

**nationalgrid**

# Getting electric vehicles moving

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# Supporting the growth of electric vehicles

The use of Battery Electric Vehicles (BEVs) is on the rise, and are fast becoming more common place. Electric vehicles are expected to play an important role in achieving the UK's targets for improving air quality and reducing carbon emissions.

In 2011 there were only 2,500 electric vehicles in the UK – as of end May 2021 there are over 260,000 BEVs, and that number is predicted to rise to more than 36 million in the next 30 years. That means demand for charge points are likely to rise, and as the electricity network for your local authority, National Grid Electricity Distribution want to help you meet that demand.

This guide lets you know:

- why charge points matter so much to your electricity network
- what the different kind of charge points are and what they do
- the quickest, most efficient and economical way of connecting charging points to the electric network.

This guide explains the different kinds of charge points there are, what the quickest ways of installing the most economical, efficient and practical charge points in your local area and the role National Grid Electricity Distribution, your host Distribution Network Operator (DNO) plays in providing power to on street charge points.

**Data taken from SMMT website clearly shows that the UK population is getting behind the UK government's decarbonisation of transport. With the uptake of electric vehicles (EVs) accelerating, the market share of Battery Electric Vehicles (BEV) in March 2020 was 2.7%, one year on, and the market share in March 2021 has more than doubled to 6.9% of all new vehicle sales.**

The sales of alternative fuelled vehicles overtook diesel-fuelled vehicles in the April 2021 SMMT data, BEV sales at 85,032 PHEV sales at 68,107 and diesel sales at 101,870.

This doubling of sales could well have been brought about by a greater range of BEV vehicles for customers to choose from, the increasing amounts of EV charge points now available, or the government's 1% Benefit In Kind for the tax year 2021/2022, or a combination of all those factors.

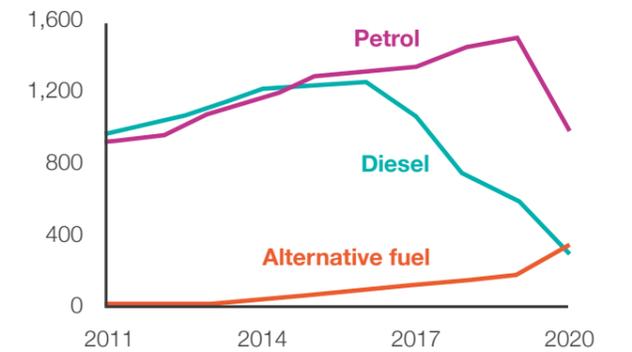
The trend of BEV ownership trend is increasing, as a company National Grid Electricity Distribution noticed a big increase in applications for EV charger installations at the new registration period came into effect in March 2021.

In National Grid Electricity Distribution's RIIO-ED1 Business Plan use was made of national forecasts to tailor scenarios for National Grid Electricity Distribution networks. In addition National Grid Electricity Distribution worked with the Centre for Sustainable Energy (CSE) to deliver the 'Who's on our wires' report.

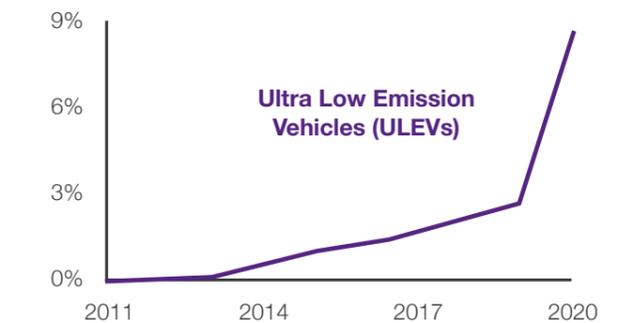
This added socio economic factors to the national growth forecasts for all low carbon technologies. For example, the numbers of electric vehicles are strongly predicted to grow in areas where the social demographic suits early adoption. This means that it is highly likely that low carbon technologies (LCTs) will be clustered closely together leading to a compound effect on specific parts of the network.

This work led to National Grid Electricity Distribution targeting the uprating of assets when other works take place over about 7% of the network, in locations where National Grid Electricity Distribution could be confident of load growth.

Thousands of cars registered for the first time - GB



Proportion of vehicles registered for the first time - GB



The current population of EVs within the four National Grid Electricity Distribution licence areas is matching the RIIO-ED1 Business Plan – with EV adoption increasing at the current rate, it is expected some 217,000 chargers to be connected to the network by 2023.

However, to meet the requirements of the government's 2035 deadline for the cessation of hybrid ICE cars and vans, this will see an extremely high, up to 70% uptake level of EV adoption.

This is given in the government's Road to Zero 2018 document, and then this rate could see up to 3,199,371 EVs, within the National Grid Electricity Distribution area, by the end of 2030.

# Who are National Grid Electricity Distribution?

National Grid Electricity Distribution are the host DNO who owns and maintains the electricity cables and lines that bring the electricity to approximately eight million homes and businesses across the South West, South Wales and the Midlands.

We run and maintain the electricity cables in your area and keep the lights on, regardless of which electricity supplier you pay your bills too.

# Supporting the transition to a low carbon future

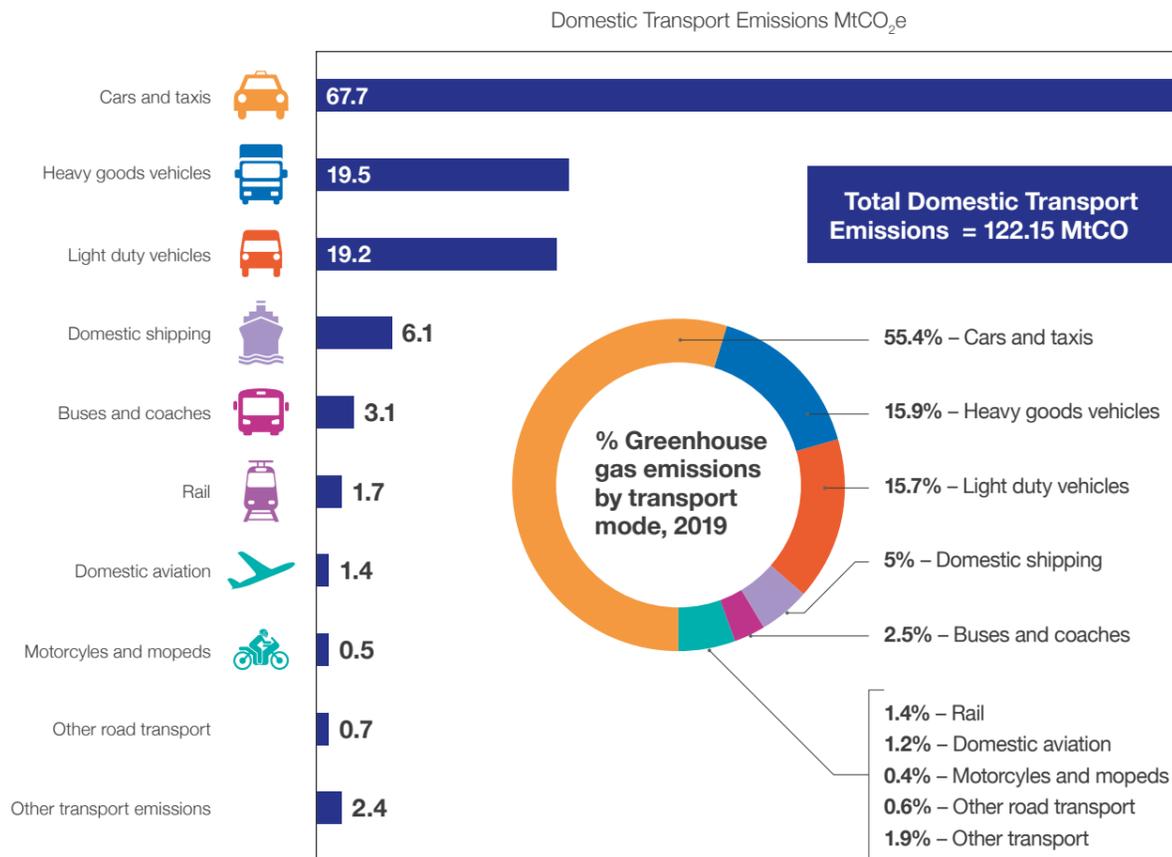
Electric vehicles can help the UK meet its carbon emission ambition by decarbonising transport emissions.

National Grid Electricity Distribution want to support local residents, businesses and the public sector to embrace a low carbon future. We distribute electricity to charge points and we provide supplies to connect them to the network.

## As transport produces about one third of the UK's CO2 emissions

The introduction of Battery Electric Vehicles (BEV) can help the UK meet its carbon emission ambition by decarbonising transport emissions.

### UK domestic transport emissions 2019



# Cost of connecting a charge point to the electricity network

How much it costs to connect a charge point to the electricity network and how long it will take to install comes down to three things, from a DNO point of view.

### In the UK and Europe there are typically five types of charge plugs:

- type 1 for AC charging
- type 2 for AC charging
- CHAdeMO for DC charging
- combined Charging System (CCS) for DC charging
- Mega Watt Charging System (MCS) ultra-rapid DC charging for HGVs, which is currently undergoing type test approval.

Assume that the battery electric vehicle has a 55kWh battery, which the on-board capabilities are limited to 11kW maximum AC charging, plus the car is capable of accepting a maximum 170kW DC rapid charge.

### How much it costs to connect a charge point to the electricity network and how long it will take to install comes down to three things:

1. what type of EV charger you installing, e.g. Super, Rapid, Fast or Slow. The Super and Rapid are known as DC chargers where the Fast and Slow are known as AC chargers?
2. how much it will cost to install the charger?
3. how long it will take?

### These three questions then lead to various other questions like:

- how many charge points do you want to connect?
- how many vehicles do you want to charge at any one time and when in the 24 hour period of a day?
- how quickly do you want them to charge?
- how long does it take to charge an electric vehicle? - This depends upon the vehicle and what it is capable of.

Charge point type and power output	Likely installation location	Specific connection requirements	Network considerations	Likely charge time for 0% to 100%
Slow up to 2.3kW	Domestic	None – connects via household 13A plug/socket	None	25 hours 45 minutes
Slow 3.7kW	Domestic or street side	Dedicated household circuit or on street equivalent	In some cases limited local reinforcement is required	16 hours
Fast 7kW	Domestic or street side	Dedicated household circuit or on street equivalent	Likely upgrade to cut-out and/or LV service cable and LV local mains	8 hours
Fast 22kW (the car limits this to 11kW)	Street side or public charging location	Three phase dedicated supply point	Requirement for three phase connection and likely local mains upgrade	5 hours 30 minutes
Rapid 50kW	Public charging location	Three phase dedicated supply point	Requirement for three phase connection and likely local mains and transformer upgrade	53 minutes
Rapid 150kW or multiple rapid chargers	Public charging location	Supply point from dedicated transformer	In most cases a new transformer will be established	26 minutes

EV models that use CHAdeMO rapid charging include the Nissan Leaf, Nissan EV 200, LEVC taxi and Mitsubishi Outlander PHEV. A selection of CCS compatible models include the BMW i3, Kia e-Niro, and Jaguar I-Pace. Tesla's Model 3, Tesla Model S, and Model X are able to rapid charge via the Tesla Supercharger network using the Tesla Type 2 connector.



# Cost of connecting a charge point to the electricity network

The only model able to make maximum use of Rapid AC charging is the Renault Zoe. Currently CHAdeMO is the only connector type, which supports V2G, this is changing as CharIN, the organisation that created CCS, have now generated a time line for CCS to be type tested for V2G by 2025.

Slow charging is a method of charging electric vehicles, used by some owners to charge at home overnight. However, slow units are not necessarily restricted to home use, they can also be found in the workplace, street furniture locations and some public locations.

If a vehicle remains stationary for a long period, such as at a Park and Ride or office car park, slow charging may provide the optimum solution.

Because of the longer charging times over fast units, slow public charge points are less common and tend to be limited to street furniture that has a limited supply capacity.

Most slow charging units are rated at up to 3kW with some lamp post chargers being rated at 6kW.

Charging times vary depending on the charging unit, the LV supply capacity to the charger unit and EV being charged, but a full charge on a 3kW unit will typically take 6-12 hours.

Most slow charging units are untethered, meaning that a cable is required to connect the EV with the charge point.

While slow charging can be carried out via a three-pin socket using a standard three-pin socket, because of the higher current demands of EVs and the longer amount of time spent charging, it is strongly recommended that those who need to charge regularly at home or the workplace get a dedicated EV charging unit installed.



The cost and complexity of the electricity network required to support new EV chargers will vary according to the type and size of the new EV charger. At a domestic fast charger level, only minimal works will be required to accommodate chargers but for larger installations and hubs of multiple chargers new transformers and substations are likely. The cost and works timescale will vary with the complexity of the works as detailed below.

Charge point type and power output	Likely installation location	Typical approximate connection lead times	Network and third party considerations	Approximate connection cost
Slow up to 3kW	Domestic	Immediate	None	None
Slow 3.7kW	Domestic or street side	Immediate in most cases	Usually none	Usually none
Fast 7kW	Domestic or street side	4 to 8 weeks	Likely upgrade to service cable and local mains	Usually none
Fast 22kW	Street side or public charging location	8 to 12 weeks	Streetworks and permissions	£3,500 to £12,000
Rapid 50kW	Public charging location	8 to 12 weeks	Streetworks and permissions	£3,500 to £12,000
Rapid 150kW or multiple rapid chargers	Public charging location	16 weeks	Streetworks, permissions and cost of land for transformer	£70,000 to £120,000

# Provision of capacity

National Grid Electricity Distribution have a sized approach to EV charge capacity with different solutions for domestic, streetside, car park or large depot scenarios.

## Domestic smart home EVs and storage

We will utilise the findings of our Electric Nation project to refine our design models. We are also investigating how three phase cables can provide additional capacity and show how a domestic installation can make use of locally generated power and storage to provide the energy required to charge an electric vehicle.

## On street charging solutions

National Grid Electricity Distribution have a variety of solutions available for charging vehicles in residential locations on the street or at communal parking areas. National Grid Electricity Distribution work with local authorities, businesses, homeowners and other regional bodies to provide the infrastructure required for electric vehicle charging.

## Hub charging solutions

Local authorities are likely to establish charging hubs in car parks and other on street locations. These offer the advantage of being able to provide a large single point load connection to the National Grid Electricity Distribution network using a bespoke transformer.

## Depot solutions

Where depots of commercial vehicles require charge we will either use the bespoke transformer option used for charge hubs or offer a high voltage connection to allow customers a higher connection capacity.

## How long does it take to connect a new charge point?

National Grid Electricity Distribution describe new electricity connections as Small, Medium or Large. This section explains the costs and time for the power supply to be connected to different types of charge points.

Step 1	Step 2	Step 3	Step 4
<ul style="list-style-type: none"> <li>decide on the number and type of charge point(s)</li> <li>identify a location</li> <li>appoint an electrical contractor for the charge point installation.</li> </ul>	<ul style="list-style-type: none"> <li>apply for an electrical power connection from National Grid Electricity Distribution.</li> </ul>	<ul style="list-style-type: none"> <li>appoint an electricity supplier who will bill for the electrical energy used</li> <li>your supplier will appoint a meter operator to install a meter for the charge point.</li> </ul>	<ul style="list-style-type: none"> <li>energise your charge point(s)</li> <li>operation and maintenance.</li> </ul>

	Number of charge points	Approximate connection time	Approximate connection cost	Other considerations that may affect the cost
<b>Small</b>	1 - 3 fast or 1 rapid charge	8 - 12 weeks	£1,000 - £3,000	Street work costs
<b>Medium</b>	More than 3 fast or more than 1 rapid charge	8 - 12 weeks	£4,500 - £75,000	Street work costs Legal costs for easement and wayleaves
<b>Large</b>	Multiple fast/rapid charge points	6 months +	£60,000 - £2 million	Street work costs Legal costs for easement and wayleaves Planning permission and space for a substation

# FAQS

We have a sized approach to EV charge capacity with different solutions for domestic, streetside, car park or large depot scenarios.

### What does National Grid Electricity Distribution know about smart charging?

Smart charging can help reduce costs for customers, as well as manage demand on the network. Through our innovation team, we ran the world's largest EV project called Electric Nation. More details on this can be found at: [www.electricnation.org.uk](http://www.electricnation.org.uk).

Electric Nation showed us that customers do not charge their EVs every night and that relatively modest price signals can divert this charge activity away from peak network demands.

### How much does the electrical connection for an on-street charge point cost?

Depending on how many vehicles you want to charge and how quickly you want to charge them, it can range from £1,000 for a new supply for a single slow to fast charge point, to £2 million or more for a cluster of rapid charge units.

That is why we are really keen to work closely with local authorities and charge point operators to help them to find the right solutions for their needs.

### What about charging my BEV when I am away from home?

The increasing trend of BEV ownership in the UK is being matched by the increasing number of EV charge points across the UK.

In March 2020 Zap Map reported there were 11,293 public charge points available, in July 2021 Zap Map reported there were over 25,000 EV Charge points installed across the UK.

### How can I find out more?

To find out more visit our website at: - [nationalgrid.co.uk/electric-vehicles](http://nationalgrid.co.uk/electric-vehicles) where you will find a number of guides for local authorities, business user guide and a general customer guide to buying a BEV, or call **0800 0963080**.



