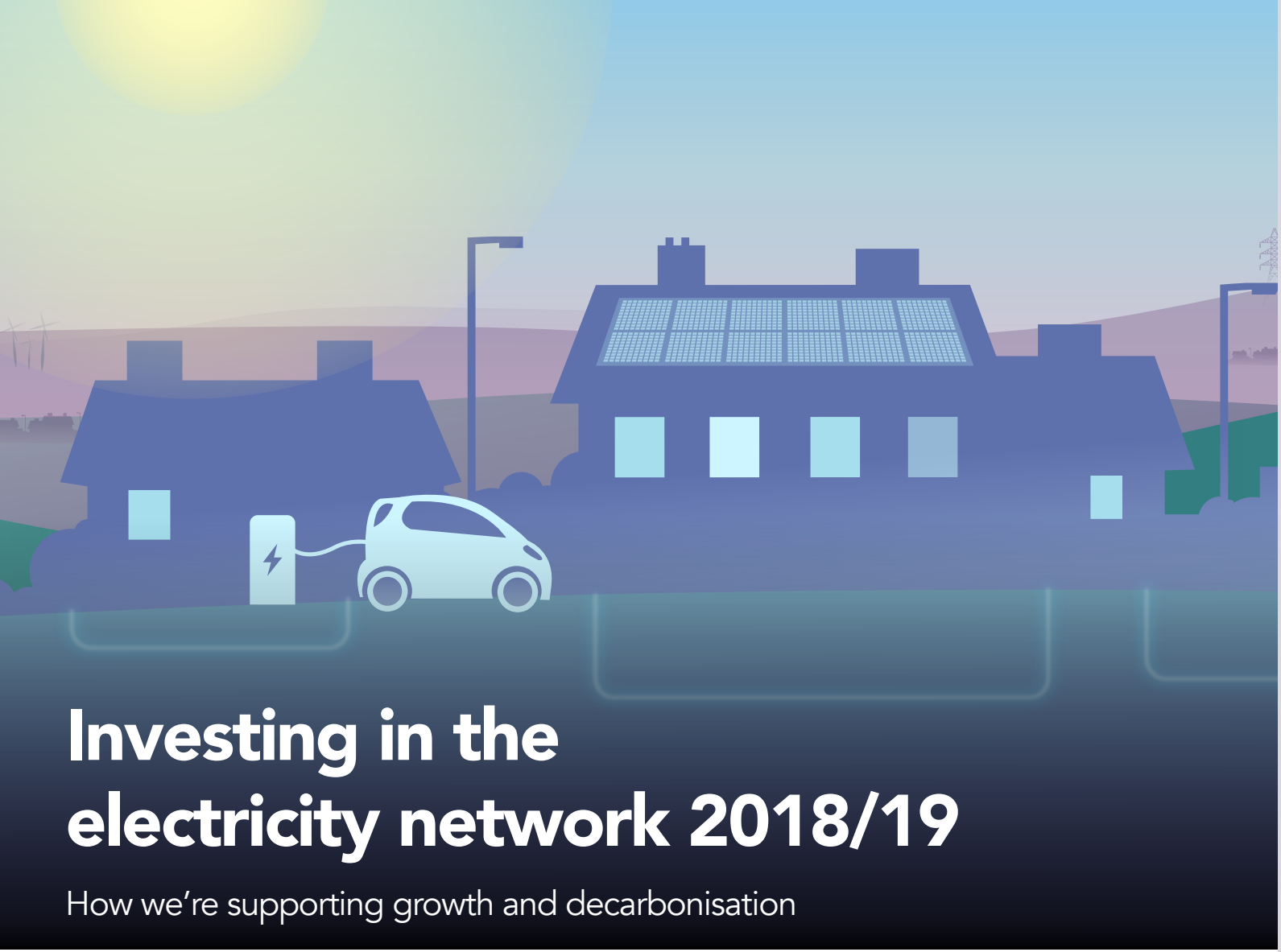
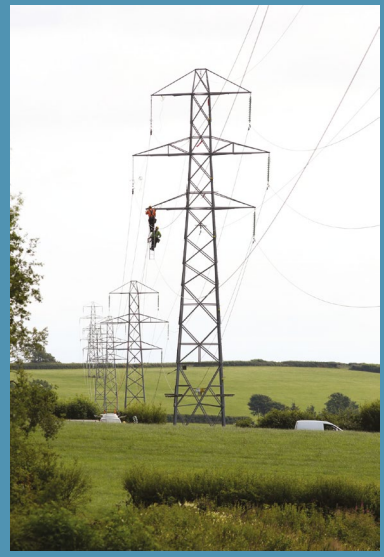


Investing in the electricity network 2018/19

How we're supporting growth and decarbonisation

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales



Introduction

Western Power Distribution (WPD) is investing £7.1 billion in the electricity distribution network between 2015 and 2023. This investment will go into reinforcing the existing network, improving network reliability, providing additional capacity and upgrading equipment.

We want to make sure that our stakeholders are aware of the changes and improvements being made, particularly in their local area.

This brochure details the investment to the electricity network that WPD is making and specifically some of the local projects that are being undertaken this year.

Electric vehicle (EV) charging
Following stakeholder feedback we have included a section on electric vehicles in this booklet on pages 15-17. Our approach to facilitate EV charging is to ensure that a suitable network exists for all charging requirements in all situations. Charging requirements vary depending on the type of vehicle and the owner's access to either their own or public charging infrastructure.

The principle is simple; the charging infrastructure requires higher volumes of energy and it is our job to provide the conduit for this energy.

Who we are and what we do

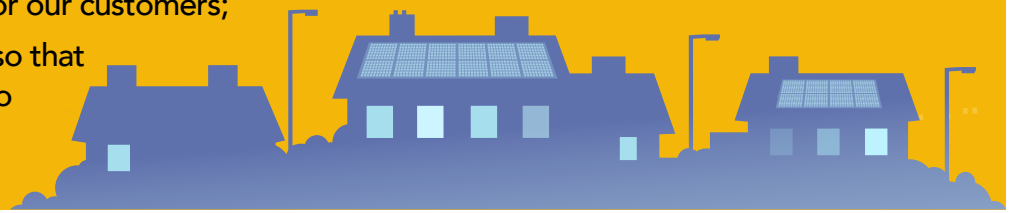
Western Power Distribution (WPD) is a Distribution Network Operator (DNO). This means we are responsible for the network of underground cables, overhead lines and substations that distribute electricity to customers' homes and businesses every day.

WPD covers the East and West Midlands, South West England and South Wales.

Our key responsibilities

We do not buy or sell electricity, or send any bills to electricity customers. Traditionally, what we do is simple and comprises of four key tasks:

- we operate our network assets effectively to 'keep the lights on' for our customers;
- we maintain our assets so that they are in a condition to remain reliable;
- we fix our assets if they get damaged or are faulty;
- we upgrade the existing networks or build new ones to provide additional electricity supplies or capacity to our customers.



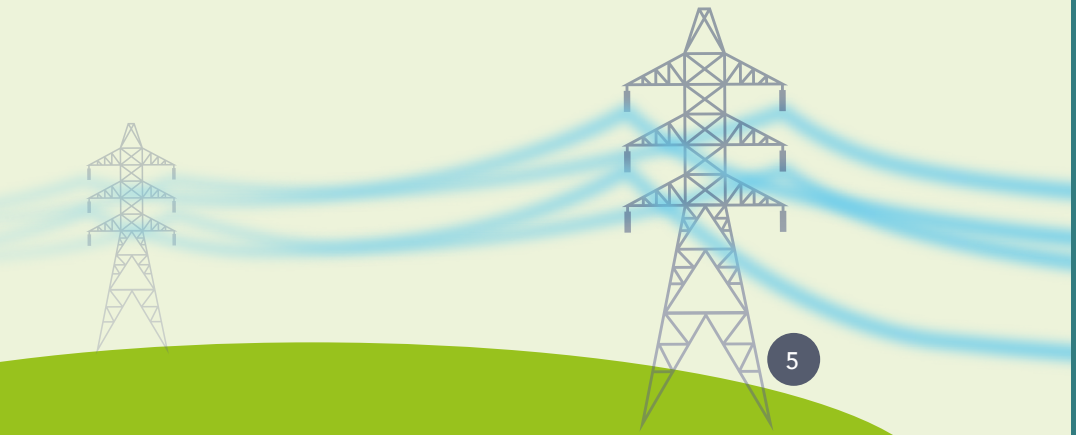
WPD investment

Our network covers densely populated residential areas and widely dispersed rural communities from the Wash in Lincolnshire down through South Wales and to Land's End and the Isles of Scilly in Cornwall.

The diversity of our network can cause a variety of issues across the distribution area. This, combined with the age of the network (a large proportion of our assets were built in the 1960s) and recent environmental challenges, mean we will need to invest more than ever to keep our network efficient and reliable in order to keep the lights on.

Our Business Plan outlines our investment commitments until 2023 and was submitted to our regulator, the Office of Gas and Electricity Markets (Ofgem), in 2015. WPD was the only DNO out of six in the UK to have its Business Plan 'fast-tracked'. This allowed us to maximise and secure our investment funding early. We committed to investing £7.1 billion in our network between 2015 and 2023 and we continue to deliver against our RIIO-ED1 investment plans.

Looking ahead to RIIO-ED2, our price control period starting in 2023, we used our January 2019 stakeholder workshops to start the conversation about our business plan early. We also established our Customer Engagement Group during 2018/19 and look forward to seeing the results that emerge as we work with the group to develop WPD's investment plans going forward.



ACROSS THE WHOLE OF WPD

2018/19:

TOTAL NETWORK EXPENDITURE:
£898M

99.994%
NETWORK AVAILABILITY

COST TO AVERAGE DOMESTIC CUSTOMER:
27p
PER DAY

Improvements following stakeholder feedback

In 2018 our 27 local Distribution Managers and their Network Planners hosted a series of workshops attracting over 200 stakeholders including MPs, council officers, councillors, LEPs and developers. This enabled us to improve bespoke, region-specific investment information for stakeholders, for example:

Stakeholders said:
"WPD could work with LAs who want charging point location information."

In response:
WPD offers Local Authority customers the opportunity to request one-to-one connection surgeries with our teams. At a local level they will be able to discuss plans for EV charging and how the electricity network can be adapted and uprated to accommodate future plans.

Stakeholders said:
"2018 Local Investment workshops are good – WPD should hold Electric Vehicle workshops too."

In response:
WPD hosted workshops on 'Electric Vehicles - helping you to make your local infrastructure plans' and has continued with a 2019 programme of workshops on both topics.

Stakeholders said:
"The online investment map could be improved, e.g. to include completed projects and updates."

In response:
The online investment map has been updated and improved. Completed projects are included and projects can be filtered by type, voltage and location.

Project examples

Due to the diversity of our network, various issues arise which must all be dealt with. This requires a range of engineering solutions to keep our network running. These solutions can be categorised as follows:

Asset replacement
Directly changing our network assets, usually due to condition or age.

Reinforcement
Upgrading our network to deal with increased demand.

Cable undergrounding
Replacing an overhead line with an underground cable for either safety or environmental reasons.

Worst served customers
Improving the network for those with the most outages (over 12 outages in three years).

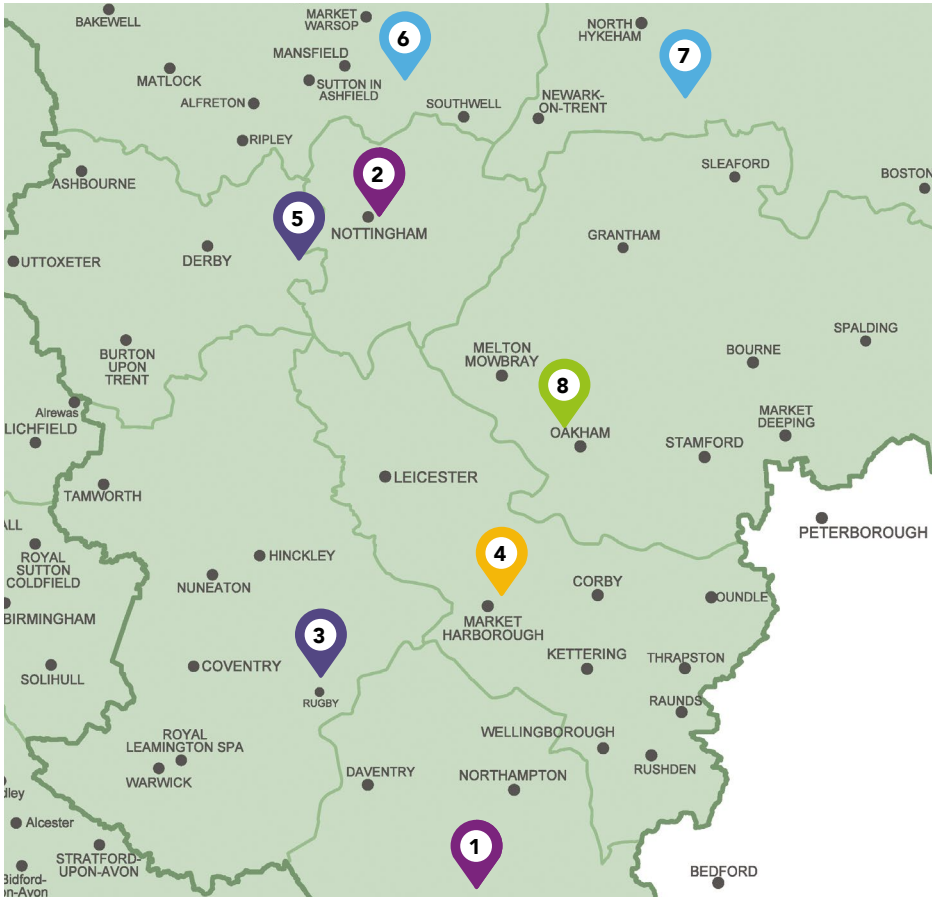
Resilience
Mitigating against the effects of adverse weather; building flood defences, tree trimming, etc.

Cable diversions
Moving the cable in the ground due to new building works.

The following pages provide some examples of 2019 projects in each of our four licenced areas.

Further examples are available on our online investment map (click here).

Projects in the East Midlands



1. NORTHANTS AND MILTON KEYNES

Yardley Gobion Reinforcement
Total spend: £85,000
Customers affected: 478
Start quarter: Q3 2019
End quarter: Q4 2019
Duration: 2 months

Details: Lay 550m of high voltage cable and change a distribution substation.
Customer benefits: Network reliability and the ability to restore customer supplies more quickly (we aim to restore 90% of customers within one hour).

2. NOTTINGHAM

The Broadmarsh Centre Redevelopment
Total spend: £178,000
Customers affected: 1,327
Start quarter: Q4 2017
End quarter: Q3 2020
Duration: 3 years
Details: Combination of cost apportioned and fully funded reinforcement works to accommodate redevelopment and expansion of the Broadmarsh Shopping Centre. Multiple 11kV and low voltage cable overlay and network reconfigurations in the city centre.
Customer benefits: Increased secure backfeeding capacity for the new development and surrounding area at 11kV and low voltage.

3. COVENTRY & WARWICKSHIRE

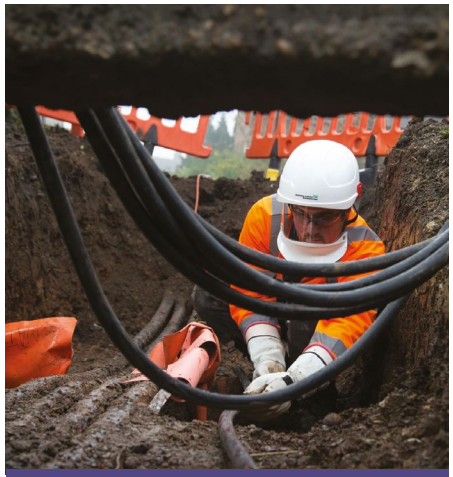
Frobisher Road, Rugby
Total spend: £65,000
Customers affected: 1,200
Start quarter: Q3 2019
End quarter: Q3 2019
Duration: 2 weeks
Details: Replacement 11kV substation due to condition. Automation installed.
Customer benefits: Improved network resilience and quicker supply restoration.

4. LEICESTER & KETTERING

Kettering and surrounding areas
Total spend: £400,000
Customers affected: 35,000
Start quarter: Q2 2019
End quarter: Q3 2020
Duration: 14 months
Details: Felling of trees near overhead lines in the Kettering, Desborough, Market Harborough, Kibworth, Oundle, Thrapston, Syston and Willoughby Areas.
Customer benefits: Minimised number of faults/interruptions caused by trees falling into overhead lines.

5. DERBY

Bourne Square - Breaston
Total spend: £78,000
Customers affected: 231
Start quarter: Q2 2019
End quarter: Q2 2019
Duration: 2 weeks
Details: Substation replacement.
Customer benefits: Improved quality of supply and reliability for customers.



6. CHESTERFIELD & MANSFIELD

Intake Wood, Clipstone
Total spend: £118,000
Customers affected: 3,100
Start quarter: Q3 2019
End quarter: Q3 2019
Duration: 6 weeks
Details: Undergrounding 310m of double circuit 33kV overhead line due to trees encroaching on the overhead line.
Customer benefits: Reduced risk of customer interruptions.

7. NORTH LINCOLNSHIRE

Coleby Village
Total spend: £450,000
Customers affected: 125
Start quarter: Q2 2019
End quarter: Q3 2019
Duration: 5 months
Details: Complete undergrounding of high and low voltage assets due to age of existing equipment.
Customer benefits: Increased capacity and flexibility of the low voltage network. Undergrounding will also improve the village aesthetics and increase accessibility to equipment.

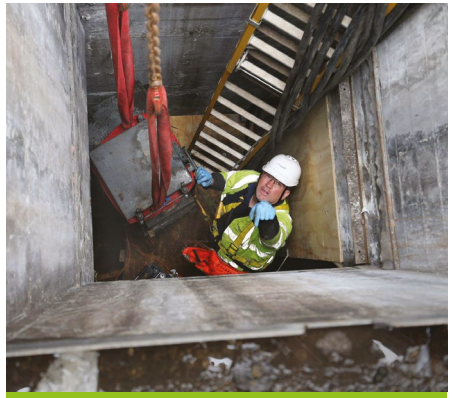
8. SOUTH LINCOLNSHIRE

Oakham
Total spend: £34,000
Customers affected: 250
Start quarter: Q4 2019
End quarter: Q1 2020
Duration: 2 months
Details: Diversion of both 11kV overhead line and underground cable.
Customer benefits: Improved quality of supply and reliability for customers.

Projects in the West Midlands

1. BIRMINGHAM

Soho Road
Total spend: £25,000
Customers affected: 100
Start quarter: Q2 2019
End quarter: Q3 2019
Duration: 2 months
Details: Overlaying 200m of high voltage cable.
Customer benefits: Increased load available in the future.



2. TIPTON

Barton Industrial Estate
Total spend: £45,000
Customers affected: 2,000
Start quarter: Q2 2019
End quarter: Q3 2019
Duration: 6 weeks
Details: Diverting and improving 200m of 11kV cable.
Customer benefits: Improved network restoration and available load.

3. HEREFORD & LUDLOW

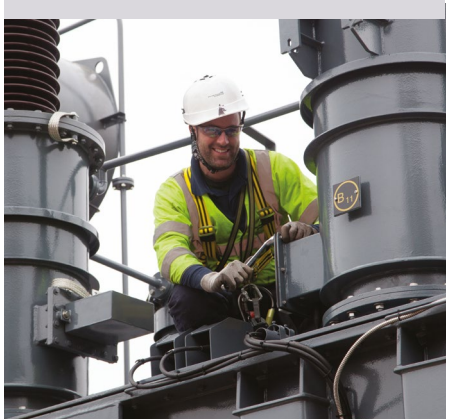
Woolhope Interconnector
Total spend: £30,000
Customers affected: 393
Start quarter: Q1 2019
End quarter: Q2 2019
Duration: 4 weeks
Details: Laying 710m of high voltage underground cable to interconnect a large spur to provide an alternative high voltage feed into the area.
Customer benefits: Improved quality of supply and reliability for customers.

4. TELFORD

Penfold
Total spend: £17,000
Customers affected: 250
Start quarter: Q1 2019
End quarter: Q1 2019
Duration: 2 weeks
Details: Replace an item of existing 11kV switchgear at a distribution substation by installing a new automation ready 11kV Ring Main Unit with radio comms pack.
Customer benefits: Improved quality of supply and reliability for customers.

5. STOKE

Ashley Village, Market Drayton
Total spend: £137,000
Customers affected : 764
Start quarter: Q2 2019
End quarter: Q2 2019
Duration: 2 months
Details: Replaced 576m of high voltage overhead lines with a new upgraded underground cable, changing two pole mounted transformers for a ground mounted substation.
Customer benefits: An increased level of security for customers and the potential for more capacity on the network.



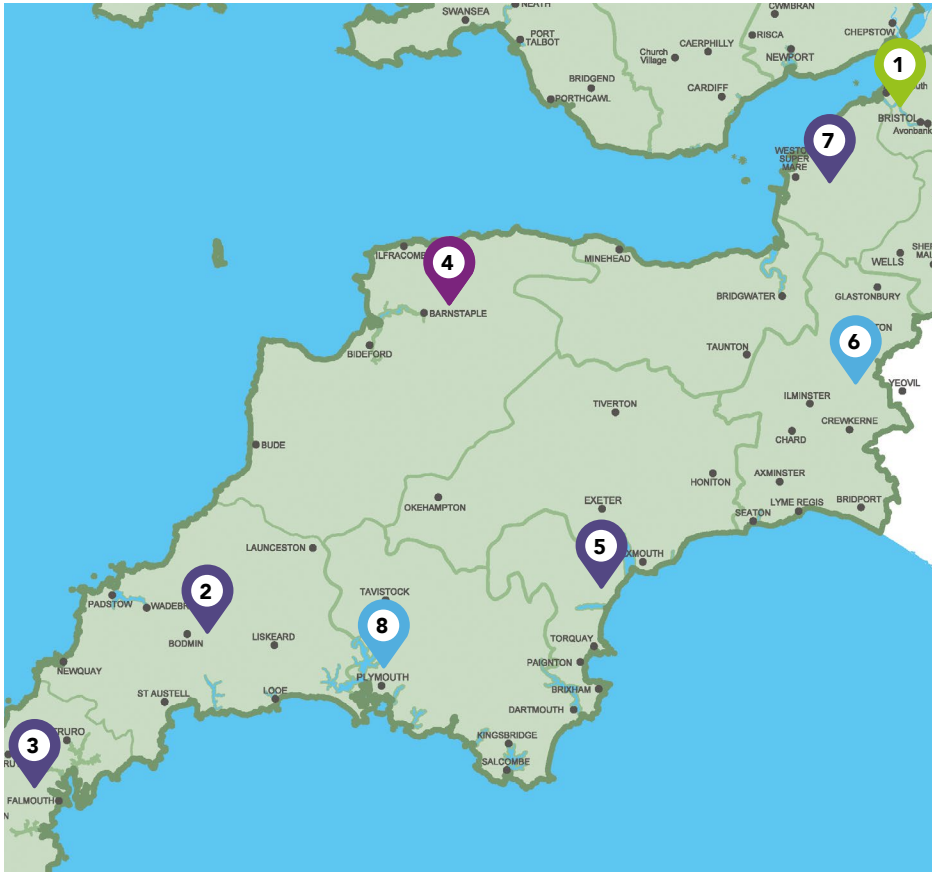
6. GLOUCESTER

Mead Lane, Gloucester
Total spend: £120,000
Customers affected: 1,668
Start quarter: Q3 2019
End quarter: Q3 2019
Duration: 3 weeks
Details: Resilience work to remove 33kV overhead line and replace with 450m of 33kV underground cable to remove the risk of failure from falling trees.
Customer benefits: Improved quality of supply and reliability for customers.

7. WORCESTER

Wilden Lane, Kidderminster
Total spend: £67,000
Customers affected: 2,450
Start quarter: Q2 2019
End quarter: Q2 2019
Duration: 5 weeks
Details: 1500m of overhead network undergrounded at a conservation site near the River Stour.
Customer benefits: Improved quality of supply and local aesthetics.

Projects in the South West of England



1. BRISTOL CITY AND OUTLYING AREA

M4/M32 Bradley Stoke
Total spend: £700,000
Customers affected: 2,000
Start quarter: Q4 2018
End quarter: Q4 2019
Duration: 12 months
Details: Replacement of existing 132kV steel tower line with underground cable to enable electrification of the main Paddington to Cardiff railway and clearing the site for new homes to be constructed and connected.
Customer benefits: Improved railway efficiency for travelling public, as well as satisfying the ever increasing demand for homes in this popular area of Bristol.

2. BODMIN

East Cornwall
Total spend: £2m
Customers affected: 5,320
Start quarter: Q2 2018
End quarter: Q2 2019
Duration: 12 months
Details: 1,085 wooden pole replacements over the 33kV, 11kV and low voltage networks due to condition or age.
Customer benefits: Improved quality of supply and reliability for customers.

3. REDRUTH

Market Street, Falmouth
Total spend: £1.2m
Customers affected: 305
Start quarter: Q1 2017
End quarter: Q4 2021
Duration: 5 years
Details: Replacement of low voltage cables and aging switchgear and installation of new transformers.
Customer benefits: Improved reliability and improved environmental impact as the result of the new assets.

4. NORTH DEVON

Roundswell
Total spend: £61,000
Customers affected: 679
Start quarter: Q2 2019
End quarter: Q3 2019
Duration: 4 months
Details: Installation of 670m of cable for 11kV reinforcement.
Customer benefits: Improved quality of supply and reliability for customers.

5. DEVON

Dawlish
Total spend: £223,000
Customers affected: 400
Start quarter: Q3 2019
End quarter: Q4 2019
Duration: 6 weeks
Details: Complete refurbishment of low voltage network.
Customer benefits: Improved quality of supply and minimised future disturbance to customers.

6. SOMERSET

The Dower House Tintinhull
Total spend: £306,000
Customers affected: 290
Start quarter: Q1 2019
End quarter: Q2 2019
Duration: 6 months
Details: Undergrounding part of an 11kV overhead line due to clearance issues. Replacement of decayed poles on the same section and installation of an additional switching point.
Customer benefits: Improved quality of supply and reliability for customers.

7. MENDIP

Weston-super-Mare
Total spend: £2.1m
Customers affected: 30,000
Start quarter: Q3 2017
End quarter: Q3 2019
Duration: 2 years
Details: New cable to bolster the 33kV network in the Weston area and allow us to remove the old steel tower circuit that runs across the entrance to Weston-super-Mare town centre.
Customer benefits: Improved reliability and quality of supply, plus an improved area aesthetically.

8. PLYMOUTH

Totnes, Plymouth
Total spend: £100,000
Customers affected: 3,291
Start quarter: Q2 2019
End quarter: Q2 2019
Duration: 3 weeks
Details: Two pole mounted transformers removed along with four spans of 11kV overhead lines which was within dense woodland.
Customer benefits: Improved reliability and quality of supply, plus an improved area aesthetically.

Projects in South Wales

1. CARDIFF

Porthkerry/Rhoose
Total spend: £60,000
Customers affected: 42
Start quarter: Q2 2019
End quarter: Q3 2019
Duration: 2 months
Details: Due to a poor performing circuit and the condition of equipment, overhead network was undergrounded and automation installed.
Customer benefits: Improved quality of supply and reliability for customers by providing reinforcement to the Cardiff airport area.

2. SWANSEA

Grange Llynfi 66kV pole changes
Total spend: £107,000
Customers affected: 21,676
Start quarter: Q3 2019
End quarter: Q4 2019
Duration: 6 months
Details: Renew heavy construction decayed poles.
Customer benefits: Improved quality of supply and reliability for customers.

3. EAST WALES

Spencer Road/Woolaston House
Total spend: £38,000
Customers affected: 850
Start quarter: Q3 2019
End quarter: Q4 2019
Duration: 3 months
Details: Reinforcement of the hospital feeder circuit.
Customer benefits: Improved quality of supply and reliability for customers.

4. WEST WALES

Cosheston
Total spend: £300,000
Customers affected: 900
Start quarter: Q1 2019
End quarter: Q4 2019
Duration: 12 months
Details: Due to the age and condition of the existing assets, a 20km section of high voltage overhead line was refurbished to modern construction standards and an additional 11kV circuit connected to reinforce the network.
Customer benefits: Improved quality of supply and reliability for customers.

Electric vehicles - supporting decarbonisation goals

Our role is to provide a network that supports the government's decarbonisation goals. Transport plays a huge part in these goals. An electric vehicle (EV) uses, on average, the same volume of electricity as a domestic house. We use our experience and expertise to ensure that electric vehicle charging can be accommodated in the most efficient and economic way. When we build new networks we will design them to be ready for the future demands that low carbon technologies, such as EVs will place upon them.

We predict that the majority of our larger local transformers will be able to accommodate a 35kWh charge every six days for each of the customers connected to it. This provides a charged range of around 150 miles in many EVs and it is likely that this will support the demands of home-connected EV charging.

We also expect that our backbone 33kV network and transformers will be able to accommodate this level of charge point activity.

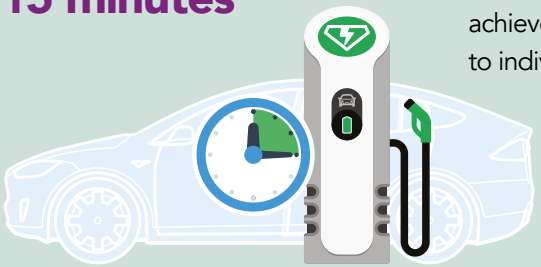
Our approach to facilitate EV charging

Motorway services and major road filling stations

In most cases motorway services installations are supplied by bespoke high voltage connections. Where the demands of the Services increase with planned charging installations we will work with operators to enhance their main electricity supply.

Major road filling stations are located in more urban locations. They can be supplied by our local low voltage mains. As demand increases we will uprate low voltage mains as required. We have already established policies that allow a second point of supply to be made available on forecourts to support the charging infrastructure.

Super chargers
at motorway services will provide full charge in
15 minutes



New homes

We have already identified that increased demands of Low Carbon Technologies such as EVs could require larger capacity service cables and are trialling these in our 'Superfast Electricity' project. We do not want today's purchasers of new properties to be faced with service upgrades in the future because we did not think ahead.

Existing homes

We appreciate that the electrical capacity of a house is the last thing on a customer's mind when they choose an electric vehicle so we are working to make this assessment and acceptance as simple as possible. Where an existing service cable is not adequate for the requirements of an EV charger, our retro-fit Superfast Electricity project (see page 18) will demonstrate how this can be achieved with minimal inconvenience to individual customers.

On street charging

As approximately 40% of all vehicles on the UK roads don't park in an off-street location, WPD is giving local councils the ability to provide new street lighting installations or bespoke EV charging installations to their streets. For established networks the solution will vary depending on the existing mains infrastructure. In some cases uprated services can be made available to streetlights but in other cases a more widespread scheme to uprate mains will be required.

Domestic chargers
will provide
150 mile
charge range

Depot based fleet users

Where a fleet user returns their vehicles to a depot location we expect them to require a relatively large electricity supply to support their charge requirements. The connections we offer are likely to be similar in design to those for larger commercial buildings or factories, either with on-site transformers or taken at high voltage. With the majority of charging for these customers taking place overnight at times of likely low demand for our network, we will offer flexible solutions such as Alternative Connections to these customers to make most efficient use of our network.

Guidance and advice documents

We have published a guidance document for local authorities who are considering public and street side charging connections. Our 'Getting Electric Vehicles Moving' guide provides details including information on the different kinds of chargers available and how charging points can be connected quickly and efficiently to our network. You can find it here.

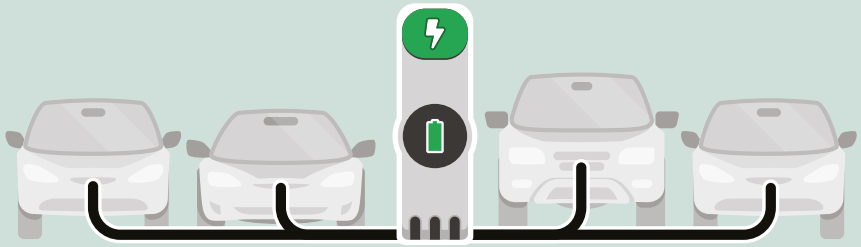
Our 'DNO engagement for local authorities guide' provides information specifically tailored to local authority customers delivering public charging points. This guide (found here) covers some of the technical considerations related to public connections as well as offering advice on how to make applications and discuss plans with us.

Capacity indication for customers

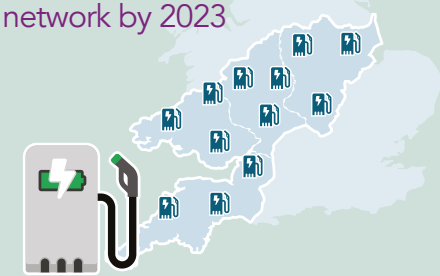
We already offer a capacity map on our website which shows customers the level of generation capacity and demand capacity at our major substations. We plan to extend this map to show our local substations and the local scope for connection of electric vehicles.

At this local level there will always be specific considerations which can affect our ability to connect individual charge points, but this map will provide a generic view of the capacity which is available in local streets (click here).

Charging hubs
will be built in public car parks, supermarkets and taxi ranks



217,000
chargers will be built on our network by 2023



Innovation and research projects

EV Emissions (2016)

Our EV emissions project was established to check the compliance of modern electric vehicles. Electric passenger vehicles from all manufacturers currently sold into the UK market were tested. Working with the Transport Research Laboratory, vehicles were tested at the Millbrook Proving Ground in Bedfordshire. They were cycled through a range of charging and discharging cycles in controlled conditions. Harmonic and power quality measurements were taken from the vehicles and the charge points.

Valuable insight was gained into the performance and compliance of vehicles with mandatory electrical emissions standards. These results are informing the refinement of the engineering standards and provided comfort that the automotive sector is designing vehicles within the limits set.

Electric Nation

At its inception the Electric Nation project was Europe's largest domestic EV charging trial with 673 participants. The project has delivered learning on how electric vehicle customers charge their vehicles at home, and improved our understanding of their acceptance of smart charging.

These results include knowledge on the frequency of charging events (typically less than twice per week) and the amount of energy consumed each time (approximately 35 kWh). The project has also confirmed a consumer willingness to accept smart charging. We proved the technology to support such a solution is available and now understand the degree to which we can rely upon it for network management purposes.

For more information go to: www.electricnation.org.uk

Superfast Electricity – three phase services

Working with Innovate UK, Monmouthshire County Council, Wales and West Utilities, Cenex and the Welsh Government the group is in the design stage of the fitting of all Low Carbon Technologies to the combination of new build and retro-fit properties in Caldicot. The project will install three phase service cables at all properties in this development in Wales. The project will demonstrate how this can be achieved and, crucially, make the network resilient to Low Carbon Technology demands. This will avoid us having to replace cables across customer's gardens and driveways in the future, due to assessment of foreseeable needs.

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Tweet us: @wpduk

Facebook: Western Power Distribution

Email: info@westernpower.co.uk

www.westernpower.co.uk

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