significantly from station to station. Some have this facility on the transformer breaker, but none of the stations have this facility on the individual generator breakers.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Exhaust replacements

Testing and replacement of the exhaust systems should continue as required. Due to the coastal location of most of the stations they have experienced issues with exhaust deterioration.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Process Hazard Review (PHRs)

The PHR was commissioned to ensure that all process safety risks associated with the operations of the stations were identified and managed to ensure compliance with internal and external standards for protection of plant and personnel. Further PHRs as required.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Fuel tank integrity

The integrity review of the fuel tanks should continue as part of the asset management. This involves cleaning/ integrity checks and painting of assets.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### LV motor control panels

The LV switchgear associated with many of the stations is now so old that it is obsolete and finding spares is very challenging. Retrofitting with more modern switchgear is achievable; however due to the current safety standards associated with new switchgear a cost benefit analysis should be completed against the price of a new panel before an investment decision is made.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Bowmore, Kirkwall

### Automation systems to support remote operation of the stations

Some of the embedded power stations can be operated remotely from Perth. Others however need an upgrade in communications and control systems to allow this function to be available. This would provide a mechanism for getting the customers back on supply earlier and for control to manage the load.

Affects: Barra, Tiree

#### Automatic voltage regulators (AVRs)

Many of the stations now have AVRs that are unsupported by the manufacturers. A very limited number of spares exist however there are questions over whether they are regarded as a “conforming spare” due to their age. New modern electronic AVR systems could be retrofitted however this is a costly exercise due to the age of the plant involved, and would be subject to cost benefit analysis.

Affects: Battery Point, Arnish, Loch Carnan, Tiree, Bowmore, Kirkwall

#### Instrumentation replacement as a result of new technology

The instrumentation systems at many of the stations are old hard wired systems from probes on the engines etc. These are predominately analogue signals and provide information on analogue meters which are no longer available to purchase. The new digital system available now utilise a 4-20mA signal to a digital meter.

Affects: Battery Point, Arnish, Loch Carnan, Tiree, Bowmore, Kirkwall

#### Ancillary support systems

Ageing plant and lack of spares continues to be an issue with these systems e.g. fuel, air, lube oil, water etc.

Affects: Battery Point, Arnish, Loch Carnan, Tiree, Bowmore, Kirkwall

#### Engine control systems

The manufacturer of the current load management system at Battery Point can now only offer limited support of this system due to its age. This model is the original generation of this system and has been superseded as a result of advances in technology.

Affects: Battery Point

#### Legislation changes

For example, The Fire Safety (Scotland) Regulations 2006 and The Pollution Prevention and Control (Scotland) Regulations 2000.

Legislation influences how we run our business and whilst consultation normally takes considerable time to be approved allowing us to prepare, it should be noted that this can have a large effect on operating safely and efficiently. Changes in legislation can result in the need to alter, retrofit, refurbish or replace certain systems.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

#### Historical land contamination

Land contamination is evident at the power stations there legacy arrangements are required to manage the station for the remainder of its life and beyond into decommissioning. Remediation of the land would be required for any future use. It is essential that station land contaminated is managed and every effort must be taken to ensure that contamination remains within our own sites.

Affects: Battery Point, Arnish, Loch Carnan, Barra, Tiree, Bowmore, Kirkwall

### Requirements under our electricity distribution licence

There are no specific requirements in our electricity distribution licence relating to the standby generating stations. Ofgem has no policy in this area.

### Conclusion: our outputs and expenditure on business activities

#### What we are going to do

We will continue providing the standby generation service as we have done for many years.

#### How much this is going to cost

We aim to maintain the standby generation stations to the level they currently are run at. The total expenditure for this is set out below:

#### Figure 14 Forecast expenditure on standby generation during the RIIO-ED1 period

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	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Total expenditure (£m)	£10.10	£8.92	£8.42	£8.86	£8.28	£8.18	£8.63	£8.27

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Standby generation .....	3, 4, 48, 49, 50, 51, 52, 56, 58
Targets .....	4, 13, 15, 16, 19, 20, 24, 25, 26, 27
Transport .....	2, 4, 14, 17, 20, 22
Visual amenity .....	3, 4, 9, 11, 15, 43, 44, 45, 46

## Appendix

### Regulatory policy

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#### Process: Has the DNO followed a robust process?

This paper is set out in five sections - **Business Activities**; **Oil**, including fluid-filled cables; **Electrical losses**; **Visual amenity**; and, **Standby generation** on Scottish Islands.

In preparing our plans, we have engaged extensively with stakeholders who told us that the environment was very important to them and that our activities should not be carried out at the expense of the environment. You can read more about what stakeholders said in [What you said](#).

Our proposed costs are set out in the data tables and have been included in the Price Control Financial Model.

#### Outputs: Does the plan deliver the required outputs?

[Ofgem's Strategy Decision](#) sets out their policy to:

Introduce a new reputational reporting requirement on broad environmental impact encompassing business carbon footprint, noise, waste and water;

Introduce a new licence requirement to reduce electrical losses; and,

Continuation of the current non-mandatory scheme to put underground overhead lines in designated areas.

Further, Ofgem expects all electricity distribution network licensees to reduce their business environmental impact and contribute to meeting GB's environmental goals.

Our proposals set out above include details on how we will manage our broad environmental impact and includes detail on our new, annual Environmental Impact Report. We have set out how we intend to reduce electrical losses in the section **Electrical losses** and how we intend to deliver stakeholder-led undergrounding of overhead lines in designated areas in the section **Visual amenity**.

**Resources (efficient expenditure): Are the costs of delivering the outputs efficient?**

Any expenditure we undertake is need-based and delivers maximum value for our customers. We have always had a close focus on efficiency – it's the way we do things. Our paper entitled [Be efficient](#) sets out how we compare with other DNOs in efficient performance and how we intend to stay at the forefront of efficiency throughout RIIO-ED1.

**Resources (efficient financing): Are the proposed financing arrangements efficient?**

Our paper entitled [Efficiently financing our plans](#) sets out how we plan to finance our plans for RIIO-ED1.

**Uncertainty & Risk: How well does the plan deal with uncertainty and risk?**

In each section of the paper, we have considered and discussed our approach to risk and uncertainty. For each area of our plan, we have considered the impact of our key risks and how we plan to mitigate those risks.

We have further detailed our approach in our paper entitled, [Efficiently managing risk](#).