

Environment & Innovation Report



westernpower.co.uk

2020/21

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 2020/21 we have achieved the following improvements:



Environmental Highlights

- **Publication of the WPD Environment Strategy** and our plans for RIIO-ED2.
- **Zero waste to landfill achieved** in three WPD licence areas.
- **Continued reduction in our Business Carbon Footprint.**
- **Reduction in fluid filled cable losses** and SF₆ leaks across the business.
- **Successfully maintaining our ISO14001 certification** and responsible environmental management throughout the Covid-19 pandemic.



Innovation Highlights

- **26 Network Innovation Allowance (NIA) projects delivered.**
- **23 organisations took part in our first ever communities and consumer vulnerability NIA call for ideas.**
- **30,805 hits on our website.**
- **£30m+ invested in NIA projects to date.**
- **78 project partners and suppliers on our NIA projects.**



Challenges

- **Continue to improve and progress** in our RIIO-ED1 business environmental outputs – specifically reducing 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.**

1.0	Introduction	04	3.0	Smart grids, innovation and our role.....	39
1.1	Who we are and what we do	05	3.1	Introduction	40
1.2	Our network	06	3.2	Progress of the innovation strategy	41
1.3	Improvement opportunities	07	3.2.1	Key Projects	43
1.4	Stakeholder engagement	08	3.3	Roll-out and innovation into BAU	46
1.5	Our Social Contract	11	3.4	Maximising the benefits of smart meter roll-out.....	47
2.0	Managing our environmental impact	12	3.4.1	Smart meter penetration	49
2.1	Introduction	13	3.4.2	Status of IT and communications investments (DS)	49
2.2	protected landscapes	13	3.4.3	Maximising the value of smart meter data	50
2.3	Oil leakage	14	3.4.4	Smart meter data.....	50
2.3.1	SF ₆ mitigation schemes	15	3.4.5	Estimated actual benefits	51
2.4	Carbon impact and climate change	16	3.4.6	Forecast actions	52
2.4.1	Business carbon footprint	16	3.4.7	Innovative solutions to new connections	54
2.4.2	Sulphur Hexafluoride (SF ₆).....	23	3.4.8	Alternative connections descriptions	55
2.4.3	Distribution losses	24	3.4.9	RIO outputs that alternative connections facilitate	56
2.5	Other environment related activities	29	3.4.10	Benefits and impacts.....	56
2.5.1	ISO14001:2015 certification	29			
2.5.2	Waste management.....	30			
2.5.3	Polychlorinated Biphenyls (PCB's)	34			
2.5.4	Environmental employee awareness	35			
2.5.5	Community environmental support and awareness	36			
2.5.6	Species and habitat protection.....	37			
			Appendices		58



Previous



Next

Environment & Innovation Report 2020/21

Introduction

Section 1.0



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 8 million 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:



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



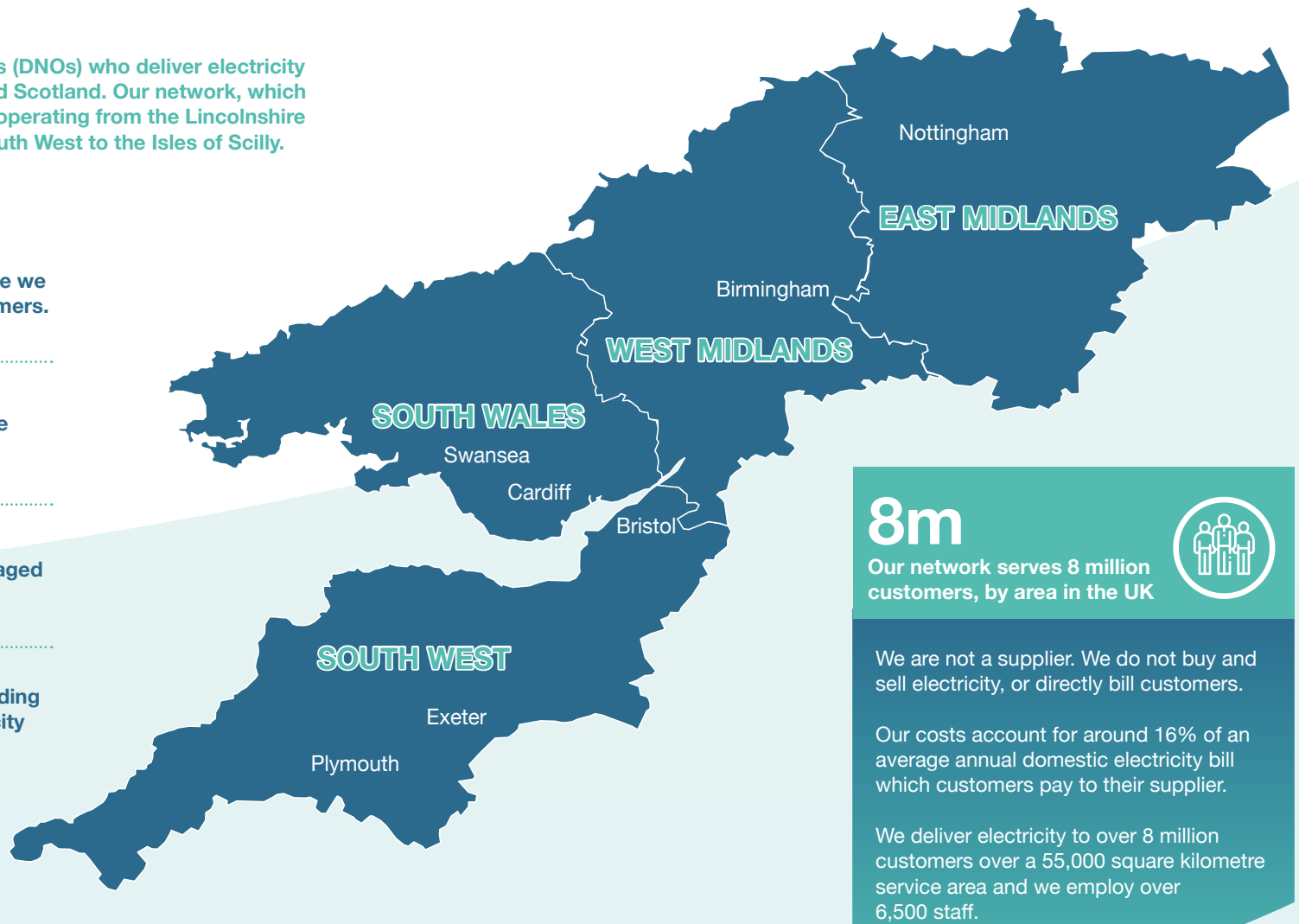
Maintaining the condition and therefore reliability of our assets.



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



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



8m

Our network serves 8 million customers, by area in the UK



We are not a supplier. We do not buy and sell electricity, or directly bill customers.

Our costs account for around 16% of an average annual domestic electricity bill which customers pay to their supplier.

We deliver electricity to over 8 million customers over a 55,000 square kilometre service area and we employ over 6,500 staff.



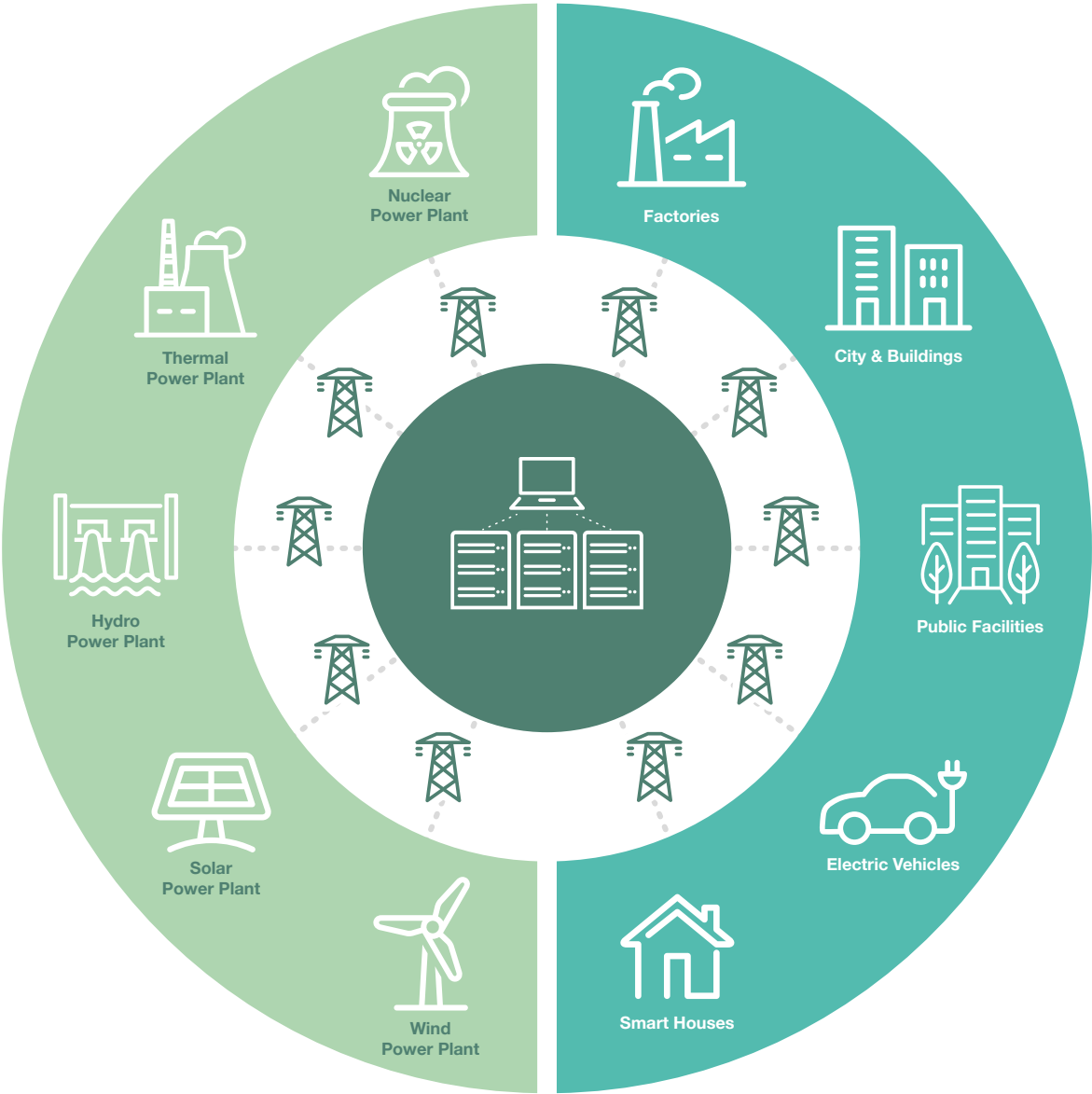
1.2 Our network

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	89,377.3
Underground cable	Km	137,971.8
Transformers	Each	189,644
Switchgear	Each	304,279
Poles	Each	1,843,122
Towers (pylons)	Each	14,641
Customer numbers	Each	7,964,377





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

Years of experience has shown that stakeholder engagement is fundamental to driving innovative and effective services for our customers. Our aim is always to deliver best-in-class practices, and by proactively building relationships, we are able to engage meaningfully, strengthening stakeholders' capabilities to provide informed scrutiny of our plans and proposals which ensures we are held to the highest standards.

WPD's engagement programme is built on strong, strategic foundations, with a track record of almost 15 years of delivery. Over this time, our engagement has grown dramatically in scope and depth, requiring an adaptive approach to the way we interact with an increasing number of stakeholders.

A centrally coordinated, locally delivered programme provides the expertise to deliver significant, detailed engagement with maximum reach, seeing us **engage with over 37,000 stakeholders in the past year.**

Whilst any company can talk about engaging stakeholders, at WPD we are clear that engagement must always lead to action.

The decisions we make must be rooted in stakeholder feedback, with a clear link between their insights and the actions we take.

It is only with this approach that we can ensure our plans are truly reflective of the needs of the communities we serve.



Stakeholders said

"To ensure initiatives and services delivered by WPD are those valued by customers it is vital that their views can be incorporated into planning. Use of innovative engagement to seek informed views will allow for more in-depth insights."



1.4 Stakeholder engagement

Co-creation is key

Our industry is undergoing a seismic shift and our ability to adapt swiftly and continue to achieve an array of positive outcomes for customers requires ambitious, high quality stakeholder engagement.

Over the last year, WPD's stakeholders have helped shape our delivery strategies – in particular helping to safeguard the most vulnerable in our communities during the disruption of Covid-19, whilst devising innovative interventions to drive a green, post-pandemic recovery.

'Co-creation' with stakeholders means letting them set the agenda from the outset, ensuring plans reflect the needs of the people we serve and instilling the flexibility to evolve our approach as those needs change.

Building our plans from the ground up with stakeholders, and providing multiple points for stakeholders to review, refine and endorse our strategies, ensures we're best placed to deliver effective actions to address the significant changes facing our network.

The last year has seen the urgency of climate change compounded by a global pandemic, requiring a dynamic shift in 'Business as Usual' practice across all industries. In this wider context, stakeholders have urged WPD to position ourselves at the forefront of the national decarbonisation effort. Stakeholders want WPD to be proactive, driving the agenda by sharing data, shaping local energy policy and collaboratively devising new services and processes.

Some of the outcomes we've achieved in 2021/21, driven by stakeholder insights are:

Community energy (CE):

"WPD should support groups to understand their potential role and opportunities provided by the energy transition including innovation and new markets."

WPD's innovation engineers held 33 one-to-one sessions to help develop viable proposals, leading to the development of an NIA project in collaboration with a CE scheme.

Customer Panel (CP):

"WPD should proactively 'lean-in' to local planning activity to offer support, advice and data to ensure plans deliver the widest customer benefits."

WPD managers reached out to every Local Authority within our network area to better understand their Net Zero plans and ambitions. As part of this we shared our future energy scenarios and discussed the impacts for their regions, offering support to co-develop their plans.

Stakeholder workshops:

"Flexible services must be rolled out as extensively as possible. Participation in flexibility must extend beyond large commercial customers."

Total flexibility contracted out 441MW, deferring £40m of reinforcement (in 2020/21 prices). Improved flexibility offerings have enabled 46 flexibility providers to participate in tenders in the last twelve months.



1.4 Stakeholder engagement

Regional stakeholder workshops

Our bi-annual, regional stakeholder workshops are an enduring component at the heart of our core engagement programme. They provide key opportunities for us to hear from a broad range of stakeholders on a variety of topics of interest to them.

The insight generated shapes the direction of our business, by allowing stakeholders to set our priorities now, and for the future.

Over 60 WPD staff members from across a range of business functions typically attended each round of events to directly lead discussions with stakeholders and offer perspectives on the actions we can take to deliver against stakeholder requirements as part of the co-creation process.

November 2020 workshops - what stakeholders told us:

The purpose of these workshops was to round off the co-creation stage of WPD's programme of engagement in support of its RIIO-ED2 Business Plan.

Stakeholders were asked to comment on feedback that had been given in the previous round of workshops and to give their feedback on the draft commitments WPD had produced as a result.

Overall, our Business Plan now contains 45 core commitments and 162 wider commitments that achieve the ambitious, fundamental outcomes our stakeholders strongly support.

Stakeholders told us:	How we acted upon this:
Environment and Sustainability:	
2043 was not an ambitious enough target to reduce the company's Business Carbon Footprint.	We have amended our core commitment to the very challenging target of achieving net zero by 2028.
The original outputs relating to WPD's operational impact (reducing dangerous leaks from cables) didn't go far enough.	We have increased our ambition to reduce the volume of oil leaked from fluid filled cables by 50% by 2028 and replace 90km of the worst leaking circuits with non-oil alternatives (up from 30% and 70km respectively).
Distribution System Operator:	
There needs to be enough capacity to connect LCTs across all of WPD's network area.	A new commitment was created to ensure there is capacity availability to enable net zero to be achieved across our regions sooner than 2050 (some areas as soon as 2030), in line with the ambitions of stakeholders in each region.
The outputs considering whole system solutions and evolving Active Network Management options were regarded as the most important priorities for a future smart network.	Commitments in this area were retained, with improvements being made to their clarity and measurability following additional stakeholder input.
Innovation:	
They wanted projects that ensure the vulnerable and digitally excluded are not left behind.	All WPD innovation schemes will take into account the possible effects on vulnerable customers by identifying those who could be left behind in advance – rather than after a project's launch. We will recalibrate our approach to ensure the widest possible benefits from day one.
Learnings from innovation projects should be integrated into 'Business as Usual'.	Going beyond this, we have created a core commitment to make a saving of £53 million over RIIO-ED2 by encompassing innovations into standard business practice that show a positive cost benefit and carbon impact.



58% of this year's workshop delegates were return attendees, enabling them to provide more informed insights than ever before on WPD's operations



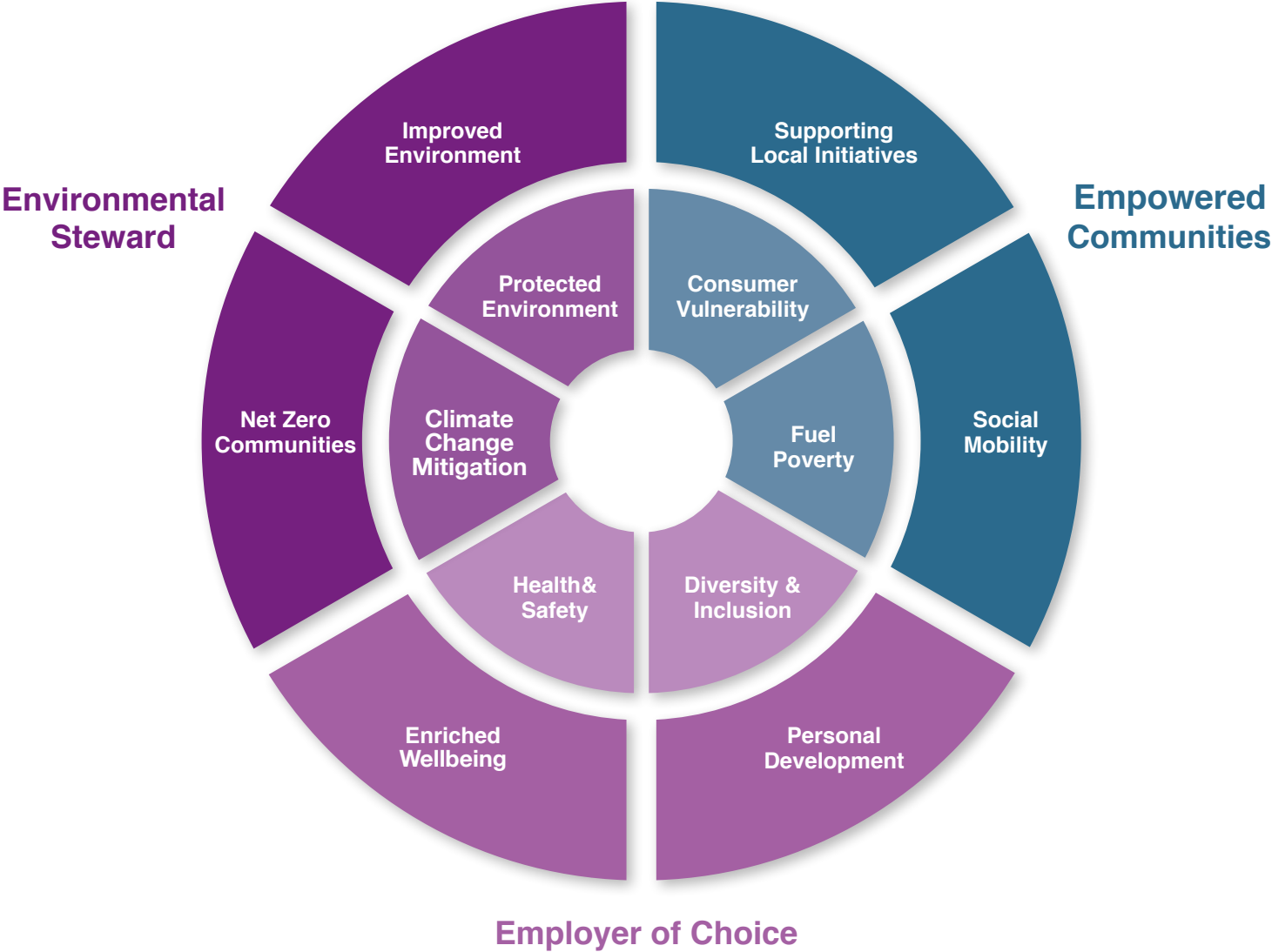
1.5 Our Social Contract

To demonstrate our commitment to act as a good corporate citizen and deliver positive contributions to society, our employees and the environment, WPD is the first DNO to develop and publish a Social Contract. The document provides a framework for ongoing responsible business practices that enables WPD to demonstrate the delivery of our purpose, and is the first time our efforts have been consolidated and formalised within a single strategy.

The three focus areas: “Employer of Choice”, “Empowered Communities” and “Environmental Steward” each contain key actions for WPD to deliver wider social and environmental benefits in our communities, in order to maximise the positive impact of everything we do as a company.

Initiatives will include funding for low carbon initiatives and climate change activities, company volunteering days for environmental projects, and the delivery of local outreach and education related to the net zero transition.

To ensure these promises are meaningful and impactful, the Social Contract is a ‘living document’ defined by ongoing engagement and improvement to meet the evolving needs of our communities.





Previous



Next

Environment & Innovation Report 2020/21

Managing our environmental impact

Section 2.0

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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. 2020/21 has been a challenging year due to the Covid-19 pandemic however our responsibility to protect the environment has not wavered and we have continued to work successfully with our supply chain, environment regulators, local authorities and local interest groups.

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 Outstanding 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 38km (69%) to date.

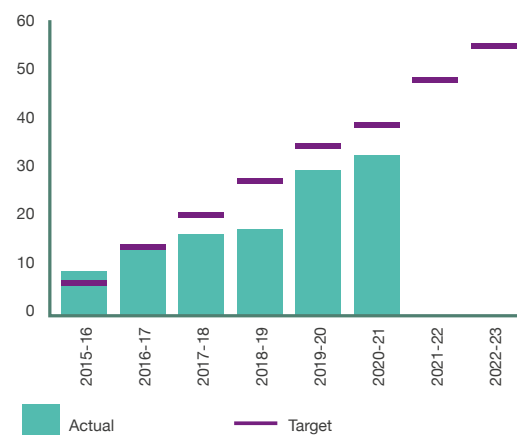
Further details regarding our undergrounding schemes in National Parks and AONBs can be found in Appendix A.

Table 2.2 Undergrounding in National Parks and AONB's (km)

	Target for RIIO-ED1	Completed (to date)	To be removed in 2021/22	To be removed in 2022/23
South Wales	10.0	2.6	2.1	4.5
South West	21.0	10.6	2.0	6.1
East Midlands	10.0	10.1	1.0	1.2
West Midlands	14.0	15.1	2.0	6.5
WPD Total	55.0	38.4	7.1	18.3

During the RIIO-ED1 period so far we have completed 38km (69%) of undergrounding overhead lines within National Parks and AONBs, see Fig. 2.2 below;

Fig. 2.2



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

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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.

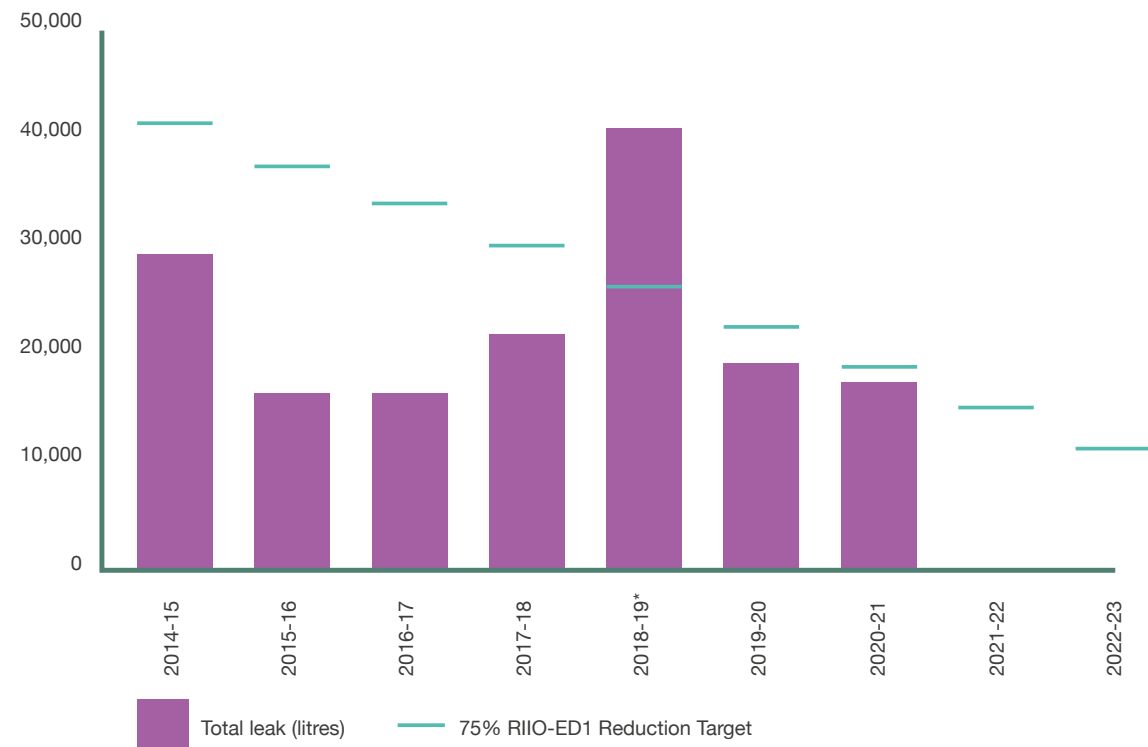
To minimise environmental damage we aim to ensure that:

- 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. RIIO-ED1 reduction target



*2018/19 - 5 circuits accounted for 60% of the volume of fluid lost



There were 67 oil mitigation schemes reported for 2020/21, of which 9 were in South Wales, 22 in West Midlands, 14 in East Midlands and 22 in the South West

Throughout 2020/21 we reduced the volume of fluid cable lost across our network by 1,802 litres

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.3.1 SF₆ mitigation schemes

During RIIO-ED1 we have undertaken 24 SF₆ mitigation schemes, of these 18 have been in the South West, 5 in West Midlands and 1 in East Midlands.

We continue to use SF₆ detection cameras to enable us to identify the source of leaks quickly and efficiently. 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.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next



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)

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.4.1 Business Carbon Footprint Table 2.4.1a annual BCF reporting

WPD carbon footprint report (tCO_{2e})

Aspect		Scope	2014/15 Total tCO _{2e}	2015/16 Total tCO _{2e}	2016/17 Total tCO _{2e}	2017/18 Total tCO _{2e}	2018/19 Total tCO _{2e}	2019/20 Total tCO _{2e}	2020/21 Total tCO _{2e}
Buildings energy usage	Buildings – electricity	2	12,454.4	10,997.7	10,622.2	7,633.5	6,454.16	5,289.43	5,150.78
	Buildings – other fuels	1	207.6	193.1	192.5	220.2	246.48	211.46	216.45
	Substation electricity	2	27,578.7	25,813.8	22,981.6	19,618.6	17,260.18	15,585.19	14,178.38
Operational transport*	Road	1	40,018.8	37,804.8	34,902.6	33,329.5	30,569.11	36,402.08	25,437.75
	Rail	1	0.0	0.0	0.0	0.0	0.00	0.00	0.00
	Sea	1	2.4	2.4	0.24	0.24	2.41	0.62	2.41
	Air	1	1,428.1	1,831.0	2,163.5	2,113.6	1,643.74	1,100.32	1,027.46
Business transport	Road	3	3,304.0	5,116.2	3,196.5	3,395.3	3,174.81	3,407.71	1,551.88
	Rail	3	21.6	20.6	21.97	21.8	20.66	18.84	0.02
	Sea	3	0.0	0.3	0.97	0.1	0.00	0.04	0.00
	Air	3	106.4	41.5	92.37	124.1	241.05	179.61	3.98
Fugitive emissions	SF ₆	1	8,282.1	14,307.5	9,545.7	10,689.5	10,933.90	9,005.41	8,676.59
Fuel combustion*	Diesel/Gas oil	1	8,574.1	7,100.9	7,041.6	6,382.3	9,217.60	9,337.14	8,805.23
Total carbon (tCO _{2e})			101,978.1	103,229.8	90,761.7	83,528.7	79,764.10	80,537.85	65,050.93
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	931,854.21
Total carbon (tCO _{2e}) including losses			2,008,618.8	1,790,572.0	1,620,926.3	1,461,020.5	1,084,266.30	1,053,602.15	996,905.14

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

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



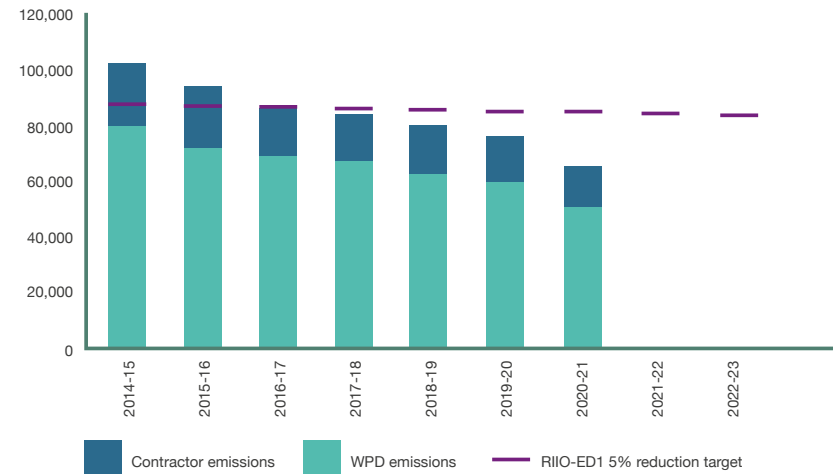
Next

2.4.1 Business Carbon Footprint

During 2020/21 WPD's total BCF (excluding losses and including contractors) across all four licence areas has continued to reduce equating to a total reduction of 36% in comparison to the base year performance in 2014/15.

Since 2014/15 our annual BCF (including losses) has reduced by 50% or 1,011,713 tCO₂e - the approximate equivalent carbon footprint of heating 365,480 average UK households.

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

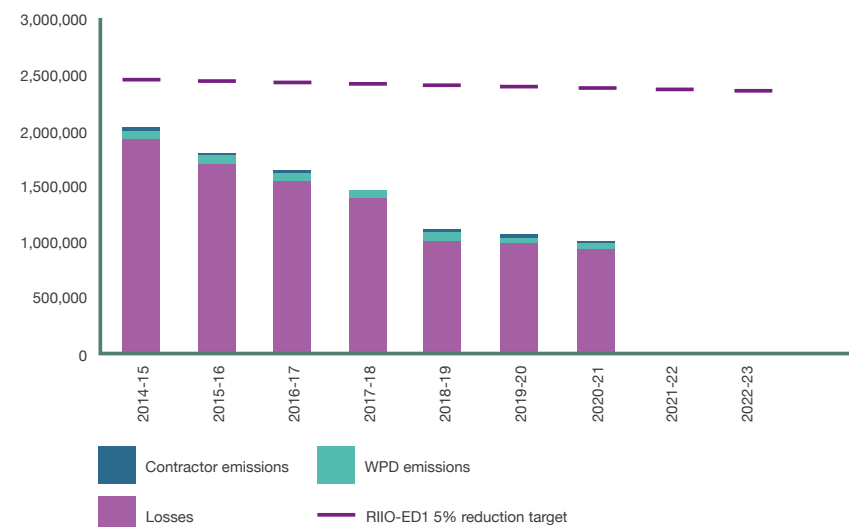


52%

Since 2014/15 our Scope 2 carbon emissions (excluding losses) has reduced by 20,703 tCO₂e or 52%



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



59%

Since 2014/15 electricity usage in offices and depots has dropped by 59%



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.4.1 Business Carbon Footprint

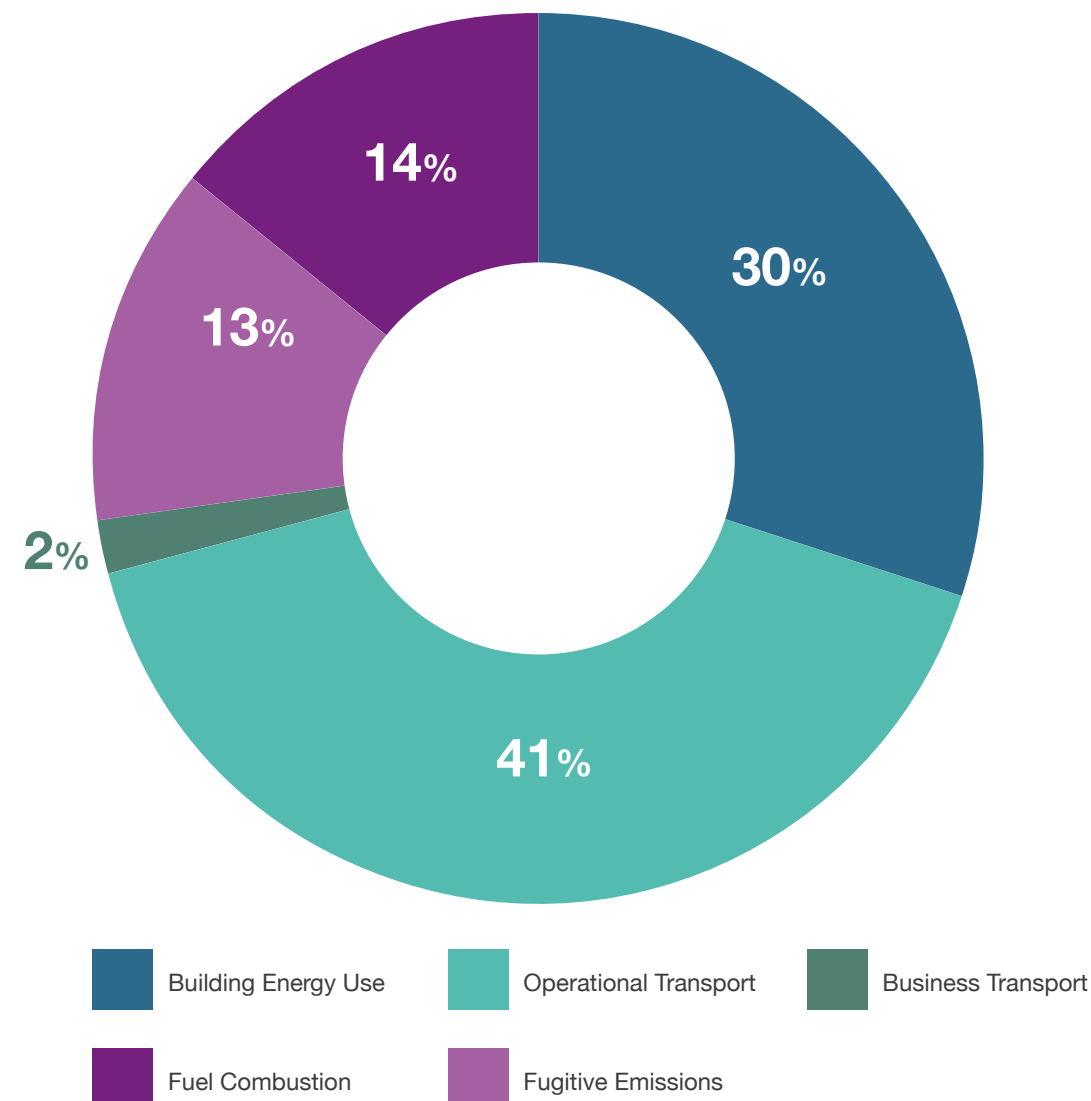
As shown opposite, and similar to previous years, the main contributors to our Business Carbon Footprint (excluding losses) is Operational Transport (41%) and Building Energy Use (30%), however, the contribution of Operational Transport has reduced in the last twelve months by 6%.

Throughout the remainder of RIIO-ED1 we will focus on reducing the impact which both operational transport and building energy use (including energy use at substations) has 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 14% of the total BCF for 2020/21, an increase of 3% 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 30% of 2020/21 BCF, a small increase of 2% 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.
- Operational transport (WPD vehicle fleet and WPD Helicopter) accounts for 41% of our overall 2020/21 BCF, in 2019/20 it accounted for 46%. 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 driver style on fuel efficiency and vehicle emissions through the roll-out of our company wide Driver Behavioural System (DBS). Furthermore throughout 20/21 we have started to introduce electric vehicles as part of our operational road transport fleet which will have a significant impact on our business carbon footprint for years to come.

Fig.2.4.1c Business Carbon Footprint (excluding losses) – WPD



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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 2020 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 RIIO-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 (RIIO-ED2).

Table 2.4.1b Emissions variations for operational vehicle replacement including electric vehicles

Emissions – operational vehicle replacements			
Previous vehicle	CO ₂ emissions (grams per km)	Current vehicle (2019)	CO ₂ emissions (grams per km)
Vauxhall Corsa	94	Nissan ENV200 40kW	0
		Ford Fiesta Van 1.5 Euro 6	96
Transit Connect SWB	115	Nissan ENV200 40kW	0
		Transit Connect SWB Euro 6	118
Transit Connect LWB	115	Nissan ENV200 40kW	0
		Transit Connect LWB Euro 6	122
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

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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 performed well during 2020/21 with reductions in both the litres of fuel used per WPD vehicle and the total volume of fuel used for operational road vehicles across the business, better than our RIIO-ED1 target level.

By continuing with our vehicle replacement programme, raising awareness of the impact of driving style and the continued roll-out of our Driver Behavioural System (DBS) we will continue to make progress towards meeting our RIIO-ED1 5% reduction target for annual fuel use whilst having a positive impact on our vehicle emissions.



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

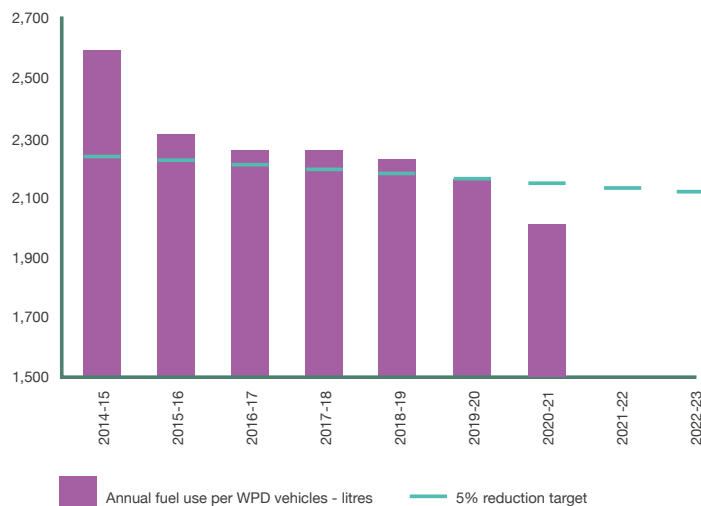


Fig. 2.4.1e Annual WPD fuel use (litres)



We have introduced a Driver Behavioural System (DBS) in to our operational vehicle fleet. The DBS influences individual driver style and fuel efficiency and has a positive impact on our vehicle emissions

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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

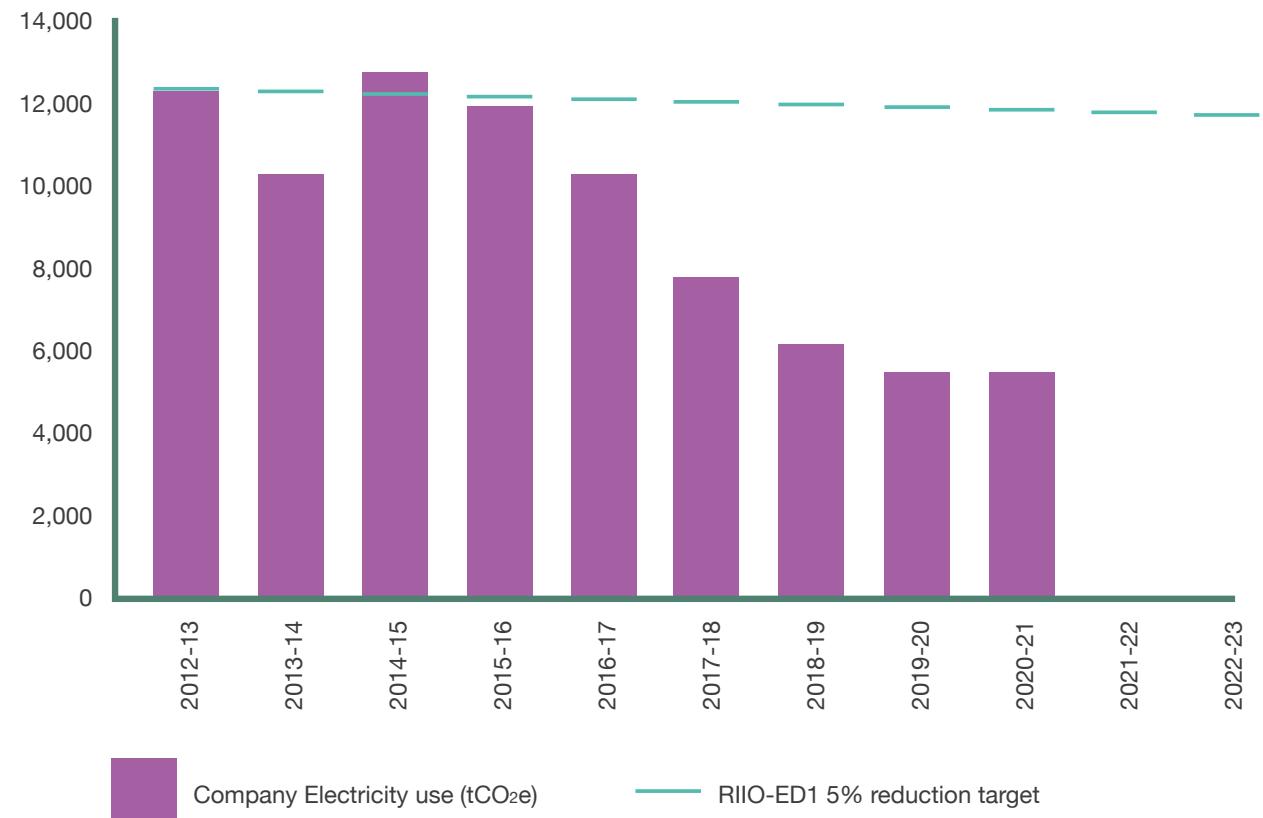


Low energy lighting

Property redevelopments improve employee awareness and energy efficiency measures and lead to energy savings. This is evident in the electricity usage we recorded in our overall BCF reporting. We propose to save around 5% of carbon associated electricity used in offices and depots over the RIIO-ED1 period. As demonstrated we are more than meeting this target with a reduction in excess of 59% since 2014/15.

Current performance

Fig. 2.4.1f Company building electricity use (tCO₂e) taken from depot SMART meter



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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.

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 0.11% and in relation to our baseline year we are meeting our RIIO-ED1 target.

Fig. 2.4.2b details the weight (kg) of SF₆ emitted annually, which has decreased since 2018/19 data.

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.

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

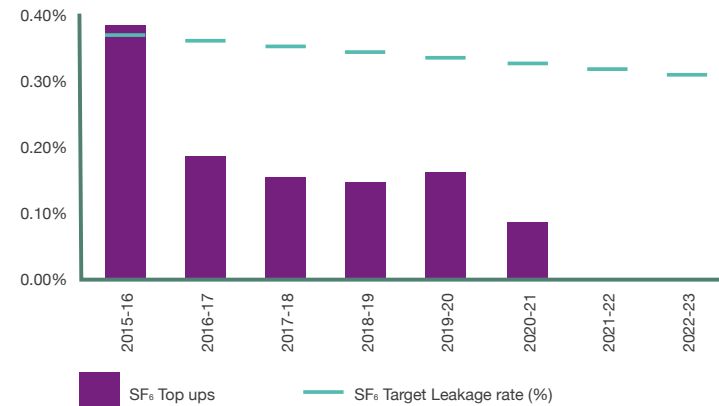
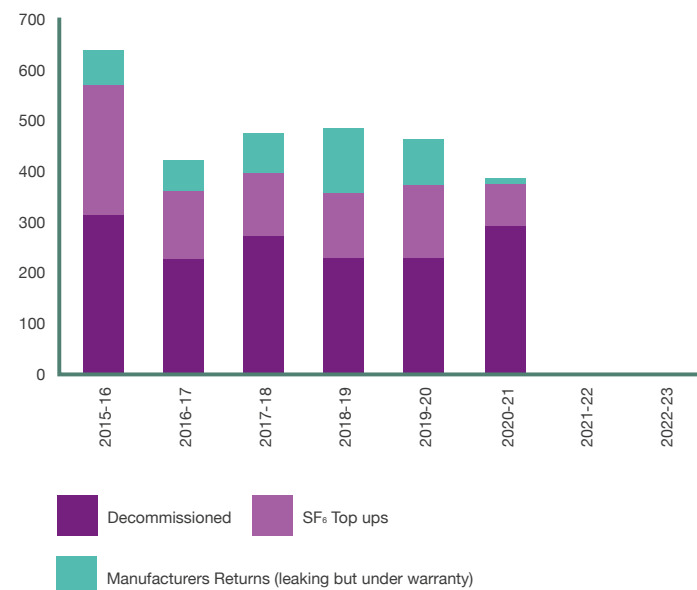


Fig. 2.4.2b Annual SF₆ emissions (kg)



SF₆ leakage rates continue to reduce, 2020/21 leak rate is **0.11%**

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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.
- Providing the SMETS 2 smart meter data is available, WPD will have the tools and methods in place to accurately locate the points on the network with particularly high losses.
- 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 'Business as Usual' (BAU) activities, have produced new and effective means to reduce losses.



Losses strategy

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



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous

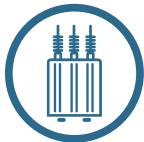


Next

2.4.3 Distribution losses

Some highlights from 2020/21 include:

The pro-active replacement of 1,996 distribution transformers



Purchase and installation of circa 90 single phase 25kVA 11kV amorphous pole mounted transformer (PMTs)



Voltage reduction completed across the four license areas of WPD



The discontinuation of cable tapering on all new 11kV and LV Mains cable circuits



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



The introduction of three phase service cables and three phase cut-outs for all new builds and service alterations as BAU



A comprehensive programme of stakeholder engagement including biennial stakeholder consultation events



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.4.3 Distribution losses

Asset replacement

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

Network design and policy review

In order to forecast what will happen on the WPD network in the future and to determine what is happening on the unmonitored parts of the network, the most powerful tool is computational modelling. Modelling effectively creates a virtual, fully monitored network which can then examine and test new ideas. Using the modelling tools WPD should be able to map where losses occur on the network, allowing for a targeted approach to loss reduction.

Modelling can also be used to predict the effect of future changes to the network, so that the effect on losses of all possible future actions can be considered before the changes are actually carried out.

WPD's current LV system modelling tool WinDebut is being replaced by ConnectLV which is a new Planning tool which is more suited to the Low Carbon Technologies (LCT) devices which are becoming more prevalent on our network, the Planning tool is capable of Losses calculations, 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.

During 2021 the 11kV tool will be replaced with the Sincal tool for all areas, which also supports losses modelling functionality.

With the adoption of power system simulated engineering (PSSE) throughout the company, the West Midlands models are all converted and switch-levelled, the Primary System Design engineers are being trained, and we are rolling the models out into the various tasks over the coming weeks and months.

With the East Midlands, the conversion to PSSE is on-going and is earlier in the process when compared to the West Midlands, perhaps some six months behind. 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

Stakeholder engagement is hugely important to every part of WPD's business. So, in developing the Losses Strategy, WPD carried out a specific Losses programme of stakeholder engagement.

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

Since 2016 WPD along with all the other Distribution Network Operators (DNOs) have been holding regular meetings of the Energy Networks Association (ENA) Technical Losses Task Group.

Distributed Generation and Distribution System Operator (DSO)

Traditional power stations are large and normally centralised; therefore, it was 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 disrupts the traditional flow of power from generators to transmission networks, to distribution networks, to the customer. If the energy from distributed generation is used locally (and within a suitably short period of time) 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. Work completed for the ENA Technical Losses Working Group by the Engineering Consultants WSP has shown that load could increase by as much as 40% due to the de-carbonisation of heating and transport, thus losses would increase as a result of DSO flexibility, smart solutions allow greater utilisation of network assets and losses increase as a consequence.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.4.3 Distribution losses

11kV Network optimisation

From the Losses Investigation Project Loughborough University has undertaken modelling which shows that by relocating 11kV Network Operator Passports (NOPs) to the optimum position for losses can reduce the 11kV element of losses by 8-12%, with the greatest potential saving occurring on overhead networks.

WPD plans to develop this further, in conjunction with Telecoms innovations, taking into account the relative benefits of loss reduction, the capacity for new LCT connections and the Interruptions Incentive Scheme, but it should be noted that there is a balance between losses reduction in kWh's and potential Customer Interruptions with more customers on a feeder.

We will progress a practical trial in the South West area during 2021.

Parc Eirin LCT connected estate

The site work has continued, on reduced scale during the Covid-19 period, with the losses project involving Pobl, Sero, Morganstone Homes and WPD, there are now the first customers living on the estate, which when finished will contain 238 homes at Parc Eirin in Tonyrefail – The Housing Estate for the Future, where each house will be fitted with a three phase LV service cable, solar panels, battery storage, heat pump, electric vehicle charging, smart washing machine and dishwasher, all devices will be programme logic controlled.

It should be noted that all the devices on the estate are single phase with the exception of the EV charger.

The housing estate will be fully monitored on the 11kV and LV side with a view to ascertaining the losses and load balancing on a “hybrid” three phase connected housing estate when compared to the single phase connected houses in the Losses Investigation Project on the Isle of Man, the object being to produce an audit trail showing that losses are reduced by using three phase service cables on new build properties.

At this time WPD are looking for another project where all of the above conditions are met but the houses use three phase devices, this would complete the audit trail which has been mentioned previously.

Substation footprint

WPD have raised the issue of the current substation footprint where the existing ground mounted transformer is a 1MVA and with the need to meet the governments Clean Growth Strategy of de-carbonising heating and transport could see a circa 40% increase in load on the LV network.

This possible increase will create issues in existing suburbs or housing estates and where new substations need installing to meet the growing load requirements and taking into account current legislation.

Various proposals have been made to the ENA Losses group and to the ENA LCT group to creating a unified DNO response.

What needs to be done first before Retrofitting housing with LCTs?

According to the Centre for Ageing Better, 21% of all homes in the UK were built before 1919, 38% were built before 1946, and only 7% after 2000, making the UK housing stock the oldest in Europe. As such a large section of WPD's existing 11kV and LV mains networks were designed for 1950s, 1960s and 1970s where the electricity usage assumptions and building fabric standards at the time of installation were lower than the building standards first introduced during the 1990s.

WPD have been involved in the design exercise of a second losses project with the Welsh government, Pobl and Sero Homes, Optimised Retrofit Project (ORP), where some 700 homes will be retro fitted with LCTs and the structure of the buildings brought up to an EPC A rating, these homes are in the Blaen-y-maes Housing Estate, where each house is fitted with a three phase LV service cable, solar panels, battery storage and possible heat pump—all devices will be programme logic controlled.

The Innovation Team in WPD are now looking at undertaking an Innovation project which would use information from the ORP scheme to build in the very important building fabric side of any retrofit project otherwise the losses of the building will not align to LCT introduction.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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.

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 0.2331 tCO₂e per KWh (published 2020 DEFRA Conversion Factors).

Current Assessment of Distribution Losses

	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Total annual losses (GWh)	4,125	3,651	3,713	3,918	3,548	3,807	3,997
Carbon equivalent (tCO ₂ e)	1,906,640	1,687,342	1,530,164	1,377,491	1,004,502	973,064	931,854



Losses Strategy

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



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5 Other environment related activities

2.5.1 ISO14001 Certification

Since 2011 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.**

Despite the challenges of Covid-19 during 2020/21 we successfully achieved recertification to the ISO14001 environmental management system standard. Our external auditors, NQA, found no major non-conformances throughout their extensive visit and the minor non-conformances which were identified have subsequently all been closed out and accepted by the auditors.

During 2021/22 we will prepare for our first surveillance visit under our new ISO14001 certificate.

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.



For the third time since 2014 no major non-conformances were raised during our ISO1400 recertification audit

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.2 Waste management

We work closely with all of our waste contractors ensuring that wherever possible waste streams are diverted from landfill, applying the principles of the waste hierarchy throughout.

As a result in 2020/21 we have seen a sustained reduction in the percentage and tonnage of waste which we send to landfill across the entire WPD network, three of our four licence areas now routinely achieving zero waste to landfill.

Redundant cabling and metal work, a significant waste stream within WPD, is segregated at our depots and collected by one of two 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 non-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.

During 2021/22 we will continue to target zero waste to landfill across all four of our licence areas, furthermore we will aim to reduce the amount of waste which we produce, improve our recycling rates and reduce our reliance on recovery routes (energy from waste) for all of our waste.

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

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

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. We met this initial 20% reduction target from 2015/16 to 2017-18 and we are now well on track to significantly meet the 5% reduction per annum until the end of the RIIO-ED1 reporting period.

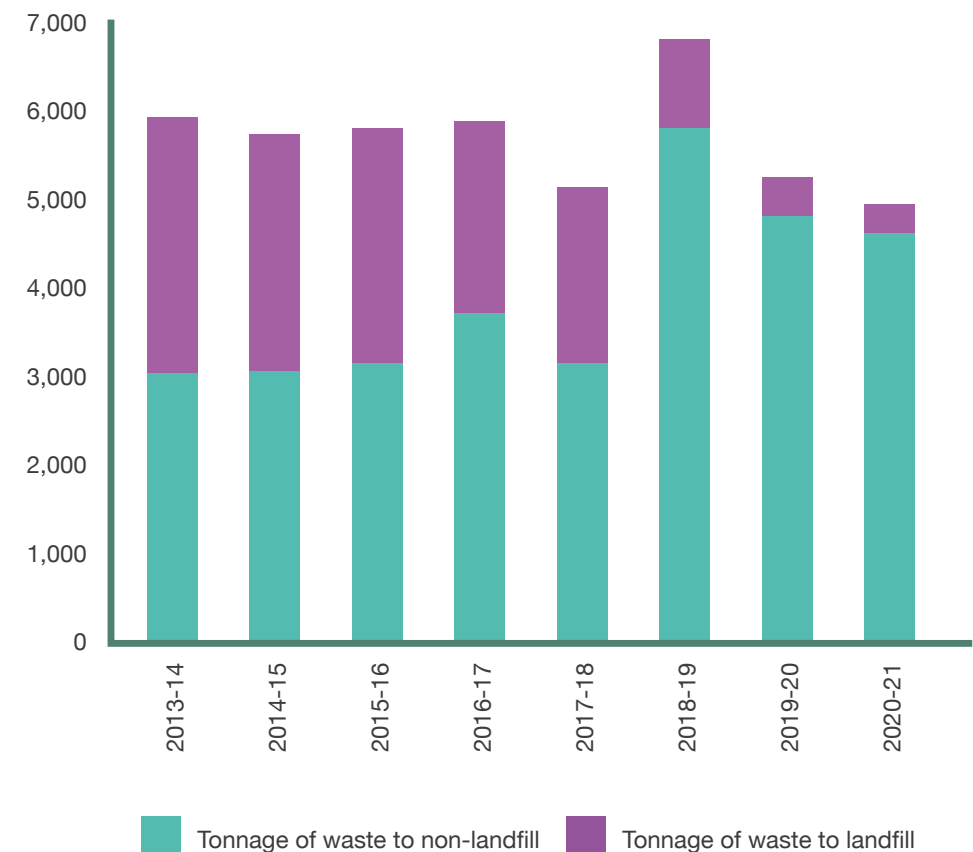
The overall tonnage of waste produced by WPD in 2020/21 has reduced by 339 tonnes from our 2019/20 total of 5,224 to 4,885 – see **Fig. 2.5.2a**. Much of this reduction is a result of greater awareness at our local sites, environmental training and collaborating with suppliers to reduce packaging wherever possible. Furthermore the percentage of WPD waste which has been disposed of to landfill has decreased again for the third year running, from 569 tonnes 2019/20 to 430 tonnes in 2020/21, a reduction of 139 tonnes or 25%.

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 2020/21, our distribution licence areas in South Wales, East Midlands and also West Midlands have routinely achieved zero waste to landfill. Our aim for 2021/22 is to reduce further the waste we dispose to landfill in our 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 Total tonnage of waste – non-landfill vs. landfill



2.0 Managing our environmental impact



Introduction



Environment



Innovation



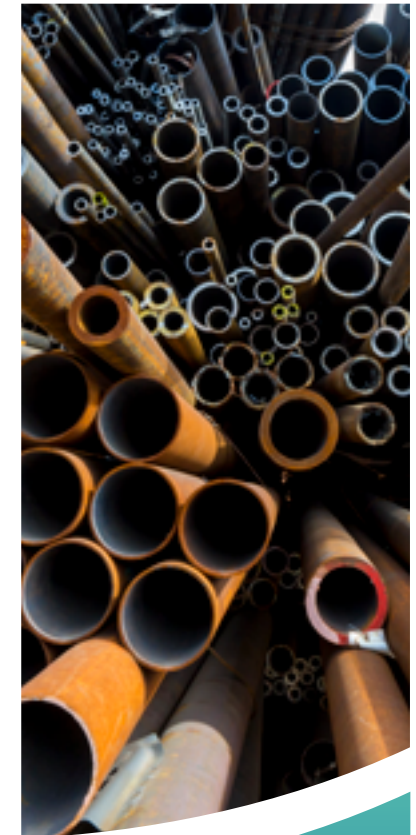
Previous



Next

2.5.2 Waste management

Fig. 2.5.2b Percentage waste disposed to non-landfill vs. landfill against ED1 landfill reduction target



The overall tonnage of waste we produced in 2020/21 has reduced by 1,646 tonnes or 25% from our 2018/19 total of 6,531 to 4,885 in 2020/21.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.2 Waste management

WPD have performed consistently well in 2020/21 reducing the overall tonnage of waste which we produce and further reducing the waste we dispose of to landfill. As a result we are very much on target to achieve our RIIO-ED1 target by 2022-23.

Waste initiatives

During 2021/22 we must 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.



Single use plastics

Our stakeholders are keen for us to reduce the amount of single use plastics entering our business. Reducing this waste stream supports not only our commitment of reducing waste overall but also our ambition to use resources more efficiently and sustainably and offers an excellent area for collaboration with our suppliers to reduce the environmental burden.

While good progress has been made with smaller items like vending machine cups further evaluation of our incoming goods is expected to yield more opportunities and examples where items may be substituted.

We will consult with our staff to identify where single use plastics are currently used in our depots and in products used on the network. This will give us a platform from which we will work with our manufacturers and suppliers to obtain more goods made from recycled plastics, eliminate plastic packaging and plastics which cannot be recycled in favour of more suitable materials.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.3 Polychlorinated Biphenyls (PCB's)

Polychlorinated Biphenyls (PCBs) are a family of **Persistent Organic Pollutants (POPs)** used in industrial and commercial applications including in electrical equipment such as capacitors and transformers.

They 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.

While PCBs were never specified for use in any of our licenced areas, their use in other electrical applications led to a very small percentage of the equipment in use on our network being unintentionally contaminated during manufacture.

As this contamination was both unintended and not requested we have very few 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.

For these reasons and concerns raised by our stakeholders regarding a desire to see a reduction in leaks from our equipment we have developed a comprehensive strategy to ensure that all PCB contaminated equipment will be removed from our network by 2025.

Our Strategy for a PCB Free Network by 2025

Surveys of PCB contamination conducted both in our business 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.

We are working in close partnership with all UK DNOs, the Environment Agency/Natural Resources Wales and in consultation with other devolved Agencies to identify and remove remaining PCB contaminated equipment by 31 December 2025 in line with UK Regulation. This partnership is underpinned by a Regulatory Position Statement supported by both environmental regulators and DNOs.

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 us to research and develop in situ PCB testing for energised overhead line equipment.
- A UK wide program of statistical analysis pioneered by us and other UK DNOs along with the Environment Agency and Natural Resources Wales 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.

Persistent Organic Pollutant Reporting 2020/21

3,710 persistent organic pollutant remedial asset changes. The wholesale replacement of assets that contain, or (where it is not possible to test) are suspected of containing, unacceptable levels of persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs).

74 persistent organic pollutant remedial oil changes. The removal of oil from assets that contain unacceptable levels of persistent organic pollutants (POPs) such as PCBs.

5,279 persistent organic pollutant oil tests. The testing of oil specifically carried out to determine levels of persistent organic pollutants (POPs) such as polychlorinated biphenyls (PCBs).

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.4 Environmental employee awareness

Ensuring and maintaining 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.

Throughout the Covid-19 pandemic we have continued to deliver environmental awareness training throughout the organisation.

Safety, Health and Environment (SHE) Conferences

Throughout 2020/21 WPD SHE Conferences have been held, via Zoom, across each of our four licence areas. Each Conference has been well supported by WPD senior management with both WPD employees and many of our contractors attending.

Environmental sustainability is now a well established agenda item at every WPD SHE Conference and during 2020/21 there have been presentations delivered and roundtable discussions on a wide range of topics including;

- **Achieving Net Zero.**
- **Electric vehicles.**
- **Resource management and circular economy.**
- **Biodiversity net gain.**

Employee awareness sessions

Throughout 2020/21 and despite the Covid-19 pandemic we have continued to deliver, albeit remotely, environmental awareness sessions at 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 continue to be briefed as standard;

- ✓ **Environmental sustainability**
- ✓ **Carbon awareness**
- ✓ **RIIO-ED1 Commitments and environmental outputs**
- ✓ **ISO14001**
- ✓ **Pollution prevention**
- ✓ **Ecology**
- ✓ **Waste management**
- ✓ **WPD environmental aspects**
- ✓ **Employee responsibility**



2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.5 Community environmental support and 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, The Conservation Volunteers and Groundwork Wales. The recent environmental initiatives that we have supported through our community funding include:

Go wild for wildflowers!

Funding from WPD helped five schools from disadvantaged areas of Bristol to learn about local wildlife and how to protect it, the schools planted 500 wildflowers which will help local biodiversity and received advice on how to further improve their school grounds for nature. This project supports schools in their vital role in giving all children enriching experiences in nature, ensuring that children learn about the importance of wildlife and taking action to protect it.

Lucy Hellier, Avon and Wildlife Trust Learning Manager explained: "Lots of schools are embracing the idea of attracting wildlife to their school grounds but need some help to maximise the best of the space available. We were able to offer advice on what to plant to create a wildflower meadow which will provide vital habitat for pollinators and be an enjoyable area for the children to explore and identify local wildlife."



Fruit tree planting at three South Wales nature reserves has helped create community orchards.

At each of the sites a variety of rare Welsh fruit trees were planted, including apple and cherry.

Peter Gater, Groundwork Wales Head of Operations said:

"Community orchards provide fresh fruit with zero food miles, and little or no pesticides used in the growing process compared to commercial farming. They provide a place for physical exercise and improve wellbeing. Spending time in nature (whether tending trees, harvesting or serving coffees for community volunteers) has a positive effect on physical health wellbeing and increased community cohesion and pride. In addition to improving land, other environmental benefits of planting the orchards include an increase in local biodiversity and air quality, reduced carbon emissions and the provision of pollinator habitats."



Groundwork Wales volunteers at Bryngarw Country Park

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

In addition, we have also 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

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.6 Species and habitat protection

The electrical distribution network operated by WPD interacts with nationally and locally important designated protected areas, wildlife habitats, fauna and flora regardless of whether the operations are located in an urban or a rural setting.

Contact between overhead lines and wildlife cause considerable disruption to electricity supplies, damage to plant and apparatus resulting in costly repairs as well as causing death or injury to the wildlife making contact. In order to mitigate this impact WPD are playing a key role, along with other UK Distribution Network Operators (DNOs) in a national project to develop strategies for reducing the risk of contact between wildlife and the overhead line network.

CEP24 Project - Mitigation strategies for the protection of wildlife from overhead lines

The aim of the project is to carry out research on the interaction of wildlife with overhead lines and structures in order to design, develop and produce a suite of UK specific mitigation measures as well as a risk assessment Software App which will provide project partners and end users with guidance on the most cost effective way of minimising wildlife contact.

Project Objectives

The project has five key objectives;

- Understand how wildlife behaves and interacts with overhead lines so as to determine those lines, structures, equipment and configurations most susceptible to inadvertent wildlife contact in the environment in which they are sited.
- Design, develop and produce a set of detailed mitigation measures to mitigate the risk of wildlife interaction with electricity overhead networks.
- Identify where newly installed materials, plant and equipment could be redesigned/modified cost effectively to make them less susceptible to contact flashover or changes to materials that already have mitigation measures incorporated within them.
- Develop a risk assessment software App to assist in identifying the current risk and the resultant risk when specified mitigation measures have been put in place.
- Provision of guidance documents.

2.0 Managing our environmental impact



Introduction



Environment



Innovation



Previous



Next

2.5.6 Species and habitat protection

CEP24 Project - Mitigation Strategies for the Protection of Wildlife from Overhead Lines

Method

The project is being carried out using a staged and structured approach to bring together the learning from research, design and development phases to allow the production of a software risk assessment tool and suitable UK specific mitigation methods which will allow a trial exercise on a typical 11kV OH network; the learning from all stages will then be used to produce an overarching guidance document.

Stage 1 - Research

- Susceptibility of line design, apparatus and equipment layout and materials used for environment they are situated.
- Likely wildlife contact, likely type of contact and the expected result of that contact to equipment and wildlife.

The research also built on existing collaborations with academic institutions, preservation society's and international bodies such as;

- International Centre for Birds of Prey.
- The British Bird of Prey Centre.

Stage 2 – Design and development of mitigation methods

The design and development of mitigation measures will need to be relative to the outputs of stage 1 and require collaboration/consultation with associated manufacturers to identify and produce a suit of suitable UK specific methods of mitigation.

Stage 3 - Build and type testing of mitigation methods

The build and testing of the suite of mitigation measures identified in Stage 2 will require collaboration/consultation with an appropriate manufacturer to produce a suite of suitable UK specific methods of mitigation.

Stage 4 – Design, develop and produce risk assessment app

This stage will require the engagement with a suitable software developer who can take the outputs of stages 1 & 2 and design and produce a logically sequenced software Risk Assessment (RA) App.

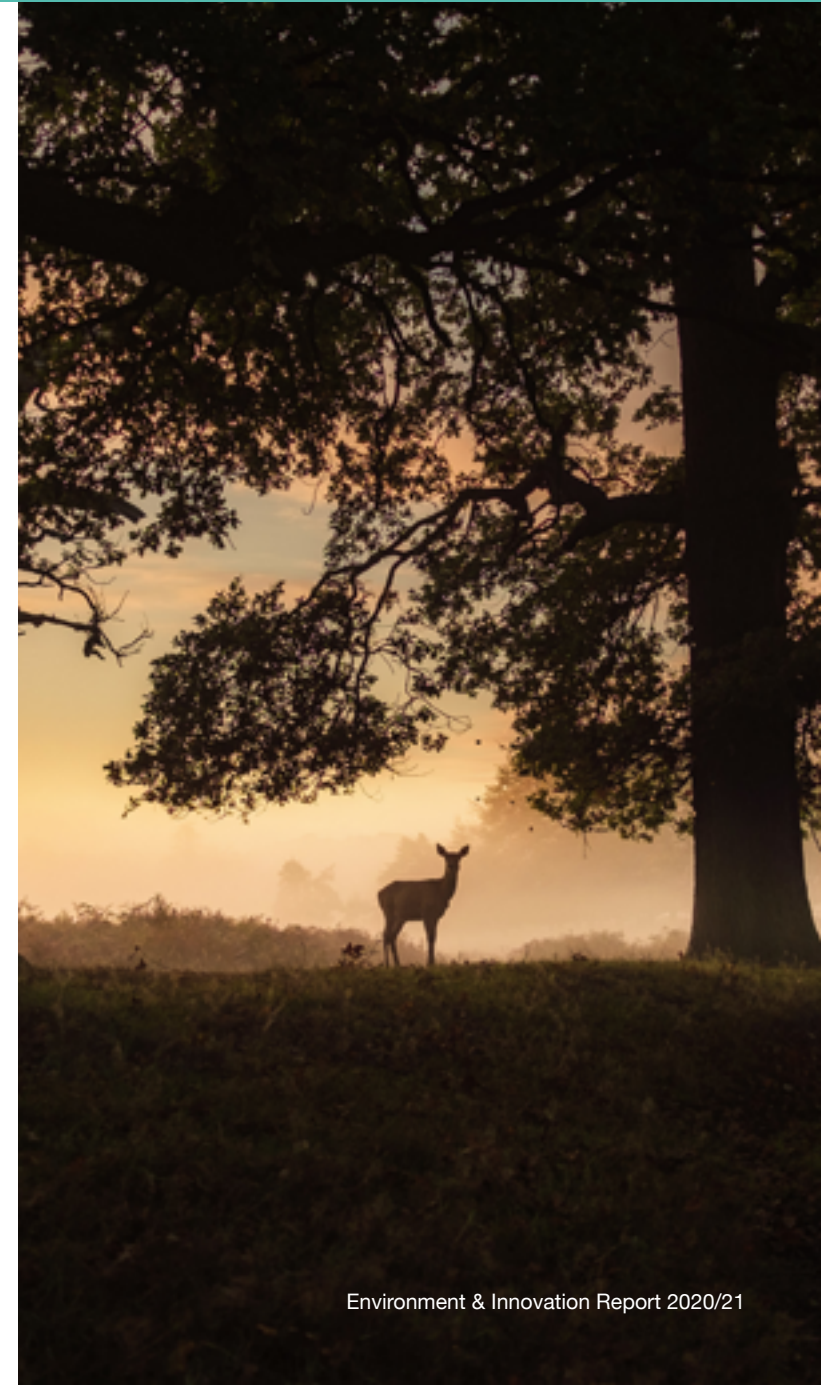
Stage 5 – Real world trial of RA app and mitigations measures on 11kV OH network

In October/November 2020 16 sites were identified across WPD and various types of mitigation installed, the installations are now currently being monitored. A real-life trial of the Software RA assessment App using knowledge gained in the previous stages will identify the type of and likelihood of the risk that further wildlife contact will be realised.

Stage 6 - Reporting on outputs

The project will culminate with the production of a functional report that will provide:

- An assessment of the outputs and learning points identified throughout the project.
- The benefits and drawbacks of the RA app, mitigation measures i.e. their use, application and maintenance requirements and any risks that may be posed through their application.
- Guidance documents for future use including, operational and strategic guidance on carrying out a RA, specification and purchase of appropriate mitigation measures, methods of application of those mitigation measures and subsequent maintenance requirements.





Previous



Next

Environment & Innovation Report 2020/21

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



Introduction



Environment



Innovation



Previous



Next

WPD INNOVATION

Transforming the electricity network



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.



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



Introduction



Environment



Innovation



Previous



Next

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. 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



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



Introduction



Environment



Innovation



Previous



Next

Our Innovation Programme

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

NIA Projects

ALARM (Automatic Location of Arc-faults through Remote Monitoring)	Net Zero South Wales
ARC Aid	OHL (Overhead Line) Power Pointer
DynaCov (Dynamic Charging of Vehicles)	PCB Sniffer
Optimal Coordination of Active Network Management Schemes and Balancing Services Market	Peak Heat
EDGE-FCLi (Embedded Distributed Generation Electronic Fault Current Limiting interrupter)	Presumed Open Data
Electric Nation - PoweredUp	PNPQA (Primary Networks Power Quality Analysis)
EPIC (Energy Planning Integrated with Councils)	SEAM (Spatially Enabled Asset Management)
Future Flex	SHEDD (System HILP Event Demand Disconnection)
Harmonic Mitigation	Take Charge
IntraFlex	Temporary Event Charging
LTE Connecting Futures	Virtual Monitoring Data
MADE (Multi Asset Demand Execution)	Virtual Statcom
NEAT (Network Event and Alarm Transparency)	Wildlife Protection

In the period between April 2020 – March 2021 we have been delivering 26 NIA projects and 3 NIC projects.

NIC Projects

EFFS	OpenLV	DC Share
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3.0 Smart grids, innovation and our role in the low carbon transition



Introduction



Environment



Innovation



Previous



Next

3.2.1 Key projects

Take Charge

The Take Charge project is designing, building, installing and trialling a brand new standardised package solution to deliver large capacity rapid EV charging to MSAs, in a far more cost and time efficient manner when compared with traditional solutions.

We recognise that Rapid EV charging is becoming increasingly important as manufacturers aim to minimise charge times and make EVs as convenient as possible for customers, and MSAs are a key charging location for customers looking to undertake long journeys. This will mean that these sites will require significantly increased power supplies.



Lessons learned

EV charging demand patterns for rapid charging will not follow previous trends seen. The method of charging is significantly different from home charging and the low dwell times demonstrate the need for power transfer in a short space of time.

MSA site locations cause varying challenges in the application of rapid EV charging. Their layout and position can enable major obstacles including railways or bridges, whilst access from one or two sides of the motorway dictates the amount of use installed chargers will receive. For this reason when selecting a trial site, access from both sides of the motorway became part of the criteria.

While designing the solution, learning included best practices for the transport before installation, connection point voltage, and earthing design. By moving away from LV charge point installations and the use of standard network assets, the number of charger installations can be significantly increased.



Customer benefits

The standardised package solutions developed as part of the Take Charge project will provide financial benefits to all customers.

The traditional option for providing this level of electricity supply, a primary substation, would have a high cost and would be time consuming to construct and commission. The new package solution developed as part of this project is expected to save £0.5m per installation, and take significantly less time to install.

With the incentives in place to decarbonise transport, it is likely that there will be ever increasing need for rapid charging, both at MSAs and at other areas within towns and cities. The benefits of this solution will therefore be replicable in a large number of areas, including at the 91 MSA sites within Great Britain. GB roll out is expected to lead to £33.3m savings if the solution was installed at 75% of these sites.



Planned implementation

The outcome of the Take Charge project will be a new standardised package solution for providing large capacity network connections fit for meeting rapid EV charging demands. This solution will be scalable across our and other DNOs networks, where demand for rapid EV charging sites will continue to increase.

The project is currently transitioning into its build phase, before we trial the solution at Exeter MSA. Exeter MSA was determined to be the most suitable site for this trial due to its location, number of customers and proximity to a suitable 33 kV Point of Connection (PoC).



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



Introduction



Environment



Innovation



Previous



Next

3.2.1 Key projects

Energy Planning Integrated with Councils (EPIC)

EPIC is developing a process for working with local authorities to create Local Energy Plans. These are used to determine a wider view of what will change on our network and the investments we will need to make in different timeframes.

While we use some local authority information in our planning assumptions, we do not reflect their long term plans in our energy scenarios. Comparing planned investments for the local authority, electricity and gas network will enable the production of an Integrated Investment Plan.

The project will also develop new tools to support automated analysis of HV networks using Python and Sincal.



Lessons learned

Current learning to date has been in relation to the work being undertaken by the Open Networks project and the degree to which this aligns with the data structures to be used within EPIC. The Open Networks project 2020 Work Stream 5 Product 4 had considered the benefits of Regional data gathering in order to reduce duplication of effort in providing the same data to different parties and also to ensure consistency of approach.

This had highlighted the difficulties that result from different parties having different timescales for their regular activities so that if data was refreshed annually it may already be somewhat out of date by the time one party was ready to use it. It assessed two potential options which were a centralised data collection service and co-ordinated regional data sharing. As both options have their advantages and disadvantages, at this stage neither has been adopted as the standard.



Customer benefits

Co-ordinated investment planning enabled by EPIC will provide benefits to customers through reduced reinforcement costs and improved support for decarbonisation. Customers will be able to value and have greater confidence in the plans being made on their behalf by utilities and their local authorities, and there will be greater certainty on any new developments they wish to be a part of that require interaction between these parties.

Customer cost savings will also be present as a result of the improved planning process. Significant amounts of investment on the network relate to reinforcement activities, and better coordinated planning will give a clear view on what will be needed and coordination between utilities and local authorities will hopefully reduce the overall reinforcement required. If this improved planning reduces our reinforcement costs by only one half of one percent this equates to £925k saving by 2023.



Planned implementation

The EPIC project will build on the existing process used to define Distribution Future Energy Scenarios (DFES) and analyse their impact which is currently used to create our shaping sub-transmission reports (which consider the 132kV and EHV networks). It will determine how to create a local energy plan and the impact this will have upon LV and HV networks by disaggregating the DFES for LV and HV networks and combining this with local authority information.

We will also be able to use the automated analysis and investment options tooling to build future investment strategies, making analysis repeatable and minimising the required resource.



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



Introduction



Environment



Innovation



Previous



Next

3.2.1 Key projects

Future Flex

The Future Flex project is developing second generation DSO flexibility services with a focus on domestic scale.

This is broadening the pool of potential providers and enabling the coordination of larger home loads including electric vehicles, smart and hybrid heating and battery storage to benefit the distribution network.

We are achieving this by understanding limitations in place relating to domestic flexibility, and developing and testing solutions for mitigating these. The project has therefore been carried out in three phases: participant engagement, solution definition and trials.

We have been undertaking trials of multiple approaches to domestic flexibility. These were developed following workshops in Bristol and London to identify what the barriers to providing domestic flexibility were and what solutions should be trialled within the project.



Lessons learned

It has been found that the value to customers of providing flexibility services is low and uncertain, with the equipment required to take part being prohibitive in some cases. This has led to limited consumer engagement and limited awareness of domestic flexibility.

The types of demand found within homes mean the overall flexibility capacity per home is limited. This means that a large number of homes are required to have significant impact, and engagement seen and the lengthy process required for on boarding mean that this is likely not feasible.

A number of data challenges have been presented during the course of the project. These range from GDPR requirements leading to the possibility of double counting homes, and the availability, accuracy and granularity of demand data not being ready to accommodate domestic flexibility.



Customer benefits

Increased use of flexibility services will lead to significant reductions in network reinforcement required. The roll out of domestic flexibility will make use of a number of home loads that can play a part in optimising the running of the network whilst engaging customers in helping meet net zero.

The benefits can therefore be seen for all customers on the network as well as those that are participating in the services. The reduction in reinforcement needed will reduce costs for the network operator and ultimately lead to savings on consumers bills. Those customers participating in the trial will receive revenue for the services they take part in and will see further savings on their energy bills.

It is expected that the overall customer savings from flexibility could reach £16.7bn per year.



Planned implementation

During the course of the trials and later design stages of the Future Flex project, plans for 'Business as Usual' (BaU) implementation of domestic flexibility services will be put in place. This will build upon learning found within the trial periods and aim to demonstrate how domestic flexibility can be used in the future.

These changes will include meeting the need for registration, asset validation and payments with personal data challenges to be addressed, rather than the existing long process that is in place, and the contract for getting involved in flexibility services will need to be reviewed to ensure it is understandable for participants and that they no longer need support to ensure they are able to engage.



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



Introduction



Environment



Innovation



Previous



Next

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 in RIIO-ED2 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. 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'.



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



Introduction



Environment



Innovation



Previous



Next

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.



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



Introduction



Environment



Innovation



Previous



Next

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).

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



Introduction



Environment



Innovation



Previous



Next

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 2020/21 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	2,701,366	2,520,215	1,163,230	1,676,512	8,061,323
No. SMETS1	775,730	744,461	318,310	419,361	2,257,862
No. SMETS2	447,661	360,120	186,071	247,593	1,241,445
Total penetration	46.2%	44.9%	44%	41%	43%

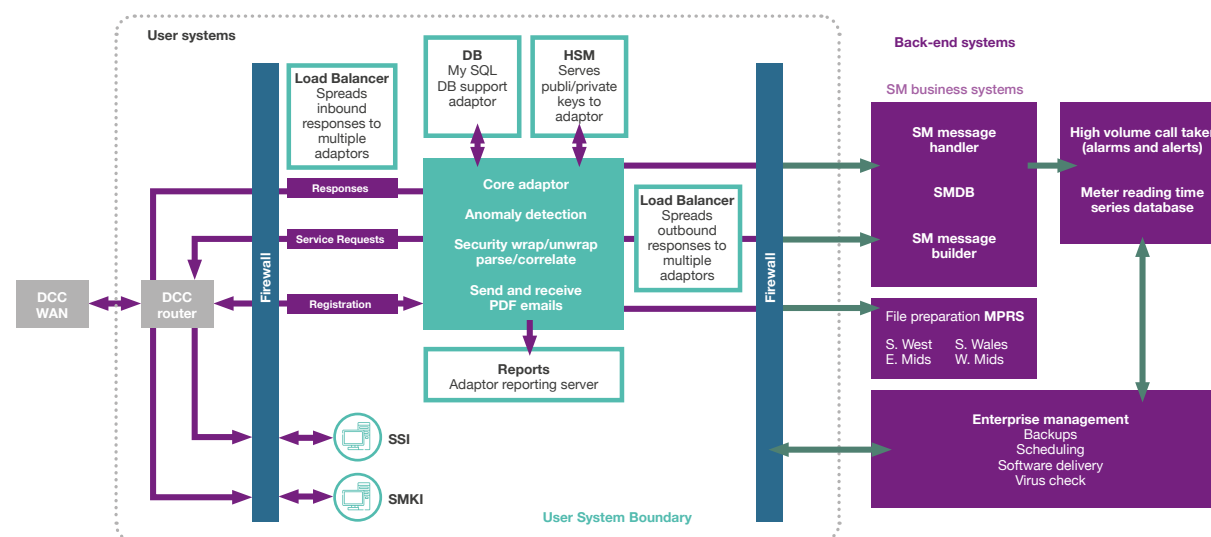
The Smart Meter Rollout is being managed by Energy Suppliers in the UK and although the initial programme of installations was due to end in 2020 this has now been extended until 2024.

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



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



Introduction



Environment



Innovation



Previous



Next



Existing SMETS1 meters are being enrolled in to the DCC of which 26% within WPD have successfully migrated to date.

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 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 1.2 million SMETS2+ electricity units installed and 600,000 SMETS1 electricity units migrated within the four licence areas as Q1 2021.

This currently equates to approx. 22% of eligible customers connected through the DCC with SMETS2+ and SMETS1 meters. This rate will need to increase rapidly however if WPD is to begin realising benefits before the end of the rollout.

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.

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



Introduction



Environment



Innovation



Previous



Next

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	0.27	0.44	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.

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



Introduction



Environment



Innovation



Previous



Next

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 continuing to be successfully installed throughout 2020/21 despite the challenges faced through the Covid-19 pandemic.

During the early part of mass roll-out, while penetration levels are still below our expected level within the 2020/21 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 2020/21 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.

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



Introduction



Environment



Innovation



Previous



Next

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.

Since starting to look at the configuration of consumption data from smart meters it has been realised that some changes are required to the privacy plan.

These changes are minor and only alter the technical wording of where and how the data will be handled upon entering the WPD smart systems. Ofgem have confirmed that the changes can be made and we are working on alterations to our data systems.

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 2020/21 regulatory year. We intend to monitor developments in this area as smart meter roll out continues.



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



Introduction



Environment



Innovation



Previous



Next

3.4.7 Innovative solutions to new connections

The drive to connect Distributed Energy Resources (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.



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



Introduction



Environment



Innovation



Previous



Next



3.4.8 Alternative connections descriptions

Our innovative solutions allow customers to connect their assets (typically generation but demand can also be accommodated) at reduced cost and within quicker timescales, but in exchange for some form of curtailment, where cost-prohibitive network reinforcement would otherwise be required.

Soft Intertrip

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

The Soft Intertrip solution utilises a Connection Control Panel, which provides two normally open contacts for the customer's control system to monitor: Stage 1 and Stage 2. When both contacts are open, the connection will be unconstrained.

The levels of curtailment corresponding to the operation of the Stage 1 and Stage 2 contacts are fixed at the planning stage and form part of the connection agreement.

Active Network Management (ANM)

This solution is a more sophisticated evolution of the Soft Intertrip solution and used mainly with larger new connections and primarily generation.

It involves the installation of an enhanced Connection Control Panel, which is installed and commissioned into a WPD central control system allowing for full dynamic control of the connected load.

Timed Connection

Based on time of day, day of the week or seasonal factors, these connections are offered based on historical data analysis. By understanding the conditions which would adversely affect the network and limiting a customer's loads during certain time periods, the connection can be permitted subject to local control mechanisms and retrospectively through metering data. No additional equipment or remote communications are required by WPD.

Export Limitation Schemes

These schemes measure the Apparent Power at the exit point of the installation and then use this information to either restrict generation output and/or balance the customer demand in order to prevent the Agreed Export Capacity from being exceeded. The equipment required is customer owned and provided, to WPD minimum standards.

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



Introduction



Environment



Innovation



Previous



Next

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 Distribution Generation (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.



Appendix A

East Midlands RRP Environmental Innovation 2020/21
South Wales RRP Environmental Innovation 2020/21
South West RRP Environmental Innovation 2020/21
West Midlands RRP Environmental Innovation 2020/21

Appendix B

RRP Environmental Innovation Commentary 2020/21



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Western Power Distribution (West Midlands) plc, No3600574
Western Power Distribution (South West) plc, No2366894
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