westernpower.co.uk

A Guide to Electric Vehicle Charging for Local Businesses

How to get started by talking to your electricity network operator

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Version Control

Issue	Date
1	24th July 2020
2	

Contact Details

Email
pwhite@westernpower.co.uk

Postal
DSO Development Team
Western Power Distribution
Avonbank
Feeder Road
Bristol
BS2 0TB

Disclaimer

Neither WPD, nor any person acting on its behalf, makes any warranty, express or implied, with respect to the use of any information, method or process disclosed in this document or that such use may not infringe the rights of any third party or assumes any liabilities with respect to the use of, or for damage resulting in any way from the use of, any information, apparatus, method or process disclosed in the document.

© Western Power Distribution 2020
Contains OS data © Crown copyright and database right 2019
No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means electronic, mechanical, photocopying, recording or otherwise, without the written permission of the DSO and Future Networks Manager, who can be contacted at the addresses given above.

Table of Contents

Who is this guide for?

This guide is aimed at all local businesses in the Western Power Distribution (WPD) area which are planning to buy and install battery, electric vehicle (BEV) charge points. These may be for a company fleet of HGV BEVs, light goods BEVs or car BEVs, or to support staff or visitors who drive BEVs.

In this guide, we explain what WPD is doing to get the network EV-ready for businesses and how we'll make sure businesses can charge their vehicles at a time and place that suits them.

Leading the charge

At WPD, we are at the forefront of developments to build an EV infrastructure. Our ground-breaking Electric Nation project investigated how domestic chargers could be connected to our networks in volume. In 2020, we launched our follow-up **Take Charge** project to demonstrate the high capacity connections that will be needed at motorway service stations.

Now we're offering extra support to businesses considering BEV fleets, to help remove some of the barriers to EV adoption. This guide also sets out the actions businesses need to take if they want to install BEV charging.

What will a BEV future look like?

The transition to BEVs is on the rise. Since April 2020, company car owners have been benefiting from 0% Benefit in Kind (BiK) tax on company vehicles – a change that will play an important part in achieving the UK's targets for decarbonising transport, as well as helping to reduce air pollution.

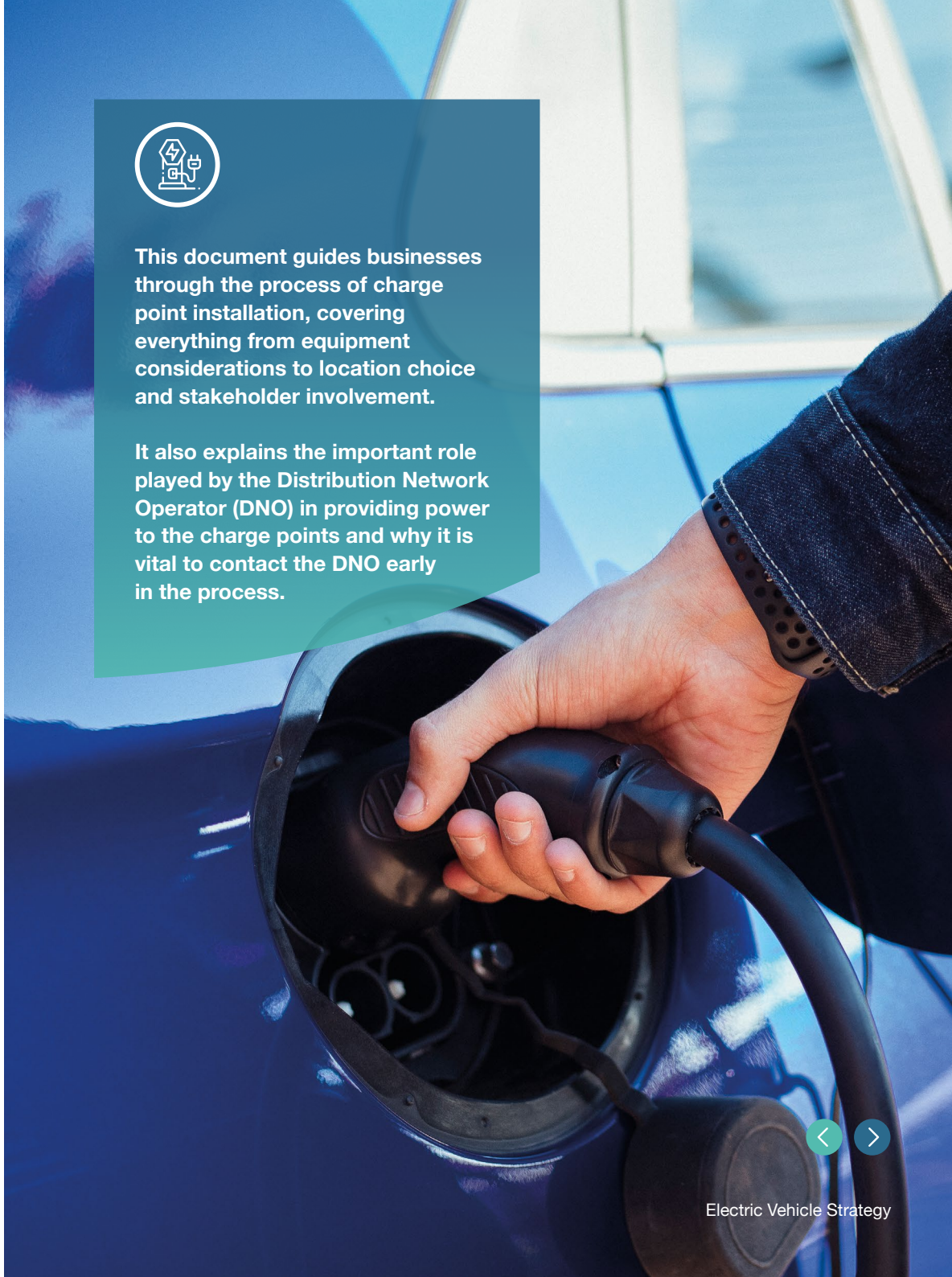
Based on Future Energy Scenarios published by National Grid, there are already more than **273,500 plug-in cars** and **8,800 light vans** on the road. WPD experts expect to see up to **3 million** in our area by 2030. The number of EVs on UK roads is predicted to rise to **36 million** by 2040.

EU legislation is also encouraging manufacturers to reduce emissions which has an additional BiK advantage for company car drivers. Company vehicle drivers using BEVs will pay no benefit in kind tax during 2020-21, just 1% in 2021-22 and 2% in 2022-23, making a significant difference to their monthly pay packet.

About 50% of new cars are currently purchased by companies. Most mainstream car manufacturers now offer electric models; there are currently more than 130 models of full or part electric cars available to buy or lease in the UK, along with a growing number of electric vans.

The transition to electric vans and commercial vehicles is likely to follow the pattern seen in private cars. New EU regulations for commercial vehicles call for CO_2 emissions from heavy-duty vehicles such as trucks and buses to be cut by 30%, by 2030, with a reduction target of 15%, by 2025. To combat rising traffic emissions, manufacturers must also ensure that at least a 2% market share of the sales of new HGV vehicles is made up of zero and low emission vehicles.

To meet these targets, a massive Europe and UK-wide charging infrastructure is needed.



This document guides businesses through the process of charge point installation, covering everything from equipment considerations to location choice and stakeholder involvement.

It also explains the important role played by the Distribution Network Operator (DNO) in providing power to the charge points and why it is vital to contact the DNO early in the process.

What is a Distribution Network Operator?

A Distribution Network Operator (DNO) is a company licensed to distribute electricity in the UK. It is responsible for the distribution of electricity downstream from the national transmission grid to industrial, commercial and domestic users. It also maintains and operates the underground cables, overhead lines and substations.

When new charge points are installed, it is the DNO that connects them to the local power network. DNOs do not supply the electricity. Electricity suppliers pay DNOs to distribute electricity through the network to homes and businesses. Customers can choose from many different electricity suppliers.

Before installing an EV charge point, businesses need to download the common EV and HP application from the Electricity Networks Association, the trade body for the DNOs: -

https://energynetworks.org/electricity/futures/electric-vehicles-and-heat-pumps.html

This site includes detailed information on how to assess the load of the business as well as other important details. The completed EV and HP connection form should then be sent to the local DNO.

For businesses in the WPD licence area, completed forms should be sent to this email address shown below: -

wpdnewsupplies@westernpower.co.uk

Additional information on electric vehicles on the WPD website can be found at: -

https://www.westernpower.co.uk/smarter-networks/electric-vehicles

When new charge points are installed, it is the DNO that connects them to the local power network.

How can DNOs help you?

The cables, overhead lines and substations in our electricity network have a typical lifespan of 50 years which means we need to plan now for future changes, including the anticipated growth of EVs.

Additional connections to the distribution network need to be assessed to determine if there is available capacity or if local upgrades will be necessary.

An early engagement with WPD (your local host DNO) and a qualified electrical contractor can help identify whether the proposed location has adequate capacity to meet the charging demand. If there is enough capacity from the existing supply, no network reinforcement is needed. If reinforcement is necessary, it will be the local DNO which provides this, along with quotations for new connections and upgrades to existing network.

The scope of the upgrade and reinforcement could extend to increases in capacity for existing transformers, distribution overhead lines and cables to meet the new higher peak demand. Costs for grid network investments will vary depending on the local situation. A guide is provided on **page 14**.

So when planning to install charge points, it is important to think about the implications for the electricity network. WPD provides the critical link to an electrical power supply. Put simply, any plan to install EV charging infrastructure needs to consider both the charge point hardware installation and any necessary grid network reinforcement.

The DNO needs to be properly engaged and consulted to coordinate and facilitate the connection of charge points to the network. The DNO also needs to know the size and type of EV chargers to determine if there will be sufficient capacity and to prevent issues for other local electricity users.

Charge point specifications

EV charge points are mainly defined by the power they can produce and the how quickly they can charge an EV.

The Connector Type is also a consideration as there are different charging plug standards and configurations for slow or fast charging compared with rapid charging, as well as direct current (DC) charging as an alternative to standard alternating current (AC) charging.

Rapid chargers come as tethered chargers; this means the charging lead is part and parcel of the charger. Rapid chargers usually come with dual CHAdeMO and CCS tethered leads and connectors.

Rapid charging is usually associated with CHAdeMO or CCS connectors. But there are two anomalies with rapid charging that need to be born in mind: -

Note:

1) Some models of the Renault Zoë use the type 2 connector to rapid charge at 43kW AC rather than DC.

2) The Tesla Model S and X use a type 2 connector but are capable of charging at greater than 150kW from a Tesla super charger.

CHAdeMO
50 kW DC

CCS
50 kW DC

Type 2
43 kW AC

*see note

Tesla Type 2
120 kW DC

*see note

The following table represents the various charging options available to plug-in car drivers based on a 30kWh battery.

Charge point type	Power transfer		Typical charging time	Recommended location
Slow	<3kW	Single phase	8-12 hrs	Ideal for vehicles that will be parked for periods of 8 hours or more.
Fast	<7kW	Single phase	3-4 hrs	
	<22kW	Three phase	1-2 hrs	
Rapid	<43kW	Three phase	80% in 20-30 mins	These chargers are ideal for vehicles that need a quick turnaround or vehicles that have large batteries installed like HGVs with 250+kWh batteries.
	<50kW DC			
Super-rapid	<43kW	Three phase	<20-30 mins	
	<50kW DC			

Power requirements and supply capacities

Larger business and commercial customers, usually those with demands above 50kVA demands, have a supply capacity which is agreed with the DNO.

The business may also pay availability charges based on this capacity. As a result of changes in business processes or general energy efficiency, this supply capacity may be greater than the business's current usage.

In light of this, businesses are advised to look back at their last 18 to 24 months of electricity bills to get a better understanding of their consumption figures in relation to their agreed capacity, as capacity may already exist for chargers. For example, a business which has a 250kVA connection but is only using 175kVA has a spare 75kVA which could be used to supply the EV chargers. In this case, it would make sense to use this spare capacity rather than paying for a bigger connection.

The capacity may also allow a business to create a long term plan, starting with a smaller number of charge points and upgrading the supply at a future date when it is operating more BEVs.

It is important to assess the number and types of EV charger points that a business would like to install. The table below outlines the design requirements for the connection of EV charge point equipment to new and existing supplies.

Charge point type and power output per outlet	New energy supply capacity required per charge point now	New energy supply capacity per charge point for future-proofing
Slow or Standard 2.4kW or 3kW	Generally not required	80 or 100Amps AC single phase (for a faster charge point)
Fast 3.7kW AC	Generally not required	80 or 100Amps AC single phase (for a faster charge point)
Fast 7kW AC	Generally not required	80 or 100Amps AC single phase (for a faster charge point)
Fast 11kW AC	Three phase AC supply; 16Amps per phase	Three phase AC supply; 80Amps per phase (for a faster or rapid charge point)
Fast 22kW AC	Three phase AC supply; 32Amps per phase	
Rapid 20kW DC	Three phase AC supply; 32Amps per phase	Three phase AC supply; 80Amps per phase
Rapid 43kW AC	Three phase AC supply; 100Amps per phase	Three phase AC supply; 100Amps per phase
Rapid 50kW DC	Three phase AC supply; 100Amps per phase	Three phase AC supply; 100Amps per phase
Supercharger 130kW DC*	Three phase AC supply; 200Amps per phase	Three phase AC supply; 200Amps per phase

* Higher power superchargers are under development and testing at the time.

Cost of installation and commissioning

The cost of charge point installation, commissioning and how long it will take depends on:

- How many charge points are required;
- How many EVs will be charging at any one time;
- If all the vehicles to be charged are BEVs;
- How quickly they need to be charged;
- How much spare capacity is available in the business premises;
- How much of thespare capacity is from the existing electricity network;
- The cost of possible network reinforcement.

	Demand or Connection Size Required			
	< 18 kVA	**< 54 kVA**	**< 276 kVA**	**< 1000 kVA**
Suitable for	up to 2 Fast Chargers	up to 6 Fast Chargers or 1 Rapid Charger	up to 37 Fast Chargers or 5 Rapid Chargers	up to 135 Fast Chargers or 20 Rapid Chargers
Space requirement (mm)	350(W) x 500(H) x 210(D)[1]	450(W) x 700(H) x 225(D)[1]	609(W) x 754(H) x 250(D)[2]	WPD Plant 3300(W) x 2400(D) Metering items 1000(W) x 2200(H) x 390(D)[3]

When planning a charge point installation, every business needs to decide which charger/s best suits its needs. Where customers are considering high capacity or large volumes of chargers at their work car parks it is worth noting that the substation equipment required for a <1000kVA connection will occupy the same space as two standard parking spaces.

[1] Metering to be positioned > 500mm and < 1800mm from the ground
[2] Equipment to be positioned > 200mm from the ground
[3] Extra height may be required subject to connectivity of equipment

Rapid chargers

50kW
DC charging on one of two connector types, either the CHAdeMO or CCS charging standards.

43kW
AC charging on one connector type, the type 2

100+kW
DC ultra-rapid charging on one of two connector types.

All rapid units have tethered cables.

Rapid chargers are the fastest way to charge an EV, often found at motorway services or locations close to main routes.

Rapid devices supply high power direct or alternating current – DC or AC – to recharge a car as fast as possible.

Depending on the model, EV cars can be recharged in as little as 20 minutes, though an average new EV takes around an hour on a standard 50kW rapid charge point.

Power from a unit represents the maximum charging speed available and times quoted are for a charge to 80%. This maximises charging efficiency and helps protect the battery.

Note:
Tesla model S and X use the Tesla Type 2 connector which is capable of 150kW DC.

Some models of the Renault Zoë are capable of rapid charging at 43kW AC.

Fast chargers

7kW
fast charging on one of three connector types

22kW
fast charging on one of three connector types

11kW
fast charging on Tesla Destination network

Units are either untethered or have tethered cables

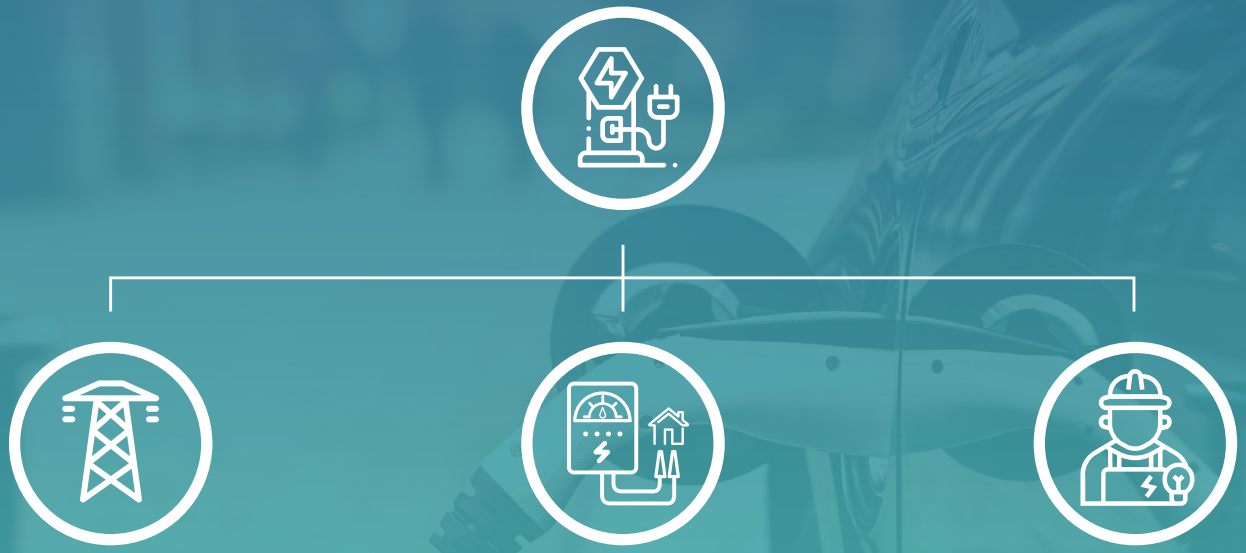
Fast chargers are typically rated at either 7kW or 22kW (single or three-phase 32A). The vast majority of fast chargers provide AC charging, though some networks are installing 25kW DC chargers with CCS or CHAdeMO connectors.

Charging times vary on unit speed and the vehicle, but a 7kW charger will recharge a compatible EV with a 40kWh battery in 4-6 hours, and a 22kW charger in 1-2 hours.

Fast chargers tend to be found at destinations such as car parks, supermarkets, or leisure centres, where you are likely be parked at for an hour or more.

Once the charger type has been chosen, it is then a good idea to take into account the key considerations and prepare a feasibility study that can be shared with the internal stakeholders and the local DNO.

Who is involved in the electricity connection process?



DNO

Electricity Supplier

Provision of required network capacity and electrical infrastructure

Suitably Qualified Contractor

For the installation of the charging point

When? Who? Why?

The following steps should be followed when considering the installation of any charge point: -

1

- Decide on the number and type of charge point(s)
- Make initial contact with your DNO to submit an enquiry and discuss network capacity at your business location
- Appoint an electrical contractor for the charge point installation

2

- Apply for an electrical network connection from your DNO
- Submit a map where the preferred location is marked with a circle rather than a specific point
- Provide your DNO with the technical data sheet for the charge point types you are planning to install

3

- Receive, review and accept the DNO design and quotation received
- Discuss tariff options with your electricity supplier
- Your supplier will appoint a meter operator to install a meter for the charge point

4

- Agree start and end dates for DNO works
- Energise your charge point(s)
- Operation and maintenance

Estimating connection cost and time

The new electricity connections are described as fast (up to 22kVA) and Rapid (50-140kVA).

This section provides illustrative costs and times for the power supply to be connected to different types of charge points including details of the connection characteristics of multiple installations of Rapid charge points.

Typical connector	Designation	Typical connector	Designation	
Type 2 43 kW AC 	Fast (up to 22kVA)	CCS 50 kW DC 	Rapid (up to 50kVA)	Multiple Rapid (up to 1MVA)
Number of charge points				
1 Fast charger		2 Rapid chargers		Up to 20 Rapid charge points
Approximate connection time				
8-12 weeks		8-12 weeks		4 months+
Approximate connection cost				
£1,000-£3,000		£3,500-£10,000		£70,000-£120,000
Other considerations that may affect the cost				
Street work costs		Street work costs Legal costs for easement and wayleaves		Street work costs Legal costs for easement and wayleaves Planning permission and cost of land for a substation

Key points to consider

The cost and timescale for each charge point project will always be specific to the location and the individual application.

The costs above illustrate that some proposed locations may cost much more than others due to power supply factors. It is therefore advisable to take a pragmatic approach when it comes to locations and the type of charging. Businesses must be prepared to be flexible and to forgo some sites in favour of more cost-effective options.

Each project will have a planning phase, procurement phase, along with an installation and commissioning phase. When planning a charge point project, businesses are strongly advised to contact your DNO early in the planning process.

As a rule of thumb, it is necessary to allow as much time for information exchange and dialogue with their DNO during the planning phase as for installation and commissioning.

It is essential that the appliances to be purchased are identified before an order is made as there can be a large discrepancy between appliances; some makes/models will require stronger connection characteristics.

Pre-procurement market engagement with candidate charge point providers will also help, as they have years of experience when it comes to installation and commissioning and will be able to offer helpful advice.

For more information on planning for procurement, please see the UKEVSE general procurement guidance for electric vehicle charge points, available at: -

http://ukevse.org.uk/resources/procurement-guidance/

WESTERN POWER DISTRIBUTION

Serving the Midlands, South West and Wales

Home

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

Registered in England and Wales
Registered Office: Avonbank, Feeder Road, Bristol BS2 0TB

westernpower.co.uk

@wpduk