ELECTRICAL VEHICLE CHARGING

ALL YOU NEED TO KNOW.

THE POWER BEHIND YOUR BUSINESS

NICEIC

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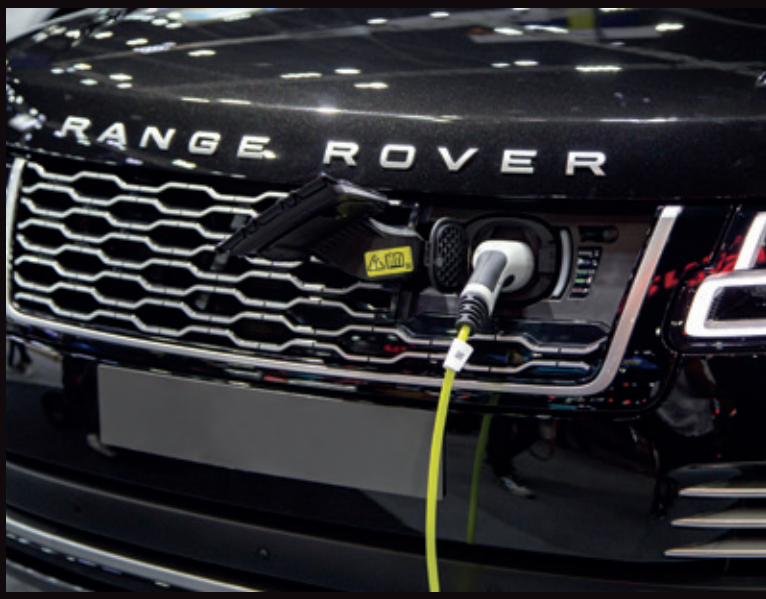


INTRODUCTION

The UK Government has launched a strategy called Road to Zero, where it aims to:

- **Drive new ultra-low emission car sales to a market share of at least 50% and up to 70% by 2030, alongside up to 40% of new vans**
- **Enable a massive roll-out of the infrastructure to support the electric vehicle revolution**

The ambitious plan, with £1.5 billion invested, provides electricians with a number of opportunities to deliver the following in the Road to Zero Strategy:

- A push for chargepoints to be installed in newly built homes and new lamp posts, potentially providing a massive expansion of the plug-in network
- The launch of a £400 million Charging Infrastructure Investment Fund to help accelerate the roll-out of the charging infrastructure
- A new £40 million programme to develop and trial innovative, low cost wireless and on-street charging technology
- Providing up to £500 for electric vehicle owners to fit a chargepoint in their home through the Electric Vehicle Homecharge Scheme
- Increase the value of grants available to workplaces for chargepoint installations
- Extend the Plug-In Car and Van Grants at current rates, and in some form until at least 2020, allowing consumers to continue to make significant savings when purchasing a new electric vehicle

For more information visit the Energy Saving Trust You Tube Channel and watch their Electric Vehicle videos.

www.gov.uk/government/organisations/office-for-low-emission-vehicles

www.energysavingtrust.org.uk/transport/electric-cars-and-vehicles

YouTube Energy Saving Trust

TECHNICAL ARTICLE

THE INSTALLATION OF AN ELECTRIC VEHICLE CHARGING POINT

TAKING YOU STEP-BY-STEP THROUGH THE PROCEDURES AND REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

Electric vehicles (EVs) can provide reductions in both carbon emissions and running costs, however the success of such vehicles relies on the availability of accessible charging points.

For users of private EVs the largest proportion of their charging is likely to be at home and so this article looks at the particular requirements of Section 722 of BS 7671 for the installation of an electric vehicle charging point.

CIRCUIT DESIGN AND LOADING ALLOWANCES

Regulation 722.311 requires that a final circuit provided for the connection to electric vehicles must be dedicated to that purpose alone. The regulation also requires that no diversity be allowed where a final circuit supplies more than one charging point. However, diversity may be allowed for a dedicated distribution circuit supplying multiple electric vehicle charging points, provided that load control is available to prevent overloading of the circuit.

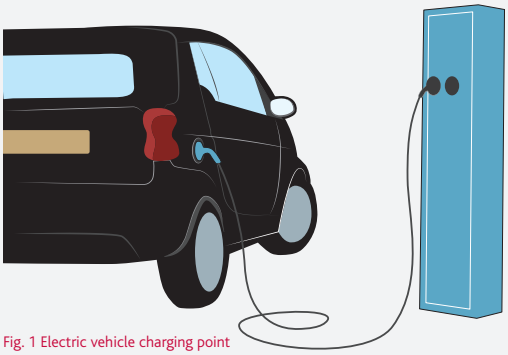


Fig. 1 Electric vehicle charging point

RCD PROTECTION OF CHARGING POINTS

Where automatic disconnection of supply is used as the protective measure, Regulation 722.531.2.101 requires every charging point to be individually protected by an RCD of at least Type A, having a rated residual operating current ($/\Delta_n$) not exceeding 30 mA disconnecting all live conductors, including the neutral (Regulation 722.531.2.1.1).

The RCD is required to be of a type that can detect and respond to the likelihood of a DC current being present as part of the charging current; typically Type B or Type A if additional equipment provides disconnection of supply in case of DC fault current above 6 mA (Regulation 722.531.2.101). If it is known that the DC component of the residual fault current will exceed 6 mA, the RCD must be of type A (Regulation 722.531.2.101).

TYPE OF SOCKET-OUTLET OR CONNECTOR AT CHARGING POINTS

Section 722 does not standardize on any one particular type of socket-outlet or vehicle connector at the charging points, but it requires these to be chosen from six different types listed in Regulation 722.55.201.1. Vehicle manufacturers' instructions should be followed when determining the type of socket-outlet or connector to be installed, as pointed out in the regulation. The listed types of socket-outlet and connector include:

- 13 A socket-outlets to BS 1363-2 where the manufacturer approves their suitability for use for the characteristics of the charging load
- Industrial type socket-outlet or connectors complying with BS EN 60309-2 having one of two specified interlocking arrangements to prevent contacts being live when accessible
- For Mode 3 charging, one of three different types of socket-outlet or vehicle connector complying with the BS EN 62196 series of standards, plugs, socket-outlets, vehicle connectors and vehicle inlets. Conductive charging of electric vehicles

Each socket-outlet should supply only one vehicle and must be installed in a fixed socket-outlet box or a distribution board, with the lowest part of the socket-outlet between 0.5m and 1.5m above the ground. Tethered vehicle connectors are permitted but not portable socket-outlets. Where an EV charging point is installed outdoors, the equipment should have a degree of protection of at least IP44.

Arrangements must be provided to prevent insertion or removal of plugs in charging Modes 3 and 4, unless the socket-outlet or the vehicle connector has been switched off from the supply (Modes are defined in Part 2 of BS 7671).

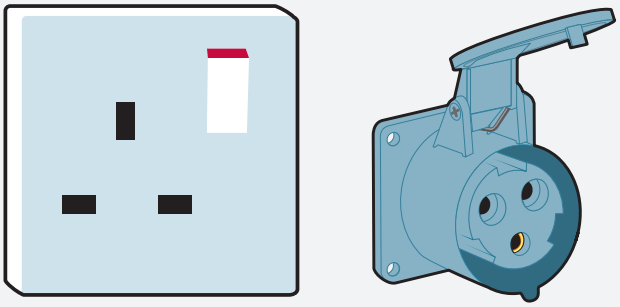


Fig. 2 Socket-outlets to BS EN 1363-2 and BS EN 63309-2

PROTECTIVE MULTIPLE EARTHING (PME)

Where the protective measure is the automatic disconnection of supply and a PME earthing facility is used as the means of earthing (TN-C-S system), special requirements of Section 722 apply if an electric vehicle charging point is:

- Located outdoors, or
- might reasonably be expected to be used to charge a vehicle located outdoors

The special requirements are intended to protect against a risk of electric shock that can arise in the unlikely event of an open-circuit fault in the combined protective and neutral (PEN) conductor of the low voltage network supplying the installation. The fault can result in a dangerous voltage to Earth existing for long periods on the earthed metalwork of the installation and equipment connected to it (including any electric vehicle and its charging equipment), posing a danger to any person touching the metalwork whilst in contact directly with the general mass of Earth, as shown in Fig 3.

An RCD offers no protection in these circumstances as the shock current flows in both the line and neutral conductors passing through the core balance of the device and consequently there is no imbalance to cause operation of the RCD.

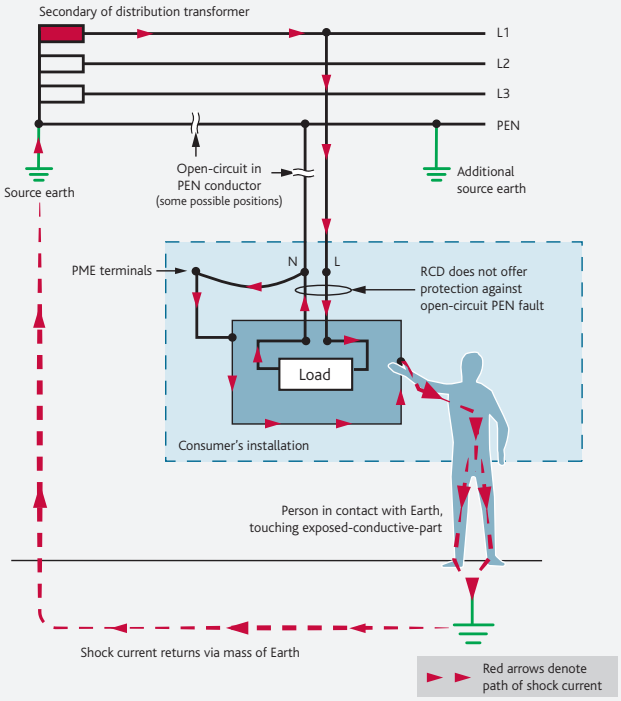


Fig. 3 Electric shock risk due to open-circuit fault in the supply neutral PEN conductor

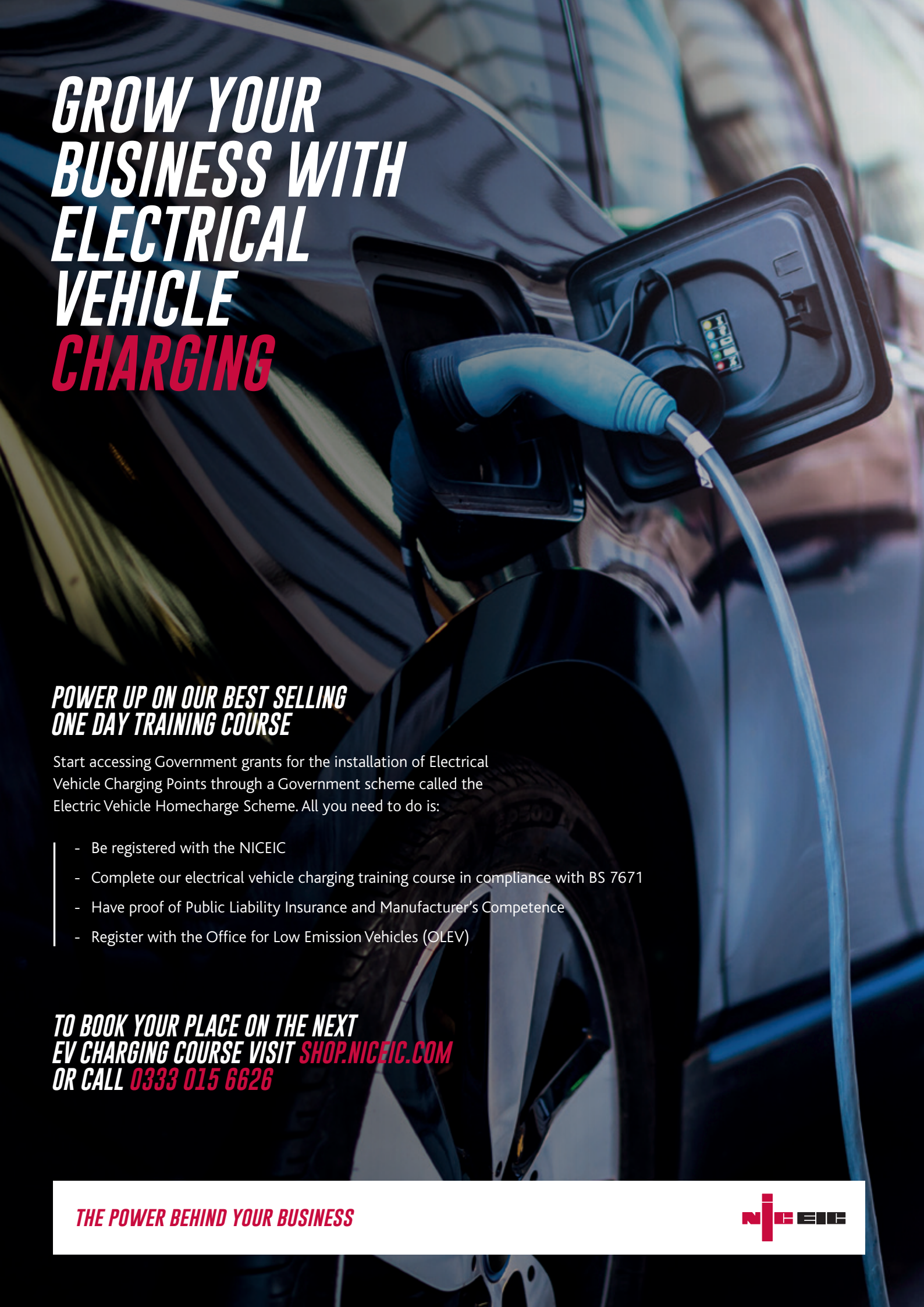
Regulation 722.411.4.1 states that a PME earthing facility shall not be used as the means of earthing for the protective conductor contact of a charging point located outdoors or that might reasonably be expected to be used to charge a vehicle located outdoors and list three methods, any one of which could be used.

Protection against electric shock for each of the methods listed is reliant on the maximum voltage between the main earthing terminal of the installation and Earth in the event of an open-circuit fault in the PEN conductor of the low voltage network supplying the installation does not exceed 70 V rms.

Options to satisfy the requirements for protection against electric shock could include converting the EV charging point to a TT earthing arrangement or using the protective measure of electrical separation.

Either of these two options isolates the EV charging point from the PME earthing arrangement which ensures compliance with 722.411.4.1 is achieved. For more detail on either of these two methods, refer to the article on Electric Vehicle Charging Installations in Connections Issue 206.

IF YOU REQUIRE TECHNICAL INSIGHT ON THE INSTALLATION OF ELECTRICAL VEHICLE CHARGING POINTS PLEASE LOG ON TO THE CUSTOMER PORTAL OR CALL THE TECHNICAL HELPLINE



GROW YOUR BUSINESS WITH ELECTRICAL VEHICLE CHARGING

POWER UP ON OUR BEST SELLING ONE DAY TRAINING COURSE

Start accessing Government grants for the installation of Electrical Vehicle Charging Points through a Government scheme called the Electric Vehicle Homecharge Scheme. All you need to do is:

- Be registered with the NICEIC
- Complete our electrical vehicle charging training course in compliance with BS 7671
- Have proof of Public Liability Insurance and Manufacturer's Competence
- Register with the Office for Low Emission Vehicles (OLEV)

TO BOOK YOUR PLACE ON THE NEXT EV CHARGING COURSE VISIT SHOP.NICEIC.COM OR CALL 0333 015 6626

THE POWER BEHIND YOUR BUSINESS

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ELECTRICAL VEHICLE CHARGING GRANTS

Grants are available that can assist with the initial purchase cost of eligible plug-in vehicles and the cost and installation of chargepoints. The Office for Low Emission Vehicles (OLEV) is responsible for these grants. The following grants are currently available in the UK:

ELECTRIC VEHICLE HOMECHARGE SCHEME

The Electric Vehicle Homecharge Scheme (EVHS) provides grant funding of up to 75% towards the cost of installing electric vehicle chargepoints at domestic properties across the UK (capped at £500 inc. VAT).

WORKPLACE CHARGING SCHEME

The Workplace Charging Scheme (WCS) is a voucher-based scheme that provides support towards the up-front costs of the purchase and installation of electric vehicle charge-points for eligible businesses, charities and public sector organisations.

WCS provides a grant equal to 75% of the purchase and installation costs of a chargepoint, capped at a maximum of £500 for each socket up to a limit of 20 sockets per company.

SCOTTISH GRANTS

In Scotland you can:

- Access an extra £300 installation grant via the Energy Saving Trust towards the cost of a 32 amp home charge point installation. This is in addition to the £500 provided by the Office for Low Emission Vehicles (OLEV)
- Secure an interest-free Electric Vehicle Loan, funded by Transport Scotland up to £35,000 to cover the cost of purchasing a new pure electric / plug-in hybrid vehicle

ACCESSING THE GRANTS

To access the installation grants, you need to submit an online application to OLEV, providing the following information:

- Be registered with the NICEIC and listed on our website
- Proof of your public liability insurance – (not employers' liability insurance)
- Proof your company's installers have been trained to install electric vehicle chargepoints; names of installers, their qualifications and renewal dates
- Proof you are approved by the chargepoint manufacturer/s to install their products
- Ensure all evidence provided is up-to-date and lists your current address

For more information on becoming an OLEV registered installer visit: **www.gov.uk/government/collections/government-grants-for-low-emission-vehicles**

FOR DETAILS OF YOUR LOCAL NICEIC TRAINING COURSE ON EV CHARGING CALL 0333 015 6626 OR VISIT SHOP.NICEIC.COM/ELECTRIC-VEHICLE-CHARGING-COURSE

IF YOU REQUIRE AN INSURANCE QUOTE PLEASE CONTACT NICEIC INSURANCE ON 0333 060 9945 OR VISIT NICEIC-AND-ELECSA-INSURANCE.COM

ELECTRIC VANS – LOW EMISSION VEHICLE GRANT

You can get a discount on the price of brand new low-emission vehicles through a grant the Government provides to vehicle dealerships and manufacturers.

The amount of the grant depends on which category the vehicle is in. The 5 categories are:

- Cars
- Vans
- Motorcycles
- Mopeds
- Taxis

Not all low-emission vehicles will get a grant. Only vehicles that have been approved by the Government are eligible for a grant.

The grant will pay for 20% of the purchase price for these vehicles up to a maximum of £8,000.

VANS

These vehicles have CO_2 emissions of less than 75g/km and can travel at least 16km (10 miles) without any emissions at all:

- BD Otomotiv e-Traffic
- BD Otomotiv e-Ducato
- Citroën Berlingo
- Mitsubishi Outlander Commercial
- Nissan e-NV200 (cargo van – image below)
- Peugeot e-Partner
- Renault Kangoo ZE
- Renault Master ZE
- LDV EV80 van
- LDV EV80 chassis cab

List correct as of June 2019, for the latest list visit **gov.uk/plug-in-car-van-grants/overview**

There are a number of Vehicle Manufacturers developing their Electric Van range including Ford, VW and Mercedes-Benz.

For full details on the Electric Vans available visit the vehicle manufacturer websites or **whatvan.co.uk**

NEW DEVELOPMENTS IN CHARGING TECHNOLOGY

ENERGY SAVING TRUST

Charging technology will continue to develop to meet the needs of the market with a number of technologies being trialed and reaching early market. An example is load management technology that is able to monitor the state of charge of the vehicles connected and adjust the power provided to individual chargepoints in real time. This allows the vehicles most in need of charging to be prioritised and is therefore a technology which is likely to become more widely available.

DNO's are also required to offer flexible connections if a customer is able to manage their peak load which can avoid extra costs.

The Government has also established the Automated and Electric Vehicles Bill which will, in the future, require all chargepoints sold or installed in the UK to be Smart.

ENERGY STORAGE

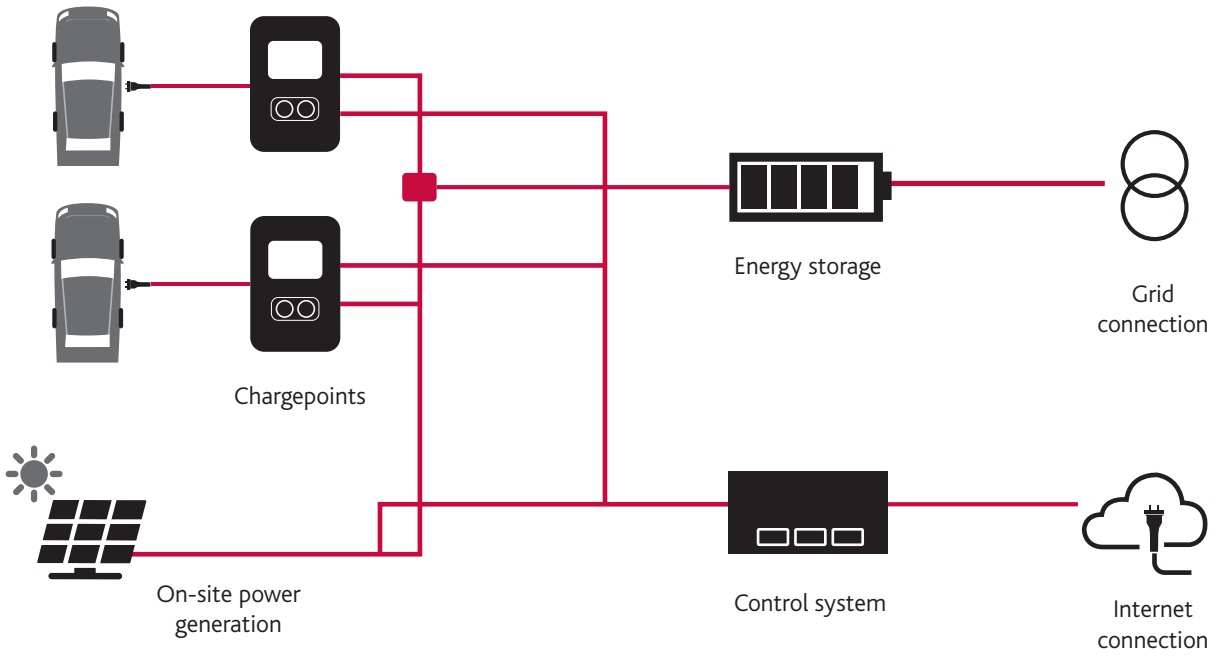
Where charging requirements exceed capacity of the local network infrastructure, a potential alternative to a costly distribution network upgrade may be to install a chargepoint solution with energy storage. This would offer a means of storing electricity off-grid to charge electric vehicles, but would also incorporate load management and integrate with a smart charging array as illustrated below.

The main benefits of energy storage solutions include the ability to avoid upgrades to the local electricity supply, which may be preferable due to cost or uncertainty over the tenure of a site.

Increased energy supply from battery storage can allow the expansion of a fleet of electric powered vehicles. In conjunction with load management and smart charging, storage can also reduce costs by avoiding peak-tariff periods. In markets where network incentives or feed-in tariffs operate, energy storage could also act as an income source. Some energy storage systems can also act in 'island mode', providing energy security in the case of a power cut.

By integrating renewable energy generation such as solar panels or wind turbines, reduced drawdown from the grid will reduce carbon emissions. Energy storage solutions incorporating 2nd life EV battery packs can also assist with addressing the problem of what to do with used electric vehicle batteries once their capacity is depleted below a level deemed suitable for driving the vehicle. Batteries at this stage of their life will still retain sufficient capacity to provide a storage solution.

THE PRINCIPLE OF ENERGY STORAGE



VEHICLE TO GRID (V2G)

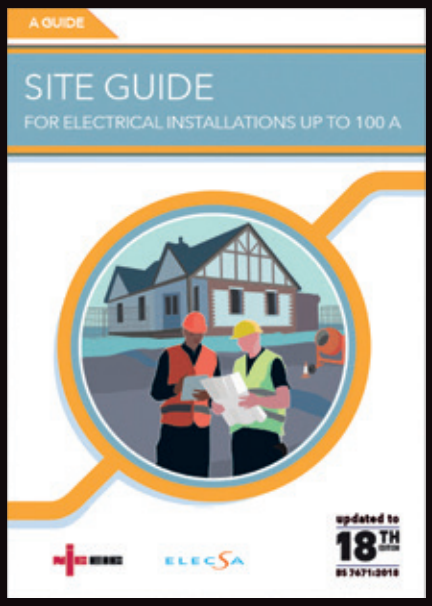
Another technological advancement is Vehicle-to-Grid technology (V2G), which looks and acts in a similar way to a standard charging installation, but uses bi-directional inverters so that energy flows both to and from the vehicle. This effectively turns a vehicle into a portable battery which can provide services to the home, business and grid such as storage and frequency response and can maximise the benefits of charging on time of use tariffs. V2G technology is currently in the testing for commercialisation stage.

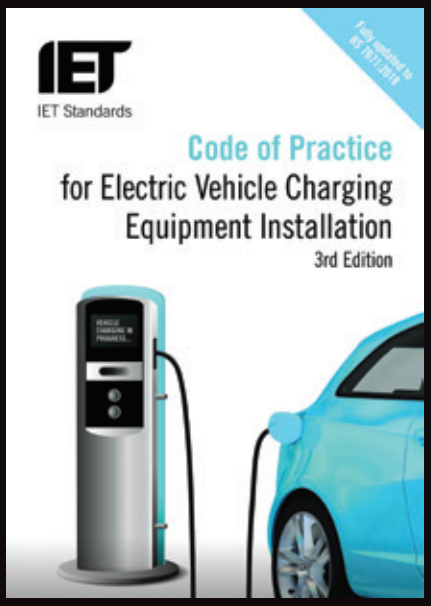
INDUCTIVE CHARGING

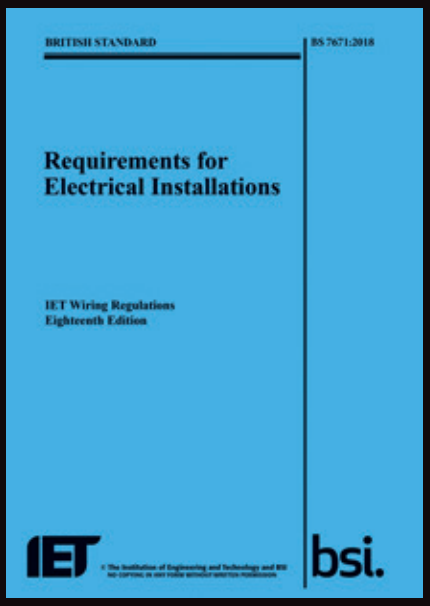
Inductive or wireless charging uses an electromagnetic field to transfer energy between an electric car and a charging pad through electromagnetic induction. This is a promising technology which could revolutionise electric vehicle use by negating the need for charging cables. The first cars with inductive charging capabilities are expected to be introduced in the near future.

FOR MORE INFORMATION VISIT
WWW.ENERGYSAVINGTRUST.ORG.UK/TRANSPORT/ELECTRIC-CARS-AND-VEHICLES

TECHNICAL PUBLICATIONS







ELECTRICAL VEHICLE TECHNICAL GUIDANCE IN CHAPTER 11

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TECHNICAL SUPPORT

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TRAINING

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INSURANCE

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