



Environment & Innovation Report



westernpower.co.uk

2019/20

WPD's Environment and Innovation Report aims to provide all of our stakeholders with a transparent and public account of our environmental and innovation performance over the last twelve months.

We will use this report to provide an all-inclusive overview that includes clear justification for our actions and the benefits to our customers. Reducing our impact on the environment and embracing the increase in low carbon technologies is one of our key RIIO-ED1 outputs.

To this end throughout 2019/20 we have achieved the following improvements:



Environmental Highlights

- **Zero waste** to landfill achieved in East Midlands and South Wales WPD licence areas
- Continued **reduction** in our Business Carbon Footprint
- **Reduction** in fluid filled cable losses and SF₆ leaks across the business
- Successful **certification to ISO14001:2015** environmental management system standard.



Innovation Highlights

- **26 projects delivered**
- **61 submissions** to our Network Innovation Allowance calls
- **28,048 hits** on our Innovation website
- **46 PQ monitors installed** as part of the Primary Networks Power Quality Analysis project
- **242 items of feedback** on barriers to domestic flexibility as part of the Future Flex project
- **1,347 events** analysed as part of the Alarm project, of which 165 look like pecking faults.



Challenges

- **Continue to improve** progress in RIIO-ED1 business environmental outputs – specifically our output for fluid filled cable leaks and SF₆ emissions
- **Continue to identify** and remove PCB contaminated equipment across the UK distribution network
- **Maintain and improve** our environmental performance and compliance record with the environmental regulators
- **Investment** in the development of alternatives to SF₆.

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Section 1.0

1.0 Introduction



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1.1 Who we are and what we do

We are one of the six Distribution Network Operators (DNOs) who deliver electricity to homes and businesses across England, Wales and Scotland. Our network, which serves 7.9m customers, is the largest in the UK, operating from the Lincolnshire coast, across the Midlands, South Wales and the South West to the Isles of Scilly.

Our four key business tasks are:

1 Operating our network assets to ensure we 'keep the lights on' for all of our customers.

2 Maintaining the condition and therefore reliability of our assets.

3 Fixing our assets should they get damaged or if they are faulty.

4 Upgrading the existing network or building new ones to provide additional electricity supply or capacity to our customers.



Our role is simple

We are not a supplier. We do not buy and sell electricity, or directly bill customers. Our costs account for around 18% of an average annual domestic electricity bill which customers pay to their supplier. We deliver electricity to over 7.9 million customers over a 55,000 square kilometre service area and we employ over 6500 staff.



7.9m

Our network serves
7.9m customers,
by area in the UK



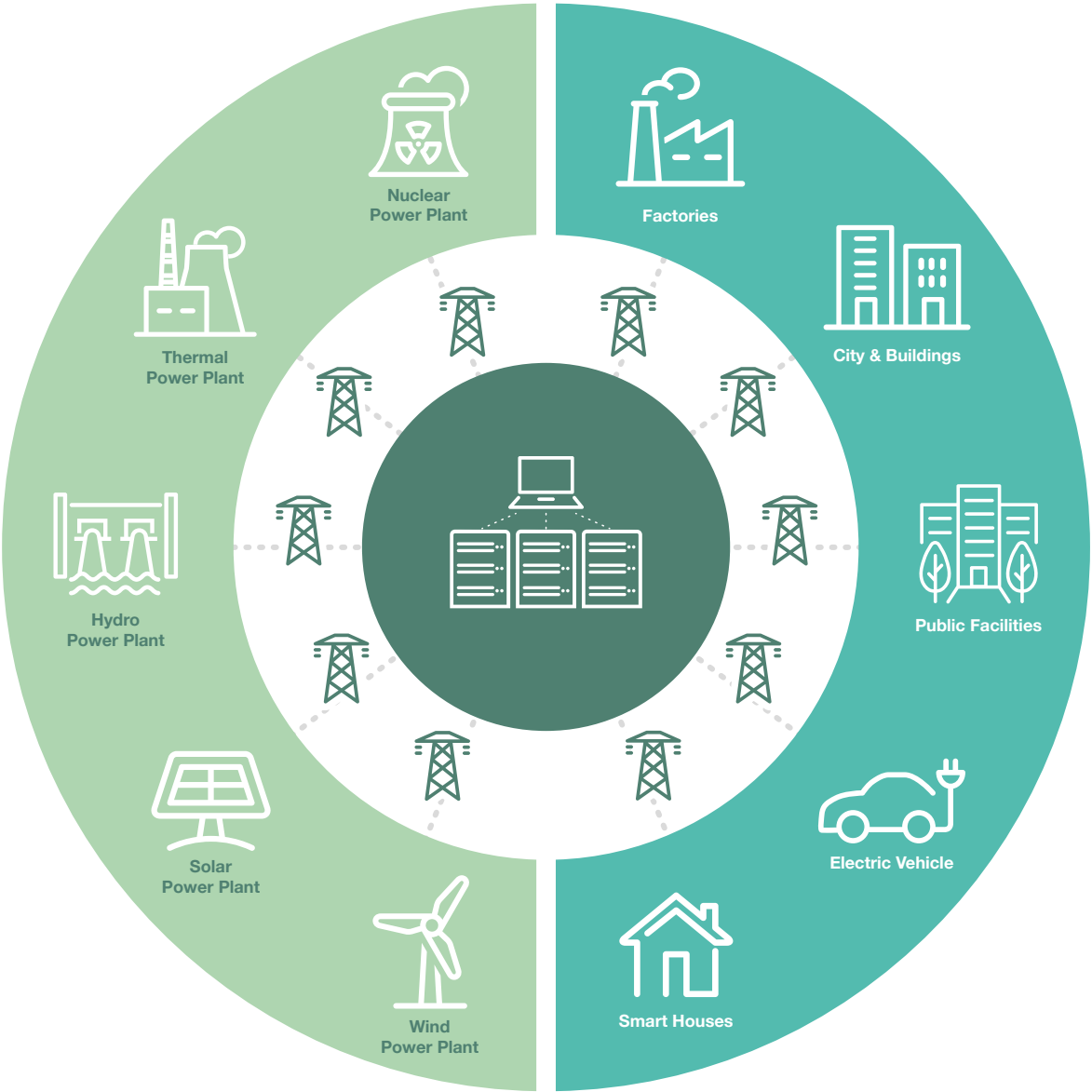
1.2 Our network

The electricity network we operate includes:

- Transformers that convert electricity from one voltage to another
- Underground cables and overhead lines that carry electricity across long distances
- Switches to turn the electricity on or off, or to alter its route
- Service connections to take the electricity into customers' premises.

Our network sits between the National Grid transmission network and the end customer.

Asset Type	Units	WPD Total
Overhead lines	Km	90,201.3
Underground cable	Km	134,711.5
Transformers	Each	187,956
Switchgear	Each	298,576
Poles	Each	1,373,565
Towers (pylons)	Each	14,755
Customer numbers	Each	7,875,322





1.3 Improvement Opportunities

We are committed to ensuring that we meet all of our compliance obligations while minimising the overall impact that our activities have on the environment in which we work and operate.

As such during RIIO-ED1 we have achieved the following environmental improvements (outputs) throughout our business:



A reduction in technical network losses

Installation of oversized transformers when replacing assets at highly loaded locations

Using larger sized cables when installing new network in Low Carbon Technology (LCT) hotspots

Undertaking innovation projects specifically related to technical losses.



A reduction in our carbon footprint

The introduction of **electric vehicles (EVs)** in to the WPD Operational Fleet

All new or refurbished WPD buildings achieving **minimum rating of 'Excellent'** for new build and 'very good' for refurbishment under the BREEAM* rating

Reducing the amount of waste we produce and send to landfill.



Reduction in the leaks from our equipment, specifically

The **volume of fluid lost** through leaks from fluid filled cable

The **volume of SF₆ gas** that is released from switchgear due to manufacturing issues

Installation of effective containment 'bunds' around plant containing high volumes of oil.

*Building Research Establishment Environmental Assessment Method



1.4 Stakeholder Engagement

In order to deliver the needs of our customers we must have mechanisms in place to provide the insight into their priorities and expectations, and to work with them to devise and shape our plans to address them.

Our stakeholder engagement programme, is vital to how we operate, underpinning the decisions we make across every strand of our business, reflecting the needs of all customers ensuring no one is left behind.

At a time of unprecedented change in the industry considering the UK's target of Net Zero carbon emissions, our stakeholders have urged us to be at the forefront of the energy transition.

WPD are challenging ourselves to go further than ever before to pursue the most extensive and embedded programme of engagement yet by enabling co-creation on all key decisions. Instead of simply asking stakeholders to review and refine our plans we seek collaborative engagement asking stakeholders to start from a blank page and work with WPD staff to co-create our strategy and plans.

Building our plans with our stakeholders

As we build our business plan for RIIO-ED2 with our stakeholders, this co-creation approach is key and was pioneered in our annual stakeholder roadshow events in February and March 2020.



Stakeholders were positive about our collaborative approach where one told us:

“Overall, having seen how other regulated companies go about their price review periods, this is by far the most collaborative, innovative and encompassing engagement and business planning process.”



1.4 Stakeholder Engagement

What stakeholders told us

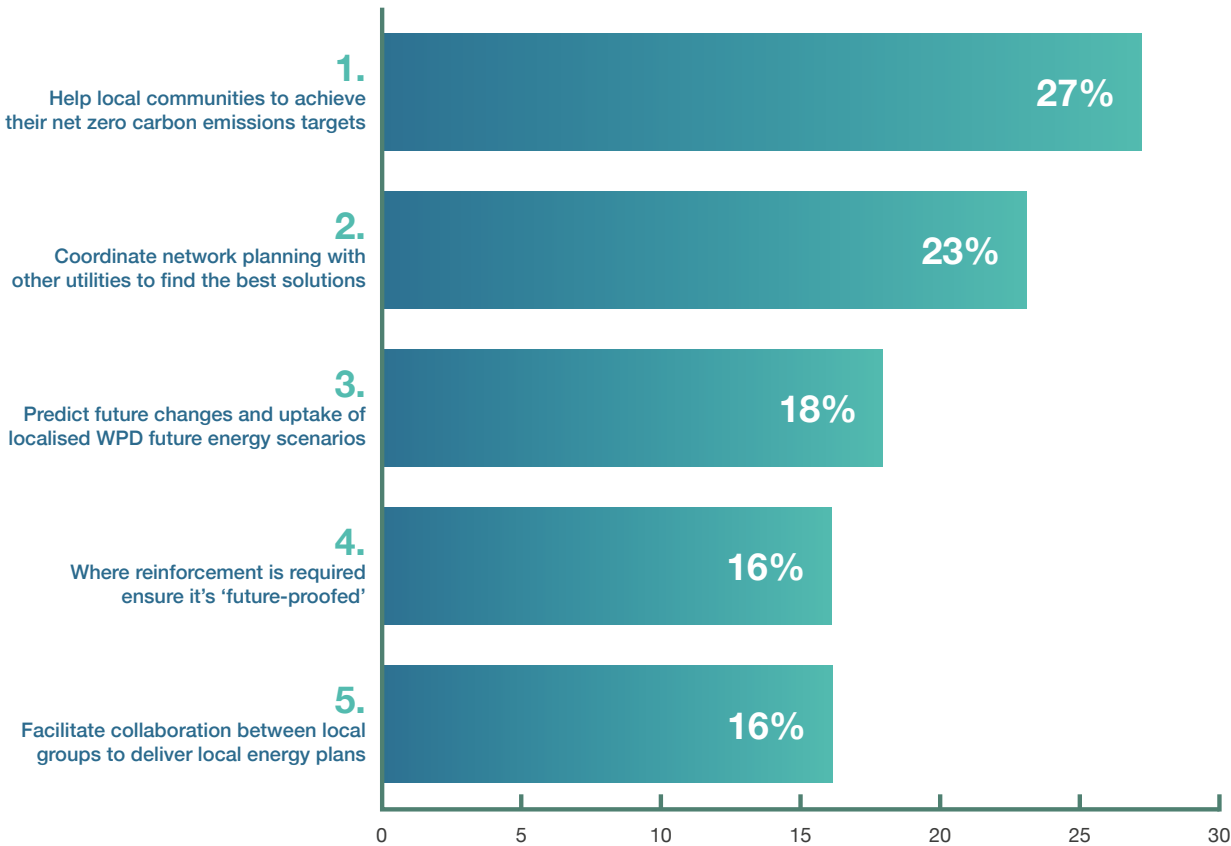
Across the roadshow events there were a range of overarching issues which stakeholders discussed. The government’s target of net zero by 2050, coupled with the often more ambitious climate targets of local authorities, was raised at every event.

Stakeholders wanted to know what steps WPD were taking to prepare the electricity network for the predicted extra demand, citing planned growth in housing and commercial development, the roll-out of electric vehicles and the uptake of heat pumps and battery storage as areas that needed guidance, leadership and investment from WPD.

When discussing WPD’s whole systems approach to delivering Net Zero, the most important of the existing priorities in this area was how WPD could help local communities to achieve their own net zero targets.

WPD Priorities

The graph below ranks the existing priorities for this topic area in order of their importance to stakeholders. These priorities were voted on at all six workshops.



When discussing the commitments they would want WPD to deliver under this priority, stakeholders were keen for WPD to provide support with knowledge and information to work with local communities on their individual needs.



1.4 Stakeholder Engagement

Stakeholder Priority Areas

Collaborating with local energy plans

In response to stakeholder feedback WPD have increased the amount of localised engagement activity focussed on better understanding the requirements of local communities, providing tailored information to support and collaborate in their planning.

Following specific training sessions on WPD's Distribution Future Energy Scenarios, WPD's 36 Distribution Managers, responsible for each of our local regions are now leading proactive one-on-one meetings with the 130 Local Authorities in our region to discuss their local energy plans and projected low carbon technology volumes.

Stakeholders have highlighted the continued importance of community energy (CE) schemes in supporting local energy plans. WPD have continued to provide support to CE stakeholders, with workshops, hosting 8 in the year to help community energy groups build knowledge and understanding of the development of flexibility markets, sharing best practice and the latest innovation projects.

Our role in delivering a low carbon future

Through our extensive engagement on the smart energy transition with over 19,500 stakeholders, they have been clear that WPD should take a leading role in delivering the UK's target of Net Zero carbon emissions by 2050.

Stakeholders want us to take a proactive role rather than waiting for developments to happen or requests to come in, acting to encourage connection of low carbon technologies and not being a 'blocker' to change.

Flexibility Services

Stakeholders have told us that the role out of flexibility services, better utilising the existing capacity of the network (avoiding the need to build bigger networks), has dramatically increased in importance as WPD establishes a Distribution System Operator (DSO).

Electric Vehicles (EVs)

Through our annual roadshows and specific EV workshops, stakeholders have told us to adopt a proactive strategy to ensure the network is ready for EVs whether it be for charging vehicles at home, en route or at their destination.

Focussed engagement with key stakeholders such as local authorities, government, EV and charge point operators has enabled us to update our EV strategy to take into account changes in priorities.

An example of this is how regular engagement has revealed an increased importance of en route charging.

Engagement with motorway service operators has provided insight on their requirements and informed the development of a new solution to providing the capacity required at these service stations.



Some of the actions we have taken as a result:

- Following a review of best practice, we have developed revised flexibility contract terms, reducing complexity and increasing accessibility to maximise participation
- Given stakeholders earlier sight of WPDs flexibility requirements by signposting needs out to 2025, an increase in scope of 4 years
- Working with OVO Energy WPD became the first in the UK to provide flexibility services from domestic properties.



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Section 2.0

2.0 Managing our environmental impact



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2.1 Introduction

We are committed to the protection of the environment and ensuring that all of our operational activities have minimal impact upon it.

Our certified company-wide ISO14001 environmental management system helps us to ensure that any potential risk to the environment and the communities in which we operate is minimised and that we continually manage and improve our environmental performance.

2.2 Protected Landscapes

We operate 90,000km of overhead lines predominantly in rural locations.

While overhead lines are widely accepted as being part of the countryside, there are a number of protected landscapes, including National Parks and Areas of Natural Beauty (“AONB”) across our geographical footprint where removing our overhead lines and replacing them with underground cables would visually improve matters.

We coordinate the undergrounding of overhead lines with established steering groups consisting of representatives from AONBs and National Parks who help us identify and prioritise where work will take place. We provide information and appropriate assistance to stakeholders to help them in scheme selection including budget costing and feasibility assessments.

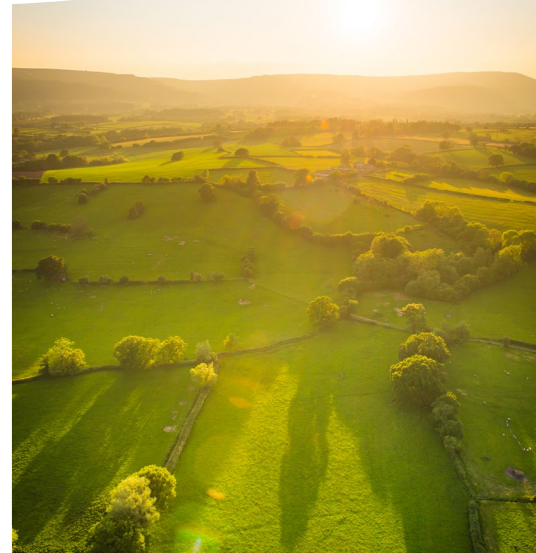
During the RIIO-ED1 period we committed to underground 55km of overhead lines within National Parks and AONB. We are on track to meet this commitment by the end of the period having completed 29.12km (53%) to date.

During 2019/20 work was undertaken to remove overhead power lines around Marquis Drive Visitor Centre, Cannock Chase. Approximately 3.5km of overhead lines and 48 wooden poles have been removed over a period of approximately 16 weeks. The programme of work was designed to minimise disruption to this sensitive area.

Further details regarding our undergrounding schemes in National Parks and AONBs can be found in Appendix A.



Further details regarding our undergrounding schemes in National Parks and AONBs can be found in Appendix A



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2.3 Oil Leakage

Older styles of electricity cables contain oil to improve their insulation properties and to enhance cooling. Occasionally, from time to time, these older cables leak when equipment is damaged, seals deteriorate or as a result of changing ground conditions.

When this happens we take steps to ensure that any damage to the environment is minimised through the removal of contaminated ground and that the leak is fixed as quickly as possible. We're also putting in place measures to help reduce the overall number of leaks that we have across our network.

The risks associated with operating fluid filled cables (FFC) and related assets can be reputational, regulatory and financial. The primary risk is associated with the leakage of insulation oil into the environment causing pollution. Leaks typically occur as the cable sheath deteriorates with age, at joint failures or as a result of third-party damage.

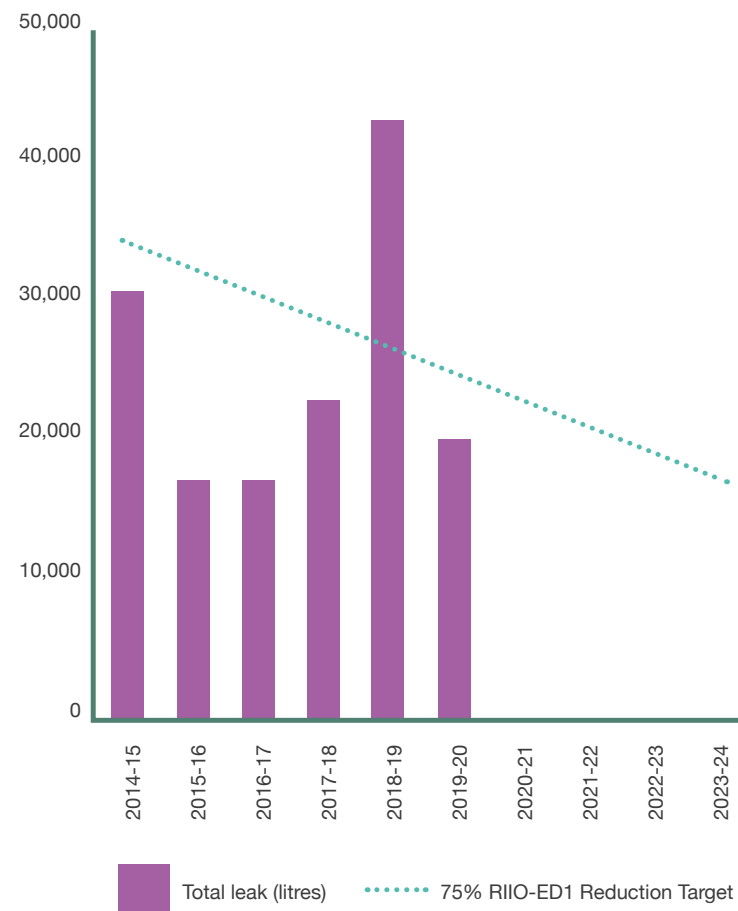
To minimise environmental damage we aim to ensure that:

- Fluid levels in all our cables are monitored remotely, the loss of pressure triggering an alarm in our Control Centres. This enables us to react quickly to any leak event
- Leaks are located quickly using perfluorocarbon tracer (PFT) and repaired
- Cables with a history of high leak rates are selected for replacement.

Additional mitigation may range from visual inspection or PFT tracing, to spot repair, sectional drain and seal or the full extraction of the cable.

All leak rates are recorded and a database of leak and cable information held centrally. Monthly reports of fluid filled cable leaks are submitted to both the Environment Agency and Natural Resources Wales.

Fig 2.3 WPD Fluid filled cable leaks vs. ED1 reduction target



In 2018/19 approx. 60% of the leak volume recorded across WPD was attributable to five cable circuits. All now fully repaired.



There were 42 Oil mitigation schemes reported for 2019/20, of which 13 were in South Wales, 16 in West Midlands, 10 in East Midlands and 3 in the South West



15%

Total volume of cable fluid lost 15% less than target volume for 2019/20

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2.3.1 SF₆ mitigation schemes

During RIIO-ED1 we have undertaken 21 SF₆ mitigation schemes, of these 15 have been in the South West, 5 in West Midlands and 1 in East Midlands.

We have introduced SF₆ detection cameras to enable us to identify the source of leaks. We replace any 11kV distribution assets that leak. For EHV assets we are taking a more proactive approach.

We replace EHV assets where repair is not possible. Units previously repaired but which leak again are also replaced.

We take a responsible and proactive approach in monitoring our SF₆ emissions. We report and record leaks in our business KPI information and regularly review SF₆ management performance at company board level.



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2.4 Carbon Impact and Climate Change

2.4.1 Business Carbon Footprint

Our Business Carbon Footprint (BCF) details the impact that our operational activities have on the environment in terms of associated carbon dioxide (CO₂) emissions.

We measure and report our BCF using equivalent tonnes of carbon dioxide (tCO₂e). The data compiled and the figures which we report follow a recognised methodology as described within international business carbon footprint standards, the Greenhouse Gas (GHG) reporting protocol and ISO14064-1.

All of our published BCF data has been verified and data assured for accuracy and compliance with the standards detailed above.

Our BCF takes account of our energy usage from offices, transport emissions (operational and business), fuel combustion and the release of fugitive emissions (SF₆). The reported data for operational transport (road) and fuel combustion also takes account of a number of our larger contractor emissions as required under the Ofgem reporting requirements.



Our Business Carbon Footprint takes account of our energy usage from offices, transport emissions (operational and business), fuel combustion and the release of fugitive emissions (SF₆)

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2.4.1 Business Carbon Footprint Table 2.4.1a Annual BCF Reporting

WPD Carbon Footprint Report (tCO₂e)

Aspect		Scope	2014/15 Total tCO ₂ e	2015/16 Total tCO ₂ e	2016/17 Total tCO ₂ e	2017/18 Total tCO ₂ e	2018/19 Total tCO ₂ e	2019/20 Total tCO ₂ e
Buildings energy usage	Buildings – electricity	2	12,454.4	10,997.7	10,622.2	7,633.5	6,454.2	5,945.3
	Buildings – Other fuels	1	207.6	193.1	192.5	220.2	246.5	211.5
	Substation electricity	2	27,578.7	25,813.8	22,981.6	19,618.6	17,260.2	15,585.2
Operational transport*	Road	1	40,018.8	37,804.8	34,902.6	33,329.5	30,569.1	32,940.1
	Rail	1	0.0	0.0	0.0	0.0	0.0	0.0
	Sea	1	2.4	2.4	0.2	0.2	2.4	0.6
	Air	1	1,428.1	1,831.0	2,163.5	2,113.6	1,643.7	1,100.3
Business transport	Road	3	3,304.0	5,116.2	3,196.5	3,395.3	3,174.8	2,825.7
	Rail	3	21.6	20.6	21.8	21.8	20.7	18.8
	Sea	3	0.0	0.3	0.8	0.1	0.0	0.0
	Air	3	106.4	41.5	92.4	124.1	241.0	114.2
Fugitive emissions	SF ₆	1	8,282.1	14,307.5	9,545.7	10,689.5	10,933.9	9,005.4
Fuel Combustion*	Diesel/Gas oil	1	8,574.1	7,100.9	7,041.6	6,382.3	9,217.6	9,239.9
Total Carbon (tCO ₂ e)			101,978.1	103,229.8	90,761.7	83,528.7	79,764.1	76,987.0
Network Losses		1	1,906,640.7	1,687,342.2	1,530,164.6	1,377,491.8	1,004,502.2	973,064.3
Total carbon (tCO ₂ e) including losses			2,008,618.8	1,790,572.0	1,620,926.3	1,461,020.5	1,084,843.5	1,050,051.4

Scope relates to definitions in DEFRA guidance and is detailed in the commentary at Appendix B. *Includes contractor emissions.

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2.4.1 Business Carbon Footprint

During 2019/20 WPD's total BCF (excluding losses) across all four licence areas has continued to reduce equating to a total reduction of 23% in comparison to the base year performance in 2014/15 (28% reduction on a like-for-like basis).

Since 2014/15 our annual BCF (including losses) has reduced by 47.5% or 955,016 tCO₂e - the approximate equivalent carbon footprint of heating 345,000 average UK households.

Fig. 2.4.1a Annual BCF (tCO₂e) excluding network losses

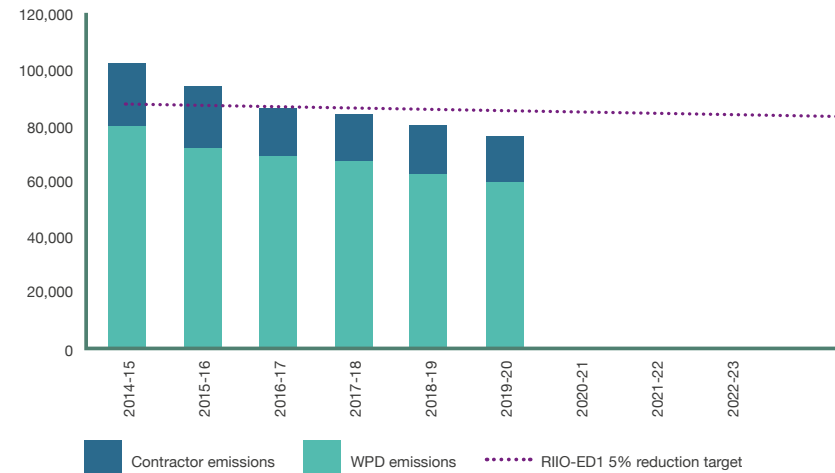


Fig.2.4.1b Annual BCF (tCO₂e) including network losses



Since 2014/15 our annual BCF (including losses) has reduced by 47.5% or 955,016 tCO₂e the approximate equivalent carbon footprint of heating 345,000 average UK households



52%

Since 2014/15 electricity usage in offices and depots has dropped by 52%



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2.4.1 Business Carbon Footprint

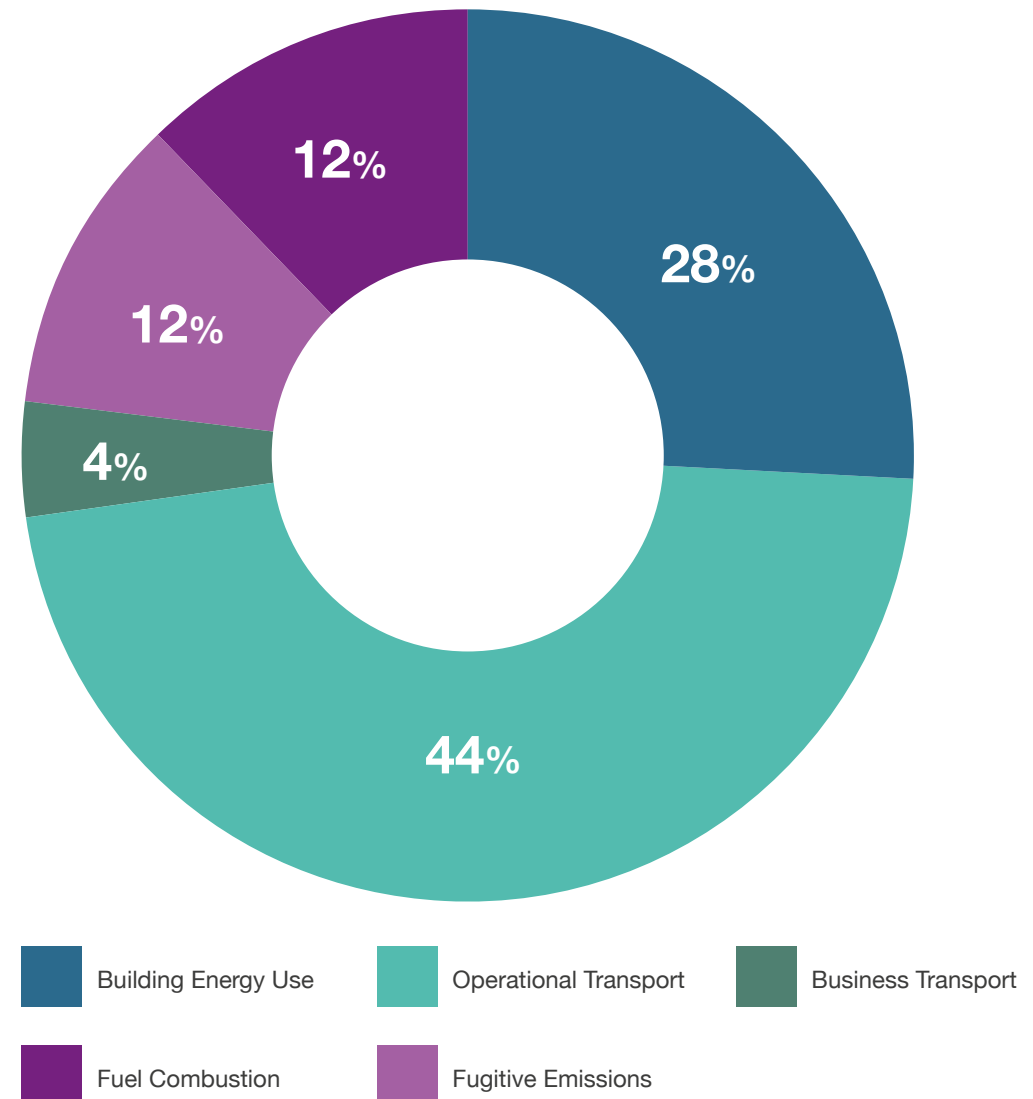
As shown opposite, and similar to previous years, the main contributors to our Business Carbon Footprint (excluding losses) is Operational Transport (44%) and Building Energy Use (28%), however Building Energy Use has reduced significantly in the last twelve months by 11%.

Throughout the remainder of ED1 we will focus on reducing the impact which both operational transport and building energy use (including energy use at substations) have on our overall business carbon footprint.

We continue to have the following initiatives in place to try to improve overall BCF performance:

- Fugitive emissions (SF₆ gas leakage) make up 12% of the total BCF for 2019/20, a reduction of 6% on the previous year. We continue to remain committed to investigating and finding alternatives to SF₆ and have put to good use the four infrared SF₆ detection cameras which enable us to quickly pinpoint the source of leaks. We replace any 11kV distribution assets that leak, if a repair is not possible, and we replace EHV assets if they have leaked three times.
- Building energy use (operational and non-operational) accounts for 28% of 2019/20 BCF, a decrease of 11% on the previous year. We will continue to install low energy lighting and energy efficient heating/cooling systems throughout our property portfolio as well as undertaking energy efficiency reviews at many of our non-operational and operational sites.
- 2019/20 saw a 12% increase in overall Operational Transport (including contractors). However during 2019/20 WPD owned fleet actually achieved an 11% reduction in emissions. Contractor fleet emissions increased by 70% due to improved reporting. To improve emissions associated with our operational transport activities we will continue to replace older vehicles with more fuel efficient alternatives and improve awareness of the impacts of driving style on fuel efficiency and vehicle emissions. Furthermore throughout 20/21 we will start to introduce electric vehicles as part of our operational road transport fleet which will have a significant impact on our business carbon footprint.

Fig.2.4.1c Business Carbon Footprint – WPD



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2.4.1 Business Carbon Footprint

Reducing emissions from vehicles

Our network is spread over an area of 55,500km² so we need to operate a significant fleet of vehicles to serve this territory effectively. Emissions are reported as part of our Business Carbon Footprint and are calculated based on fuel usage data, in line with the published 2019 DEFRA conversion factors.

Procurement processes are used to ensure that when our vehicles reach the end of their useful lives, they are replaced with more efficient options.

An example of replacements for some of our most commonly used operational vehicles shows this process in practice (data comes from the vehicle registration certificate).

Additionally, during the remainder of ED1 there will be a program of replacing smaller vans with an electric vehicle (EV) equivalent.

We are also in the process of reviewing our entire light commercial fleet (approximately 2800 vehicles, including larger vans and 4x4 vehicles) with the aim of replacing existing vehicles with EV to the fullest extent possible during our next price review period (ED2).

Table 2.4.1b Emissions variations for operational vehicle replacement

Emissions – operational vehicle replacements			
Previous vehicle	CO ₂ emissions (grams per km)	Current vehicle (2019)	CO ₂ emissions (grams per km)
Vauxhall Corsa	94	Ford Fiesta Van 1.5 Euro 6	82
		Nissan ENV200 40kW	0
Transit Connect SWB	115	Transit Connect SWB Euro 6	118
		Nissan ENV200 40kW	0
Transit Connect LWB	115	Transit Connect LWB Euro 6	122
		Nissan ENV200 40kW	0
Isuzu DMAX	183	Isuzu DMAX Euro 6	183
		Ford Ranger Euro 6	182
Isuzu DMAX MEWP	183	Isuzu DMAX MEWP Euro 6	183
Transit 350 MWB RWD (Current Euro 6 model) WLPT	197	Iveco Daily 35S14V RWD	195
		Transit 320 Custom Euro 6	159
Transit 350 MWB FWD Euro 6	185	New Transit 350MWB FWD Euro 6	179
New Transit 350 MWB AWD Euro 5	255	New Transit 350 MWB AWD Euro 6	250

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2.4.1 Business Carbon Footprint

We measure the contribution of vehicle emissions to our overall BCF performance in terms of fuel usage converted to equivalent tonnes of carbon dioxide (tCO₂e).

We have demonstrated good performance during 2019/20 with reductions in both the litres of fuel used per WPD vehicle (on target) and the total volume of fuel used for operational road vehicles across the business, now below our ED1 target level.

By continuing with our vehicle replacement programme and raising awareness of the impact of driving style via a Driver Behavioural System we hope to continue to make further progress towards meeting our RIIO-ED1 5% reduction target for annual fuel use.



Fig. 2.4.1d Annual fuel use (litres) per vehicle

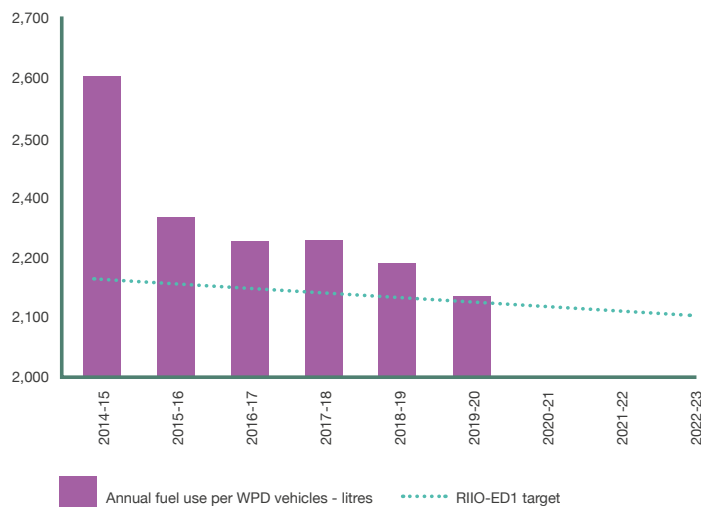
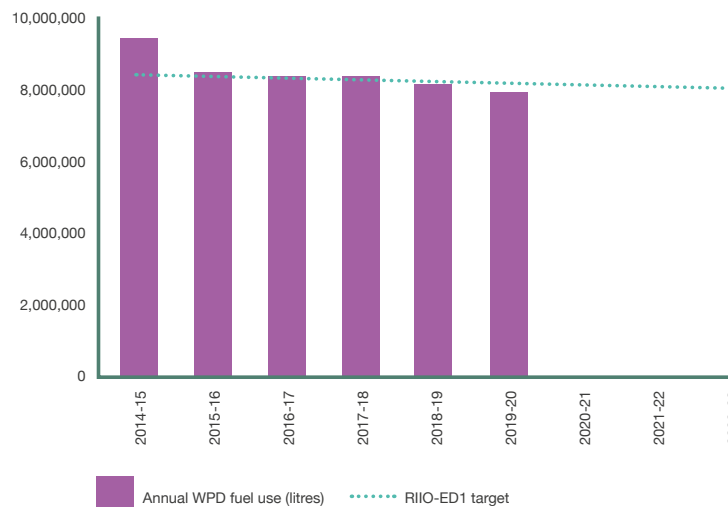


Fig. 2.4.1e Annual WPD fuel use (litres)



We are introducing a Driver Behavioural System (DBS) in to our operational vehicle fleet this will influence individual driver style and fuel efficiency and a positive impact on our vehicle emissions

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2.4.1 Business Carbon Footprint

Building Energy Use

We operate from 60 offices that vary in age and construction. We know that when refurbishment of these buildings takes place, there are opportunities to improve their energy efficiency.

In West and East Midlands, many offices were new or refurbished to the BREEAM standard of 'excellent' or 'very good' when facilities were being developed for our local team based operational structure, and all new builds achieved the 'excellent' rating.

In the South West and South Wales our properties are older, with more scope to implement energy savings measures. Whenever refurbishment work is planned we ensure, where appropriate, that it is carried out to the "very good" standard under BREEAM to reduce energy consumption.

The "very good" standard is the highest which can be achieved for a refurbished building.

Local improvements include:



Installation of motion sensors for lighting



Improvements to air conditioning units

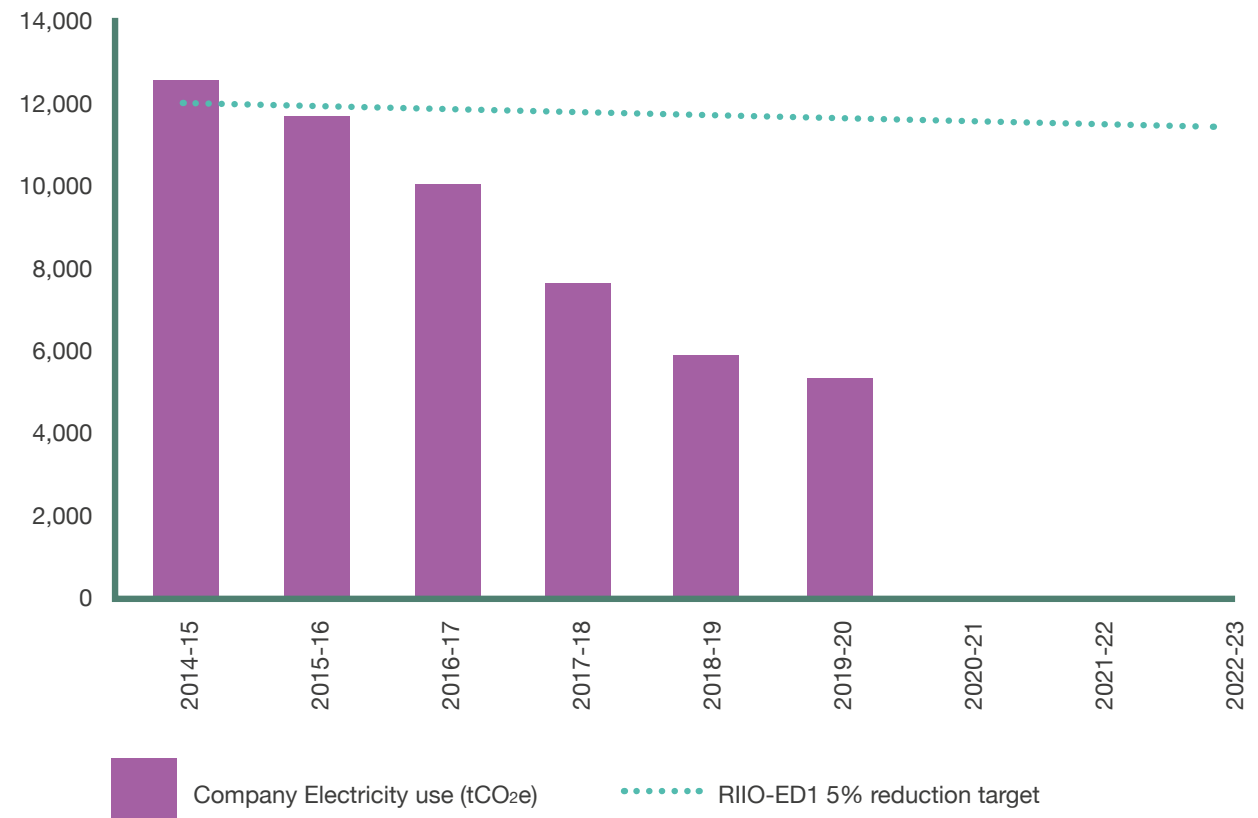


Low energy lighting

The property redevelopments improved employee awareness and energy efficiency measures and are leading to energy savings. This is evident in the electricity usage we recorded in our overall BCF reporting. We propose to save around 5% of electricity used in offices and depots over the RIIO-ED1 period. As demonstrated we are more than meeting this target with a reduction of almost 50% since 2014/15.

Current Performance

Fig. 2.4.1f Company building electricity use (tCO_{2e}) taken from depot SMART meter



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2.4.2 Sulphur Hexafluoride (SF₆)

A gas which is used throughout the electricity industry as an insulating medium in switchgear, SF₆ provides many tangible benefits, however it is a potent greenhouse gas with a high global warming potential (GWP).

Working at an industry level with manufacturers, WPD are helping to develop alternatives to SF₆.

We will continue to replace older oil filled switchgear with SF₆ insulated switchgear and we predict that our total SF₆ bank will be approximately 23,000 kg by 2023 – an increase of 10,000kg on our baseline year. Where an existing SF₆ asset replacement is required we replace with a lower SF₆ volume unit, lowering the overall SF₆ bank.

Fig. 2.4.2a shows that our annual SF₆ leak rate is still very small at 0.16%. and in relation to our baseline year we are meeting our ED1 target.

Fig. 2.4.2b details the weight (kg) of SF₆ emitted annually, which has decreased compared to 2018/19 data. See emission data information below.

Fig 2.4.2a Annual SF₆ Leakage rate (top-ups only)

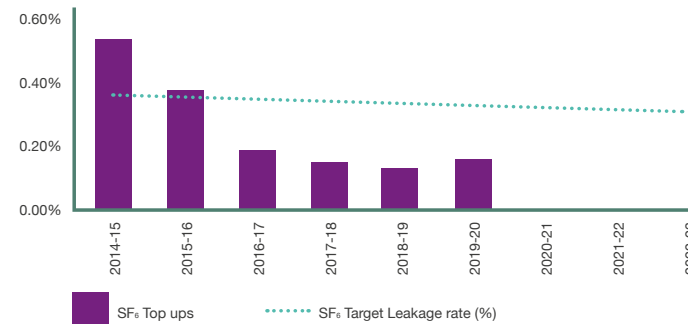
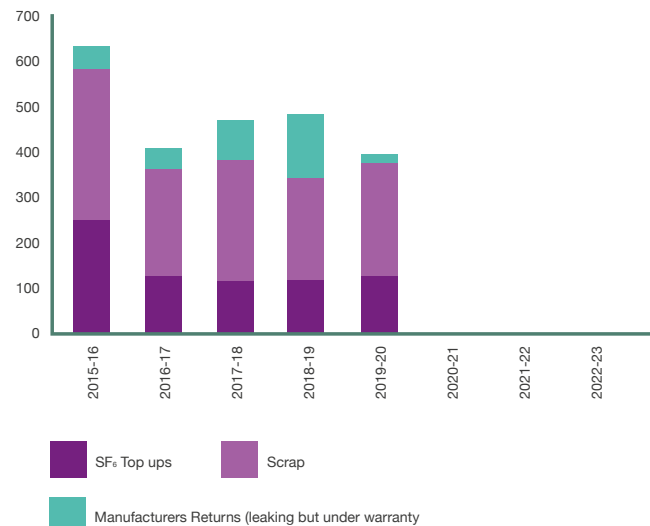


Fig. 2.4.2b Annual SF₆ emissions (kg)



SF₆ leakage rates continue to reduce, 2019/20 leak rate is **0.16%**

Emission data is collated from the following data sources;

- SF₆ top-up figures as reported on our company asset database
- Decommissioned units returned to our company plant centres
- Units returned to manufacturers for further investigation.

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2.4.3 Distribution losses

WPD's objectives regarding losses management are that by the end of the RIIO-ED1 period: -

- The losses across the WPD network will have been reduced to a level that is as low as economically and practically viable
- All future investment decisions will take losses into account to ensure that the best balance is achieved between network investment costs today and energy supply costs for future customers
- WPD will have the tools and methods in place to accurately locate the points on the network with particularly high losses using smart meter data once supplier roll-out is complete
- All of the WPD stakeholders will be aware of the importance of losses
- Using the knowledge gained from various innovation projects, computer modelling and investment appraisal WPD will through BAU have produced new and effective means to reduce losses.



Losses Strategy

WPD publish an annual losses strategy document that can be found below: -



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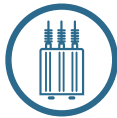


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2.4.3 Distribution Losses

Some highlights from 2019/20 include:

The continued pro-active replacement of 1,996 distribution transformers with low loss equipment



Start the installation of amorphous core single phase 11kV pole mounted transformers (PMTs) to reduce losses



Replacement of the existing LV mains modelling tool



WPD have built IT systems to receive and analyse smart meter data and have had our privacy plan approved



Regular updates on the Losses page of the WPD website



A comprehensive programme of stakeholder engagement including biennial stakeholder consultation events



The design intervention for losses on new installation of 8,184 distribution transformers and 11,880 kilometres of underground cables



Active membership of the ENA Technical Losses group



Completion of the Innovate UK feasibility study of An Energy Revolution for the market town of Caldicot where a reduction of losses were proposed by using three phase service cables



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2.4.3 Distribution Losses

Asset Replacement

WPD's work to uprate assets continues through RIIO-ED1.

Network Design and Policy review

WPD's LV system modelling tool includes losses calculations for each scenario used, but as one of the first measures WPD undertook was to increase the underground cable size and removed cable tapering this means upgrades are uniform across the company.

At LV and 11kV, planners are able to comply with the majority of losses designs by using the uprated selection of cables and transformers made available since 2016.

At EHV WPD currently uses two system modelling tools, PSS/E and IPSA. PSS/E can create a losses calculation and will become the standard system within WPD.

Whilst all EHV designs are bespoke, WPD has completed work to provide templated solutions for generation connections, these templates incorporated the losses impacts.

Stakeholder Engagement

WPD's 2019/20 Stakeholder engagement events introduced plans to consider the demand of electric vehicles and other Low Carbon Technologies which is seen as the next significant area of increased losses on the WPD network.

Losses pages on WPD website

WPD has developed and published a set of pages related to losses on the WPD website. They explain losses in more detail and lead into actions that are being taken to reduce losses as a result.

The WPD Losses page can now be accessed via requisite links from the ENA Technical Losses page.

ENA Losses Group

During 2019 the ENA Technical Losses group issued a contract to WSP for producing a recommendation for a Regulatory Incentive Mechanism, this contract should be completed by Q3 2019, during October 2019 WSP presented the Regulatory Incentive Mechanism paper at the LCNI in Glasgow.

Distributed Generation and DSO

Traditional power stations are large and centralised; therefore it is justifiable to connect them directly to the National Grid transmission system. In contrast to this, renewable energy sources and storage tend to be smaller and more distributed around the country; meaning they are usually connected to local distribution networks.

This changes the traditional flow of power from large central generators to transmission networks, to distribution networks, to the customer. If the energy from distributed generation is used locally then this reduces losses.

As WPD moves towards a DSO way of working there will be a need to manage energy flows across the network to increase utilisation and balance demand and generation. This has the potential to increase losses if power flows increase or demand and generation cannot be balanced.

Alternatively it could reduce losses if the network was perfectly balanced. This balance must be achieved against an economic and efficient measure so the cost of losses should be considered.

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2.4.3 Distribution Losses

Forthcoming Plans

WPD has identified a number of areas in which the focus of efforts will be applied for the coming year and beyond, they are described below: -

WPD has created a losses specific webpage explaining the basic issues regarding losses, what is being done to reduce them and who interested parties should contact regarding losses issues.

A substantial task which will continue in the next 12 months is working through the 26 recommendations made in the external consultancy report by SOHN Associated on losses and deciding which of them are feasible. Many of these recommendations are likely to lead to further research, so this task may start new innovation projects. **Appendix 1** of the **WPD Losses Strategy** contains the full list of these recommendations and identifies whether each one has been adopted, rejected or is a current or future consideration.

WPD is looking at a project to supply street lights from a dedicated three phase LV mains cable and providing dual three phase electric vehicle charging points from each street light.

With the UK government stating that by 2040 only new electric vehicles shall be available to purchase this will have a large impact on the electricity network, WPD are undertaking projects to best manage this impact to the network as a whole.

WPD is working with a developer to future proof their development by providing three phase supplies to all the houses on the various sites.

WPD is in discussion with a manufacturer on producing a dynamic switching device which would look at each three phase circuit supplied from a substation and balance the single phase loads across the three phases.

WPD will examine the issues of upgrading the 6.6kV network in Bath to 11kV and will look to extend this process throughout the WPD network.

WPD has investigated the option to have a larger unit substation footprint to allow the installation of 11kV rapid electric vehicle chargers.

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2.4.3 Distribution Losses

The Losses Investment Profile over the RIIO-ED1 Price Control Period

Under WPD's current business plan, WPD investments into asset replacement are taken from the network reinforcement budget when it is seen to be economically viable to do so, under the Cost Benefit Analysis (CBA) scheme described below.

WPD also have a number of innovation projects which aim to help reduce losses. These projects are funded by the Network Innovation Allowance (NIA). Projects such as the Losses Investigation, which has set up a fully monitored LV network on the Isle of Man, are aimed solely at improving the understanding of losses.

Whilst projects such as FALCON, which was aimed at smart-grid related techniques, also benefit losses as well. NIA funding is provided by Ofgem to all DNO's to run technical or innovation projects directly related to their network, which have the potential to deliver financial benefits to the licensee or their customers.

Cost Benefit Analysis, Tools and Methodologies

WPD will only undertake loss reduction activities when a CBA has found them to be economically beneficial.

To represent the societal cost of losses WPD use the standard Ofgem CBA spreadsheet and financially value losses using the Ofgem agreed figure of £48.42 per MWh. This figure is the average wholesale cost of energy in 2011/12, expressed in 2012/13 prices.

For some analysis, the Ofgem CBA spreadsheet is not sufficient and a bespoke model is constructed.

When this is the case, WPD produce a simplified version in the Ofgem format and publish the bespoke CBA to explain the full methodology.

The environmental benefits can be calculated using the agreed equivalent carbon emissions figure of 0.2556 tCO₂e per KWh (published 2019 DEFRA Conversion Factors).

Current Assessment of Distribution Losses

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Total annual losses (GWh)	4,125	3,651	3,713	3,918	3,548	3,807
Carbon equivalent (tCO ₂ e)	1,906,640	1,687,342	1,530,164	1,377,491	1,004,502	973,064



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2.5 Other environment related activities

2.5.1 ISO14001:2015 Certification

Since 2015 we have been certified to ISO14001, the international standard for environmental management systems (EMS), across all four of our licence areas.

During this time we have found having the certification beneficial in a number of ways:

- **Validates how we manage our operational activities via our own EMS to ensure minimal impact on the environment**
- **Provides confidence to interested parties and industry regulators**
- **Ensures that we meet all of our compliance obligations**
- **Provides a consistent and recognisable approach to how we manage environmental issues across our entire business**
- **Demonstrates our value of good environmental stewardship**
- **Encourages our business to improve our environmental performance and to look to future developments in environmental management and sustainability.**

During 2019/20 we had one ISO14001 surveillance visit by our newly appointed external certification body, NQA. No major non-conformances were raised during the visit, a few minor non-conformances were identified which were all closed out to the satisfaction of the auditors.

During 2020/21 we will be preparing for our re-certification visit to the ISO14001 standard.

Five key approaches on the new ISO14001:2015



Emphasis on leadership

Greater commitment from the top management



Focus on strategic fit & risk management

An increased alignment with unique context, strategic direction and risk orientation



Effective communication & awareness

Driven through a communication strategy and its effectiveness



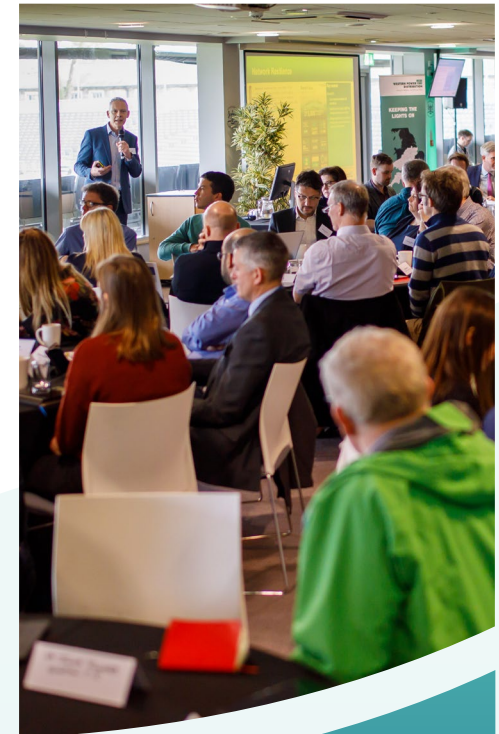
Greater protection for environment

Proactive initiatives, objective measurements and improving environmental performances



Life cycle perspective

Each stage of a product or service; from development to end-of-life is on focus



No major non-conformances were raised during the ISO14001 audit, a few minor non-conformances were identified which were all closed out to the satisfaction of the auditors

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2.5.2 Waste Management

We continue to work closely with all of our waste contractors ensuring that where possible waste streams are diverted from landfill and that we always apply the principles of the waste hierarchy.

As a result in 2019/20 we have again seen a dramatic decrease in the percentage and tonnage of waste which we send to landfill across the entire WPD network. Both WPD East Midlands and WPD South Wales are now achieving zero waste to landfill - see **Fig 2.5.2.1**.

Redundant cabling and metal work, a significant waste stream within WPD, is segregated at our depots and collected by one of three dedicated contractors who we have worked with for many years. We receive monthly revenue for the collected metal/cable and this waste is, in turn, processed and eventually returned to the marketplace for re-use.

Our largest waste stream, by weight, wooden poles are replaced throughout our network and are collected from many of our operational depots.

We continue to dispose of the poles via a waste to energy plant in the north of England, avoiding expensive and prohibitive landfill costs whilst ensuring that we comply with the waste hierarchy.

We continue to segregate our waste at all of our depot locations and transport units into the following waste streams:



Metal



Cable



**Dry mixed
recyclables***



**General
waste**



Wood



Organics



**Redundant
wood poles**



**Hazardous
waste****

*Cardboard/paper/plastics

**Batteries/contaminated rags/used electrical insulating oil/aerosols/fluorescent tubes

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2.5.2 Waste Management

RIIO-ED1 Target – Waste

Our RIIO-ED1 Business Plan states that we will reduce the amount of waste sent to landfill by 20% over the first two years of RIIO-ED1 and 5% per annum thereafter.

This target does not include the recycling of our scrap metal and cable. [Fig. 2.5.2e](#) demonstrates that we met this initial 20% reduction target from 2015/16 to 2017-18 and we are well on track to meet the 5% reduction per annum until the end of the ED1 reporting period.

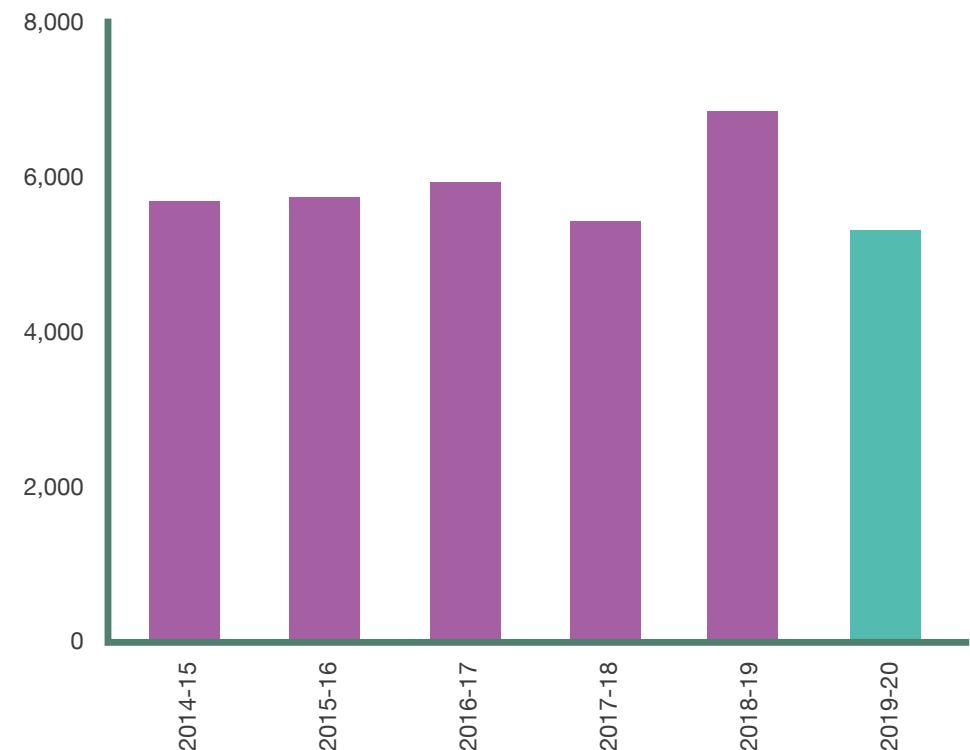
The overall tonnage of waste produced by WPD in 2019/20 has reduced by 1467 tonnes or 22% from our 2018/19 total of 6692 to 5224 in 2019/20 - see [Fig. 2.5.2a](#). Much of this reduction is a result of greater awareness at our local sites, environmental training and collaborating with suppliers to reduce packaging wherever possible. It can be seen that the percentage of WPD waste which has been disposed of to landfill has decreased again. From 776 tonnes 2018/19 to 569 tonnes in 2019/20, a reduction of 207 tonnes or 26%.

This decrease in our reliance on disposing waste to landfill is a result of working extensively with our existing waste contractors to find alternatives to landfilling waste, utilising local waste to energy plants wherever they are available and improving waste awareness at our local depots. Throughout 2019/20 our distribution licence areas in South Wales and East Midlands have continuously achieved zero waste to landfill. Our aim for 2020/21 is to achieve zero waste to landfill in our West Midlands and South West distribution licence areas and continue to improve our recycling percentages across the entire business and reduce our reliance on energy to waste disposal.



Fig. 2.5.2a Tonnage of total waste

Annual Tonnes of waste





2.5.2 Waste Management

Fig. 2.5.2b Tonnage of waste to non-landfill

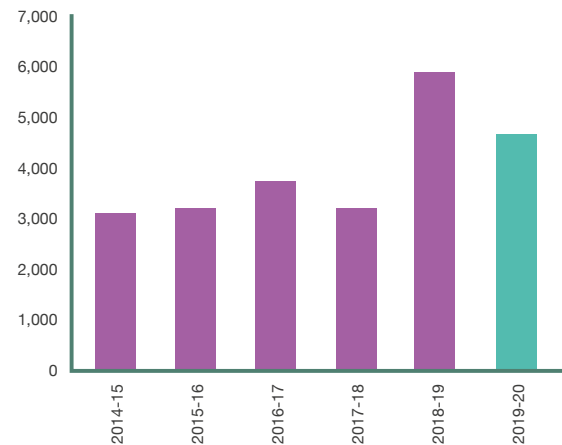


Fig 2.5.2c Tonnage of waste to landfill

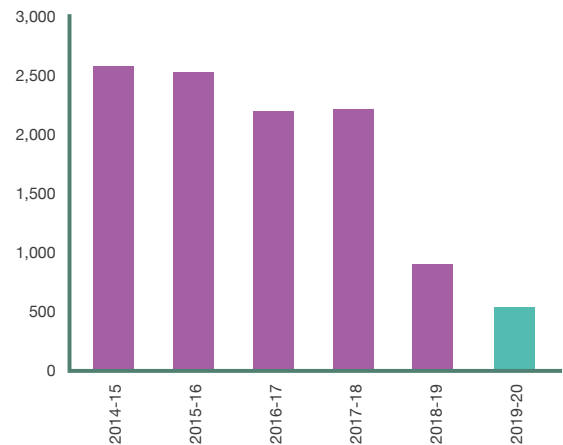


Fig 2.5.2d Annual percentage waste to landfill vs. non landfill

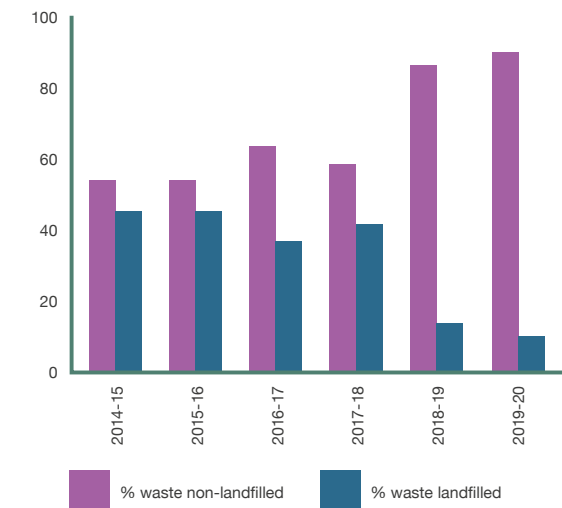
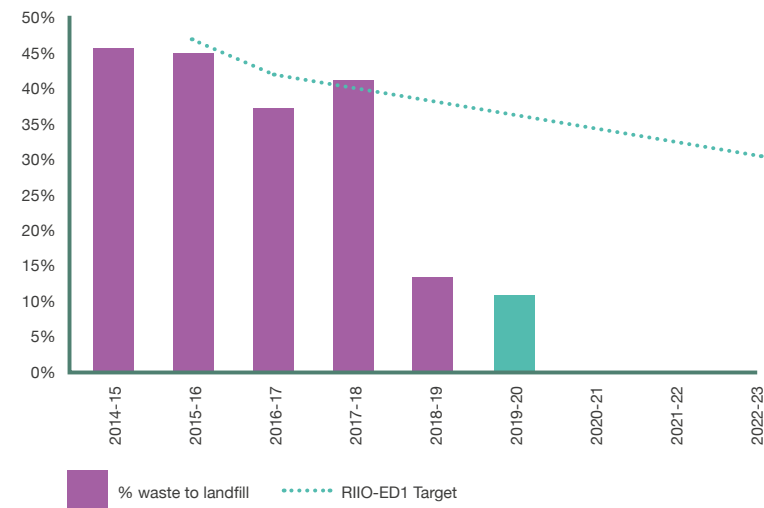


Fig 2.5.2e Percentage of waste to landfill



The percentage and tonnage of waste disposed of to landfill has decreased for a second consecutive year. The actual tonnage of waste produced has also reduced significantly during 2019/20

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2.5.2 Waste Management

Waste initiatives

During 2020/21 we will continue to target the tonnage of waste we receive and produce across our business – employing the principles of the waste hierarchy and reducing the actual tonnage of waste in the first instance before focusing on the amount of waste being reused, recycled or recovered.

We will specifically:



Liaise with our manufacturers and suppliers to identify opportunities to reduce the amount of packaging and embedded waste entering our business.



Work with our Purchasing Team to ensure that waste reduction initiatives are a key requirement of future contracts where applicable.



Continue to work with our waste contractors and local depots to identify alternative disposal routes for our waste, increasing the amount of waste we recycle and reduce further our reliance on both landfill and recovery disposal.



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2.5.3 WPD Depots

Since 2014 we have applied for and held 30 environmental permits for the storage of used electrical insulating oil with the Environment Agency and Natural Resources Wales.

As part of the permit compliance process, our permitted depot sites must be able to demonstrate to the Environmental Regulator that all pollution prevention measures are robust, fit for purpose and legally compliant. We have implemented a practical approach in terms of oil storage, risk minimisation and the management of the environmental permits across our business, in line with our company environmental management system.

Throughout 2019/20 we have had a number permit compliance visits by the Environment Agency and Natural Resources Wales at our permitted sites. The majority of the visits have been unplanned and to date we have had no major non-conformances issued at any of the sites visited, any minor non-conformances identified have been addressed promptly and closed by the Regulator.

During 2020/21 we will continue to manage our permitted sites in line with Environment Agency/Natural Resources Wales guidance and environmental legislation.

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2.5.4 Polychlorinated Biphenyls (PCB's)

Background

Persistent Organic Pollutants (POPs) are chemicals of global concern due to their potential for long-range transport, persistence in the environment, ability to bio-magnify and bio-accumulate in ecosystems, and in turn their significant negative effects on human health and the environment.

PCBs are a family of POPs used in industrial and commercial applications including in electrical equipment such as capacitors and transformers due to their qualities of chemical stability, fire resistance and not easily generating a vapour.

While PCBs were never specified for use in any WPD licenced area, their use in other electrical applications led to a very small percentage of the equipment in use on WPD's network being unintentionally contaminated during manufacture. As this contamination was both unintended and not requested WPD have no records of the assets affected.

Before a full global ban on PCB production was implemented in 1987 any item manufactured in a facility where PCBs were in use was at risk of contamination, so must be assumed to contain PCBs and therefore be registered with the Environment Agency and Natural Resources Wales.

In 2000 a complete ban on the use of PCBs was imposed, but an exemption was made for electricity network transformers which could be left in service until the end of their useful life.

This exemption ended in July 2019 when new regulations required the removal of all potentially PCB contaminated equipment by 31 December 2025.

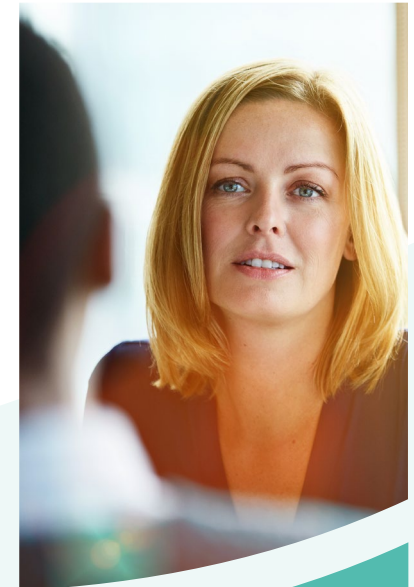
WPD's Strategy for a PCB Free Network by 2025

Comprehensive surveys of PCB contamination conducted both in WPD and the wider electricity industry show that most of the contaminated oil has already been removed and disposed of by approved methods at sites authorised by the Environment Agency.

WPD is working in close partnership with all UK electricity network operators, the Environment Agency and in consultation with other devolved Agencies to identify and remove remaining PCB contaminated equipment by 31 December 2025 in line with UK Regulation.

The strategy for identification and removal includes:

- **An accelerated program of testing all ground mounted equipment prior to the end of 2025**
- **Innovation projects led by WPD to research and develop in situ PCB testing for energised overhead line equipment. Such test are currently impossible without costly and inconvenient interruptions to customer supplies**
- **A UK wide program of statistical analysis pioneered by WPD and other UK Network Operators along with the Environment Agency to identify target and remove assets from the UK PCB register**
- **Targeted replacement of assets that are both potentially PCB contaminated and also do not comply with current high efficiency standards, thereby eradicating PCB risk and reducing Network Losses.**



Working with all UK electricity network operators, the Environment Agency and in consultation with other devolved Agencies to identify and remove remaining PCB contaminated equipment by 31 December 2025 in line with Regulation

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Employee Awareness Sessions

We have delivered environmental awareness sessions at all of our depots across all four WPD licence areas. While some aspects of the sessions are tailored to meet the specific needs of each depot, the following environmental issues are briefed as standard;

- ✓ Environmental sustainability
- ✓ Carbon Awareness
- ✓ ED1 Commitments and Environmental Outputs
- ✓ ISO14001
- ✓ Pollution Prevention
- ✓ Ecology
- ✓ Waste Management
- ✓ WPD Environmental aspects
- ✓ Employee Responsibility

2.5.5 Environmental Employee Awareness

Ensuring that all of our employees are aware of their environmental responsibilities and the impact that their activities and that of WPD could potentially have on the environment is a key requirement of our environmental management system.

In 2019/20 we delivered environmental awareness training to approximately 350 employees across the business.

Environment Conference

In October 2019, WPD West Midlands held their second Environment Conference. Over fifty management attendees considered how critical good environmental performance is to WPD, our parent company, PPL, our industry regulators OFGEM, environmental regulators, our stakeholders and the general public.

Practical demonstrations of innovative mobile battery generation were given in the depot yard whilst speakers presented information highlighting regional environmental performance, current and future legal obligations and improving waste management.

Breakout sessions and round table discussions were held to deliberate key environmental sustainability topics including;

- **Achieving Net Zero Carbon**
- **Reducing Waste**
- **Embracing Circular Economy principles**
- **Measuring Fugitive emissions.**

Feedback from the Conference was very positive, consequently during 2020/21 Environmental sustainability will now be incorporated into all annual Company SHE Conferences.



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2.5.6 Community Awareness

At WPD we try to ensure that we are recognised as a socially responsible business by proactively supporting charity and community projects that are aligned with our company objectives.

This includes a commitment to supporting the protection of our environment and wildlife, while also supporting the government's net zero carbon emissions aim, which we publicise through our internal and external communications. As part of WPD's ongoing commitment to the environment, we are committed to planting 7,000 native trees and shrubs each year. This is achieved through partnerships with the Avon Wildlife Trust, Gloucestershire Wildlife Trust, The Conservation Volunteers and Groundwork Wales. The recent environmental initiatives that we have supported through our community funding include:

Nottinghamshire Wildlife Trust – 'Keeping it Wild' programme

Funding from WPD enabled 18 inner-city youngsters to learn more about wildlife, water safety and participate in a plastic pollution initiative.

Nottinghamshire Wildlife Trust's 'Keeping It Wild' group helps develop young people through practical activities that build their understanding about wildlife and teaches valuable life skills.

Part of WPD's funding enabled the group to attend a residential excursion, connecting Nottinghamshire Wildlife Trust with the 'Our Bright Future' wild coasts youth programme, run by North Wales Wildlife Trust. The youngsters learnt about invasive species in Wales from the leaders in UK biosecurity at North Wales Wildlife Trust, such as hairy mitten crabs and zebra mussels. They also got to explore really wild places and special areas of outstanding beauty and also took part in a beach clean with wild coast 16- 25 year old youth programme #waronplastic.

Jamie Shortland, Keeping it Wild Youth Leader stated, "This is an opportunity not to be missed and only possible thanks to the generosity of the Western Power Distribution Community Fund. When the young people found out about the funding they were pretty overwhelmed and very happy, that's the impact a small but massive in its own right residential does to a young person that gives their time to helping wildlife and the environment and the community that lives within and amongst it."



Children from Sheepscombe School getting a closer look at the bird boxes with Paul Fawcett, WPD Team Manager for Gloucester, and Alicia Carey, CEO of Hawkwood College.

Supporting the birds and the bugs in Gloucestershire

Bird boxes and bug hotels, funded by WPD, have helped to enhance an outdoor classroom for children visiting Hawkwood College in Stroud.

The first children to explore the new outdoor learning space came from local school Sheepscombe. The Year 5 and 6 pupils had been learning about bird and insect habitats and were excited to see some first hand.

Alicia Carey, CEO of Hawkwood, said: "We are delighted to be able to welcome visitors to our new outdoor classroom which provides a wonderful setting for hands-on learning and to encourage an awareness of wildlife, sustainability and healthy lifestyles."

Hawkwood College, Centre for Future Thinking, is an education and arts charity founded on sustainability principles.



Nottingham Distribution Manager Dave Hewitt (back right) receives a business partner certificate from Nottinghamshire Wildlife Trust CEO Paul Wilkinson and Keeping it Wild Youth Leaders.

Energy savings promotion

Energy efficiency is another key contributor to preserving our environment, so we featured a campaign promoting ways that WPD has saved energy to help inspire not only our own staff, but our customers.

Case studies and tips on how to save energy were posted in our internal staff magazine, as well as online and via social media.

We are also keen supporters of Big Energy Savings Week, which we again promoted extensively on social media in January.

A dedicated webpage was set up and developed to offer tips and signposting to further agencies for support: www.westernpower.co.uk/customers-and-community/energy-saving-tips

In addition, we have prepared a full set of educational resources for children following the creation of Ecobot, our energy savings mascot.

This offers downloadable presentations and tasks about renewable energy and how to save energy: www.westernpower.co.uk/ecobot-resource-library

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2.5.7 Ecology Management

Our consultant ecologists, GE Consulting have supported WPD across all regions with advice on protected species and protected sites.

With over 50 WPD projects in the last year the types of advice sought has varied including many badger related situations, great crested newt, bat and dormouse advice as well as the more typical requests such as issues concerning nesting birds. The most common area of advice has been with regards to the planning of new installations.

As more and more wayleaves officers and planners become aware of the need to survey for the ecological impacts of their projects, a best practise forward planning approach to ecology management is becoming the norm throughout WPD.

“Whilst it’s great that more and more planners are becoming aware of the need to consider potential impacts on protected species and sites, the key is to consider ecological survey work as early as possible because on finding certain ecological receptors, follow up surveys and licensing can be required to make the WPD work lawful and this can sometimes take up to a year to undertake, so involving an ecologist early is really important.”

Jon Garner - Managing Director,
GE Consulting

Work within SSSI’s

WPD continue to work with Natural England to develop and approve a ‘generic assent’ agreement for works within designated Sites of Special Scientific Interest (SSSI’s) in England.

WPD has assets placed in or over a large number of SSSI’s throughout our English licence areas, and gaining assent from Natural England to undertake work within them can be a lengthy process and places an administrative burden on both WPD and Natural England.

Whilst the proposed generic assent will not cater for excavation or major works being undertaken (these will still require an individual assent to be granted) the agreement will cover general low impact maintenance works such as;

- **Overhead line tree and vegetation clearance in woodland and hedgerows (outside nesting season)**
- **Like for like pole replacements**
- **Overhead line replacement and maintenance.**

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2.5.8 Adaptation/Flood Preparedness

In May 2015 we produced a second Climate Change Adaptation Plan.

There has been no change to the fundamentals of climate change risk since our last Environment & Innovation Report.

The UK Climate Predictions (UKCP09) published under the Climate Impacts Programme remain in place as the base dataset for climate change in the UK.

Whereas, third round Climate Change Adaptations Plans based on the newly published UKCP18 dataset are due for submission at the end of 2021, WPD are planning to complete the work by April 2021 to enable any recommendations to be fed into our RIIO-ED2 submissions.

Throughout 2019/20 we have continued to work with the University of Newcastle to complete more research on the effects of climate change. We have provided the University with locational data and other weather related impact data for our network. They have simulated the effects of climate change on the whole range of environmental impacts that may affect our business.

The main risks that impact our network remain unchanged; they include extreme weather events, flooding and significant temperature changes.

Understanding Uncertainties

Using the UKCP09 impact of climate predictions, we have plans in place to mitigate the affects of climate change on our network. New research has highlighted the increased risk of interdependencies, such as the effect of high winds after periods of prolonged rainfall which can increase the chance of trees being uprooted and affecting our overhead lines.

Details of actions

We continue to work through our programme of substation flood prevention work.

We have further developed our capability to respond to flood events using portable equipment and mobile pumps. We have also altered our specification for pole-mounted transformers to improve their resilience to lightning and our amended overhead line design standards which take into account a potential rise in temperature are now in place.

Addressing barriers and interdependencies

We do not see any barriers to our adaptation to climate change. Instead we remain focused on addressing the interdependencies, including the impact of transportation issues when flood water could hamper our access to our substation sites.

Monitoring and evaluation

The recent report from the Adaptation Sub Committee highlighted the work carried out within the electricity industry. We report on our actions to our regulator, Ofgem, and our response to recent extreme weather events demonstrates that we are well prepared for the impact of any climatic changes.





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Environment & Innovation Report 2019/20

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

Section 3.0

3.0 Smart grids, innovation and our role in the low carbon transition



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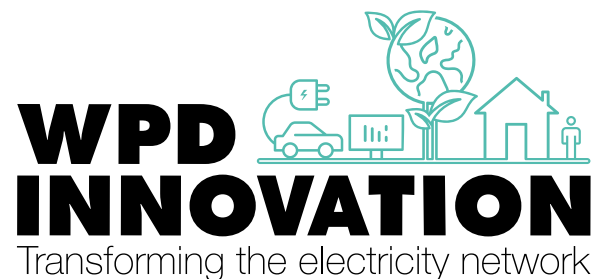
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3.1 Introduction

Innovation is core to our business strategy. We innovate to adapt to the changes in our network, facilitate the delivery of Net Zero and continue to improve our network performance and customer service.

To ensure that our network remains affordable, we are continuously providing more flexible solutions that are better, cheaper or quicker than the current ways of doing things.

Our Innovation Team is dedicated to working with our business experts, external partners and customers to identify problems, find solutions and trial them through our innovation projects

Our commitments

We recognise that as a Distribution Network Operator we have a very important role to play in the decarbonisation of the energy system. Therefore, through our innovation work we commit to overcome the barriers to the energy transition.

We need to ensure that our electricity distribution network is able to facilitate the increasing demand from the electrification of heat and transport while at the same time allowing the connection of more low carbon generation. We will continue to innovate to find novel ways of efficiently and effectively transforming our network and the way we operate it to meet these requirements.

Our high standards of customer service, safety and reliability need to be maintained while keeping costs low for our customers. We will use innovation to achieve these aims and develop new technologies, commercial solutions and standards that will enable us to make the most out of our existing network and assets, reducing expensive interventions.

The changes that will be brought by the energy transition will create opportunities for people, making it even more important to ensure that those opportunities are accessible to everyone.

We will work with our communities to understand how best we can support our vulnerable customers and ensure that no one is disadvantaged.

We aim to find the most efficient ways of addressing the technical challenges of the future electricity network, while at the same time keeping electricity affordable for everyone.

As part of this, we want to understand how we can best support our customers and our communities so that no one is left behind in the energy transition.

To achieve that, our projects are shaped around the key priority areas of Decarbonisation and Net Zero, Heat, Transport, Data, Communities and Consumer Vulnerability.



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3.2 Progress of the Innovation Strategy

We have delivered more than 120 projects over the previous and current price control periods and spent over £80m on innovation so far.

For us, innovation is an embedded activity. All projects and solutions ranging from small-scale innovations through to larger scale trials need to be designed and implemented in a way that they will be suitable for Business as Usual integration.

Our wide and varied programme of innovation has enabled us to be suitably placed to support our changing needs as a business and our customers' increasing demands and requirements.

Most notably, we have developed and rolled out Active Network Management (ANM) solutions across our four licence areas. We worked to understand the network requirements that can be supported through flexibility offerings and customers' willingness to participate. This has enabled the development of the Flexible Power brand and increased the number of substations utilising flexibility to avoid asset investments from 71 in 18/19 to 122 in 19/20. We have purposely innovated in a wide number of technical and commercial areas.

As part of the Network Equilibrium project, we have explored, designed and successfully trialled new systems that optimise the operation of our network and control our assets in ways that we have never been able to do before. We recognise how these capabilities are important for a DSO and since the project ended in June 2019, we are working on their business as usual roll out.

Our priority areas are:

1 Decarbonisation and Net Zero



2 Heat



3 Transport



4 Data



5 Communities and Consumer Vulnerability



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Our Innovation Programme

Our Innovation Programme consists of a wide range of innovation projects.

NIA Projects	
Losses Investigation	Multi Asset Demand Execution (MADE)
CarConnect (Electric Nation)	Future Flex
LV Connect & Manage	PCB Sniffer
Entire	Harmonic Mitigation
Smart Energy Isles	Wildlife Protection
Visibility Plugs & Socket	Virtual Monitoring Data (VM -Data)
Primary Networks Power Quality Analysis	IntraFlex
EDGE-FCLi (Embedded Distributed Generation Electronic Fault Current Limiting interrupter)	Automatic Location of Arc-faults through Remote Monitoring (ALARM)
Next Generation Wireless Telecoms Analysis	Electric Nation - PoweredUp
CADET (Curtailment and Dispatch Estimation Toolkit)	Presumed Open Data (POD)
Virtual Statcom	LTE Connecting Futures
OHL (Overhead Line) Power Pointer	Net Zero South Wales - Cross Vector Scenarios
Network Islanding Investigation	ARC Aid

In the period between April 2019 – March 2020 we have been delivering 26 NIA projects and 3 NIC projects

NIC Projects		
EFFS	OpenLV	DC Share



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3.2.1 Key Themes of the Trials

As well as the Innovation Strategy, we publish an annual NIA innovation progress report.

	Safety improvement	Cost efficiency improvement	Customer service improvement	Reliability improvement	Environmental improvement
Statistical Ratings of OHLs		✓		✓	✓
Solar Storage		✓		✓	✓
Common Information Model		✓	✓		
LV Plus	✓	✓	✓		
LCT Detection	✓			✓	
FREEDOM		✓	✓		✓
SF ₆ Alternatives					✓
DEDUCE		✓	✓	✓	
Carbon Portal					✓
Hydrogen Heat and Fleet		✓			✓
CADET			✓		
EDGE FCLi	✓	✓	✓	✓	
Electric Nation		✓	✓		✓
ENTIRE		✓	✓		✓
Losses		✓			✓
LV Connect and Manage	✓	✓	✓	✓	
LV SEF Protection	✓		✓		
MADE		✓	✓	✓	
Network Islanding		✓			✓
Next Gen Wireless		✓	✓	✓	
OHL Power Pointer	✓	✓	✓	✓	
PNPQA	✓	✓	✓	✓	
Smart Energy Isles			✓		✓
Visibility Plugs and Sockets		✓			
Virtual STATCOM		✓			
I&C Storage		✓	✓	✓	✓
Alternative Cut-outs	✓		✓		
Engineered Poles	✓				✓



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3.2.1 Key Themes of the Trials

DC Share

DC Share is a £5.6 million, three year Ofgem funded Network Innovation Competition project due for completion in Spring 2023 it will provide a network equalisation solution designed to provide a means of sharing system capacity across Alternating Current (AC) secondary substations with different load profiles by extracting latent power, converting it to Direct Current (DC) and then distributing it to vehicle charge points via a new high capacity DC cable network.

The solution will comprise 4 x AC/DC Grid Tied Invertors providing DC power to the ring with up to fifteen rapid charging DC charging points in physically different locations. A bespoke control system will monitor and manage the connections and control the power flows to ensure maximum availability under a variety network system constraints, in a safe and economic manner.

Given that the concept of providing Electric Vehicle (EV) rapid charging via DC connections has never been trialled before, this project is considered to be of prime importance to encourage the accelerated take-up of EV's in accordance with the governments Clean Growth Strategy and for progressing its carbon neutral infrastructure policies.

The Government's Clean Growth Strategy sets out the importance of accelerating the shift to Low Carbon Transport with one of its key aims being to "Develop one of the best EV charging networks in the world" alongside the policy of ending the sale of new conventional petrol and diesel engine cars and vans by 2035.

There are currently just over 200,000 EVs in GB.

National Grid's "two degrees" Future Energy Scenario is based upon 7.3 million EVs (30% of vehicles) by 2030. The majority of these are expected to be Battery Electric Vehicles with substantial battery capacity and rapid charge capability.

Rapid chargers will be a necessary part of the charging ecosystem that will enable longer and irregular journeys, as well as adoption of EVs in high utilisation fleets. Furthermore, the provision of rapid chargers in cities and urban environments is particularly important to support these fleets and maximise improvements to local Air Quality.

Rapid Chargers represent a significant load to distribution networks, so rapid charging facilities are likely to require network reinforcement due to the power requirements of each charger and the fact that these are likely to be deployed as charging hubs.

An existing substation might be able to connect one or two rapid chargers but when they are required at scale, network reinforcement will likely be required. However, grid connection and reinforcement costs are significant and are often cited as a concern for EV charging point connection customers.

The project method will use an Equalisation Network to provide an alternative, cost-effective solution for rapid EV charging demands, more flexibly than a traditional AC reinforcement solution.



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3.2.1 Key Themes of the Trials

The solution seeks to explore the comparative benefits of a DC network, where power flows can be actively managed, and fault level contained, over a traditional AC network reinforcement.

The method uses an equalisation network between existing substations and makes use of the differences in demand patterns to provide the required capacity from whichever has availability.

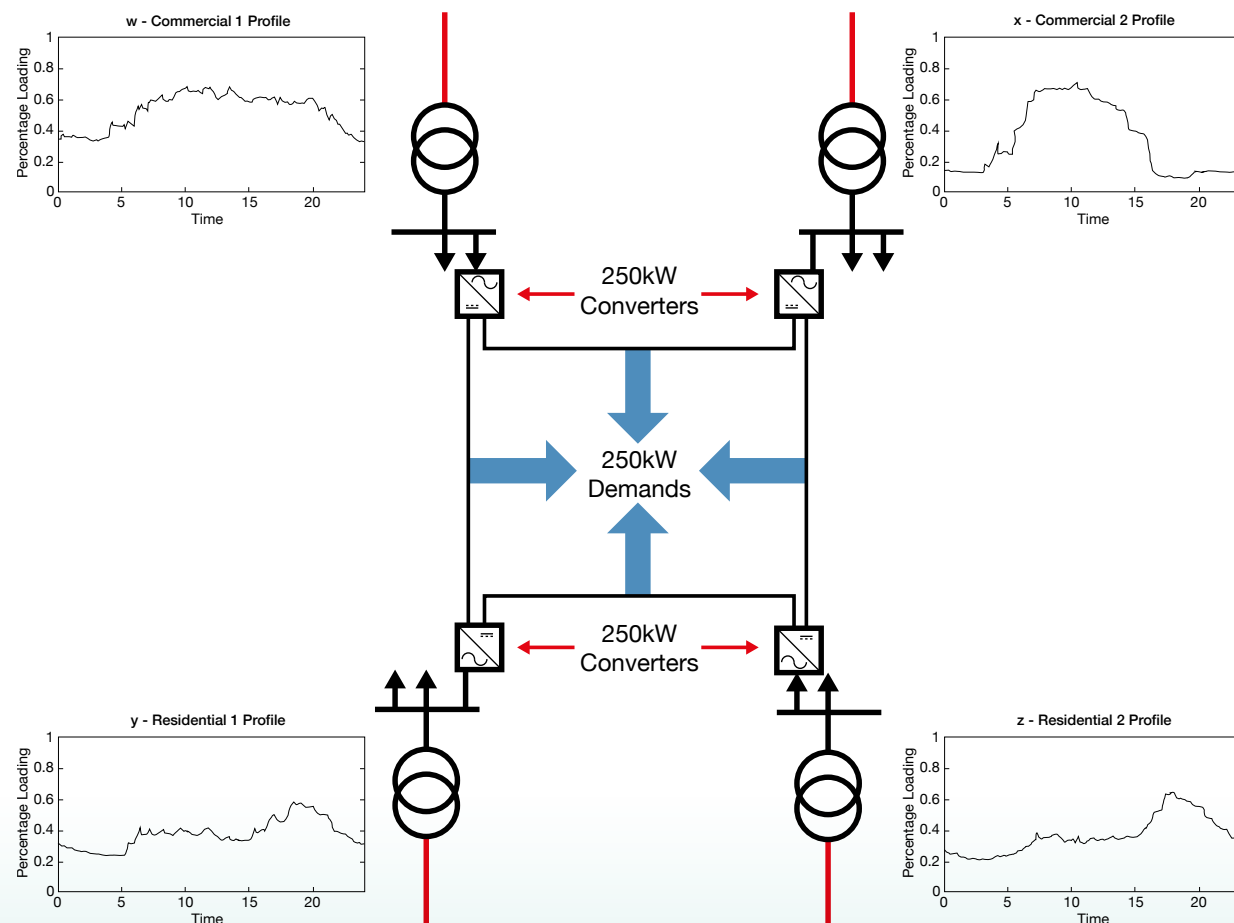
DC Share will employ four 250kW bi-directional power electronic converters to connect to existing substation Low Voltage (LV) boards and provide connections to vehicle charge points via a new high capacity DC cable network.

The equalisation network balances demands such that transformers experiencing heavy demand receive support from those that are more lightly loaded.

This offers benefits by evenly distributing loads between assets, reducing the probability of stranded assets.

This method provides a means of sharing system capacity across AC secondary substations with different load profiles.

Using a DC ring to provide the capacity for the rapid charging points leaves capacity on the existing LV AC cables for demand growth of the existing users.



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3.2.1 Key Themes of the Trials

IntraFlex

To date, the procurement of DNO flexibility services have taken little consideration of potential impacts on the wider wholesale market. The IntraFlex project is looking to test a short term market for DSO flexibility services which actively accounts for the imbalance they create in the wider electricity market.

By providing better information to suppliers the project will look to lower exposure to imbalance costs and decrease the costs of providing flexibility in the long run. Operating closer to real time through the NODES market place is hoped to bring new participants to flexibility services.

Over its two year duration, the £1.2m trial will design the necessary mitigations and run two market tests.

Following the development of the market design, and its review by stakeholders in April, the project is now finishing the system builds and recruitment ready for the Phase 1 trials in August and September 2020. These will run in current Constraint Management Zones and aim to test the basics of short term market operation and limited information sharing. Once completed these will help refine the design of the market and systems for the full Phase 2 testing in spring 2021.

Phase 2 will feature more complete information sharing and more developed market operation. The two phase design allows us to start testing with users quicker to better understand the complexities of potential market behaviour.

Future Flex

First generation Distribution System Operator (DSO) flexibility services are currently being procured across GB, for example through Flexible Power. These tend to be provided by large distribution connected assets. The Future Flex project aims to develop second generation DSO flexibility service with a focus on the domestic scale. This looks to widen the pool of potential providers and enable the coordination of larger home loads including electric vehicles, smart and hybrid heating and battery storage to benefit the distribution network.

This 25 month, £828k project started by hosting two workshops to gain participant input to develop a commercial design, a trial platform and to undertake a trial. This resulted in the following three ideas being taken forward:

- **DSO-ready homes:** This work stream will identify and deploy interventions in the customer journey to futureproof homes for DSO services. The objective is to deliver a set of costed interventions to make homes DSO-ready through adopting a customer-centric approach.
- **Sustain-H Trial (with aggregated data sets):** This work stream will implement a trial with different data options with energy suppliers and/or asset aggregators using the Sustain service as a test case. The objective is to demonstrate the provision of an inclusive DSO service, which is accessible to a broad range of domestic solutions, and is flexible on data provision.
- **Pro Low Carbon:** This work stream is conducting analysis of carbon intensity of DSO services, with an emphasis on domestic flex. As stated in our Community Energy Strategy we are taking steps to understand the carbon intensity of the services we buy and have taken proactive steps to start reporting on the carbon associated with our services. We have taken a simple approach based on the UK Government GHG Conversion Factors for Company Reporting. For clarity, these emissions would generally fall under the Scope 1 emissions of the companies providing services to us. The total emissions associated with services procured by Flexible Power is approximately 165tCO₂e across our four licence areas for 2019/20. There is an additional 11tCO₂e of “Out of Scope” emissions associated with Bio Energy.

The primary focus to date has been the design and marketing of the Sustain H trial which is currently being assessed by potential participants.



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3.3 Roll-out and Innovation into BAU

We have been continuously building on the learning generated from our projects.

For example, fault currents were explored as part of a collaborative IFI project, demonstrated within FlexDGrid, an LCNF Tier-2 project, and now being refined and made suitable for small-scale rapid deployment as an output of our EDGE-FCLi NIA project.

As outputs are delivered, they are developed into new learning that can be taken forward and developed as business as usual. Outputs obtained from other DNO projects are fed into this process to ensure that we gain maximum benefit from innovation projects.

All solutions rolled out from innovation follow the same route as our other policies and techniques introduced into the company. Policies are reviewed by the senior network managers before they are introduced. The rollout process includes implementation plans and, where appropriate, training and dissemination sessions.

We monitor all the projects as they develop and make use of learning and outcomes as they are reported. Through the Network Equilibrium project we have developed and successfully trialled our System Voltage Optimisation (SVO) technology which has revolutionised the way we operate our network in real-time and proved the significant network capacity benefits it can offer. We are now planning the roll-out of SVO which will enable us to make the most out of our existing network.

Innovative solutions can also improve the security of electricity supplies by ensuring generation matches demand in local areas. Solutions could enable sections of the electricity network to be run in isolation for short periods of time. Distribution network technology will continue to advance and we can gain benefits by adopting it.

Our experience shows that new solutions available today will become standard in the near future. For example, Active Network Management (ANM) was bespoke when our Low Carbon Hub project started in 2011. ANM is now business as usual and we have a framework agreement in place with three vendors, with multiple zones currently active and a plan in place for all of our remaining network to be active by 2021. A critical evolutionary change is the increase of LCTs such as EVs and electrified heating solutions on the distribution network. Challenges and opportunities have been demonstrated by our Electric Nation and FREEDOM projects.

Our Lincolnshire Low Carbon Hub project developed a practical application of ANM which is part of our Alternative Connections policy suite. Alternative Connections are available to all generation customers seeking a connection where significant reinforcement is required.

Export limitation devices have been developed by manufacturers to locally balance generation and demand. However, due to the lack of an industry standard, the variance in the quality and method of operation of these devices is wide. We developed a policy for acceptance of these schemes which outlines the minimum requirements to achieve compliance with the new WPD policy. This policy was circulated to the other DNOs and following further refinement was developed in conjunction with manufacturers to form a new UK standard - ENA Engineering Recommendation G100.

The ENTIRE project explored the technical and commercial requirements to utilise flexibility as a service to avoid asset investment requirements. Through trialling over 47MWh of flexibility and generating policies and procedures, this enabled the Flexible Power brand to be developed and is now offering business as usual flexibility solutions to the whole business.



As outputs are delivered, they are developed into new learning that can be taken forward and developed as business as usual



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3.4 Maximising the Benefits of Smart Meter Roll-out

Smart Meters have the potential to provide data to enhance our existing core business activities such as fault management, network planning and asset management.

There are also potential benefits which could help the deployment of low carbon technologies and the move to actively managed networks. With many of these applications the benefits increase as the density of smart meters on the system increases.

Fault management

Smart metering will provide a number of functions to support fault restoration and reporting activities. For example when there is a power cut, 'last gasp' functionality will trigger a message to notify a loss of supply.

This will provide a level of visibility down to individual premises that has not been available before.

Additional functionality will allow the 'energisation status' of meters to be checked remotely, giving us a clearer indication of which customers are off supply, enabling us to better determine what type of fault has occurred (blown fuse, open circuit fault, single premise). This will help ensure we respond in the right way first time and improve our restoration times. In the case of a call regarding a 'single premise', it will also help to remotely identify if the issue is on the network or on the customer's own equipment.

On completion of any restoration work, it will be possible to check that all supplies have been restored, which is particularly useful in storm scenarios where faults at High Voltage (HV) can mask additional issues at Low Voltage (LV).

The ability to check will reduce the possibility of teams leaving the area while customers may still be off supply. As smart meters record interruption and restoration times, fault management applications will become more effective as the density of installed smart meters increases and more information becomes available to provide a comprehensive view of the network.

Smart meters have the potential to provide valuable data which could enhance our core business



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3.4 Maximising the Benefits of Smart Meter Roll-out

Network planning

Existing network planning assumptions are already being challenged due to the volume and type of distributed generation on the LV network. At present, the majority of load data is derived from measurements at HV source circuit breakers at primary substations.

At LV, maximum demand indicators provide us with a limited view of load at distribution substations but no load duration is collected. Smart meter data can provide increased visibility on the aspects of network activity that can subsequently inform load-related investment decisions. Data on half-hourly power flows (real, reactive, import, export) and maximum demand (both for individual meters and aggregated for network sections) allow us to determine load profiles, which can be used to:

- **Check that loading is within operational and thermal capacities of network components**
- **Determine thermal capacity headroom to gauge the scope for accommodating additional (LCT) loads**
- **Inform the prioritisation of load-related network investments**
- **Identify reverse power flows, which might require us to take action**
- **Avoid unnecessary reinforcements or network issues from demand over or underestimation**
- **Identify where power factor correction is necessary or can act as an alternative to network reinforcement**
- **Identify areas where network losses are highest.**



The data collected will provide us with a more comprehensive understanding of where there are issues on the network and where there is adequate capacity to accommodate additional connections or more LCTs without the need for network reinforcement.

Aggregated load data will create a more detailed profile of the loads experienced at points on the network. This can support the identification of overloaded sections of network and aid in the prioritisation of network reinforcement where load issues have been identified.

Aggregated load data can also ensure that network reinforcement is avoided where it is not necessary. For example, maximum demand indicators may suggest that a substation is overloaded based on a momentary high load, whereas aggregated metering data may demonstrate that this was of very short duration and in line with design parameters requiring no intervention.



Connections

As with load-related network investment, increased visibility of voltage levels and power flows can help us reduce the time to connect new loads and generation. It can also provide benefits to new connectees via lower connection charges and the ability to assess options for the use of smart solutions to reduce or avoid upstream reinforcement.



Asset management

A wide range of data will be available from smart meters to support asset management activity. Each meter will be able to act as a voltage monitoring point and be capable of issuing alarms relating to voltage anomalies (under voltage, over voltage).

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3.4.1 Smart Meter Penetration

The percentage penetration of Smart Meters in each of the DNO's Distribution Services Area at the end of 2019/20 period is provided in table 3.4.1.

3.4.1 Smart meter penetration

Licence area	East Midlands	West Midlands	South Wales	South West	Total
No. MPANs	2,693,809	2,522,563	1,158,751	1,669,512	8,044,635
No. SMETS1	782,571	752,421	323,634	424,387	2,283,013
No. SMETS2+	288,614	229,706	114,223	153,829	786,372
Total penetration	39.76%	38.93%	37.79%	34.63%	38.15%

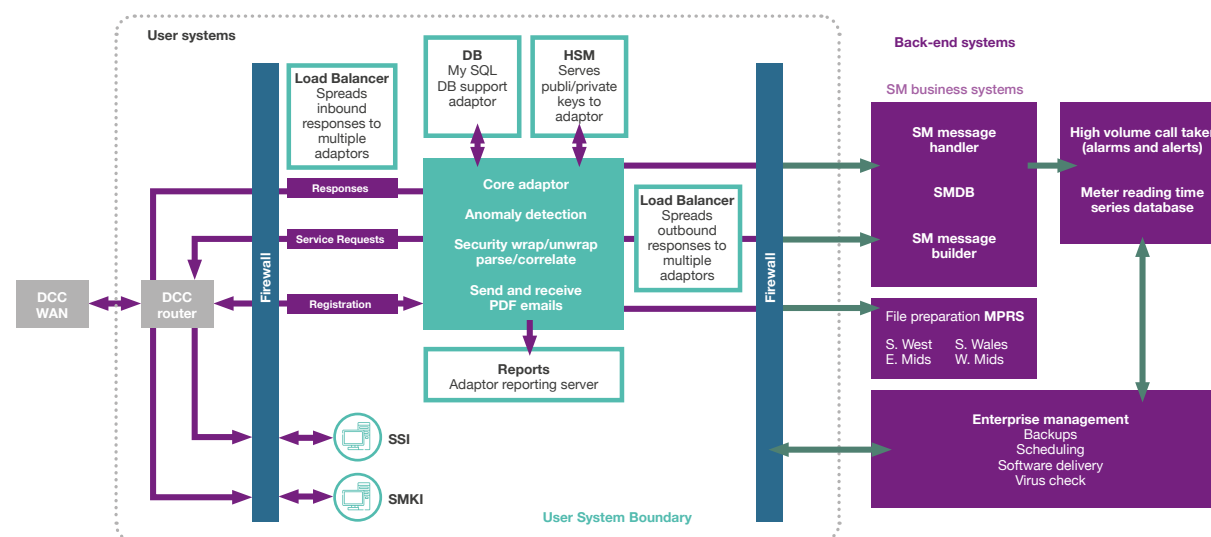
The Smart Meter Rollout is being managed by Energy Suppliers in the UK and although the initial programme of installations was due to end in 2020 this has now been extended until 2024.

3.4.2 Status of IT and Communications Investments (DS)

The current status of IT and communications investments which are required to maximise the benefits of smart metering data – are detailed in Worksheet E5 – Smart Metering (published as an appendix to the Report) and the accompanying commentary report.

We have successfully completed the update and implementation of our systems in line with DCC R3.0 and the Enrolment and Adoption programme. In addition to proving system functionality we have successfully passed an independent audit to ensure our security architecture and environment meets the security requirements of the overall national programme.

Fig 3.4.2 Smart Metering - User System Environment



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Existing installed SMETS1 meters are planned to be enrolled in to the DCC through late 2019 in to 2021

3.4.3 Maximising the Value of Smart Meter Data

While energy suppliers have been installing SMART meters in our distribution area since 2012, the units installed until late 2018 were the SMETS1 type with no interoperability.

The deployment of SMETS2+ devices has increased steadily since Q3 2018 with WPD connecting to around 2,500 meters per day. The migration of SMETS1 devices from original supplier to DCC has also commenced and we are seeing these volumes grow and expect a significant increase in these volumes in the next 12 – 18 months.

WPD continues to lead the way with in excess of 780,000 electricity units installed within the four licence areas as Q1 2020.

3.4.4 Smart Meter Data

At present our innovative connections solutions are targeted at large scale customers.

Soft Intertrip and Active Network Management (ANM) require real-time links so do not use smart meter data. We can however use smart meter data to complete retrospective checks on Timed Connections.

As our innovation continues and smaller customers are focused for solutions, smart meter data will become a key dataset for us.

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3.4.5 Estimated Actual Benefits

The estimated actual benefit of using smart metering data during the current price control period was included in our RIIO-ED1 Business Plan and was as follows:

Table 3.4.5a

	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Efficiency saving on load-related reinforcement	0.00	0.00	0.00	0.00	0.43	0.70	0.85
Efficiency saving on connections related reinforcement	0.00	0.00	0.00	0.00	0.50	0.80	0.98
Savings from last gap functionality	0.00	0.08	0.23	0.38	0.60	0.75	0.75
Savings from restoration confirmation	0.00	0.01	0.04	0.06	0.09	0.11	0.11
Total per annum	0.00	0.09	0.26	0.43	1.62	2.36	2.69

Table 3.4.5b

Smart metering benefits for demand side response and active network management (£m)

	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23
Total per annum	0.00	0.00	0.00	0.00	0.00	0.5-1.5	0.5-1.5	0.5-1.5

The level of estimated actual benefit declared in the WPD RIIO-ED1 Business Plan was based on a number of assumptions which may no longer be valid.

- **Commencement of mass rollout of smart meters was not delayed**
- **Penetration of SMETS1 meters was very low**
- **Customer numbers with no Smart Meter WAN coverage would be good**
- **Consumption data was able to be used in disaggregated form**
- **Power outage/restoration alerts are received in a timely manner**
- **Smart Meter voltage measurement has a high and known accuracy.**

Consequently the level of estimated actual benefit will need to be reviewed once the outcome of the aforementioned becomes clearer.

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3.4.6 Forecast Actions

The start of an increased number of SMETS2+ meters since Q3 2018, and supplier trials within the licence areas has led to increasing numbers of SMETS2+ meters throughout 2019/20.

During the early part of mass roll-out, while penetration levels are still below our expected level within the 2019/20 regulatory year, we continue in 'evaluation mode' whereby the smart metering data we receive will be assessed, but our existing business processes and systems will largely continue as before.

The actions we intend to take are as follows:

Avoided losses to network operators

This benefit depends on:

- A high penetration of smart meters
- The availability of Supplier Time of Use (TOU) tariffs
- Significant numbers of customers taking up these tariffs
- The TOU tariffs incentivising a customer response which reduces the maximum demand
- The In Home Display driving changes in customers' consumption behaviour.

We intend to monitor developments in this area as smart meter roll out continues.

Reduction in Customer Minutes Lost (CML)

The benefits in this area can be summarised as the ability for us to understand the nature of a loss of supply, either a single customer or multiple customers, by using data from multiple Smart Meters.

A secondary benefit which we have seen since acting on these alerts is that we are also aware when a third party might have inadvertently disconnected the supply or operated our equipment.

In these cases we can offer safety advice. These were not realised during the 2019/20 regulatory year due to the lack of penetration and reliability of alerts received.

Reduction in operational costs to fix faults

While there is the potential for us to benefit from avoiding unnecessary site visits for single outage calls as soon as the very first meter is enrolled into the DCC, in practice this depends on:

- SMETS2+ meters being installed
- The meter being connected at a premise where a single outage call occurs
- The integrated system is already in place and has correctly identified network faults with the currently installed SMETS2+ meters.

Savings for other faults requires sufficient SMETS2+ meters on faulted circuits to allow rapid identification of fault type/position and therefore quicker response and repair.

We intend to evaluate the outage and restoration alerts that we receive during this period.

Reduction in calls to faults and emergency lines

This benefit depends on:

- A high penetration of SMETS2+ smart meters
- Supply outage and restoration alerts being received in a prompt manner from the Communications Service Provider systems
- Customers being familiar with smart meter capabilities and having sufficient trust to rely on the meter to notify us about power loss.

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3.4.6 Forecast Actions

Smart meter voltage data

This benefit depends on: Voltage data from SMETS2+ and enrolled SMETS1 meters can be used to understand how our network is operating. Data at the near or far ends of a network is especially useful as it can show trends in the demand or generation loadings of the network.

For example, a high voltage at the end of a network can indicate high levels of embedded generation. Conversely low voltage can indicate a high level of load.

We can use this data as an early warning triage of our network. Substations with predominantly high or low volts over a long period of time can be identified and substation level monitoring can be installed. The logic rules for voltage analysis have already been written and are currently being evaluated and tested.

Better informed investment decisions for electricity network reinforcement

This benefit depends on:

- **Data privacy plans being approved**
- **A high penetration of SMETS2+ smart meters**
- **Sufficiently detailed customer connectivity models**
- **Access to sufficiently granular consumption information.**

We have an approved Data Privacy Plan and Privacy Impact Assessment and plan to integrate our systems to enable network teams to utilise the data from late 2020.

Avoided cost of investigation of customer complaints about voltage quality of supply

Any voltage quality of supply benefit is limited by undefined accuracy of meter voltage measuring elements.

While there is the potential for this benefit to start being realised from the very first meter enrolled into the DCC, in practice it depends on:

- SMETS2+ meters being installed
- The meter being connected on sub-optimally performing parts of the distribution network.

Network capacity investment savings from electricity demand shift depend on the following:

- A high penetration of smart meters
- The availability of Supplier TOU tariffs
- Significant numbers of customers taking up these tariffs
- The TOU tariffs incentivising a customer response which reduces the maximum demand.

It was not possible for WPD to realise these benefits during the 2019/20 regulatory year. We intend to monitor developments in this area as smart meter roll out continues.



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3.4.7 Innovative Solutions to new connections

The drive to connect DER remains at the forefront of our activity and with it the impact on the distribution system meaning scarcity of readily available capacity.

While we are still encountering an appetite to connect traditional forms of generation many developers are turning to energy storage as a means of providing flexible services to the market.

With its requirement for an equivalent demand capability, energy storage brings its own challenges to design and operation of the distribution system.

To realise the customer's capacity requirements we often need to undertake conventional reinforcement but that can take time and sometimes can be prohibitively expensive. There is also an increased risk of stranded assets or reinforcement lagging development as the growth rate of DER and LCT demand increases.

To avoid the need for network reinforcement and therefore reduce connection timescales and costs we have developed a suite of Alternative Connections that offer a number of options for those customers who are open to the possibility of being flexible and are prepared to accept a level of curtailment.



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3.4.8 Alternative Connections Descriptions

Our innovative solutions allow customers to connect their distributed generation at reduced cost, with quicker timescales but will contain some form of curtailment to avoid expensive reinforcement costs.

Soft Intertrip

Some networks are constrained due to a single upstream asset requiring reinforcement, or a single limit being infringed under certain conditions.

This solution has an on-site soft-intertrip Remote Terminal Unit which provides two normally open contacts for the customer's control system to monitor; Stage 1 and Stage 2. When both sets are open, the connection will be free of constraints.

The levels of curtailment corresponding to the operation of the Stage 1 and Stage 2 contacts will be defined at the planning stage.

Active Network Management (ANM)

This solution is the most complex and used mainly with larger new connections and primarily generation.

Customer control equipment is installed into a WPD control solution which allows for full dynamic control of the network, generation and demand.

Timed Connection

This solution is a simple timer-based device that monitors the connection agreement with the customer, which will include some form of curtailment based on times of day.

The customer's connection agreement will include an operating schedule which will define the times and levels of capacity available to them. The solution is supplied by the customers equipment and does not require any additional investment from us to implement.

Export Limiting

This solution is suitable for all capacities. It measures the apparent power at the customer's exit point and uses that information to restrict generator output when the customer's agreed export capacity is about to be exceeded.

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3.4.9 RIIO Outputs that Alternative Connections Facilitate

Our innovative solutions cover a number of our RIIO outputs. The outputs of each project are detailed in our Innovation Strategy.

At a high level these solutions cover:



Connections and customer satisfaction

Providing a faster service and engagement with major connections customers



Reliability and safety

Enhancing network resilience and doing so in a safe manner



Environment

Increasing the uptake of LCTs

By allowing more DG customers and other major customers to connect to the network in a way that is more cost-effective and does not impact on other users, we are changing the way the business operates (with new policies and procedures) and facilitating the connection of new customers with LCTs. The rapid adoption of these solutions show how successful these changes have been.

3.4.10 Benefits and Impacts

Our Alternative Connections give a number of clear benefits and impacts:

- They allow the connections to the network that in the past would have required significant reinforcement
- They enable connections to be made more quickly
- They do this at reduced cost currently £5.13m reduction to customers connection costs
- They do not require significant change to our business and so are able to be rolled out in a structured way.

The capacity released in 2019/20 was 12.1MW with an equivalent customer cost saving of £267k.

Alternatively, we can report this cumulatively to date as released capacity to date of 178.4MW with an equivalent customer cost saving of about £10.26m.



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3.4.11 Forecast for roll-out of Active Network Management (ANM)

We are releasing new ANM zones every six months. The full roll-out table is below.

Table 3.4.11

GSP Group	Active BSP Group	Quoting from	Building during
Bicker Fen	Skegness	Active	Active
Grendon	Corby Northampton	Active	Active
Bridgwater	All	Active	Active
West Burton	Horncastle	Active	Active
Indian Queens	Truro	Active	Active
Swansea North	Swansea	Active	Active
Pembroke	Pembroke	Active	Active
Cellarhead	Meaford	Active	November 2018
Rassau	Abergavenny	Active	November 2018
South Devon	Landulph – Abham – Exeter GSPs	Active	January 2020
Feckenham	Feckenham	November 2018	April 2019
Aberthaw	All	Active	April 2019
Staythorpe	All	November 2018	November 2019
Berkswell	Warwick	April 2019	April 2020
Axminster	All	April 2019	April 2020
Shrewsbury	All	April 2019	April 2020
Bishops Wood	Hereford	November 2019	November 2020
Rugeley	All	November 2019	November 2020
East Claydon	All	November 2019	November 2020
West Burton	All	November 2019	November 2020
Pyle	Pyle	April 2020	April 2021
Remaining GSPs requiring ANM.	Actual GSP will be dependent on applications and any resultant constraint.	January 2021	November 2021

Timed Connections do not require any actions on our part and are therefore available to customers as needed. Soft Intertrip and Export Limiting is available in a discrete set of circumstances so is available to all relevant customers.

The number of deployments and related capacity released through the roll out of all our innovative solutions will of course be dictated by customer demand. However, we expect to see similar or slightly increased deployments to those in recent years.

3.4.12 Trials Deriving Solutions

The most successful innovative solution to come through specific trials was ANM We trialled our ANM solution on the Tier 2 Low Carbon Hub project.

The solution was further developed on equipment specification using shared best practice with other DNOs in particular. We now have ANM contracts to multiple vendors.

By using multiple vendors we keep competition active in this particular market, thereby keeping costs to customers and our business at their most competitive.

In addition to other innovation project successes we also drive innovative solutions through business as usual development.

Appendix A

East Midlands RRP Environmental Innovation 2019/20

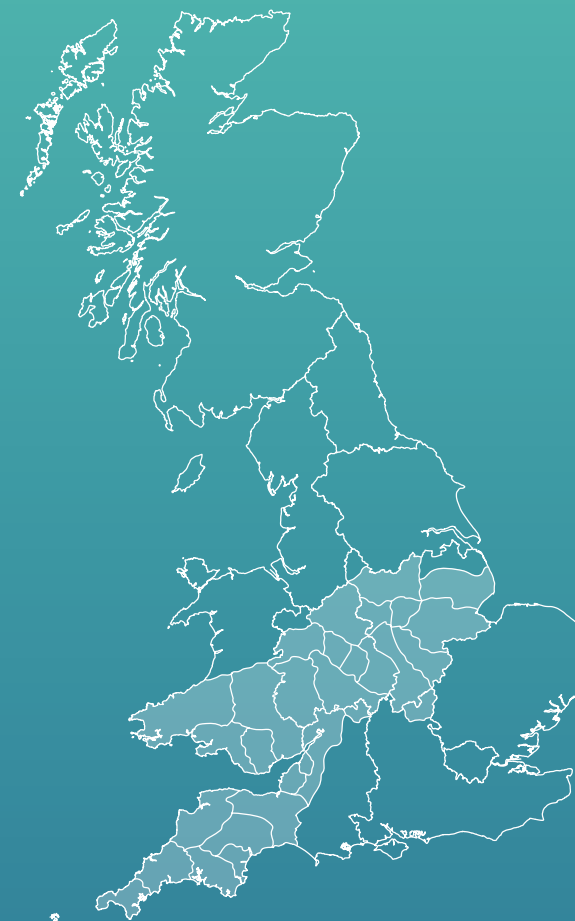
South Wales RRP Environmental Innovation 2019/20

South West RRP Environmental Innovation 2019/20

West Midlands RRP Environmental Innovation
2019/20

Appendix B

RRP Environmental Innovation Commentary 2019/20



Western Power Distribution (East Midlands) plc, No2366923
Western Power Distribution (West Midlands) plc, No3600574
Western Power Distribution (South West) plc, No2366894
Western Power Distribution (South Wales) plc, No2366985

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