



**electricity**  
**north west**

Bringing energy to your door

# Environment Report

2015-16



# Environment Report

Approved for issue: 31 October 2016

## Contents

1	Introduction .....	2
1.1	Executive summary .....	2
1.2	Our business / who we are .....	3
1.2.1	Environment and energy management policy .....	3
1.2.2	Role of stakeholders in environmental management .....	4
1.3	Purpose of the report.....	4
2	Managing our environmental impact.....	5
2.1	Introduction .....	5
2.2	Visual amenity.....	5
2.3	Oil leakage .....	6
2.4	Carbon impact and climate change .....	7
2.4.1	Business carbon footprint.....	7
2.4.2	Sulphur hexafluoride emissions (SF6 Emitted) .....	8
2.4.3	Distribution losses .....	9
2.5	Other environment related activities .....	12
2.5.1	ISO 50001.....	12
2.5.2	Climate change adaptation.....	12
2.5.3	Hazardous waste .....	13
2.5.4	Noise complaints.....	13
3	Smart grids, innovation and our role in the low carbon transition .....	14
3.1	Introduction .....	14
3.1.1	Key challenges.....	14
3.1.2	Low carbon technologies deployed .....	15
3.2	Progress of the innovation strategy .....	16
3.2.1	Summary of innovative solutions deployed.....	16
3.3	Roll out of smart grids and innovation into business as usual.....	19
3.4	Transfer to business as usual (BAU) .....	19
3.4.1	Benefits and impacts.....	20
3.4.2	Smart metering.....	20
4	Appendices .....	22

# 1 Introduction

## 1.1 Executive summary

We are dedicated to achieving the highest standards of environmental performance, not only by minimising the risks created by our activities, but also through targeted investment in outputs that deliver a positive environmental impact.

We are also determined to play our part in enabling the transition to a low carbon future and the environmental benefits this will bring. This influences both our asset investment plans and our investment in measures to reduce our own carbon footprint.

To achieve our environmental objectives we have committed to action across all our activities and have set the ambitious environmental targets below in our RIIO-ED1 business plan to ensure we are on the right track.

**Table 1: RIIO-ED1 Environment commitments**

<b>Commitment:</b>	<b>Measurement:</b>	<b>Target</b>	<b>Target date:</b>
Reduce losses	Annual gigawatt hours (GWh) saved	11	2021
Reduce carbon footprint	Tonnes of Carbon Dioxide Equivalent (tCO <sub>2</sub> e)	10%	2020
Reduce oil lost from cables	Litres lost	<30,000 per year	2023
Undergrounding overhead lines	Km removed	80	2023

In the first year of the RIIO-ED1 period we have made good progress with headline achievements against our commitments of:

- Reduced non-technical losses of 1.8 GWh identification and resolution of theft and deployed technologies that will reduce losses in future years.
- 5.3% reduction on our business carbon footprint from the previous year.
- 4 km of overhead line removed to enhance visual amenity.

Our overall leakage from underground cables in the year was 31,220 litres which was slightly above our target for 2023. This represents some 2.6% of our total oil in service.

In addition, we have also been heavily engaged in connecting new low carbon generation, developing new innovation to accommodate smart grids and preparing for the roll out of smart metering. In 2015-16, we achieved the following:

- 130 MW of low carbon technologies connected.
- 14,900 customer interruptions and 1.3m customer minutes lost avoided through the use of new innovative technologies.

- £2.59m invested in enabling smart meter roll-out.
- Implementation of an energy management system to the ISO 50001 standard.

It is of course early days and 2016-17 will bring new challenges in maintaining the momentum in reducing our carbon footprint, continuing with our investment plans and in realising the benefits of our innovations.

## **1.2 Our business / who we are**

As a company with a workforce of 1700 people, a large contractor workforce, an electricity distribution network serving 5m customers with 13,000 km of overhead lines, over 44,000 km of underground cables, almost 86,000 items of switchgear and more than 34,000 transformers, a fleet of over 600 commercial vehicles and 15 depot and office sites, our activities create both risks and opportunities in regard to the environment.

The environmental risks we encounter include those associated with holdings of electrical insulating oil, waste management, vehicle emissions, holdings of sulphur hexafluoride gas (SF<sub>6</sub>) and work in environmentally sensitive areas.

We have opportunities to minimise resource use and reduce waste to landfill. As the electricity distribution network operator for the north west of England we also have a key role to play in enabling the transition of our region to low carbon energy and through this in supporting the UK as a whole in meeting its climate change targets.

Recognition of these obligations is reflected in our environment and energy management policy.

### **1.2.1 Environment and energy management policy**

Electricity North West is committed to achieving excellence in environmental and energy management performance, minimising any adverse impacts our operations might have and fulfilling our obligation to manage energy and improve the environment that we operate in.

We will:

- *Identify the environmental and energy using aspects associated with our activities, minimising those with any adverse impact whilst promoting those with beneficial impact.*
- *Comply with all applicable environmental and energy management law, and other relevant requirements and, where possible, exceed them.*
- *Integrate environmental performance and energy management considerations into business as usual processes including the setting and reviewing of objectives and targets.*
- *Operate and maintain systems of work that minimise adverse environmental impacts and seek to minimise energy usage whilst delivering beneficial impacts.*
- *Fully inform, instruct, train, supervise and equip people to identify and minimise adverse environmental impacts, maximise energy management opportunities and deliver beneficial impacts.*
- *Make environmental and energy management performance a significant factor in the selection of suppliers of goods and services.*
- *Implement and maintain a robust environmental management system that is certified to the ISO 14001 standard and an energy management system which is certified to ISO 50001.*

- *Manage the waste generated by our activities according to the principles of reduction, re-use and recycling.*
- *Minimise the carbon footprint of our business and actively contribute to the low carbon economy.*
- *Manage our business operations to prevent pollution and wasteful use of energy.*
- *Maximise the sustainability of natural resources used in our activities.*
- *Develop and promote a culture of continuous improvement with regard to environmental and energy management performance.*

To deliver this policy commitment we work to an environment strategy that is based on:

- A clear understanding and visibility throughout the business of environmental issues and impacts
- Targeted investment and expenditure in environmental control measures
- Strong corporate governance and performance management
- Continuous learning and improvement
- A systematic approach to environmental management

To support our drive for excellence in environmental performance we have implemented an environment and energy management system that is certificated to the ISO 14001 Environmental Management and ISO 50001 Energy Management standards.

### **1.2.2 Role of stakeholders in environmental management**

We have a stakeholder engagement strategy that includes new advisory panels composed of stakeholders who are subject experts. One such panel focuses on sustainability, ensuring our network can adapt to future challenges such as a low carbon economy and climate change, whilst keeping bills affordable. We also meet regularly with our regional partners in relation to visual amenity in designated areas. Through this process our stakeholders play a key role in shaping our environmental strategy.

### **1.3 Purpose of the report**

The purpose of this report is to provide the detail on the progress we have made in the first year of the RIIO-ED1 (2015-2023) period in terms of our overall strategic environmental objectives and meeting the environment targets we set out in our RIIO-ED1 business plan.

## 2 Managing our environmental impact

### 2.1 Introduction

This section provides detail on the progress we have made in 2015-16 in regard to the environmental risks and opportunities we encounter including those for which we have set targets in our RIIO-ED1 business plan. These are visual amenity, oil leakage, business carbon footprint, sulphur hexafluoride (SF<sub>6</sub>) emissions and distribution losses.

### 2.2 Visual amenity

We have three National Parks and four Areas of Outstanding Natural Beauty, collectively known as Designated Areas, either wholly or partially within our region. These are:

- Arndale and Silverdale (Cumbria)
- Forest of Bowland (Lancashire)
- North Pennines
- Solway Coast
- Lake District
- Peak District
- Yorkshire Dales

We have a programme for undergrounding overhead lines for visual amenity and since its inception we have worked with regional partners to ensure its success. As part of our wider stakeholder engagement plan we meet quarterly with representatives from the above Designated Areas.

In our RIIO-ED1 business plan we have planned to invest £9m in undergrounding 80km of existing overhead lines by 2023 (although the exact length will depend on the nature of the sites proposed by our regional partners). Against this target we removed a total of 3.79km of overhead line and installed 3.41km of underground cable inside Designated Areas in 2015-16 in the following projects.

**Table 2: Visual amenity activity summary 2015-16**

Designated Area	O/head Line Removed (km)	U/ground Cable Installed (km)	Expenditure (£m)	Benefit
Forest of Bowland: Middle Lees – Cow Ark circuit	1.22	1.35	0.13	Visual Amenity
Solway Coast: Pearsons Blackdyke Farm, Silloth	0.93	1.19	0.09	Visual Amenity
Lake District: Cawdale – Stanegarth circuit	0.80	0.87	0.56	Visual Amenity
Peak District: Derbyshire Levels, Glossop	0.84	-	0.05	Visual Amenity
<b>TOTAL</b>	<b>3.79</b>	<b>3.41</b>	<b>0.83</b>	

In 2016-17 we have the following projects planned:

**Table 3: Planned visual amenity activity 2016-17**

	Designated Area	Expenditure (£m)	Benefit
North Pennines	Raise Bank, Alston	0.08	Visual Amenity
	Rawdale and Mardale ABS – Goodcroft PMT	0.01	Visual Amenity
	The Loaning, Alston	0.40	Visual Amenity
	Coatley Hill – Sunnyside, Alston	0.25	Visual Amenity
Lake District	Abbots Reading near Haverthwaite	0.00	Visual Amenity
	Spark Bridge – Broad Haws 11kV Spur	0.02	Visual Amenity
	Docker Nook – Kilnstone Hydro	0.00	Visual Amenity
	Toms Howe – Hill House, Longsleddale	0.00	Visual Amenity
	Bushby House, Caldbeck	0.06	Visual Amenity
	LDNPA Surveys Phase 1	0.01	Visual Amenity
	LDNPA Surveys Phase 2	0.08	Visual Amenity
Solway Coast	Priesthill, Beaumont	0.13	Visual Amenity
	The Kiln Cottage Spur, Beaumont	0.06	Visual Amenity
Forest of Bowland	Woflen Hall – Fell Foot, Chipping	0.09	Visual Amenity
	Greenbank Spur, Farleton	0.02	Visual Amenity
	Priory Farm, Hornby	0.05	Visual Amenity
	Farleton Crossing	0.03	Visual Amenity
Yorkshire Dales	Streets – Water Houses, Malham	0.00	Visual Amenity
Peak District	Derbyshire Levels, Glossop	0.16	Visual Amenity
<b>Total</b>		<b>1.13</b>	

Details of our strategy for project assessment and delivery, analysis of costs and benefits, stakeholder engagement and support and our approach to the assessment of projects is included in our document *Undergrounding for Visual Amenity – Scheme Selection and Design Process 05 May 2016* which can be found at the following link:

<http://www.enwl.co.uk/sustainability/reports-and-assurance>

The data relating to our visual amenity activity can be found in worksheet E1 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

### 2.3 Oil leakage

We have used fluid filled cables since the 1960s as part of our extra high-voltage distribution network at 132,000 volts down to 33,000 volts. The fluid acts as an electrical insulator and will be either mineral naphthenic oil or linear alkyl benzene or a mixture. In all cases the fluids will have a low viscosity and colour, not unlike water.

Leaks from fluid filled cables can occur for varying reasons including cable damage by third party excavations, cable damage due to installation failure, failure of oil equipment, pipe work, monitoring gauges, oil tanks etc. and cable joint failure.

Whilst only a very small percentage of cables ever develop leaks, a leak can present a significant environmental risk if it is adjacent to a water course or an aquifer.

Our strategy to address oil leakage from fluid filled cables is to replace them with alternative modern oil free cabling and to respond quickly to leaks on legacy circuits.

We have committed in our RIIO-ED1 business plan to maintain a leakage rate of less than 30,000 litres per year by 2023. To achieve this we aim to replace 57km of oil filled cable which will reduce our overall oil in service by 131,560 litres and 3,900 litres of oil lost per year, a reduction of 13% compared to 2014-15.

To help achieve this target we removed 33km of 33kV and 2km of 132kV oil-filled cable in 2015-16, reducing our overall oil in service in cables by 64,023 litres or 5% of the total oil in service in 2015-16

When leaks are detected we respond in accordance with requirements, including response times, of the joint Environment Agency and Electricity Companies *Operating Code on the Management of Fluid Filled Cable Systems* Issue 3, 2013.

In 2015-16 a total of 31,220 litres of oil was lost representing 2.6% of the total oil in service.

In 2016-17 we plan to remove a further 5.87km of 33kV and 0.03km of 132kV oil filled cable.

The data relating to our oil leakage activity can be found in worksheet E2 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

## **2.4 Carbon impact and climate change**

### **2.4.1 Business carbon footprint**

Within our Environment and Energy Management Policy we have committed to minimise the carbon footprint of our business and actively contribute to the low carbon economy.

The target set in our RIIO-ED1 business plan is to reduce our 2014-15 business carbon footprint (excluding losses) by 10% by the end of 2019-20. The benefits of this reduction will be the equivalent of over 2,440 tonnes of CO<sub>2</sub> emissions saved including a reduction of 1,237,379 kWh of energy used in powering our buildings and substations and a reduction of 804,727 litres of diesel used to power the operational fleet, plant and equipment.

This reduction will be delivered primarily through investment and management focus on buildings energy usage, operational transport, business transport, fugitive emissions and fuel combustion.

In 2015-16 we continued to implement energy efficiency measures through the refurbishment of our buildings, and the replacement of fleet vehicles and company cars with more efficient vehicles. We also continued to realise the benefits from investment in fuel efficiency including reduced vehicle weights, installation of rev limiters, improved management of fuel cards, and challenging operators on vehicle choice to ensure most efficient vehicle is utilised for the job.

Our business carbon footprint (excluding losses) for 2015-16 was 23,133 tCO<sub>2</sub>e, a reduction of 1,282 tCO<sub>2</sub>e (5.3%) on the previous year, and included a significant increase in fuel used to power emergency generators during the two major storm events that occurred in the year.



**Table 4: Business carbon footprint 2015-16**

Emissions	2015/16 Tonne CO <sub>2</sub> E	2014/15 Tonne CO <sub>2</sub> E
<b>Scope 1</b>		
Operational transport (direct labour)	3,376	3,910
Operational transport (contractors)	4,043	5,191
Business transport - road	1,192	1,158
Fugitive emissions - SF <sub>6</sub>	334	863
Fugitive emissions - other	18	14
Fuel combustion	4,113	2,958
<b>TOTAL</b>	<b>13,076</b>	<b>14,094</b>
<b>Scope 2</b>		
Buildings energy usage	9,840	10,198
<b>TOTAL</b>	<b>9,840</b>	<b>10,198</b>
<b>Scope 3</b>		
Business transport - rail	29	27
Business transport - air	188	96
<b>TOTAL</b>	<b>217</b>	<b>123</b>
<b>Business Carbon Footprint (exc. losses)</b>	<b>23,133</b>	<b>24,415</b>
Losses	667,982	728,045
<b>Business Carbon Footprint (inc. losses)</b>	<b>691,115</b>	<b>752,460</b>

The data relating to our business carbon footprint can be found in worksheet E3 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

#### **2.4.2 Sulphur hexafluoride emissions (SF<sub>6</sub> Emitted)**

SF<sub>6</sub> is a gas with excellent electrical insulation and other properties, which have led to its widespread use in electrical switchgear and in a number of other industrial applications. However, there is concern over any SF<sub>6</sub> that escapes into the atmosphere since it is a potent greenhouse gas.

In terms of our strategy to address the level of SF<sub>6</sub> emitted, we contribute to the overall UK electricity transmission and distribution industry in supporting the Government initiatives to ensure the implementation of sound policies for the control and use of SF<sub>6</sub>. The European electricity industries have also agreed a set of actions with the manufacturers of electrical equipment using SF<sub>6</sub>, to reduce emissions of the gas to the atmosphere. Leakage rates are

being reduced in cooperation with power equipment manufacturers under a programme of continuous improvement.

On a company level our current policy is to continue to install modern SF<sub>6</sub> equipment with lower leakage rates and over the RIIO-ED1 period we plan to reduce our leakage rate by over 20% from a rate of 0.38% (as a proportion of the mass in service) in 2013 to 0.30% by 2023.

In 2015-16 a total of 14.63kg of SF<sub>6</sub> was lost from our system, with a carbon equivalent of 334 tCO<sub>2e</sub>. This loss equates to 0.10% of the total mass in service.

In the RIIO-ED1 period we had originally planned for a rise in the total mass of our SF<sub>6</sub> holding by approximately 20% to around 17,000kg. This predicted rise however is currently under review following a policy decision in 2015-16 to re-commence installation of oil-filled ring main units. In 2015-16 our overall total holding of SF<sub>6</sub> actually reduced by 2,116 kg from 16,852kg to 14,736kg.

The data relating to our SF<sub>6</sub> holding, leakage and associated carbon footprint can be found in worksheet Regulatory Instruction Guidance worksheets E2 and E3 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

### **2.4.3 Distribution losses**

When electricity is generated, not all of the electrical energy which flows through the power network reaches the customer. This is because power networks use-up some of the energy in the process of transporting the electricity to customers. In the broadest sense, distribution network losses are the difference between the electrical energy entering the distribution network, and the electrical energy that leaves it. Some losses are associated with the technical characteristics of the electricity network ('technical' losses), whilst other losses are more to do with measurement and billing ('non-technical' losses).

Losses cost customers money and contribute to carbon emissions. They can be reduced in various ways but these measures also cost money. At Electricity North West we act on behalf of our customers to determine the appropriate balance between spending money on reducing losses, and saving money for customers by lowering the energy lost during transportation.

The overall level of losses will be influenced to a greater extent by electricity usage i.e. the more electricity consumed, the more power transmitted and distributed, the more losses and vice versa. This movement in losses is reflected in the total losses associated with our network. In 2015-16 losses<sup>1</sup> were 1,445,254,010 kWh or the equivalent of 667,982 tCO<sub>2e</sub>. This was a reduction of 27,745,990 kWh from 2014-15 which together with a change on the conversion factor equated to a reduction of 60,063 tCO<sub>2e</sub>.

We can however proactively target losses reduction and our strategy for losses is to continually review the options for reducing the losses on our network. We have examined the potential to reduce network losses through the application of various alternative investment strategies during the RIIO-ED1 period and are adopting, as policy, only those strategies that deliver clear positive benefits for our customers.

---

<sup>1</sup> it should be noted that the reported losses figure is a snapshot of received data as of the date of this report and will change as further settlement reconciliation runs are carried out (up to 28 months after each relevant settlement date).

We also plan to maintain and expand our activities to investigate and minimise non-technical losses, such as theft, while continuing to establish a more reliable losses reporting baseline within RIIO-ED1.

As part of this strategy we have identified a number of priorities for reducing both technical and non-technical losses.

**Table 5: Losses strategy summary**

Investment	Actions	
<b>Technical losses</b>		
Distribution transformers (ground-mounted)	Replace old (pre-1990) large, ground-mounted, secondary network transformers with capacities of 800kVA and 1000kVA with lower loss EU Eco design	Proactive
Primary transformers	When installation or replacement required, replace with lower loss EU Eco design	Opportunistic
Grid transformers	When installation or replacement required, determine best type to reduce losses with all new transformers lower loss EU Eco design	Opportunistic
Distribution transformers (pole-mounted)	When installation or replacement of larger pole-mounted secondary network transformers required, replace with lower loss EU Eco design	Opportunistic
Cables (high voltage and low voltage)	Install large-cross section cables (300mm <sup>2</sup> ) at both HV and LV as standard	Opportunistic
<b>Non-technical losses</b>		
Transactional theft	Continue to work alongside suppliers to help reduce transactional theft	Proactive
	Monitor / share best practice with other DNO's	Proactive
Theft in conveyance	Develop our theft in conveyance services	Proactive
	Contribute to the development of the National Revenue Protection Code of Practice	Proactive
	Increase number of investigations undertaken	Proactive
	Monitor / share best practice with other DNO's	Proactive
Unmetered supplies	Undertake regular audits of unmetered supply inventory	Proactive
<b>Low Carbon Networks (LCN) Fund Strategy</b>		
LCN Fund	Review and analyse the details of the LCN Fund innovation projects	Proactive

Our losses strategy can be found at the following link:

<http://www.enwl.co.uk/docs/default-source/default-document-library/electricity-north-west---losses-strategy---april-2015>

A summary of our activity in this area is contained in the tables below.

**Table 6: summary of losses costs and benefits from activities in RIIO-ED1<sup>2</sup>**

Programme / project title	Distribution Losses – Justified Costs	Reduced Losses	Reduced Emissions Associated with Losses	Cumulative reduced losses to date
	£m	GWh	tCO2e	GWh
Standardise use of 300mm <sup>2</sup> HV cable	0.51	0.00	0.00	0.00
Standardise use of 300mm <sup>2</sup> LV cable	0.14	0.00	0.00	0.00
Proactive replacement of pre-1990 1000kVA transformers	0.86	0.00	0.00	0.00
Proactive replacement of pre-1990 800kVA transformers	0.19	0.00	0.00	0.00
Opportunistic primary transformer replacement	0.01	0.00	0.00	0.00
Opportunistic pole-mounted transformer replacement	0.02	0.00	0.00	0.00
Relevant theft of electricity action	(0.01)	1.8	501.92	1085.97
<b>TOTAL</b>	<b>1.72</b>	<b>1.8</b>	<b>501.92</b>	<b>1085.97</b>

<sup>2</sup> For all technical losses initiatives it is assumed that there were no losses saving in the first year (2015-16) and the full losses saving will commence in the following years.

**Table 7: summary of amount of losses activity in regulatory year and estimate for 2016-17**

Programme / project title	Description of unit	Volumes in regulatory reporting year	Forecast volumes for following regulatory year
Standardise use of 300mm <sup>2</sup> HV cable	1km of cable	158	260
Standardise use of 300mm <sup>2</sup> LV cable	1km of cable	41	40
Proactive replacement of pre-1990 1000kVA transformers	Transformers	47	45
Proactive replacement of pre-1990 800kVA transformers	Transformers	12	10
Opportunistic primary transformer replacement	Transformers	2	2
Opportunistic pole-mounted transformer replacement	Transformers	53	50
Relevant theft of electricity action	Theft case identified	602	600

The data relating to our loss reduction activities can be found in worksheet E4 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

The cost and benefit analyses for our innovative solutions are included in the appendices.

## **2.5 Other environment related activities**

### **2.5.1 ISO 50001**

To underpin our target of reducing our business carbon footprint by 10% by 2020, in 2015-16 we implemented an energy management system across the company. This system, designed to meet the requirement of the ISO 50001 standard, has driven us to carry out a full review of our energy use and consumption, identify opportunities for improving energy performance, set energy reduction targets and put procedures in place for managing energy use.

We have sought external certification of the system and anticipate achieving this in early 2016-17.

### **2.5.2 Climate change adaptation**

Under the Climate Change Act 2008 the UK Government is allowed to ask certain organisations to produce reports on the current and future predicted effects of climate change on their organisation and their proposals for adapting to climate change.

As part of the second round of reporting we were invited to provide a progress update report which was duly submitted to DEFRA in June 2015. As with the report we submitted for the first round of reporting in 2011 we worked with other electricity network companies to produce an ENA Engineering Report which was used as an appendix to our company submission.

The 2015 report confirmed the main potential climate change impacts on our business as flooding, increase in temperature, increased vegetation growth and resilience to extreme events. The report put particular focus on threats from flooding and following the floods of December 2015, most of the arguments we made remain valid although in future submissions we might revise our views on flooding at lower voltage substations.

The 2015 report can be found on our website through the following link:

<http://www.enwl.co.uk/docs/default-source/sustainability/2015.pdf?sfvrsn=4>

### **2.5.3 Hazardous waste**

In 2015-16 we continued to enhance our procedures for transferring used electrical insulating oil and other hazardous waste between our operational sites and depots. We introduced an electronic system, through an iPhone App, whereby our employees can easily record the details of any waste movements, the data for which can then be centrally accessed and used for reporting to the Environment Agency.

Our oil recycling facility at Blackburn continues to play a significant part in managing our environmental impacts by allowing us to minimise the use of raw materials and disposal of waste oil.

### **2.5.4 Noise complaints**

We received 38 noise related complaints in 2015-16 These included complaints relating to substation noise, on-going works, substation alarms and damage to customer property. All complaints were dealt with through our customer service processes.

The data relating to noise complaints can be found in worksheet E2 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

## **3 Smart grids, innovation and our role in the low carbon transition**

### **3.1 Introduction**

As the electricity distribution network operator for the north west of England we have a key role to play in enabling the transition of our region to low carbon energy and through this in supporting the UK as a whole in meeting its climate change targets.

This section describes our activity in 2015-16 in regard to smart grids, innovation and generally how we are fulfilling our commitment in this area.

#### **3.1.1 Key challenges**

Our business and our industry face long term challenges in regard to energy use.

- Government initiatives on energy efficiency, carbon costs, renewable energy generation and electric vehicles combined with increasing customer awareness of energy issues will drive changes in customer behaviours that will impact significantly on electricity consumption in terms of patterns and levels of demand.
- Increased use of electricity for heating and transport will increase customer demand for electricity, improved reliability of supply and information when supply is interrupted.
- Our assets are ageing with many of our assets now approaching their previously assumed end of life and at a time when we are asking them to perform new functions.

These challenges and the new technologies that are emerging to tackle them present other opportunities.

- New technology itself has the overall ability to add value to our business by enabling improvements in customer service and reducing costs.
- Energy storage can help us manage demand uncertainty and help customers and communities improve energy efficiency.
- Smart meters will allow us to monitor how much power our customers are using or producing in near real time, and allow us to positively influence usage and operate the network more responsively.
- New markets are emerging through which customers can earn value while helping solve network constraints.
- Regulatory models can be developed that support changes needed.

Our innovation strategy is built to resolve these new challenges and to realise the opportunities. It is made up of five objectives with the aim of delivering value to our customers.

- Maximise the use of existing assets
- Apply innovative solutions to real problems
- Deploy proven technology today
- Generate value for customer's now

- Offer new services and choice for the future

In line with this strategy we have developed a range of projects, some of which have been completed and a number of which are currently in flight. All projects are designed to support one or more key innovation themes:

- Safety and environment - strive to continuously improve safety and reduce impact on the environment
- Network resilience – improve network performance and reduce risk
- Capacity – maximise the use of existing assets to increase demand and generation capacity
- Efficiency – provide our existing services at lower cost
- Customer service – improve customer experience and offer new services with more choice
- Commercial evolution – change our role from network operator to system operator

Full details of our innovation work can be found on our dedicated ‘Future’ web pages through the following link:

<http://www.enwl.co.uk/about-us/the-future>

Our innovation strategy can be found at the following link:

<http://www.enwl.co.uk/docs/default-source/innovation-strategy/innovation-strategy-18-march-2016.pdf>

The data relating to the benefits of using innovative solutions for connections can be found in worksheet E6 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

The cost and benefit analyses for our innovative solutions are included in the appendices.

### **3.1.2 Low carbon technologies connected**

In 2015-16 we connected 7,918 low carbon technologies with a total capacity of 130 megawatts (MW). 7,913 of these were connected onto our secondary<sup>3</sup> network of which 7,349 were distributed generation units. On our primary<sup>4</sup> network we connected 5 low carbon technologies all of which were distributed generation units.

We anticipate similar deployment in 2016-17.

The data relating to low carbon technologies deployed can be found in worksheet E7 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack in the appendices.

---

<sup>3</sup> 11kV and below

<sup>4</sup> 33kV to 132kV



## 3.2 Progress of the innovation strategy

The first year of the RIIO-ED1 period has been a crucial period for us in both preparing for and actually deploying the innovative solutions identified in our strategy. Our activities during 2015-16 have focussed on transitioning these solutions into business as usual via a number of new and amended policy updates, completion of associated procurement exercises to allow us to purchase key products and services as well as internal training on how to carry out the range of activities associated with the deployment of the innovative solutions.

The volume of low carbon technologies uptake on the secondary network was 29% below the forecast volumes for 2015-16. A key reason for the recorded low volume is the issues we have with data visibility for items connected beyond the meter. As an example, we had no notifications in the year of heat pump installations although it can be assumed that installations did take place.

Electric vehicle connections were also below expectation. Connection of photovoltaic installations was broadly in line with plan and connections of installations not subject to Engineering Recommendation G83 *Recommendations for the Connection of Type Tested Small-scale Embedded Generators (Up to 16A per Phase) in Parallel with Low-Voltage Distribution Systems* was above the expected level.

The volume of low carbon technologies uptake on the primary network was in line with forecast. More photovoltaic units than anticipated were connected onto the secondary network.

Our current innovation strategy is focussed in more detail on the practical application of innovative solutions, building on the data gathering and modelling outputs proposed in our original strategy submitted with our RIIO-ED1 business plan. In 2015-16 the Innovative Solutions from our strategy that we made progress on where:

- Capacity to Customers (now known as managed connections)
- Fault Support Centre including deployment of Bidoyng (smart fuse)
- Connect and Manage PV Clusters on LV networks
- Transformer Regeneration including combined on-line transformer monitoring

### 3.2.1 Summary of innovative solutions deployed

#### **Capacity to Customers (now known as managed connections)**

##### *What the solution is*

Managed connections provide customers wishing to connect to the network with a lower cost connection and reduced waiting times versus traditional network reinforcement based connection arrangements. It utilises advances in network automation and communications alongside innovative commercial terms. It is a form of active network management (ANM) solution which may seek to disconnect managed customers from the network for agreed periods only in the event of a relevant network fault.

##### *How the solution is being used*

Managed connections are now the standard connection offer provided to all generation customers connecting to the EHV network. Managed connections afford customers a lower cost connection and as such have become the default connection offer provided to all DG customers.

To support decision making by customers, information on the potential 'curtailment factor' (the typical period of time that a customer could expect to be at risk of disconnection) is provided alongside the connection offer. Customers may choose to reject the managed connection offer and instead opt for a more traditional connection arrangement without the managed elements.

#### *How the solution is delivering benefits*

Economic benefits flow to connection customers from lower reinforcement costs and reduced time to connect. Environmental benefits accrue as a result of the connection of low carbon generation such as solar/wind farms.

In 2015-16 this solution delivered an estimated £5.55m in gross avoided costs.

### **Project: Fault Support Centre including deployment of Bidoyng (smart fuse)**

#### *What the solution is*

The Fault Support Centre is an enhanced low voltage network fault management solution which makes use of the increased penetration of intelligent devices such as the Bidoyng (smart fuse) coupled with an innovative commercial partnership with a third party provider.

The Fault Support Centre provides a real-time operational management of LV networks to allow for the proactive management of faults. The data obtained can be further used to target areas of the network which would benefit from asset replacement.

#### *How the solution is being used*

The solution is being used as the business-as-usual method by which all transient faults are managed. In the event that a transient fault is detected, a Bidoyng smart fuse (or suitable alternative such as the Weezap) is fitted to the suspect LV network. Our third party service provider, Kelvatek, is informed of the event and information is passed across that allows real-time monitoring of the associated network.

Kelvatek will continue to monitor the affected networks until they have determined the location of the fault and issued an instruction to our field teams to investigate or it can be reasonably shown that the transient fault is no longer active. In such cases the equipment will be recovered and redeployed elsewhere.

#### *How the solution is delivering benefits*

The Fault Support Centre allows for the proactive management of LV transient faults. It is clear from our own customer engagement that these types of fault are amongst the biggest cause of customer dissatisfaction. The ability to repair these faults before they have chance to progress into a permanent fault will significantly reduce the number of associated faults and reduce customer disruption accordingly.

Further benefits flow from the reduced CIs and CMLs and associated fault costs that the proactive management of faults delivers.

In 2015-16 this solution delivered an estimated £0.67m in gross avoided costs, 14,564 customer interruptions avoided and 1,310,760 customer minutes lost avoided.

## **Connect and Manage PV Clusters on LV Networks**

### *What the solution is*

As a result of the learning outcomes of the LCNF Tier 1 Project – Low Voltage Network Solutions (LVNS), we have been able to successfully implement a streamlined approach to the connection of domestic scale PV systems to the low voltage (LV) network. These systems are often connected in clusters and can give rise to associated network voltage and thermal issues.

Traditionally, a network operator would require detailed and time consuming network assessments to be performed in advance of allowing the connection to proceed. As a result of the research that was undertaken as part of the LVNS project and the sophisticated network modelling that underpinned, we have been able to adopt an alternative approach.

We have successfully shown that up to a certain threshold i.e. percentage of customers with PV systems, it is acceptable to allow the connections to proceed. Once the threshold is met we will install network monitors to assess using actual recorded data if the network requires any further assessments.

### *How the solution is being used*

The solution is being actively used across our region. We have established a business process supported by internal policy that provides for a continued monitoring of the PV volumes. Specific actions are triggered when these volumes are exceeded and follow up actions are performed as appropriate.

### *How the solution is delivering benefits*

The solution delivers benefits to customers in the form of avoided waiting times associated with the connection of PV systems to the LV network. We have also been able to avoid expensive and resource intensive network connection studies, thus reducing internal costs and freeing up resources to concentrate on other parts of our connection services.

In 2015-16 this solution delivered an estimated £0.55m in gross avoided costs, 305 customer interruptions avoided and 26,842 customer minutes lost avoided.

## **Transformer Regeneration including combined on-line transformer monitoring**

### *What the solution is*

The condition of the oil in the transformer main tank is a good proxy for the general condition of the transformer as a whole. It has been shown from recent research that transformer oil regeneration (a process whereby transformer oil is cleaned through an on-site process) can result in an improvement in the overall condition of the transformer thus can extend the expected life of the transformer when used in combination with enhanced condition monitoring.

### *How the solution is being used*

Transformer regeneration is being used as an alternative to traditional transformer replacement during RIIO-ED1 thus reducing the cost of asset replacement.

In 2015-16 our activities have been limited to preparation and establishing delivery capabilities for this solution. As such there are no physical outputs in this reporting period.

### How the solution is delivering benefits

The financial benefits from this project are derived from the potential transformer life extension and deferment of asset replacement costs. Other benefits include quality of supply benefits which are limited to improved understanding of the risk of failure of older transformers and a better insight into the oil ageing process.

The environmental benefits result from extending the life of transformer and its oil therefore reducing the requirements for disposal and recycling of used oil and scrap transformers.

### 3.3 Roll out of smart grids and innovation into business as usual

All our innovative solutions are designed, implemented and monitored through a set process.

Figure 1: innovative solutions roll-out process



The cost and benefit analyses for our innovative solutions are included in the appendices.

### 3.4 Transfer to business as usual (BAU)

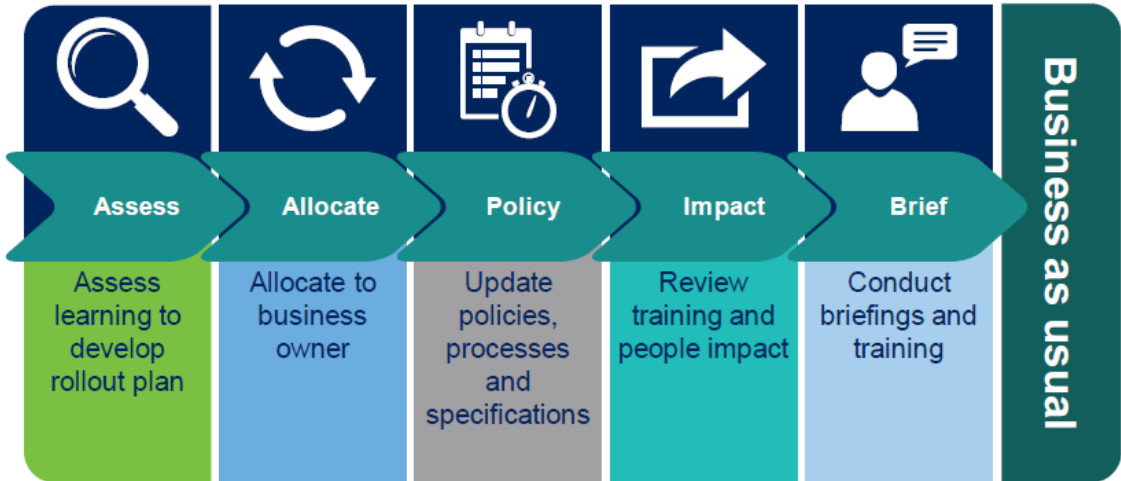
Managing the transition of an innovative solution, device, technology or new operating arrangement into BAU is perhaps the most important stage in delivering benefits to customers. This phase generally represents the final stage of a project's time line and is the culmination of its successful outcome.

The ability to transition the innovation to BAU is an important consideration when innovation investment opportunities are assessed. We recognise that some projects are aimed at informing our understanding and learning and in such instances BAU transition normally involves updates to business processes, procedures and specifications. The BAU assessment also considers the technology risk, the development time line and our ability to support the developers in a meaningful manner before embarking on a project.

To ensure the successful transition to BAU, we select innovation investments that are assessed as having a good chance of delivering value for customers. We focus on challenges that have been identified in our business plan and use innovation to address these issues. We use a cost benefit analysis approach to ensure that best value projects are taken forward.

We have developed a five stage initiative-tracking process which enables us to take innovation and other business initiatives into BAU.

Figure 2: innovative solutions transfer to business as usual



**3.4.1 Benefits and impacts**

With the roll-out of the above innovative solutions in 2015-16, the following benefits have been realised<sup>5</sup>:

Table 8: innovative solutions benefits and impacts

Innovative Solution	Additions	Estimated Gross Avoided Costs (£m)	Benefits	
			CI Impact (Interruptions)	CML Impact (Minutes)
Capacity to Customers	4	5.55	N/A	N/A
Fault Support Centre	198	0.67	14,564	1,310,760
Connect and Manage PV Clusters on LV Networks	9,761	0.55	305	26,842

**3.4.2 Smart metering**

Although the energy supply companies are responsible for their rollout, we are preparing to maximise the benefits from the data they will provide in the future.

Our strategy is to help customers and suppliers with the transition to the new meters, for example by upgrading our service positions where necessary to accommodate a smart meter.

At the same time we will train our employees and upgrade our IT systems so we can use smart meter data for the benefit of our customers. We are also working with suppliers to ensure customers are properly informed about smart meters.

<sup>5</sup> In 2015-16 our activities Transformer Regeneration including combined on-line transformer monitoring has been limited to preparation and establishing delivery capabilities for this solution. As such there are no physical outputs in this reporting period.

In 2015-16 a total of 1,049 smart electricity meters were installed in our distribution service area, in addition to those installed in previous years, but the penetration of smart meters is still very low.

In 2015-16 we incurred £1.68m in IT costs covering the procurement, implementation and commissioning of the gateway infrastructure connecting our IT systems to the Data and Communications Company's (DCC) central systems as part of the Smart Meter Implementation Programme and required by the Smart Energy Code. Connection to DCC's central systems facilitates access to smart meter data, generated from alerts and service requests, which in the longer term will enable a system operator to manage its network more effectively and cost efficiently for its customers.

We also paid £0.68m in communication licensee costs to the DCC, as required by the Smart Energy Code and defined by DCC's published charging methodology statement.

DCC's systems and our gateway are under construction with an expected go-live date of autumn 2016, after which we will start to receive smart meter data.

Throughout the year, we have continued to play an active role at industry level through the Energy Networks Association Smart Metering Operations Group and its sub-group looking specifically at the safety aspects of the roll-out.

The smart meter programme has not yet rolled out to the extent that benefits are identifiable. However, in 2016-17 we are hopeful that the roll-out will have progressed to the point where we will be to quantify realised benefits.

The data relating to smart meter readiness expenditure can be found in worksheets E5 and E8 of the RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack and in section E5 of the RIIO-ED1 RIGs Environment and Innovation Commentary in the appendices.

## 4 Appendices

Regulatory Reporting Pack and Commentary:

- RIIO-ED1 Environment Report – Environment and Innovation Reporting Pack 1.0 Final
- Environment and Innovation Commentary ENWL 2015-16 Final

Cost Benefit Analyses (Losses):

- Install 300sqmm HV Cable versus 185sqmm HV CV1 CV2 V2 (2)
- Install 300sqmm HV Cable versus 185sqmm HV CV3 V2
- Install 300sqmm HV Cable versus 185sqmm HV CV7 V2
- Install 300sqmm HV Cable versus 185sqmm HV Other V2
- Install 300sqmm LV Cable Versus 185sqmm LV CV1 CV2 V2
- Install 300sqmm LV Cable Versus 185sqmm LV CV7 V2
- Install 300sqmm LV Cable Versus 185sqmm LV Other V2
- Opportunistic 200kVA PMT Replacement CV7 V2
- Opportunistic 200kVA PMT Replacement Other V2
- Proactive 800kVA GMT Replacement CV21 V2
- Proactive 1000kVA GMT Replacement CV21 V2
- Programme 23MVA Replacement CV7 V2
- Relevant theft v no activity CV21 CBA vfinal

Cost Benefit Analyses (Innovation):

- C2C CBA RIIO ED1\_v5
- LV fault management CBA RIIO ED1\_v4
- PV CBA RIIO ED1\_v4