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Department for Transport

Guide to **Electric Vehicle Charging Infrastructure for Local Authorities**

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To find out more about Cenex visit their website:
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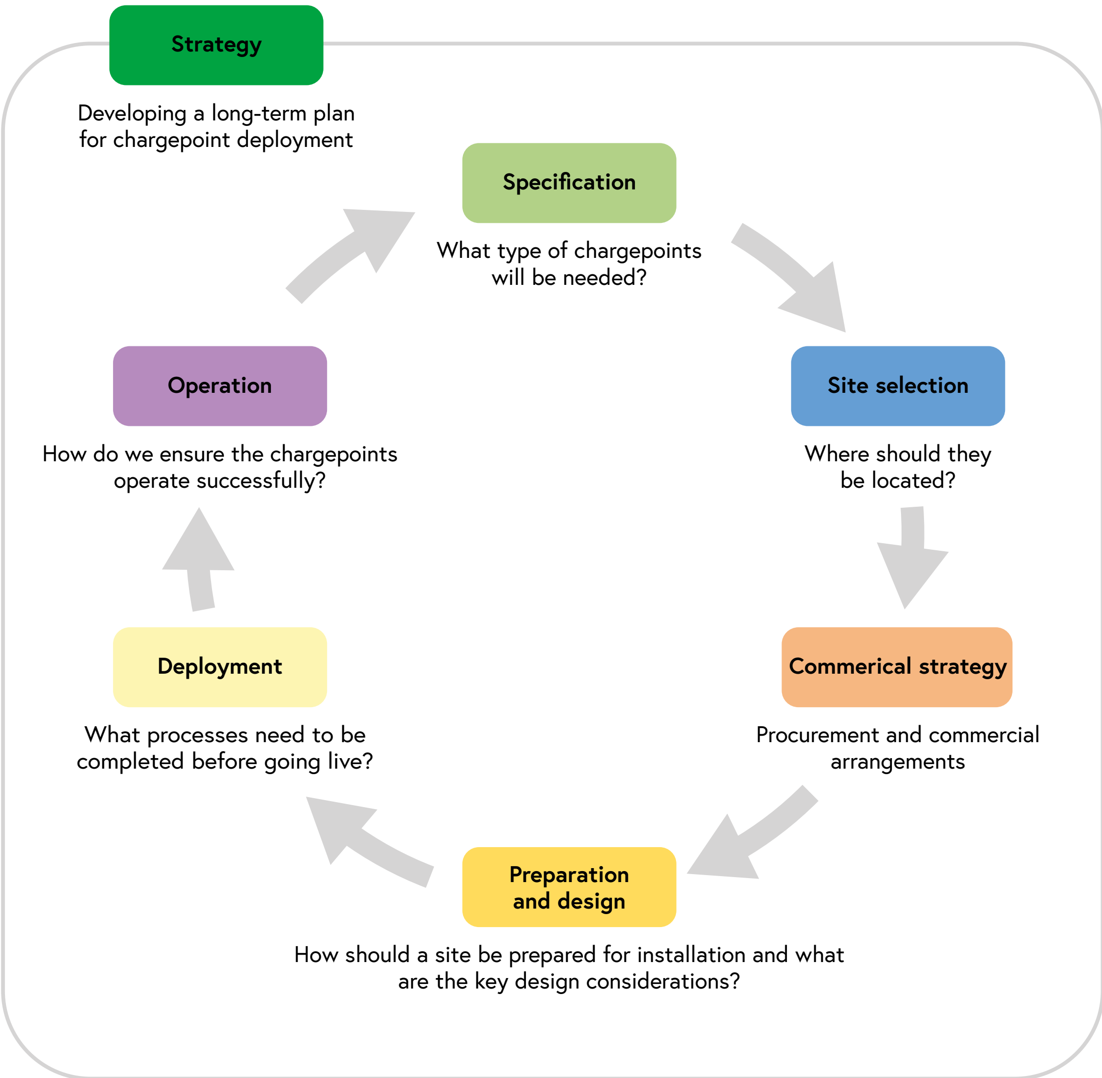
Section 1

Overview

This guide is intended as a comprehensive reference document for local authority officers in the UK, covering the key aspects of electric vehicle (EV) charging infrastructure installation in detail. The guide is structured to follow the typical lifecycle of an EV charging infrastructure project, with each section corresponding to a phase in the process of deploying chargepoints. This guide can be read in full or read in discrete sections.

All projects should be planned in line with strategies for EVs and EV charging, and take consideration of wider transport strategies.

Figure 1.1 Developing a long-term plan for chargepoint deployment



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1.1 EV chargepoint delivery summary

This section can be used as a general guide to deploying chargepoint infrastructure, with more detail provided in relevant sections presented throughout this guide. A general overview of the end-to-end process for deploying a chargepoint can be found in Appendix G.

Table 1.1 EV infrastructure summary and checklist

Lifecycle phase	Summary
Strategy/specification	Prior to commencing the deployment process of EV charging infrastructure, a local authority should first produce an EV charging strategy. This ensures that any deployment is aligned with said strategy. This strategy should consider the long-term needs for provision and the commercial competitive landscape, the type(s) of chargepoint most suitable to meet community needs, alongside available spaces on-street, in car parks and in other locations.
Site selection	To start the site identification and selection phase, the project should have identified the specific chargepoint type(s) to be installed as part of a strategy. For some projects, such as charging fleet vehicles at depots, this phase may be straightforward. For more wide-scale projects, for example, the rollout of an on-street charging network, there will likely be a significant longlist of locations that need to be assessed. To assess any number of sites, an initial shortlisting exercise can be undertaken. Criteria to consider include (dependent on chargepoint type): **(a)** existing and anticipated privately funded infrastructure; **(b)** proximity to households without off-street parking; **(c)** local EV uptake; **(d)** suitability of footways for additional street furniture; **(e)** redevelopment opportunity; **(f)** grid capacity; **(g)** land ownership; **(h)** accessibility; **(i)** traffic flows; **(j)** existing traffic enforcement; **(k)** cellular coverage; **(l)** biodiversity; **(m)** distance to amenities (shops, cafes, restaurants, stations); **(n)** proximity to buildings or areas of conservation; **(o)** potential users of the infrastructure; and **(p)** competitive market environment. When an initial sift is complete and sites have been scored, ranked or dismissed, it is good practice to contact the local Distribution Network Operator (DNO) as they provide the critical link to an electrical power supply. Some charging infrastructure may not require a new energy supply (typically those under 7 kW). Whereas for installations of higher-powered chargepoints or where several chargepoints are being installed, it is likely that DNO involvement will be required. Land registry and highways consents checks should also commence, to understand land ownership and asset boundaries.

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Table 1.1 *cont.*

<table>
<tr>
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Further checks that may assist in narrowing the shortlist include site visits with a highways engineer. This will help to understand access and manoeuvrability of where the chargepoint may be located.
<table>
<tr><th>Key tasks</th><th>☒</th></tr>
<tr><td>Design process for site identification and selection</td><td>☐</td></tr>
<tr><td>Assemble site longlist</td><td>☐</td></tr>
<tr><td>Score and rank longlist sites</td><td>☐</td></tr>
<tr><td>Conduct desktop surveys</td><td>☐</td></tr>
<tr><td>Conduct site surveys</td><td>☐</td></tr>
<tr><td>Assemble site shortlist</td><td>☐</td></tr>
<tr><td>Proceed to preparation stage for shortlisted sites</td><td>☐</td></tr>
<tr><td>Undertake site visits if necessary</td><td>☐</td></tr>
<tr><td>Engage DNO with shortlisted sites</td><td>☐</td></tr>
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<tr>
<td>Procurement</td>
<td>
The extent of the services that need to be outsourced will depend on the operating model selected. The different commercial arrangements that a local authority can adopt include:
(a) public – private commercial partnership (concession);
(b) own and operate;
(c) appointing an external operator;
(d) lease;
(e) joint venture; and
(f) land lease.

There are also several procurement methods that can be used to release sites to the market. The local authority should examine each to understand the most suitable. Many factors need to be considered before releasing sites to the market, and more information can be found in Section 5.3 of this guide.

Once the operating model and procurement strategy have been developed, and the local authority wishes to go to tender, sites can be selected from the shortlist. Irrespective of the procurement method being employed, the following should be considered:
(a) the scope of the services being procured;
(b) funding availability;
(c) technical specifications for equipment and back-office systems;
(d) contract terms (tariffs, revenue share, length etc.);
(e) subsidy control or procurement procedure financial limits;
(f) key performance indicators (i.e., site performance); and
(g) local competition (does the local authority need to ensure there are multiple providers in the area, to avoid a local monopoly?).

When combining multiple sites/areas, it is worth considering the overall infrastructure strategy for an area and balancing future need, scale opportunities and likely overall commerciality of the combination of sites.
</td>
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Table 1.1 *cont.*

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During procurement, it is also worth noting the whole life carbon costs of the chargepoint, including manufacture, installation and disposal.
<table>
<tr><th>Key tasks</th><th>☒</th></tr>
<tr><td>Decide on preferred operating model</td><td>☐</td></tr>
<tr><td>Identify relevant funding mechanisms and procurement routes</td><td>☐</td></tr>
<tr><td>Work with procurement department to design procurement process</td><td>☐</td></tr>
<tr><td>Run procurement process and evaluate responses</td><td>☐</td></tr>
<tr><td>Appoint service provider (supplier)</td><td>☐</td></tr>
</table>
</td>
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<tr>
<td>Preparation</td>
<td>
Depending on the project and strategy, work during the preparation stage may be done internally, where expertise and skills allow, or by an external service provider.
Key elements of this stage include:
Power
Regardless of chargepoint type, it is important that power demand is evaluated. This will identify if the site requires, on day one or in the future, an upgrade to an existing power supply or a new supply.
Guidance on techniques such as load management, on-site generation, storage and how to work with your DNO, is in Sections 3.5 - 3.7.
Should the site require DNO work, you may need to provide a preliminary site design.
<table>
<tr><th>Key tasks</th><th>☒</th></tr>
<tr><td>Evaluate power supply requirements with DNO</td><td>☐</td></tr>
<tr><td>Investigate alternative techniques such as load management</td><td>☐</td></tr>
<tr><td>Apply for new or upgraded connection if required</td><td>☐</td></tr>
<tr><td>Plan for the costs, legal requirements and timescales for DNO works</td><td>☐</td></tr>
</table>
Installation design
To deliver a site, preliminary and concept designs are required. When producing designs, several best practice items should be considered. This includes electrical distribution, earthing design, civil works, parking bay layout, disabled accessibility, security, streetscape guidance and future proofing.
Site/parking layouts
Where possible, charging infrastructure can and should be integrated into existing spaces, without disrupting other users of the space.
Accessibility
Charging infrastructure should be accessible. More information can be found in the PAS 1899:2022 Electric vehicles - Accessible charging - Specification.
</td>
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Table 1.1 *cont.*

Security

Both physical resilience and cyber security should be considered during site design and delivery strategy. Considerations should also be given to how site access and restrictions are enforced, and how vandalism will be controlled. A crime and disorder assessment should be completed to complement designs.

Key tasks	☒
Create installation designs for each site	☐
Ensure designs comply with best practice guidance, including design for accessibility, security and future proofing	☐
Iterate as necessary and gain approvals for designs	☐

Permissions and licensing

Chargepoints are subject to highways and consents procedures. This requires the local authority to grant relevant streetworks permits or licences/leases and planning permission.

Sites may also be subject to Traffic Regulation Orders (TROs), land ownership checks and liability.

Key tasks	☒
Work with local authority legal/consents officers to understand specific site requirements	☐
Gain necessary legal approvals (TROs, planning, land use etc.)	☐

Community engagement – pre-deployment

Irrespective of permissions and licensing, it is recommended that both intended user group(s) and non-users are consulted on the plans. Not only does this help advertise the infrastructure to encourage good utilisation once implemented, but it can help highlight any user concerns that can be addressed whilst still in the preparation phase. In some cases, it may be a requirement to consult local stakeholders.

Key tasks	☒
Create community engagement plan	☐
Engage identified stakeholders	☐
Gather feedback and iterate designs as required	☐

Construction planning

When power availability, planning, designs and community engagement are complete, construction phase plans should be produced. This will detail timelines and the health and safety risks associated with the construction phase of the project.

Key tasks	☒
Produce construction phase plan	☐

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Table 1.1 *cont.*

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Back-office support
The local authority should consider options for arising commercial and legal issues, enforcement, planned and reactive maintenance, revenue collection and data management. Having these systems in place will help inform future planning and management of the site. This may also include how the local authority and service provider will promote the site.
<table>
<tr><th>Key tasks</th><th>☒</th></tr>
<tr><td>Decide on a payment structure and agree review process for pricing</td><td>☐</td></tr>
<tr><td>Design a system for reservation (if required)</td><td>☐</td></tr>
<tr><td>Design reporting mechanisms for monitoring performance of deployments</td><td>☐</td></tr>
<tr><td>Plan for community engagement once operational phase begins</td><td>☐</td></tr>
<tr><td>Design systems for and agree user support, maintenance and end of life commitments with external supplier(s)</td><td>☐</td></tr>
</table>
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<tr>
<td>Deployment</td>
<td>
The level of involvement and responsibilities of the local authority during deployment will vary depending on the operating model.

To prepare the site, initial works may include DNO upgrades or a new connection (if required) and civils works. All necessary electrical equipment should be installed and connected, including metering, isolators, distribution and protective devices by qualified/accredited personnel. When the power connection has been confirmed, any remaining licences can be granted to the chargepoint operator (CPO) and the chargepoints can be installed.

As part of the deployment, the installer will ensure that the charging system is properly commissioned from both an electrical and a software perspective. Any necessary notifications to the DNO, grant funders and public charging databases should be made. If outsourced, the local authority can approve the installation if this has been agreed as part of the supplier's contract.
<table>
<tr><th>Key tasks</th><th>☒</th></tr>
<tr><td>Installation of hardware, civil works and electricals</td><td>☐</td></tr>
<tr><td>Commissioning completed</td><td>☐</td></tr>
<tr><td>Notifications completed</td><td>☐</td></tr>
<tr><td>Site deployment checking and approvals</td><td>☐</td></tr>
</table>
</td>
</tr>
<tr>
<td>Operation</td>
<td>
The guidance presented for this phase, whilst applicable to the operational phase of the project lifecycle, must be planned for earlier in the project to ensure the right processes and systems are in place.

Management and back-office support
When a site becomes operational, the site will move to business-as-usual.

Maintenance and back-office support procedures should be implemented, including regular reviews with service providers and regular reporting on key KPIs, such as reactive maintenance, revenue and utilisation.
</td>
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</table>

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Table 1.1 *cont.*

	Customer support and operation Implementation of plans to advertise infrastructure to drivers and provide support where required. The local authority may wish to operate a monitored email inbox and a service provider should offer a helpline. **End of life** End of life plans for the charging deployment should be planned for and contractually agreed with any external suppliers. This should take account of sustainable practices and recycling.

Key tasks	☒
Produce business-as-usual processes for maintenance, revenue collection, data management, enforcement, legal and commercial issues	☐
Observe performance of system to make changes to operation of the deployment, inform other projects and update strategy as required	☐
Carry out planned community engagement activities and respond to user feedback as required	☐
Installed sites uploaded to third-party websites/apps to ensure visibility of the infrastructure to users	☐
Receive and store health and safety files and as-built drawings	☐

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Section 2

EV charging infrastructure strategy – developing a long-term plan for chargepoint deployment

2.1 Support in developing an EV charging strategy

Local strategies should identify how to provide affordable, convenient charging for residents, businesses and visitors without causing footway disruptions that could discourage walking and cycling. Particular attention should be given to the charging needs of those without off-street parking.

The purpose of this guide is to provide technical assistance to local authorities on deploying EV charging infrastructure. It is not intended to give guidance on developing an EV charging strategy.

An initial checklist has been provided in Appendix F that will be a useful first step in considering what factors should be included in a charging strategy.

Further support and guidance on how a local authority can prepare its charging strategy is available:

(a) The Department for Transport (DfT) funds the Energy Saving Trust (EST) to run the local government support programme – an impartial advisory service which helps local authorities in England to develop local policies and strategies to support zero emission vehicle (ZEV) uptake.

(b) All local authorities in England are provided free access to the National EV Insight & Support (NEVIS) as part of the Local EV Infrastructure (LEVI) Fund.

It is vital that local authorities and policymakers up and down the country plan for zero emission vehicle uptake. The transition is reaching mass market with the ZEV mandate setting annual minimum targets for the proportion of new zero emission cars and vans sold in the UK, starting at 22 % of cars and 10 % of vans in 2024, then rising steadily to reach 80 % of cars and 70 % of vans by 2030, on a pathway to 100 % by 2035.

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Section 3

Fundamentals of EV charging infrastructure

The purpose of this section is to introduce the basic concepts of EV charging infrastructure.

3.1 EV charging technology

3.1.1 AC and DC charging

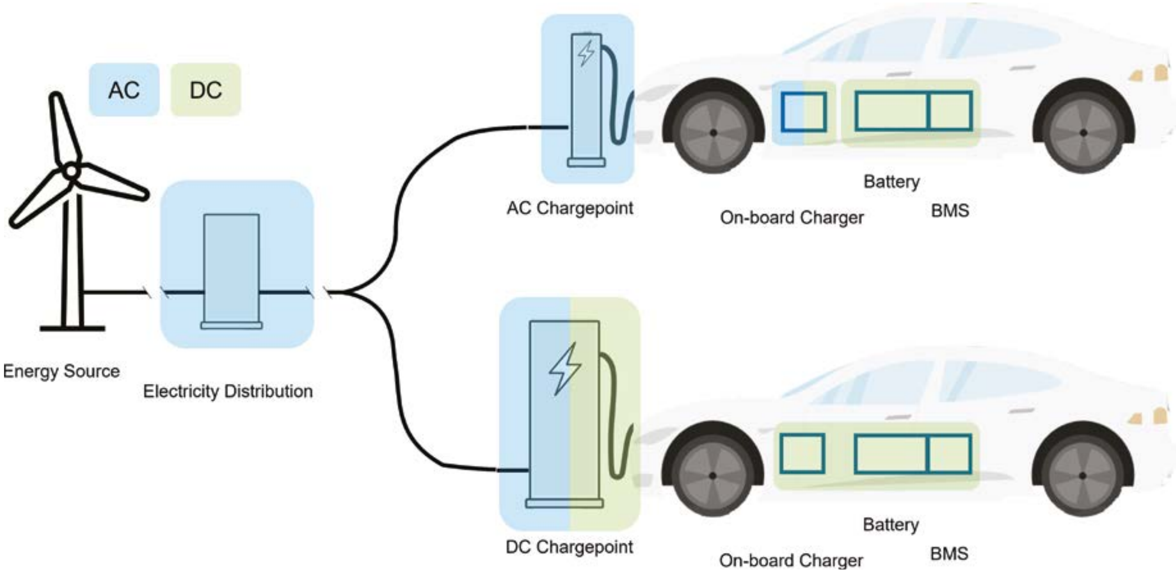
The national electricity network in the UK – that is, the network of wires that supplies electricity to our homes and businesses – is an alternating current (AC) electricity system. At the heart of all EVs is a rechargeable battery which powers the vehicle and requires direct current (DC) electricity. EV charging systems can be categorised depending on where the conversion from AC to DC is done:

(a) An AC charging system is where the power transfer to the vehicle is in AC and the conversion from AC to DC is done 'on-board' by the vehicle itself.

Within AC charging systems, there are also two further sub-categories depending on the number of electricity supply phases used; single-phase and three-phase. See Section 7.1 for more on single and three-phase electricity supplies.

(b) A DC charging system is where the conversion from AC to DC is done 'off-board' by the charging infrastructure and hence the power transfer to the vehicle is in DC. DC charging systems typically require a three-phase supply.

Figure 3.1 AC and DC EV charging system



AC charging systems are typically used for low-power (slower) charging. DC charging, where the added size and weight of the power electronics are housed in the chargepoint, is typically employed for high-power (rapid and ultra-rapid) charging.

Although there are some exceptions, the vast majority of modern EVs have vehicle inlets to facilitate both AC and DC charging. Larger vehicle segments, such as electric buses and heavy goods vehicles (HGVs), often only use DC charging due to their high-power charging requirements.

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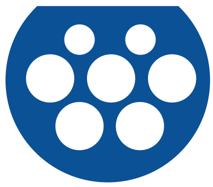
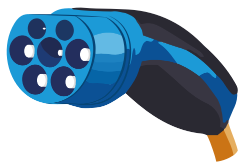
3.1.2 Connector types

3.1.2.1 AC charging standards

The dominant standard in the UK and Europe for AC is the Type 2 standard.

AC chargepoints can either have a socket-outlet, which the EV driver connects to with their own Type 2 charging cable (untethered), or a permanently connected tethered cable. Tethered chargepoints are usually convenient for users, while chargepoints with untethered socket-outlets facilitate unobtrusive designs which are potentially less at risk of vandalism as well as damage to, and trip risks of, unravelled cables.

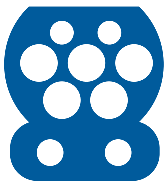
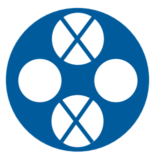
Figure 3.2 Type 2 AC charging connectors

Type 2 socket-outlet	Type 2 tethered cable
	

3.1.2.2 DC charging standards

There are two types of DC charging connectors common in the UK market, Combined Charging Standard (CCS) and CHAdeMO, as shown in Figure 3.3.

Figure 3.3 DC charging standards

CCS	CHAdeMO
 	 
The CCS integrates two DC pins to the Type 2 AC standard and therefore both Type 2 AC and CCS DC charging is achieved with the same inlet.	The CHAdeMO standard is a separate DC connector which is not integrated with the vehicle's AC connector. CHAdeMO includes its own DC power and communications within the pins of the connector.
CCS is the most dominant DC charging standard in the UK and Europe and is also used by larger vehicles such as refuse collection vehicles.	CHAdeMO is used by a limited number of vehicles, typically from Japanese manufacturers such as Nissan and Mitsubishi, although their newer models are adopting CCS.

Charging on AC or DC requires the EV driver to plug the connectors into the correct inlet, after which the car then 'talks' to the chargepoint to initiate a charging session, ensure that there are no faults and that it is safe to start charging. If charging at a home or at some workplace chargepoints, the vehicle then automatically starts charging.

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The power range of EV charging infrastructure is shown in Table 3.1. The terms used for slow to ultra-rapid charging are not standardised throughout the industry but are indicative of the power ranges normally attributed to each term. The difference between 'power' and 'energy' is:

(a) **Power** (i.e., charging power) is the rate at which energy is generated or used. This is expressed in kilowatts (kW).

(b) **Energy** (i.e., battery energy) is a measurement of how much fuel is contained or used by something over a specific period of time. This is expressed in kilowatt-hours (kWh).

As thinking of refuelling in these terms is relatively new to drivers making the switch, the time taken to charge a battery from 20 % to 80 % state of charge (SOC) has also been used. However, given the size of an EV battery can vary (from 24 – 100+ kWh, depending on the vehicle), the amount of range added to a typical EV battery in 20 minutes is also provided.

The times below are an indicative guide and consumers will need to check with their vehicle manufacturer on specific timings, although these will vary depending on battery state and size. Whilst power is also delivered at varying rates during charging.

Table 3.1 Charging power

	AC or DC	Example output power rating (kW)	Miles added per 20 minutes charging	Estimated indicative charging time from 20 – 80 % for 58 kWh battery
<8 kW	AC	3.7	4 - 5	9.5 hours
8 – 49 kW	AC	7.4[1]	7 - 10	5 hours
	AC	11	11 - 15	3 hours
	AC	22	7 - 30	1 hour 30 minutes to 5 hours[2]
50 – 149 kW	DC	25	25 - 34	1 hour 20 minutes
	DC	50	50 - 67	40 minutes
150+ kW	DC	100	100 - 133	20 minutes
	DC	150+	150+	15 minutes

Modern EVs can achieve 3 – 4 miles driving for every kWh of energy used, depending on temperature (including use of heating and air conditioning), driving style and driving conditions (motorway or urban driving and traffic).

3.2 The choice between AC and DC charging

At the time of writing, very few vehicles on the UK's roads are capable of 22 kW AC charging. The power capability of the cars' on-board chargers (OBC), both now and in the future, should be a key factor to consider. Today, the majority of new EV models on the market are capable of charging at least 11 kW. It is likely that OBCs with modern power electronics could increasingly support 22 kW charging in the future. But a current vehicle with a 6.6 kW OBC (such as the Nissan LEAF) will only charge at 6.6 kW if plugged into a 22 kW AC charger.

1 Commonly referred to as simply '7 kW charging'.
2 Charging time is dependent on the size of the vehicle's on-board charger.

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The appropriate power rating depends on the type of charging location and whether the electrical supply will be a new connection or an existing connection that is repurposed. For many CPOs and electric vehicle supply equipment (EVSE) suppliers, the cost difference between 7.4 kW and load managed (see Section 7.2.3) 22 kW AC charging equipment could be modest, but increasing numbers of vehicles will be able to charge at least 50 % faster. Chargepoints rated to 11 kW are not usually recommended as a vehicle with a single-phase OBC capable of up to 7.4 kW will only receive around 3.7 kW from a three-phase, 11 kW chargepoint.

An alternative option, that should also be considered by local authorities and CPOs, is to install DC chargepoints with power output in the 20 – 30 kW range. The biggest advantage is that all vehicles connected to this type of chargepoint should always be able to achieve the full charging power available over most of the charging cycle. DC charging equipment can also make use of load management to ensure effective use of the available grid capacity.

DC charging requires a tethered cable, ideally for each connector standard supported and it needs to be considered that there are still some older vehicles which are unable to charge with DC, which are dependent on AC charging networks for public charging. The capital cost of the DC chargepoint is likely to be higher and the chargepoint itself may be bigger than a 22 kW AC equivalent. These considerations mean that DC charging is often unsuitable for on-street locations.

There is a role for both 20 – 30 kW DC, and 22 kW AC, in the delivery of a balanced EV charging strategy. The choice can depend on several factors including the type of location, dwell times, existing charging provision, business case assessment, security and street clutter concerns.

3.3 New and future technologies

3.3.1 Bidirectional charging

Bidirectional charging, also known as vehicle-to-everything (V2X), with specific application such as vehicle-to-building (V2B), vehicle-to-home (V2H) and vehicle-to-grid (V2G), is the concept of using an EV to store energy like a traditional battery and to provide power back when needed. This ability to charge and discharge a vehicle is known as bidirectional power transfer. Benefits of V2X include balancing the energy system at periods of high-demand or low-generation, and optimising and maximising use of renewable power generation, thereby reducing carbon emissions and providing energy resilience.

There are currently barriers that prevent V2X from being deployed as readily as conventional one-way EV charging. These include a lack of hardware standards, vehicle compatibility and the capital costs of V2X chargepoints. Despite these current barriers, National Grid has forecast that up to 1.7 GW of V2G capacity could be connected to the energy system by 2030. At the time of writing, V2X technology is still in development and has not reached large-scale usage. It may be useful to include this technology for future proofing purposes, but it may be some time before it is commercially deployed at scale.

For more on V2X, refer to the following resources:

- **(a)** the Cenex website, with multiple case studies, insights and references for V2G; and
- **(b)** the V2G hub, for a map of V2G projects around the world and reports registry.

3.3.2 Wireless charging

Wireless charging technology allows an EV to be charged without the need for a physical connection between the vehicle and the charging infrastructure. Power transfer is achieved by induction and has benefits including the ease of use for drivers and the reduction of clutter.

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Whilst the technology is proven and is in real-world use in other transport sectors such as maritime, there are currently barriers which prevent widespread use for road transport. This includes standardisation, interoperability, the absence of compatible vehicles, cost and complexity.

Despite these barriers, and dependent on future developments, wireless charging could have future applications in a wide range of use cases including autonomous vehicles, disabled users and for taxi ranks.

Case study	
Name	Wireless Charging of Electric Taxis (WiCET)
Purpose	Wireless charging innovation

Figure 3.4 WiCET case study

The WiCET project, funded by the Department for Transport through Innovate UK, involved a consortium of partners led by Cenex, including Sprint Power (vehicle integration), Nottingham City Council (trial hosting), Coventry University (human factors research), Hangar 19 (back-office and billing), Shell and Transport for London (research).

The project retrofitted wireless charging receivers and associated integration to LEVC TX and Dynamo e-NV200 taxis. A wireless charging system was installed in a public taxi rank in Trent Street, Nottingham. This system allowed the vehicles to receive top up charges at 11 kW whilst queueing in the taxi rank to extend their range without impacting upon operations.

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3.3.3 Community charging

Community charging enables those using an EV to access chargepoints at private and workplace locations while they are not in use by the owner. It is an easy and convenient way to temporarily make a private chargepoint publicly available. This solution can be paired with cross-pavement channels (see Section 4.6.3) to allow neighbours to share a charger and help those without designated off-street parking. Community charging allows users without driveways to access competitive charging tariffs from neighbours or in places that they plan on staying for a short period of time. There are a range of applications and services available that offer community charging.

3.3.4 Charging standards

The International Organization for Standardization (ISO) has developed EV charging standard ISO 15118-20 which is designed to future proof chargepoints. There are two aspects of ISO 15118-20 relevant to this guide:

1. **Plug & Charge.** Currently, there is manual intervention required by the user to authenticate themselves to access a chargepoint network. Plug & Charge, when adopted by vehicle manufacturers, will allow a vehicle to automatically authenticate itself, complete payments and undertake charging events. In this future scenario, an EV user will simply plug their vehicle into a chargepoint and walk away, and the charging session will be handled by the ISO 15118-20 system.
2. **Smart charging and V2G.** ISO 15118-20 facilitates grid managed charging including bidirectional (V2G) charging. In the future, this will allow V2G via CCS DC and Type 2 AC charging systems. The CharIN association's roadmap lays out the pathway to V2G via CCS by 2025.

   NOTE: For AC charging systems, the vehicle would need additional on-board hardware to allow for bidirectional charging and the charging infrastructure installation would also need to be ready for V2G.

For local authorities, procuring ISO 15118-20 ready chargepoints and a Chargepoint Management System (CPMS) (see Section 3.10.3 and Appendix D) is recommended to ensure that their local networks are future proof.

3.4 Supplying and managing power

All EV charging infrastructure requires a source of electrical power. There are two potential sources:

1. The national electricity network via a connection to the local network of the DNO, hereafter referred to as a 'DNO connection'.
2. Local renewable generation sources located on-site, hereafter referred to as 'on-site generation'.

3.5 Introduction to Distribution Network Operators (DNOs)

There are seven DNO groups operating in the UK, each responsible for a regional distribution services area (see Figure 3.5).

1. Electricity North West (ENW);
2. Northern Powergrid;
3. Scottish and Southern Electricity Networks (SSEN);
4. SP Energy Networks (SPEN);
5. UK Power Networks (UKPN);
6. National Grid Electricity Distribution (formerly Western Power Distribution); and
7. Northern Ireland Electricity Networks.

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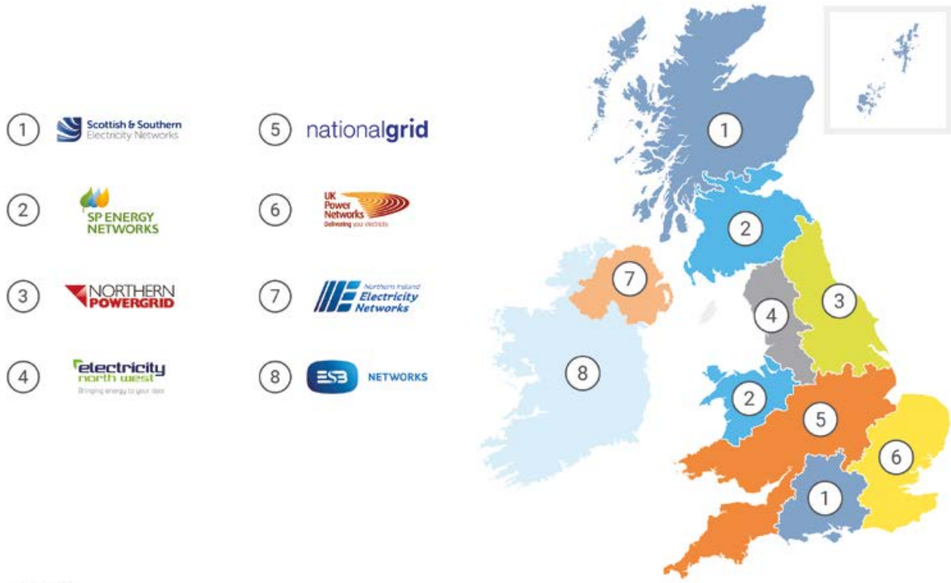
Figure 3.5 UK Distribution Network Operators (DNOs). Reproduced by permission of Energy Networks Association Limited



In addition, there are Independent Distribution Network Operators (IDNOs). IDNOs are regulated in the same way as DNOs, except the IDNO licence does not have all the conditions of the DNO licence[3]. IDNO networks are mainly extensions to the DNO networks serving new housing and commercial developments.

For most EV charging deployments with a DNO connection, the local DNO is a key stakeholder, which should be engaged at the earliest opportunity. They should also be engaged when developing EV charging strategies. This guide provides more information on how to best work with your local DNO for EV charging projects in Section 6.6.

To find out who your local DNO is, refer to the tool provided by the Energy Networks Association (ENA) Who's my energy supplier or network operator?

3.6 On-site generation and storage

Deploying on-site generation at an EV charging site can provide an alternative option to connecting to the national electricity network, for instance, in areas a significant distance from the existing network. Combining this with an energy storage system – typically a battery energy storage system (BESS) – gives flexibility as to when the energy generated is subsequently used, which is important for sites where EV availability and periods of generation do not align.

For some sites, deploying on-site generation and storage may result in a lower total cost than upgrading the DNO connection, or be preferred for sustainability purposes, given that such a system allows EV charging to use locally generated renewable energy. On-site generation can be used as a stopgap temporary measure but considerations around carbon, noise and air quality implications will need to be taken into account.

3 Source: Ofgem.

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3.7 Load management

Load management is where charging power is controlled at a local level to avoid exceeding the maximum demand of the DNO connection or other distribution constraints at larger sites. This can be useful to maximise the deployment of EV charging at a site whilst avoiding or deferring potentially costly upgrades to the DNO connection. For more information, see Appendix B.

3.8 Smart charging and the Automated and Electric Vehicles Act

Smart charging is a way of charging EVs at times when demand for electricity is lower, for example, at night, or when there is lots of renewable energy on the grid. This can be done through a smart chargepoint, an app or a timer on the car. By smart charging on an EV tariff, drivers could save money on their energy bills.

A smart charger can respond to a signal from a third-party controller to reduce charging power or completely defer charging.

The Automated and Electric Vehicles Act 2018 (AEVA) gives the government powers to mandate that all EV chargepoints sold and installed in the UK have smart functionality and meet minimum device-level requirements[4]. The core requirement of 'smart' functionality is that the chargepoint must have a data connection and be able to respond to remote control signals.

The Electric Vehicles (Smart Charge Points) Regulations 2021 have now been made into law by Parliament.

These regulations mandate that most private (domestic and workplace) chargepoints sold in Great Britain are smart and meet minimum device-level requirements.

3.9 The Public Charge Point Regulations 2023

The Public Charge Point Regulations 2023 came into effect on 24 November 2023. The purpose of the regulations is to improve the experience consumers have when using public chargepoints.

When the various provisions within come into force, they will have the following extent:

- **(a)** **Pricing transparency.** The regulations require pricing to be in pence per kilowatt hour, displayed clearly on the chargepoint, or through a separate device, as long as it doesn't require sign-up to use it. Once EV charging has commenced, the tariff price charged cannot increase above the initially advertised maximum rate. This has come into force with the regulations.
- **(b)** **Contactless payment.** From 24 November 2024, all new chargepoints of 8 kW and above, (aswell as all chargepoints of 50 kW and above), must offer customers the ability to make payments by contactless cards, in addition to any other payment methods that the CPO chooses to offer.
- **(c)** **Reliability.** From 24 November 2024, a CPO's network of public chargepoints of 50 kW and above will need to meet an average (mean) 99 % reliability requirement. The CPO will also be required to submit annual reports on chargepoint reliability achieved.
- **(d)** **Helpline.** From 24 November 2024, CPOs must provide a free of charge, 24/7 staffed telephone helpline for users needing assistance using the CPO's chargepoints. Records of helpline usage must be kept and submitted quarterly.
- **(e)** **Data.** From 24 November 2024, the regulations require CPOs to record and hold certain information for each chargepoint, which includes reference data and availability data, complying with the Open Charge Point Interface (OCPI) open data standard. This must be made available free of charge and shared in a machine-readable format.

4 Electric vehicle smart charging: Government response (publishing.service.gov.uk)

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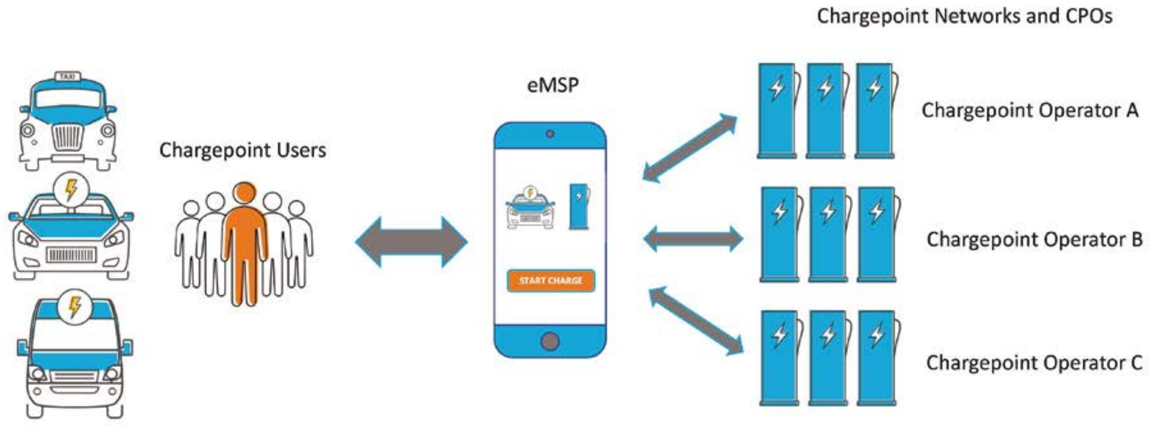
(f) Payment roaming. From 24 November 2025, CPOs will need to ensure that a person using their chargepoints can pay using a payment service provided by at least one third-party roaming provider external to the CPO.

3.10 Chargepoint networks

Figure 3.6 Chargepoint networks, eMSPs and CPOs



3.10.1 Public and private chargepoint networks

A chargepoint network is a collection of EV chargepoints that are controlled by a single operator. These can be both private or public. EV drivers that do not have access to private networks will be reliant on public networks for their charging needs.

3.10.2 Chargepoint operators (CPOs)

CPOs deploy, operate and maintain a public chargepoint network. This may be a different body to the chargepoint owner, installer or maintainer. The division of responsibility between the chargepoint host and a third-party CPO depends on the operating model (see Section 6.4).

3.10.3 Chargepoint Management Systems (CPMS)

The activities of EV charging networks require the chargepoint to have an internet connection to allow it to connect to a Chargepoint Management System (CPMS) (also known informally as a 'back-office') operated by the CPO.

The CPMS is a database of the chargepoints within the network. It is the platform responsible for monitoring the status of each chargepoint, initiates and terminates charging events when an approved user is identified, and collects data on transactions and energy usage.

3.10.4 e-Mobility Service Providers (eMSPs)

eMSPs are providers that offer EV charging services to the end user. This often includes operating a platform to facilitate payment or data services for EV charging across multiple networks. This can include providing user access through mobile apps whilst other services include features for locating chargepoints.

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The eMSP is a commercial agreement, put in place with the CPO. It allows the eMSP to provide its users access to the CPO's network. Some businesses may operate as both a CPO and an eMSP.

eMSPs operating in the UK can be found in the EV Roam database. EV Roam is the ID Registration Organization (IDRO) in the UK and issues eMSPs and CPOs with unique IDs. EV Roam is part of Renewable Energy Assurance Limited, a wholly owned subsidiary of the Renewable Energy Association.

3.10.5 Chargepoint network payment and roaming

The Alternative Fuels Infrastructure Regulations 2017 mandated that all public chargepoints are accessible for consumers to pay for energy on an ad-hoc basis, without providing their personal details or signing up for an account. Many CPOs facilitate ad-hoc access to their chargepoints via guest access to mobile or web applications.

One way to ensure that a user can easily access a chargepoint, irrespective of the network, is by providing a pay-as-you-go payment option. The Public Charge Point Regulations 2023, mandate that from 24 November 2024, all new chargepoints of 8 kW and above, as well as all chargepoints of 50 kW and above, must offer customers the ability to make payments by contactless cards.

Chargepoint payment network roaming allows the user to utilise a single app or RFID card that is provided by an eMSP or other provider to access multiple chargepoint networks.

3.10.6 Shared charging services

There are shared charging services (often referred to as community charging services) where the owner of a private chargepoint shares access with other users (at a cost). This type of solution can help those without private driveways to charge their EV near their home.

Increasing the utilisation of existing home and workplace chargepoints (which typically have a low level of utilisation) represents a quick, cost-effective and scalable means to provide EV charging. Active encouragement for the take-up of these solutions may form part of a local authority's charging strategy.

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Section 4

Specification – what types of chargepoints do we need?

This section provides an overview of the physical design principles of each type of chargepoint. This is overlaid with information on the standard charging power of each type of chargepoint.

4.1 Physical design

There is considerable variation in physical design of EV charging infrastructure.

In this section, the various charging solutions will be categorised by their physical form factor and a top-level description given. A summary of the target locations for each solution is shown in Section 4.7.

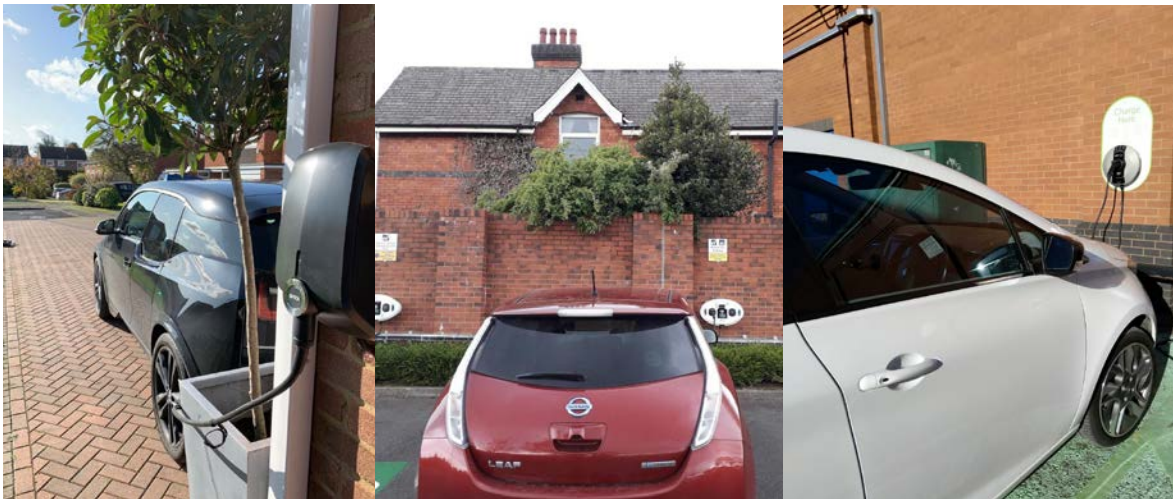
4.2 Wall-mount

Wall-mounted AC chargepoints require an existing support structure.

Table 4.1 Wall-mounted AC chargepoint basic specification

	Specification
Power range	3.7 – 22 kW
Outlet configuration	Tethered or socket-outlet(s)

Figure 4.1 Example wall-mounted AC chargepoints in home, public and workplace locations



These devices are often used in private locations but may be suitable for some public locations where there is a suitable available supporting structure, such as in car parks.

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4.3 Post/pedestal-mounted

Many wall-mount chargepoints can also be mounted on posts or pedestals to allow them to be placed adjacent to parking spaces where there is no existing supporting structure.

Table 4.2 Post/pedestal-mounted AC chargepoint basic specification

	Specification
Power range	3.7 – 22 kW
Outlet configuration	Tethered or socket-outlet(s)

Figure 4.2 Example post/pedestal-mounted chargepoints

4.4 Free-standing/pedestal (AC)

Free-standing AC chargepoints do not require an existing structure, post or pedestal mount. Some of these chargepoints, typically those intended for on-street applications, resemble bollards and integrate into the existing streetscape.

Table 4.3 Free-standing AC basic specification

	Specification
Power range	7 – 22 kW
Outlet configuration	Socket-outlet(s)

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Figure 4.3 Example free-standing AC chargepoints

4.5 Free-standing (rapid and ultra-rapid DC)

Rapid and ultra-rapid DC chargepoints have less variability in their form factor. That said, there are two further sub-categories:

1. **Single unit.** The AC to DC rectification is included within the chargepoint. They are large units, typically 1.5 m or more in height. This large volume is required to house the high-power electronics and an additional ventilation or cooling mechanism.
2. **Modular system.** These systems have one unit that is responsible for the AC to DC conversion, which then provides DC power to one or more dispenser modules.

Unlike with public AC chargepoints, DC charging infrastructure will have tethered cables attached and will deliver DC at 50 kW and over. Higher-power ultra-rapid chargepoints are larger than 150 kW rapid chargepoints.

Table 4.4 Rapid and ultra-rapid DC specification

	Specification
Power range	50+ kW
Outlet configuration	Tethered cables (for CCS and CHAdeMO)

Figure 4.4 Example rapid and ultra-rapid chargepoints

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4.6 Other infrastructure

There are innovations designed to combat the challenge of providing EV charging infrastructure on-street, in already cluttered streetscapes.

4.6.1 Flush-fit

Chargepoints designed to be hidden when not in use.

Table 4.5 Low visual impact AC basic specification

	Specification
Power range	7 – 22 kW
Size	Small, minimal or zero (when not in use) visual impact
Outlet configuration	Socket-outlet(s)

Figure 4.5 Low-impact infrastructure solutions: Urban Electric UEone, Streetplug and Trojan Energy. Reproduced by permission of Trojan Energy Limited

4.6.2 Integrated and dual-purpose

These are chargepoints that have been designed to integrate with other infrastructure. This can be existing infrastructure or new hardware that serves a dual-purpose (for example, local information, advertising, road updates).

Most commonly, these chargepoints make use of the electrical supply from new or existing street lighting. This solution is cost effective as there is no need for an additional electrical supply.

However, due to power limitations on lighting circuits, there may be a limit on the number deployable and the individual outlet power rating is 7 kW or less. There are also special considerations to be made regarding the electrical earthing of all on-street charging infrastructure (see Section 7.4.2).

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Section 4 – Specification – what types of chargepoints do we need?

Figure 4.6 EV charging integrated with street lighting: Ubitricity, Char.gy and City EV. Reproduced by permission of Ubitricity and City EV

Table 4.6 Integrated, dual-purpose AC basic specification

Figure 4.7 Integrated, dual-purpose AC chargepoint: Podpoint

Figure 4.8 Example of an integrated, dual-purpose chargepoint. Reproduced by permission of Legrand Finland Oy

	Integrated, dual-purpose AC specification
Power range	3.7 – 7 kW (uses existing single-phase supply)
Outlet configuration	Single socket-outlet (street lighting)
	Single or double socket-outlet (integrated)

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4.6.3 Cross-pavement solutions

Cross-pavement solutions are a way of overcoming barriers to on-street residential charging in some areas, by routing a cable from the home to the road, enabling households to charge using their domestic energy tariff. Consideration must be given to the surrounding environment and whether the solution effectively mitigates any cable trip hazards from trailing cables or affects wider accessibility on the footway. Additionally, cross-pavement solutions need to be deployed considering equitable EV charging access for all users and compliance with electrical requirements, in particular, ensuring simultaneous contact risks are mitigated.

Figure 4.9 shows examples that allow the EV user to charge from their own charging infrastructure using their home energy tariff, despite not having access to their own private driveway.

Table 4.7 Cable channel basic specification

	Specification
Power range	3.7 – 7 kW (uses domestic single-phase supply)
Outlet configuration	Can make use of a tethered or socket-outlet chargepoint

Figure 4.9 Cable channel solution: Kerbo Charge and Gul-e. Reproduced by permission of Kerbo Charge and Oxford Direct Services Trading Limited

NOTE: To install cable channels, the local authority will need to ensure the necessary licences and permissions are in place (see Section 7.5). Reinstatements will need to be approved by the local authority, and, as with all public charging infrastructure (particularly in on-street locations), to consider the question of liability issues (see Section 7.5.5).

4.7 Charging locations

There are four key charging location categories accommodating different user groups and their use cases:

1. **Long-stay.** Locations including residential and workplaces where vehicles are likely to be parked for a number of hours or overnight.
2. **Short-stay.** Locations including tourist, leisure and/or retail destinations where vehicles are likely to be parked for a small number of hours.
3. **Hub locations.** Locations which are dedicated to refuelling EVs, providing the fastest possible charge for as many different types of users as possible.
4. **En-route.** Locations which are dedicated to refuelling EVs, providing the fastest possible charges for those travelling into or through a region or area.

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Section 4 – Specification – what types of chargepoints do we need?

The top opportunities and challenges associated with each of the location types are presented in the following sections. This is included within this guide as it introduces key concepts that are pertinent to implementing charging infrastructure, such as land ownership, DNO connections and hardware costs, for each of the location types.

4.7.1 Long-stay

Appropriate equipment specification: 3.7 – 7.4 kW AC standard charging.

Figure 4.10 On-street residential long-stay charging

4.7.1.1 Long-stay: opportunities and challenges

The **opportunities** common to long-stay locations are:

- **(a)** For many use cases, long-stay parking represents a repetitive and predictable behaviour, for instance, parking at home or at work. It is therefore an ideal opportunity to charge an EV.
- **(b)** Providing charging in residential areas offers particular benefits to those who do not have off-street parking.
- **(c)** Many long-stay parking locations are owned and operated by local authorities, including park and rides, residential parking zones and workplace car parks.
- **(d)** Longer stays allow for lower-power solutions, which are normally lower in cost and less likely to require significant grid reinforcement, and therefore quicker to install.
- **(e)** Smart, load-managed (see Section 7.2.4) solutions are available that can benefit the grid and optimise the power available to connected vehicles.
- **(f)** Innovative solutions (such as those shown in Section 4.6.3) are available that can reduce additional street furniture and/or utilise existing electricity supplies – the latter of which typically results in lower-cost and quicker chargepoint installation.

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The **challenges** common to long-stay locations are:

The commercial business case can be less attractive than other forms of charging for the following reasons:

- **(a)** Lower power naturally delivers slower charging, meaning less throughput of electricity and vehicles.
- **(b)** It is likely that EVs will remain plugged-in for some time after a charge session has completed, especially in cases where the owner is unable to return to the vehicle purely to unplug (for example, park and ride) or unwilling to unplug (for example, overnight charging).
- **(c)** Combination of low power and low turnover of vehicles means that a greater quantity of chargepoints are required to meet demand.
- **(d)** Residential charging in on-street areas potentially adds street furniture to footways, reducing the available width for pedestrians or creating trip hazards (see Section 7.5.5).

However, many of these challenges can be addressed through entering well-considered contracts with suppliers and CPOs which strengthen the business case for private investment, reducing the need for public subsidy. These considerations are discussed in Section 5.

4.7.2 Short-stay

Appropriate equipment specification(s): For AC charging, load managed 22 kW and 7.4 kW fast AC charging is common. In locations where the typical vehicle dwell times are less than a couple of hours, then inclusion of 20 – 50 kW DC charging deployments can be suitable.

Figure 4.11 Short-stay charging at a tourist attraction: Warner Brothers Studio Tour, Watford

4.7.2.1 Short-stay: opportunities and challenges

The **opportunities** common to short-stay locations are:

- **(a)** Installing EV charging infrastructure in locations already popular with motorists will support charging in line with consumers' existing habits.
- **(b)** Chargepoints in high footfall locations will be seen by more people, increasing the visibility of the EV charging network and developing consumer confidence in EVs.
- **(c)** Short-stay locations can blend a mixture of 22 kW and 7.4 kW AC charging equipment with 20 – 50 kW DC charging options for faster charging.
- **(d)** Load management will likely be an important tool to make the most efficient use of existing grid supply capacity and ensure any new or upgraded grid connections are cost effective.
- **(e)** Providing EV infrastructure at retail and leisure destinations can help to promote the destination to EV users, potentially resulting in higher patronage.
- **(f)** In the long-term, EV charging infrastructure may contribute additional revenue to the site owners or, alternatively, could be provided as a free service to further attract EV users to the site.

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The **challenges** common to short-stay locations are:

- **(a)** Less likely that land will be owned and operated by the local authority, necessitating site access agreements and wayleaves, or initiative by the landowner.
- **(b)** Three-phase supply is required, which is not always available and may require additional works to implement (see Section 7.1).
- **(c)** 22 kW AC charging equipment will not provide a full 22 kW charge to all EVs, as this is dependent on the on-board charger fitted to the vehicle (see Section 3.2).
- **(d)** The infrastructure may not be available to the public at all hours, depending on location (for example, outside of opening hours), limiting its utilisation.

4.7.3 Hub model

At hub locations, EV charging is the primary reason to visit. Locations include:

- **(a)** **Existing fuel stations.** Addition of EV charging to fuel stations that are located to serve local drivers. These existing fuel stations may transition to a hub dedicated purely to EV charging.
- **(b)** **New EV charging hubs.** New locations created purely for EV charging, similar to fuel stations situated with shops or other services. Hubs are often close to retail outlets (for example, supermarkets), located in residential areas or provided for specific user groups such as taxis and private hire vehicles.
- **(c)** **Fleet vehicle charging hubs.** Charging infrastructure provided for charging of fleet vehicles at the fastest rate possible to support ongoing operations.

Appropriate equipment specification(s): 50 kW DC rapid and 150+ kW ultra-rapid. 22 kW AC fast charging may also be appropriate for hubs located near destinations.

Figure 4.12 EV charging hub in Stretford, Manchester

4.7.3.1 Hub: opportunities and challenges

The **opportunities** common to hub locations are:

- **(a)** Hubs have the potential to be the most used form of EV charging infrastructure provision, owing to their large usage capacity and high-power.
- **(b)** The hub owner can generate additional revenue from rental of on-site retail spaces, spaces to work on the go and concessions.
- **(c)** Technology is available that allows for additional power/chargers to be increased over time through the addition of modular transformer components.

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(d) Providing multiple chargepoints at a single site increases confidence that charging infrastructure will be available as and when required by EV users.
(e) Hubs can be combined with shared mobility services such as e-car clubs, e-cycles and e-scooters, as well as with public transport stops.

The **challenges** common to hub locations are:

(a) High capital costs associated with equipment, site preparation, electrical connection and installation.
(b) They typically require installation of a dedicated substation (see Section 6.1) to support installation of multiple high-power chargepoints, adding further cost and longer implementation times.
(c) Identifying suitable locations for EV charging hubs is complex, requiring factors including traffic flows and electrical capacity to be understood.
(d) In a hub setting, there is a desire to provide the fastest charge possible, however, this should be considered against the cost of the grid upgrades, the number of chargepoints and possible futureproofing works.

4.7.4 En-route

As with hub locations, at en-route locations, EV charging is the primary reason to visit. Locations include:

(a) **Existing fuel stations (en-route).** Addition of EV charging to fuel stations that are located close to the strategic road network.
(b) **Motorway service areas.** Serving EVs using the motorway network.

Appropriate equipment specification(s): 50+ kW DC rapid generally and ultra-rapid (150+ kW) along the strategic road network.

Figure 4.13 Ionity ultra-rapid chargepoints at a motorway service station

4.7.4.1 En-route: opportunities and challenges

It is expected for much of the provision of en-route charging to be undertaken by the private sector, so challenges and opportunities have not been included in this guidance.

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Section 5

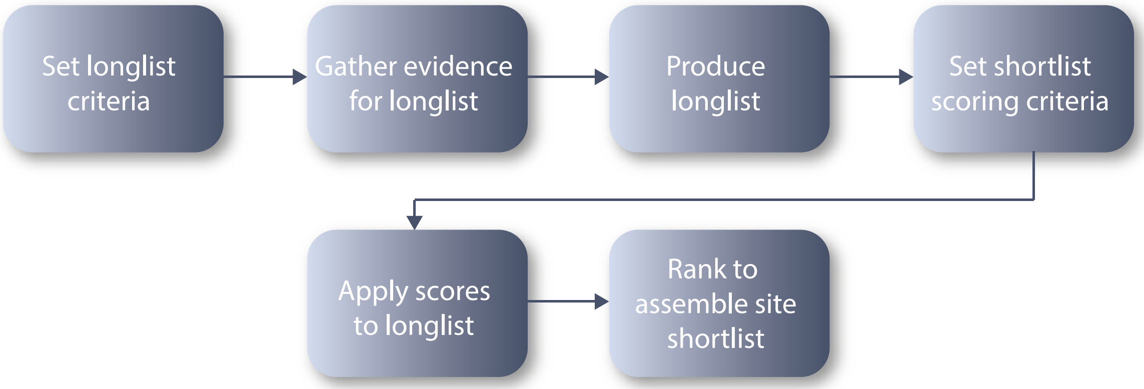
Site selection – where should the chargepoints be located?

This section is relevant to local authorities deciding where to deploy charging infrastructure.

5.1 Site identification and selection process

How sites are identified will depend on the charging solution being deployed, however, a common process can be followed to identify and assess sites (see Figure 5.1).

Figure 5.1 Site identification and selection process



5.2 Longlist production

A longlist of sites should be collected and stored. This may be through assessing an asset register or listing resident requests.

5.3 Shortlisting criteria and scoring

When shortlisting, the following criteria are useful to consider:

(a) Proximity to households without off-street parking

The most likely users of residential charging infrastructure will be drivers without off-street parking. Therefore, chargepoints are best located where the key user groups are. This can also be tied to resident requests for charging infrastructure.

(b) Resident requests

Compiling resident requests for charging infrastructure can be useful to locate areas with high demand for chargepoints. These requests can be mapped using easily available software but need to be considered alongside other transport strategies. It may also be prudent to monitor EV registrations in the local and surrounding areas to understand demand changes.

(c) Suitability of footways for additional street furniture

Footway widths should be checked to ensure they can accommodate chargepoints (more than 2 m once installed) without overcrowding or negatively impacting pedestrians, particularly disabled people. See Section 7.3 for further details on installation considerations and Section 7.1.2 on how the availability of electrical power supply can influence site selection. In some scenarios, the footway may need repair, which could be an ideal opportunity to take a dig-once approach and install infrastructure at the same time.

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(d) Redevelopment opportunity
Linking into the highways team within the local authority is useful for identifying areas which will be undergoing other infrastructure development (for example, broadband installations) or other construction activity. Doing this can maximise efficiency and reduce groundworks costs of the chargepoint project. The relevant licence or permit application will also help the authority to identify collaboration opportunities.

(e) Grid capacity
Locations that are close to local substations or existing power feeds will require little trenching and cable laying, saving costs. As of April 2023, the costs of network reinforcements and upgrades have been socialised, enabling lower costs when grid upgrades are required.
Many DNOs have, or are developing, mapping tools for grid capacity which can provide an early indication of whether a site is likely to have spare capacity or not (see Section 7.1.2). DNOs should be engaged at the earliest opportunity when considering chargepoint deployment, and if any sites nearby would be more suitable.

(f) Land ownership
Highway authorities may look to prioritise sites within their road network, which they own and are responsible for maintaining. When local authorities consider off-street locations, they may first assess whether car parks they own are suitable for charging infrastructure, as permitting installation on these sites is easier compared to privately owned land.

(g) Accessibility
Consider how accessible the site is (see Section 7.7). If a site can be designed to accommodate all users, it will entice more usage.

(h) Traffic flows/modelling
The higher the traffic flows, the higher the exposure to users. This applies to both en-route and hub sites, where high-mileage users will be looking for top up charging. In some cases, traffic modelling may be acceptable to gain a proper understanding. It is key to consider speed restrictions on the highway, as this may impact the accessibility and desire to use.

(i) Existing traffic restrictions
Any existing traffic restrictions, such as a maximum stay time, should be considered to ensure the site is suitable. For lower-powered chargepoints, vehicles will need to be plugged in for many hours to obtain a full charge and the consumer may not be able to move the vehicle if charging ends in the middle of the night.

(j) Cellular coverage
Chargepoints require an internet connection (usually delivered via a cellular connection) to operate (process payments, provide telemetry etc.). The sites will therefore need to be covered by 4G or better (or have a dedicated internet connection installed), checked at the charging location before installation. The 3G networks are gradually being switched off, as mobile providers prepare for better, faster, and more reliable services. Cellular coverage should be considered when planning installation of chargepoints.

(k) Biodiversity
The proximity of a proposed location to trees and other plants should be considered. Trees and biodiversity may require removal or could be protected with tree preservation orders. Removal could be costly and have an impact on any biodiversity net gain requirements.
By considering the above criteria (and any others), the local authority could begin to map the sites to determine which to prioritise. As above, this can be utilised to develop a portfolio with a mix of sites across these categories.

(i) **Demand.** Does the area have high existing demand for charging infrastructure?

(ii) **Cost.** Does the site have high costs owing to the location, grid capacity or other factors (i.e., accessibility)?

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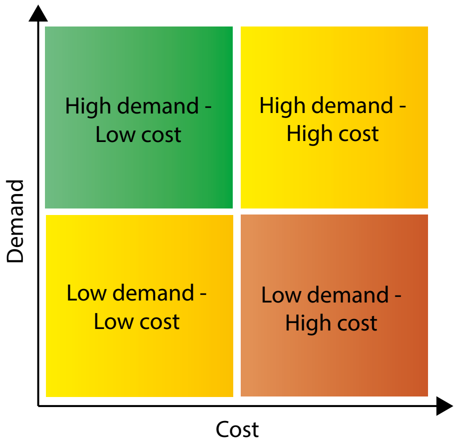
Figure 5.2 Site identification and selection process



Case study	
Name	Islington Borough Council
Purpose	On-street EV chargepoint request form
Islington Borough Council have implemented a system, hosted on their website, by which residents in the borough can request a new chargepoint. The web-form asks the necessary questions to capture the relevant data from the user and makes it clear to the applicant how their data will be used. Whilst the Council could have developed a mobile application to serve the same purpose as a web-page form, this would have required greater development effort and is unnecessary given that data collection will be once per user.	
More information	Request for an on-street electric vehicle (EV) charging point - Islington Council

5.4 Site surveys

Desktop and on-site surveys are important to capture information about potential sites at two stages:

1. **Ease of installation** (see Section 7.1). The survey should identify how easily a chargepoint can be installed and potential costs.
2. **Inform the design of the installation** (see Section 7.3). The specifics of the site are looked at in detail to allow the installer to design the necessary electrical and civil works, cost the works and subsequently complete the installation. This may be done in conjunction with, or wholly by, a chargepoint supplier.

Appendix C lists a number of considerations that could be included in a site survey.

NOTE: Depending on the procurement schedule, site surveys may be performed by staff from the local authority itself (or their approved contractors), or by an EV charging installer that has been contracted to deploy EV charging.

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5.5 Underground services

Local authorities may have access to data which allows for a survey for underground services to be done from a desktop. Online tools are available to local authorities, such as LineSearchBeforeUDig and DigDat, which can be used as an initial starting point. It will be necessary to check for any warnings of the presence of underground services during the site survey. To confirm the presence and precise location of buried services, such as power cables, the relevant equipment owners, such as the DNO, highways authority, Ministry of Defence or Network Rail, should be contacted. If there is still uncertainty, then it may be necessary to perform a non-intrusive survey, for example, using cable locating devices. For more on underground services surveys, refer to the HSE guide.

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Section 6

Procurement – who will supply and pay for the chargepoints?

6.1 Overview

As part of a local authority's EV charging infrastructure procurement strategy, four high-level decisions must be made:

1. What is the appropriate level at which to be conducting procurement? For example, should it be conducted by the county council or by individual district councils? Or perhaps even wider in collaboration with other neighbouring authorities or other tiers of local government?

   This decision may require a compromise between speed and impact; working with others may take longer but will have a greater impact as the resulting procurement exercise will cover a larger region and would likely see greater economies of scale.

2. What procurement method will be used? (See Section 6.8.)

3. Which operating model is preferred and therefore what goods and services are needed to be procured? (See Section 6.4.)

4. How will consumer interests be maintained, and monopoly exploitation be avoided?

   This strategic decision will require an understanding of the local competitive landscape now and into the future, consideration of appropriate contractual controls on key terms such as tariffs charged to residents, and whether to procure for one supplier or multiple suppliers to ensure local competition.

In addition, the following need to be considered, irrespective of the procurement method followed:

(a) the scope of the services being procured (Section 6.5);
(b) funding availability and mechanisms (Section 6.10);
(c) technical specifications for equipment and back-office systems (Section 6.11.1);
(d) contract terms (Section 6.14); and
(e) other constraints such as subsidy control or procurement procedure financial limits.

6.2 Enabling private investment in EV charging via procurement methods

Well-considered operating models and procurement tenders will allow local authorities to reduce, or eliminate, the need for public subsidy towards charging infrastructure in their area.

6.3 Generating revenue from EV chargepoints

A chargepoint operator's main source of revenue is from the electricity sold to drivers. The revenue generated by a chargepoint will vary greatly depending on its location and power, both of which will influence the chargepoint's throughput (i.e., how many vehicles a chargepoint can serve over a period of time). As EV ownership increases over time, revenues from charging infrastructure will increase.

Local authorities should prepare procurement tenders which aim to attract private investment, usually through chargepoint operator investment. Depending on the commercial arrangement, they will wish to consider the opportunities for an appropriate share of revenue over the period of the contract as the EV market and utilisation develops.

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Local authorities should note that linking revenue share to network utilisation may be better for the commercial sustainability of the network. However, the local authority should always aim to cover their contract management costs, either through a proportion of revenue share or a small indexed fixed fee.

6.4 Operating models

6.4.1 Introduction to operating models

Before a local authority can begin its procurement exercise, they must determine what operating model they want to pursue. This section compares four common operating models. It will outline how, for each model, the responsibilities relating to capital costs, operating costs and revenue are shared differently between the landowner and an external supplier.

The operating models outlined in this section focus on public charging infrastructure.

Whilst the most obvious distinctions between each operating model are in how costs and revenue are shared, there may also be a variable share in the contractual control over how the chargepoints are operated. In general, the greater the investment made by an external supplier(s), the greater the control the supplier(s) may require. However, this is balanced with the revenue potential of the site. Where a site has high revenue potential, it will be more attractive to external suppliers, leaving the local authority landowner in a position to reduce, or eliminate, the requirement for any public funding to be put towards the project.

A local authority must select an operating model to use for public charging networks. This will then inform the goods and services that need to be procured, and the contractual arrangements that need to be agreed with the external supplier(s).

The following sections explain each of the models, outlining at a high level the practicalities of each and their respective benefits and drawbacks.

6.4.2 Concession

A concession contract consists of the right for the service provider to exploit the work that is the subject of the contract or that right to exploit together with a payment for the service provided.

Here, the local authority provides some capital investment. The local authority retains some control over the quality of service and/or location of the electric vehicle infrastructure, (EVI) by having an active role in contract management and performance monitoring of the service provider. The risk and responsibility associated with installation, maintenance, operations and asset utilisation is transferred to the service provider who finances the capital and replacement costs of the charging infrastructure.

Consequently, the contract term can be as long as it needs to reflect the period required by the service provider to recoup the capital investment and make a return on it.

The local authority often retains a small portion of the revenue generated as a payment for the concession and to fund contract management. Important elements of control can be retained by the local authority by ensuring that relevant terms and conditions are used.

A lease, on the other hand, is simply an interest in the property. The party leasing the land has a grant of possession of the land for a definite period and for a definite payment arrangement. Consequently, the local authority has very limited control over the eventual EVI service.

More information can be found on the LEVI repository[5,6].

5 https://nevis.cenex.co.uk/login?redirect_to=/repository/concession
6 https://nevis.cenex.co.uk/login?redirect_to=/repository/land-lease

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The concession model can require relatively little up-front capital investment from the landowner, though the proportion of costs can vary considerably, depending on the commercial attractiveness of the sites and the contractual terms available to a supplier. Generally, the longer the contractual term the landowner offers, the greater the capital investment the external supplier will be willing to provide. This is because there is more time for the investment to be recouped and profit generated. As EV ownership is forecast to rise over the coming decade, an external supplier can expect the highest revenue returns from the concession agreement in the later years of the contract. However, lengthier contract durations may result in higher maintenance and replacement costs during the contract as technology improves, and these costs should be considered when planning for a long-term concession. It is recommended that responsibility for replacement of hardware and technology improvements are made clear in the contractual terms.

6.4.3 Own and operate

The own and operate model represents the most involved level of intervention for the landowner. All costs are covered, and all revenue is retained by the landowner. The landowner or a specialist third party (for example, installer, civils contractor) prepares the site, including groundworks and electrical connection, procures the EV charging equipment, funds the installation of the equipment and purchases a back-office (CPMS) system to manage the chargepoint. This option requires significant public funding from the outset, as well as funding to cover maintenance and other operational costs. By comparison with other ownership models, own and operate offers the greatest revenue opportunity but also the greatest risk to the landowner. In this model, the landowner has control over all aspects of how the chargepoint is operated, including tariffs and network compatibility.

When evaluating the merits of this approach, local authorities should consider the staffing implications and investment required to deliver this service.

6.4.4 External operator

The key difference between the own and operate and the external operator[7] models is that the local authority directly manages the customer and receives charging revenue in the former (paying the service provider as a sub-contractor), whereas the service provider manages the customer and receives income in the latter.

Therefore, external operator is a contractual relationship between the local authority and service provider whereas in own and operate, the network is local authority branded, but the back-office and operations may be sub-contracted. In external operator, the local authority should receive the larger share of the revenue, but this is a sliding scale depending on the level of control retained in the contract.

Usually, the service provider collects the revenue and then shares it back to the local authority. In own and operate, the local authority retains all of the revenue and pays the sub-contractors as necessary.

The supplier then provides the back-office (CPMS) system at no direct cost, in return for a share of net revenue gathered by the chargepoint, or at a fixed monthly cost (without revenue share). This operating model removes some of the operating expense. The capital investment is still entirely provided by the landowner and, except for chargepoint network interoperability (see Section 3.10.5), the landowner retains control of how the chargepoint is operated.

7 https://nevis.cenex.co.uk/repository/external-operator

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6.4.5 Lease

The lease operating model typically represents the lowest level of investment from the landowner. All capital and operating costs are covered by an external supplier, with a share of revenue (or rental payment) retained by the landowner in return for their land. This model involves the least exposure to financial risk but the least opportunity for revenue generation.

The success of this model relies on sourcing an external supplier willing to accept the financial risk. This will be dependent on the type of site being offered and its revenue generating potential. In less appealing sites, external suppliers may seek additional contractual assurances to mitigate long-term risks, such as greater autonomy over user tariffs, a longer lease period, and/or favourable contract termination conditions. It has also been common for lease agreements to provide the external supplier with ownership of the local connection assets. This poses several risks, particularly for installations in the highway. While installing in the highway eliminates disruption to pedestrian movement, it can be problematic for access and egress, lease agreements and traffic management.

6.5 Procurement scope

When planning procurement, the scope of equipment and services being procured must be considered. This could range from the supply of chargepoint hardware for a single site, to the recruitment of a provider for a full service to identify multiple sites, providing equipment and back-office systems.

The first key consideration when designing a procurement exercise is the operating model that is being used. For the own and operate model, procurement can be relatively simple and the local authority can run separate procurements (see Section 6.8) for the goods and services required. However, as all costs will need to be met by the landowner, substantial public funding or financing is required. For the other business models, where the revenue and costs are split with the supplier(s), designing the procurement exercise becomes more complex. Table 6.1 lists the considerations that need to be made for the other operating models.

Table 6.1 Procurement scope considerations: business model

Relevant operating model(s)	Consideration	Referenced sections
External operator	Is the CPMS being procured compatible with the hardware that the local authority has or plans to procure?	6.13 Chargepoint operator and CPMS procurement checklist
Lease/concession	Is there suitable power provision in place?	7.1 Power
All	There is a risk for some sites with low expected utilisation that suppliers will not be willing to bid unless the contractual terms are favourable. If this is the case, options available include: **(a)** combining less attractive sites/areas with more commercially attractive sites under larger contracts to enable cross-subsidy; and **(b)** using the own and operate model.	6.14 Contracts 6.4.3 Own and operate

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6.6 Procurement scope: DNO engagement

In Section 7.1, the subject of providing power and DNO engagement is covered. When considering DNO engagement as part of tender preparation, there are two applicable scenarios:

1. **Implementation only.** For supply and installation of a known number of EV chargepoints of a known power at known sites with allocated power provision. Under this category, the local authority must have already engaged with the DNO and obtained a cost quote for each network connection to tender for the contract with an accurate quote.
2. **Consultancy and implementation.** A local authority may include consultancy services during tender preparation. Consultation will include either:
   (i) identifying and selecting charging locations and solutions; or
   (ii) designing the system to supply power to each location (a combination of one or more of a new DNO connection; existing DNO connection; load management system; on-site generation and storage).

In these scenarios, it is acceptable not to engage the DNO by this stage, as the consultant will do this for the local authority.

6.7 Procurement scope: design and installation services

Installation services are sourced in three main ways:

1. **In-house.** Some local authorities have access to in-house civil and electrical teams who can complete installation works with no outsourcing required. In-house teams must be capable of chargepoint installations in line with the advice given in Section 7.4.

   Using in-house teams with no prior experience of installing EV charging infrastructure is not recommended for significant deployments. However, if in-house expertise does exist, this approach can give the local authority the greatest level of control over the installation quality.

   NOTE: In-house teams may not be authorised by the DNO to perform contestable works (see Section 7.1.2).

2. **Outsourced to specification.** A local authority can define the specification for installation, accounting for the considerations such as electrical supply, civil works and parking bay layout listed in Section 7.6.

   With this approach, the local authority retains full control over the design and hence, the quality of the installation. However, the installation specification must ensure that enough detail is included for installers to be able to quote accurately without being overly prescriptive to prevent innovative solutions. Additionally, installers may be reluctant to quote for work at sites which they have not previously surveyed themselves.

3. **Outsourced design and delivery.** When the design and the installation work are outsourced, it may be necessary to use a case study to assess the installer's cost and quality for a typical installation. Once recruited, the installer will then be able to ensure that the information collected as part of a site survey is accurate before completing design and installation work.

   This approach may be most appropriate to recruit and then work alongside a commercial CPO to design a charging network. This is because CPOs may be better placed to optimise the locations for EV chargepoints factoring in DNO connections and business case. However, the local authority should ensure an equitable deployment of charging infrastructure and will need to be careful to agree contractual terms to retain appropriate control.

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6.8 Procurement approaches

Local authorities should be familiar with public procurement processes. For further guidance, refer to the Local Government Association's guide to procurement[8].

The Procurement Forum section of the LEVI Knowledge Repository, funded by the Department for Transport and hosted on the National EV Insight & Support (NEVIS) service, contains extensive guidance for local authorities to address the key challenges associated with procuring EVI including setting terms and conditions, knowing what to procure and agreeing service level agreements (SLAs). This guidance includes:

- **(a)** heads of terms for contractual arrangements;
- **(b)** technical schedules; and
- **(c)** tender evaluation.

The guidance is primarily aimed towards what has become the most popular operating model, the concession arrangement, but is also relevant for the other operating models.

6.8.1 Conventional public procurement

Public competitions run by the local authority allow all interested contractors to respond to an invitation to tender. Depending on the maximum budget, different approaches may be taken, ranging from three quotes to a full open public tender.

Many local authorities use the request for information (RFI) procedure to help define their procurement objectives and terms of reference. It is hoped that this guide may remove the need to carry out an RFI stage.

Depending on the goods and/or services being procured, the tender may be split into lots, allowing different suppliers to tender for different contracts.

6.8.2 Specialist frameworks

There are specialist frameworks and dynamic purchasing systems (DPS) which are designed to be used by local authorities procuring EV charging infrastructure.

The Procurement Act 2023 comes into force on 24 February 2025. These regulations replace the existing set of procurement regulations.

Under the new regulations, concessions cannot be arranged through dynamic markets[9] or frameworks.

To be considered to be commenced under the existing regulations (CCR 2016, PCR 2015 etc.):

- **(a)** Prior to 26 May 2023, a prior information notice (PIN) was used as a call for competition by a sub-central contracting authority.
- **(b)** A contract notice, voluntary transparency notice, below-threshold contract opportunity, utilities notice or sub-contract notice was published under the previous legislation.

DPS, framework agreements and contracts let before 24 February 2025 must be managed under the existing regulations. DPS and framework agreements let under previous agreements must end before 23 February 2029 or when they expire, whichever is earlier.

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8 *A councillor's guide to procurement*, 2019 edition (local.gov.uk)

9 The Procurement Act 2023 replaces DPS and qualification systems with a single new 'commercial tool' called a dynamic market. Dynamic markets are an evolution of DPS with an expanded scope of what can be purchased using them. https://www.gov.uk/government/publications/procurement-act-2023-guidance-documents-define-phase/guidance-dynamic-markets-html

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Section 6 – Procurement – who will supply and pay for the chargepoints?

Concessions can be arranged using the different procedures set out in CCR 2016 before 24 February 2025 and must be arranged using the procedures set out in PA 2023 after that date.

There may be other specialist frameworks accessible to all UK local authorities in the future. Those listed below are current examples of existing frameworks and dynamic purchasing systems. Others include NEPO, ESPO, Procurement Services by Kent Council etc. When procuring work, you should seek individual legal advice:

(a) Vehicle Charging Infrastructure Solutions (VCIS) DPS

The Vehicle Charging Infrastructure Solutions (VCIS) DPS[10], run by the Crown Commercial Service and running until April 2026, offers access to the following:

- **(i)** consultancy and feasibility;
- **(ii)** civil design and installation;
- **(iii)** provision, installation and maintenance of hardware;
- **(iv)** software and back-office solutions;
- **(v)** lease and purchase of products; and
- **(vi)** full end-to-end service.

The VCIS framework has been designed to allow buyers to build their own specifications, competitions and contracts but provides a standardised process and access to existing suppliers. This can save time with respect to a conventional public competition which would effectively be starting from scratch.

(b) Transport Technology & Associated Services (TTAS) framework

The TTAS is also operated by the Crown Commercial Service however, it is a conventional framework rather than a DPS. The current iteration of the TTAS is due to expire on 5 October 2025.

Under the TTAS, contract durations are limited dependent on the lot (for example, up to 7 years for complex services). This contrasts with a DPS, which typically does not specify maximum contract length. The TTAS also differs to a DPS by having a fixed supplier list, containing 76 registered suppliers. This means no new organisations can register, though they could be integrated as subcontractors to a TTAS registered supplier. The primary differentiator between the TTAS (as a framework) and VCIS (as a DPS) is that pricing rates and terms are agreed upfront, and suppliers must not exceed these costs in their tender.

The TTAS is broad in scope and offers seven lots, however, the lot relevant for EV charging infrastructure is Lot 5: Sustainable Transport Technologies[11].

6.9 Assessing business cases

The business case for any chargepoint deployment is sensitive to the data and assumptions used. Commercial chargepoint network operators will likely have their own methodology for assessing the business case for sites. They may be willing to share the results with a local authority as part of the site identification process. The key variables that impact the commercial viability of a site are:

(a) The expected percentage utilisation (both now and in future). This is a combination of multiple lower-level factors:

- **(i)** The type of location. As mentioned in Section 4.7, different location types will have varying levels of utilisation.
- **(ii)** The hours for which the chargepoint is available (not all locations will be accessible to chargepoint users 24/7).

10 Vehicle Charging Infrastructure Solutions (VCIS) - CCS (crowncommercial.gov.uk)

11 Transport Technology & Associated Services - CCS (crowncommercial.gov.uk)

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(b) The power output of the equipment. Higher-power infrastructure will have greater energy throughput for an equivalent utilisation and therefore will generate greater revenue.
(c) The charge to users.
(d) The cost of the charging infrastructure, which will vary due to the appropriate charging specification for the location (see Section 4.7).
(e) The cost of the installation, which will vary from site to site due to, for example, proximity to new or existing electrical connections and the civil works required (see Section 7.1.4).
(f) The cost of DNO connections or reinforcement works (see Section 7.2.3).
(g) The duration of the contract on offer (see Section 6.14.1).

6.10 Funding arrangements

The conclusion of the factors discussed in Section 6.9 is that, typically, high-power charging (rapid or ultra-rapid) in en-route and hub locations have stronger business cases than lower-powered charging (slow, standard or fast) in long or short-stay locations. This is because the higher energy throughput is sufficient to offer a greater (and/or faster) return on investment despite greater capital costs.

The UK is now seeing increased private investment in networks targeting both short and long-stay use cases. When a local authority selects an operating model for a charging infrastructure project, they are choosing between using public funds (own and operate), attempting to attract private investment (lease), or a combination of both public and private funds (external operator, concession).

The stronger the business cases for the chargepoints, the greater the proportion of private investment which can be leveraged from an external supplier to support their installation and/or operation. Conversely, locations with weaker business cases may have a greater need for public intervention. To attract private funding for a lease or concession agreement for long-stay locations, the local authority will need to offer contractual terms that make the investment commercially viable.

Key factors affecting the commercial viability include the length of the contract, level of operating tariffs, share of revenues and expected chargepoint utilisation levels at the locations[12].

Letting larger contracts, which bundle together more commercially attractive sites along with those with lower expected utilisation, can ensure comprehensive charging infrastructure across an area, whilst leveraging private investment. This is sometimes referred to as a portfolio approach.

Large-scale, long-term contracts competitively tendered to the market can enable local authorities to serve the charging needs of residents into the future, taking advantage of economies of scale and future market confidence in EV uptake provided by the ZEV mandate. The detail of the contractual terms offered by local authorities is critical both in ensuring commercial viability and securing appropriate protections for the local authority and its residents. Key factors to consider include appropriate competition in the local market, how to ensure tariffs charged to residents remain appropriate for the duration of the contract and asset ownership when it ends.

6.10.1 Loans

Loans are available for net-zero and EVI projects via the UK Debt Management Office. As the market moves to an early majority, private lenders are also beginning to offer loans for EVI. The key factors to consider are the tenure of the loan (length of term) and interest rates which can be fixed or floating. The repayment of the loan will typically rely on revenue from the EVI deployment. Therefore, a good view of current and future utilisation of the EVI, and a commercial arrangement which allows the local authority to earn sufficient revenue, are essential to secure the loan. Some innovations in the green finance industry are working on lending products which link the loan payback to EVI utilisation. The following are some sources of EVI loans for local authorities.

[12] https://nevis.cenex.co.uk/repository/funding-evi

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6.10.1.1 Public Works Loan Board (PWLB)

The PWLB is operated by the UK Debt Management Office (DMO) on behalf of the HM Treasury. The board provides loans to local authorities from the National Loans Fund for capital projects.

6.10.1.2 National Wealth Fund (NWF) lending

The UK's NWF is a government-established investment vehicle aimed at mobilising private sector capital to support the nation's clean energy transition and stimulate economic growth.

6.10.1.3 Asset financing

Crown Commercial Services (CCS) have a Loan and Leasing DPS which provides local authorities access to funding for the acquisition of assets including EVI. The DPS offers a choice of fi nancing options, including hire purchase and asset secured loans.

6.10.1.4 Bonds

A bond is a fixed-income instrument used to finance larger investments. These are different to loans as they are tradeable and fixed rate, whereas loans are not tradeable and may have either fixed or floating rates.

Bonds that are used to raise funds specifically for climate-related projects are often called Green Bonds or Local Climate Bonds[13]. These are linked to assets and backed by the issuer's balance sheet. Although not regulated, local authorities are wise to use internationally recognised Green Bond Principles or Climate Bonds Initiative standards to define the approach to issuance and set rules on the use of proceeds.

6.11 Central government support

To support the accelerated deployment of charging infrastructure, the UK government is currently making funding available to households, businesses and local authorities. The government continues to provide measures to increase consumer confidence, including the £381 million Local Electric Vehicle Infrastructure Fund to support local authorities in England to deliver local chargers to drivers without off-street parking. This is alongside other interventions to support charging on the strategic road net-work, as well as residential and workplace grants.

6.11.1 Alternative funding mechanisms

In some circumstances, central government funding may not be applicable, or is insufficient for the local authority. In this circumstance, there are further options a local authority could pursue to finance the installation of charging infrastructure:

- **(a)** third-party investment (other than a chargepoint operator); and
- **(b)** public/community-funded model.

6.12 Chargepoint specifications

The local authority must ensure that their specifications are designed to procure suitable equipment for the intended use. The LEVI Knowledge Repository, funded by Department for Transport and hosted on the National EV Insights & Support (NEVIS) service has produced Technical Schedules guidance to support this. This is a set of possible statement options to guide local authorities and ensure nationally consistent terminology and specification for EV infrastructure procurement.

13 https://nevis.cenex.co.uk/repository/local-climate-bonds

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6.13 Chargepoint operator and CPMS procurement checklist

The specification for the CPO and CPMS should include the considerations listed in Table D.1 within Appendix D.

6.14 Contracts

In this section, contract terms relevant to EV charging projects are listed; which are relevant will depend on the scope of the individual project.

The scope of the procurement activity will also impact the relevant contractual terms with recruited suppliers. Guidance and best practice on procuring EVI, including contractual terms, is available through the National EV Insight & Strategy service, funded by the Department for Transport. These are particularly focussed on the concession model but are relevant for all of the models and provide guidance on all of the issues below.

6.14.1 Contract durations

The local authority will agree a finite contract duration with the supplier. Generally, longer contractual terms are more commercially attractive as they offer longer time for investment to be recouped and profits generated, whilst reducing the need for public funding. This can be particularly relevant in areas with less immediate demand for the infrastructure and therefore a riskier business case in the near term. Local authorities may need to reconsider their chosen operating model (see Section 6.4) or the terms of the cost/revenue share (see Section 6.14.3) for deployments with weaker business cases.

Alternatively, they can offer a longer contract duration to attract greater private investment. Long contractual terms are typical for infrastructure investments and offer significant benefits for both the local authority and the investor, provided the terms are carefully constructed.

6.14.2 Exclusivity

When tendering for chargepoint suppliers, local authorities should carefully consider contractual terms before entering into agreements which give a chargepoint supplier exclusive rights to install chargepoints in their area. Government preference is to avoid exclusivity wherever possible and to look to drive on-street competition to protect consumers.

Reducing the risk of local charging monopolies benefits the consumer by way of increased choice and may help to moderate tariffs charged to drivers. It is also beneficial to the local authority, as the Competition and Markets Authority reports "[Monopolies] put local authorities in a much weaker negotiating position in the long term", and it may "make it more difficult to replace operators that are failing to deliver".

Enabling multiple chargepoint providers to operate in an area is unlikely to hamper large-scale deployment of charging infrastructure, with many areas already home to multiple chargepoint operators. Different operators specialise in different spaces, and providing exclusivity to one operator may hinder rollout and future investment opportunities.

To ensure charging provision can be competitively procured at the end of a contract, local authorities should ensure that they retain ownership of local connection assets (for example, the connecting electric infrastructure).

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6.14.3 Costs and revenue share

For all operating models, except the own and operate model, the local authority will need to agree the cost and revenue sharing percentages within the contract.

As the concession model becomes a more popular route to deploy chargepoints, lengthier 10 – 20 year concession contracts are becoming more common. In return for a longer contract, local authorities should assess whether a greater revenue share for the authority is beneficial, and in many cases can expect a significant contribution to the project costs from the supplier. In some areas, suppliers may be willing to provide all the costs, while still providing a portion of revenue share to the local authority. For longer contracts, it may be appropriate to agree changes to the revenue share over time, for example, fixed to certain levels of utilisation. These agreements can prioritise the operator recovering its up-front investment costs in the early part of the contract whilst allowing the landowner to benefit from a higher share of revenues in the longer term.

Local authorities should note that linking revenue share to network utilisation may be better for the commercial sustainability of the network. However, the local authority should always aim to cover their contract management costs either through a proportion of revenue share or a small indexed fixed fee.

6.14.4 Charging tariff structure

The contract will need to include terms around how the charging tariff structure and level (i.e., p/kWh for a consumption-based tariff) will be set for the charging infrastructure. This will need to account for varying levels if different types of solutions are included under the same contract (for example, 7 kW residential charging and 50 kW rapid charging at a hub location). Additionally, the contract may need to include terms for any discounts offered to certain users (for example, local residents or members of the charging network).

Local authorities should consider the importance of affordable charging in their EV strategy, and design contract terms accordingly. The level of control on a tariff will depend on the level of private investment in the network. Local authorities should consider the Heads of Terms guidance on Tariff Administration for concession arrangements where the private sector is providing the majority investment.

The greatest variable cost in setting tariffs is the electricity price. Local authorities may want to allow CPOs to set the tariff under an agreed administration which considers this and allows local authorities sufficient control to protect the consumers. This is particularly important in the context of rising wholesale electricity costs.

NOTE: The lease model gives the landowner the least control over charging tariffs.

6.14.5 Delivery terms

Terms of supply and delivery need careful thought.

Supply contracts should have clear delivery dates and potentially a damages regime if those are missed. If the local authority is lining up installers and other parties that need to integrate, then it must hold the seller to their commitments on timing.

Particularly in the case of hardware coming in from overseas, check the delivery terms carefully to see who is responsible for storage and delivery costs. INCOTERMS are often used as a form of industry shorthand to set out the parties' various responsibilities here.

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Check the force majeure clause carefully. For example, pandemic and COVID-19 delays are often included as circumstances giving rise to the ability for the seller to delay its obligations. It is sometimes reasonable to remove these from force majeure clauses, as the circumstances are generally known. Sellers should contract based on what they can deliver, and not make unrealistic commitments they then rely on force majeure not to keep.

6.14.6 Risk

Under the own and operate model, ensure that title in the equipment passes to you as early as possible, usually linked to the substantial part of payment. Risk is usually with the delivering party but check carefully to ensure that the equipment is insured during transit by the right party to avoid losses.

6.14.7 Energy supply

If the supplier owns the energy metering hardware, the local authority may wish to include terms to have control over aspects of the energy supplier selected for the charging infrastructure. For example, ensuring that the supplier uses a renewable energy tariff. Additionally, for some operating models an agreement may be required to determine how the cost of energy supply is divided.

6.14.8 Maintenance and end of life

The contract with a maintenance provider should list the maintenance activities, frequency and cost (if not covered by the operating model) as well as any responsibilities and actions for the supplier at the end of the contract period (see Section 6.14.9).

In lease and concession models, the terms of the contract should set out that maintenance and end of life costs are the responsibility of the supplier.

6.14.9 Exit strategy

The local authority should consider the exit strategy from the existing contract. This allows them to select a new supplier at the end of the contract, or if the supplier has not met its contractual commitment (i.e., metrics measured in a KPI framework) by underperformance. Depending on the operating model, this may require the supplier to remove their hardware (concession or lease) or to disconnect the chargepoints from their CPMS (own and operator or external operator).

A significant consideration for the exit strategy is the ownership of local connection assets. The landowner should ensure that through the initial contract, the ownership will be retained or transferred at the end of the contract. This ensures that a contract can be re-tendered competitively with alternative providers at the end of a contractual term. It should also mean that future installation costs will be reduced, as the connecting works will have been completed.

6.14.10 Installation approval

If installation services are procured, the contract should define the method by which deployments will be approved by the local authority and how potential disputes will be handled.

6.14.11 Warranties

For own and operate networks especially, a clear warranty duration and terms for both hardware provision and the installation services is vital. The terms should set out a full list of exclusions, so the local authority understands the risk.

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6.14.12 Service level agreements (SLAs)

The contract should contain SLA terms to agree the required responsibilities and quality of the service provider, as well as the repercussions should the supplier fail to meet these terms. Examples of terms to be included are:

- **(a)** availability and reliability of charging infrastructure and agreed penalties for poor performance;
- **(b)** provision of chargepoint usage data in a free and accessible way to the local authority by an agreed method and frequency (see Section 9.3);
- **(c)** response times for resolution of chargepoint issues both remotely for software-related problems and on-site for hardware problems; and
- **(d)** methods and availability of customer service systems and resolution times to customer queries, issues or complaints. The CPO should provide a 24-hour customer support system.

6.14.13 Access to data

The local authority should ensure that the appointed CPO is contractually bound to freely share the chargepoint network usage data (see Appendix E for the datasets to be shared). This data can be invaluable in making decisions such as adding to the network in areas of high utilisation or advertising chargepoints to users where utilisation rates are low. This is also important where government funding is sought as the sharing of such data is often a requirement of receiving this funding.

6.14.14 Changes to the network

The local authority should have a plan for future deployments as part of its strategy. This may be subject to change for many reasons, including experience gained from the future utilisation of the infrastructure yet to be deployed. The contract therefore should seek to include terms of how the local authority and supplier will work together to identify and select additional sites for deployments or to remove infrastructure where there are issues.

6.14.15 GDPR

As mentioned in Section 9.3.1, the local authority should conduct a GDPR assessment prior to deploying charging infrastructure to understand what personal data will be collected and how it will be used. When contracting with suppliers, the terms should identify the relevant GDPR roles of the contracting parties to establish overall accountability for adhering to regulation.

6.14.16 Allowing for innovation

If material changes are proposed to the contract, this may require the termination of the contract and a new procurement.

This rule can inhibit innovation during the term of the contract. For example, in 2012, a London borough council faced an investigation by the European Commission due to a proposed switch to low-energy light bulbs on its street lighting private finance initiative (PFI) project.

To avoid this risk, the procurement advertisement and subsequent contract should identify the opportunity for future technology changes. The contract should provide a clear mechanism for change control, setting out the scope of acceptable changes and an appropriate way of adjusting price, if relevant.

This change control mechanism needs to be far more detailed than in a typical private sector contract. During market engagement, the tender should consider what future innovation is most likely and ensure the contract is drafted to accommodate this, for example, through a tailored change control mechanism.

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6.15 Tender evaluation

The criteria and weightings for evaluating tenders for EVI will have a huge impact on how the market will respond and should be constructed carefully. Standard public sector procurement approaches for purchasing goods or services are not necessarily well suited to concession arrangements, where the local authority is effectively offering a valuable investment opportunity to the market.

The Procurement Forum section of the LEVI Knowledge Repository, funded by the Department for Transport and hosted on the National EV Insight & Support (NEVIS) service, contains specific guidance for local authorities on evaluating concession style contracts. Elements of the guidance are relevant to other operating models also.

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Section 7

Preparation and design – how should a site be prepared for installations?

This section outlines the key decisions impacting the deployment and operation of the infrastructure.

Depending on the project and strategy, work at the preparation stage may be completed internally or by an external supplier.

7.1 Power

In this section, the considerations that need to be made to ensure that the necessary power supply is provided for any EV charging deployment will be presented.

7.1.1 Contacting your DNO

As significantly more demand customers connect, or upgrade their connections, it is essential that they do so in a timely and efficient manner. When developing chargepoint deployment plans, the DNO will be able to provide technical expertise and location-specific advice. The DNO should also be involved in the development of any local authority EV charging strategies, to ensure the DNO is aware of future plans and to provide input from an electricity grid perspective. All DNOs can be contacted via their websites.

7.1.2 New or existing connection?

The first decision that needs to be made is whether the chargepoint(s) can be powered from an existing electrical supply or whether a new connection or an upgrade to the existing connection will be required. For some sites, such as on-street deployments or potentially rural car parks with no access to an existing DNO connection, this is a simple decision. For others where there is an existing connection, some thinking is required to understand whether the capacity of the existing connection is sufficient for the infrastructure that is to be deployed now and in the future. This high-level decision-making process is shown in Figure 7.1.

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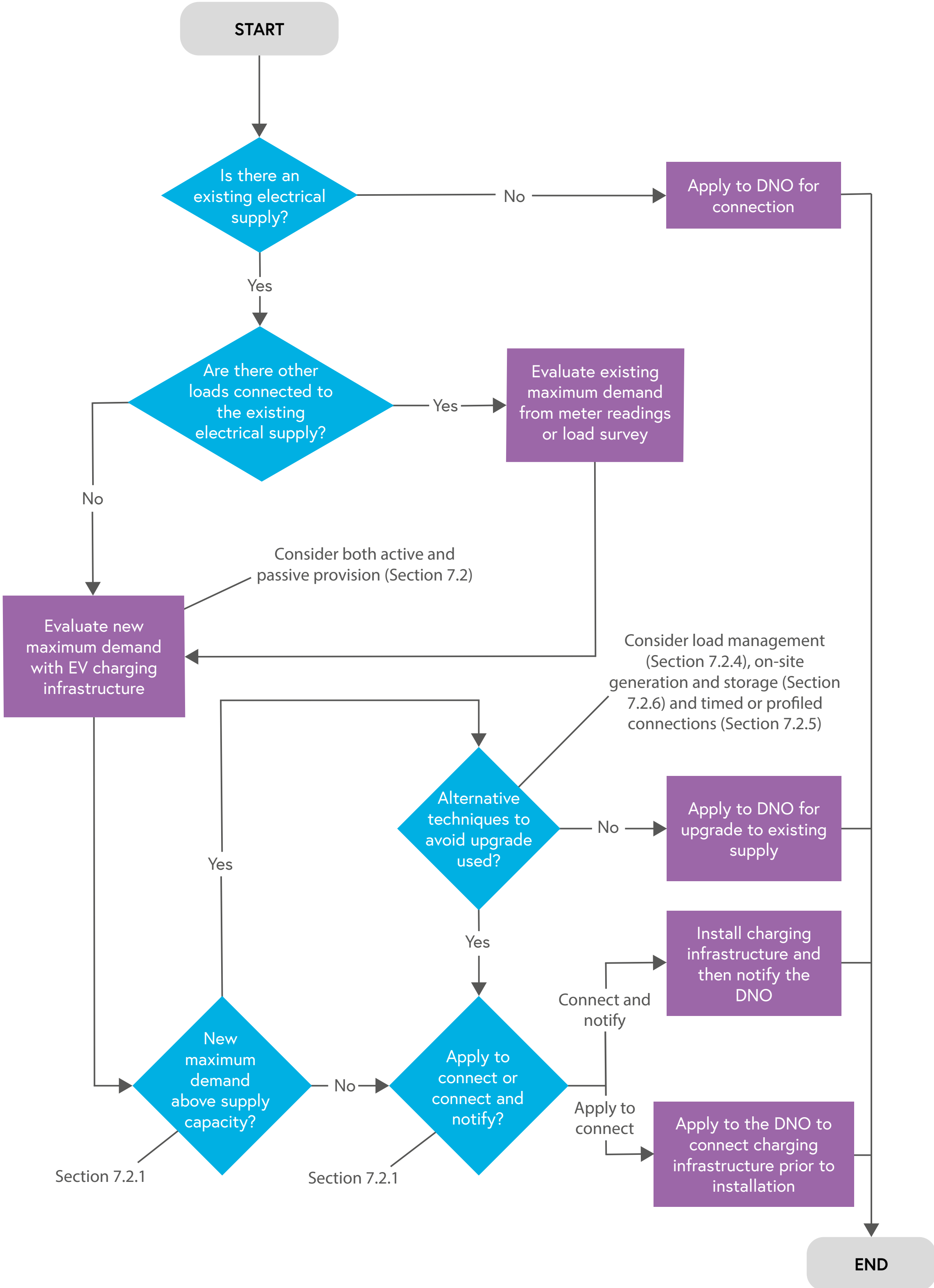
Figure 7.1 Top-level electrical supply assessment process



For both existing and new connections, alternative techniques such as load management and on-site generation and storage should be considered. Local authorities should also consider whether to use an IDNO to carry out the contestable section of the works, which will be shown in the connection offer. This can sometimes be a cost-effective and quicker alternative.

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NOTE: DNO connections can be either single or three-phase. In the UK, single-phase electricity is typically used for domestic and small commercial sites whilst three-phase electricity is used for larger commercial and industrial sites with higher demand.

7.1.3 New connections

Guidance on how to complete an application for a new connection is provided by each DNO on their website.

7.1.4 Existing connections

The goal at this stage is to understand which of the following three potential eventualities applies to the site:

1. **Scenario 1.** The EV charging infrastructure can be deployed without the need for connection upgrade or the need to limit chargepoint power output or the use of alternative techniques such as load management (see Appendix B).
2. **Scenario 2.** The EV charging infrastructure can be deployed without the need for connection upgrade if one or more of the following techniques are employed:
   (i) load management (see Section 7.2.4);
   (ii) timed or profiled connections (see Section 7.2.5); and
   (iii) on-site generation and storage (see Section 7.2.6).
3. **Scenario 3.** The alternative techniques listed above are not available, deemed to be unsuitable or are not cost effective when compared with the cost of a new or upgraded connection. This scenario should become increasingly unlikely given the changes to who pays for network reinforcement required for new and existing connections.

   NOTE 1: At this stage, it is recommended that you engage your DNO to understand if they can assist with this evaluation. The DNO may even recommend that a new connection (see Section 7.1.3) is more cost effective than upgrading an existing supply. This may also be the case if there is a significant distance between suitable distribution points connected to an existing supply.

   NOTE 2: DNOs may charge for this evaluation support.

7.2 Evaluating existing maximum demand

The existing site maximum demand may be obtainable from the supply meter. If unavailable, then a load survey (part of the site survey) should be completed by a competent electrician or electrical engineer to evaluate the site's maximum demand as a result of the existing loads. Guidance is given by the ENA's Frequently Asked Questions[14] on how to complete a maximum demand (adequacy of supply) assessment.

7.2.1 Connect and notify or apply to connect?

Even for locations where the increase in maximum demand due to EV charging deployment is acceptable for the current supply capacity, it may be necessary to apply to connect the equipment before doing so. This is because the charging infrastructure may not exceed the agreed supply capacity but may affect the DNO's wider network.

The ENA provides a flowchart to understand whether a deployment must apply to connect. Circumstances which require an application to be made prior to connection include:

(a) uncertainty around the safety of the existing DNO service equipment;
(b) the EV chargepoint is not listed on the ENA's approved equipment database;

[14] Connecting to the networks – Energy Networks Association (ENA)

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(c) the EV charging demand contributes >30 % of the overall site maximum demand; and
(d) the chargepoint is a V2G installation (see Section 3.3.1).

If an application to connect (to an existing supply without upgrading the connection) is necessary, then the ENA application form can be used for all UK DNOs.

7.2.2 Specialist DNO tools and open datasets

For deployments where there is flexibility over where the charging infrastructure is deployed, DNOs are increasingly providing access to data and specialist tools to inform site selection decisions.

The tools and datasets that DNOs offer vary. The types of tools that can be found include:

(a) **Maps of assets.** Provides information on the location of wires and substations which can help to prioritise sites for EV charging deployments that are close to existing infrastructure and may incur lower connection costs.

(b) **Demand information and capacity maps.** Makes it possible to see demand information about existing primary substations, bulk supply points and grid supply points. This can be useful for understanding whether the network has capacity for additional infrastructure, particularly for high-demand deployments such as rapid charging hubs.

(c) **Open data portals.** Portals that provide information including maps, charts and dashboards about the distribution network which can aid developers in planning their connections.

(d) **Budget estimates.** Tools to prepare and put in budget estimate requests which can help customers get indications of connection costs prior to submitting a connection application.

(e) **Connection design tools.** Enable customers to provide additional details about projects, to provide more automated and improved budget estimates and timescale information for connecting EV charging assets to existing connections or new connections.

(f) **Connections surgeries/ask the expert.** Allows a local authority to have conversations with experts and discuss the considerations required for projects, complex schemes, or deployments with long lists of possible sites, prior to submitting an application.

(g) **Guidance materials.** Specific information for customers on the connections process steps for different types of assets such as EV charging, solar photovoltaics (PV), batteries and heat pumps. Guidance materials can also be tailored to different types of locations, such as public charging, or for fleet operators considering their approach to fleet electrification. Additionally, the guidance may provide case studies and high-level estimates of costs and connection timescales.

The tools and datasets can be accessed via the websites of the DNOs (see Section 3.5).

The DNOs strongly recommend that decisions are not made solely based on the above tools and datasets and that the appropriate DNO should be engaged as early in the process as possible.

7.2.3 Costs and timescales

7.2.3.1 Cost guidance

In May 2022, Ofgem announced the conclusion of their Significant Code Review. From April 2023, connecting customers will no longer pay for necessary grid upgrades when needed for a new or upgraded connection. In such situations, network reinforcement costs will be socialised across bill-payers in the DNO area, significantly reducing connection costs.

In addition to the estimation tools (see Section 7.2.2), guides are available from National Grid Energy Distribution (NGED) and Scottish & Southern Energy Networks (SSEN) for the potential costs for connecting EV charging.

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7.2.3.2 Timescales

DNOs are also bound to guaranteed standards to responding to requests for alterations to existing supplies or new connections. These range from 5 days for small connections up to 65 days for very large extra-high-voltage connections[15].

7.2.4 Load management

Load management systems can be used to control the charging power of multiple EV chargepoints such that the site capacity is not exceeded. This allows more charging infrastructure to be deployed using an existing connection without costly upgrades.

7.2.5 Timed or profiled connections

Timed or profile connections are DNO connections which have set times when demand must be below an agreed level, but higher demand is permitted at other times:

- **(a) Timed connections.** Two or three periods with different capacity limits.
- **(b) Profile connections.** Up to 48 (half-hourly) different capacity limits.

Typically, the times required to have lower demand will be in the morning and afternoon when demand on the network is highest. Use of timed or profile connections could minimise the new DNO connection or upgrade work required to meet demand. However, these connections are relatively new and are not currently available from all DNOs.

7.2.6 On-site generation and storage

It can be cheaper on a total cost of ownership (TCO) basis to deploy on-site renewable generation and storage instead of upgrading the DNO connection, or to limit the upgrade costs. Local authorities may value this approach as an investment in a green technology that can provide additional resilience to loss of power to their operations in case of power cuts.

At a high level, the concepts are as follows:

- **(a) On-site generation.** Green energy generation by wind or solar PV located on-site, connected as part of the site's energy system behind the meter.
- **(b) Energy storage.** An energy storage system, typically a BESS located on-site, is charged when demand is low and/or supply is high and then dischargedwhen demand is high and/or supply is low.

These technologies can be used either on their own or together. The benefit of on-site generation and storage systems will depend on multiple factors:

- **(a)** The expected use case of the charging infrastructure and whether charging times will align with periods of generation.
- **(b)** The cost of any required new DNO connections or upgrades without the on-site generation and storage. This will be highly specific to the location.
- **(c)** The costs associated with the on-site generation and storage systems.

[15] National Grid Electricity Distribution - Budget estimate

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Case study	
Name	Dundee Rapid Charging Hub
Purpose	Use of on-site generation and storage to manage DNO connection costs

Figure 7.2 Dundee rapid charging hub case study. Reproduced by permission of Dundee City Council

Dundee City Council have rapid charging hubs which make use of on-site generation and storage which maximises the amount of charging infrastructure that can be deployed on the DNO connection. The battery storage system charges when EV charging demand is low and discharges to support the available solar PV generation and DNO connection when charging demand is high.

The charging hub is used by local private hire vehicles to charge quickly during their hours of operation to minimise downtime.

The system tracks the usage of the chargers and the generation of the PV and works to maximise the amount of renewable energy that is used to charge the vehicles. During 2020, the site generated 32 MWh from the PV canopy and used 444 MWh on the chargers. With the solar generation not always being aligned with the charger usage, the site would have only used 88 % of the onsite generation. However, the E-STOR battery system captured nearly all the surplus energy to achieve a renewable energy usage of 97 %. A net carbon saving for the year was 521 kg of CO_2e[16].

More information	Dundee - United Kingdom (c-e-int.com)

7.2.7 Future proofing

Future proofing can include passive provision that facilitates the efficient addition of more chargepoints. This can take the form of:

(a) provision of a three-phase electrical supply (see Section 7.1) and power distribution that is oversized for the initial active deployment but will be sufficient for additional EV charging infrastructure to be added in the future;

(b) deployment of a load management system (see Section 7.2.4) that will allow additional chargepoints to be added, without needing to upgrade the electrical supply; and

(c) provision of civil works that enable additional chargepoints to be deployed easily. This can include trenching works and provision of ducting, or the deployment of additional ground mounting points.

16 Connected Energy, Dundee City Council Partnership (Case Study 3) | Make UK

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7.3 Installation design

The information captured during site surveys (Section 5.4) is used to inform the installation design. The design of any installation will include considerations such as parking bay layout, chargepoint positioning and electrical distribution.

7.4 Installation standards

There are two key standards which must be complied with for all EV charging installations:

Figure 7.3 BS 7671 *Requirements for Electrical Installations*

1. BS 7671 *Requirements for Electrical Installations* 'IET Wiring Regulations'. This contains the key requirements for compliant electrical installation of EV charging infrastructure.

Figure 7.4 IET *Code of Practice for Electric Vehicle Charging Equipment Installation, 5th Edition*

2. The IET *Code of Practice for Electric Vehicle Charging Equipment Installation*. The current version at the time of writing is the 5th edition. This code of practice gives advice on the practical interpretation of BS 7671 for installers of EV charging equipment. The 5th edition of the code of practice reflects changes to legislation, increased rollout of higher-powered chargers, and new guidance that is available.

7.4.1 Electrical distribution design

As part of the site survey, an installer should establish the suitability of any existing distribution equipment to be used for the chargepoints. For locations which require a new supply, a new feeder pillar may be required. A feeder pillar houses the DNO's connection and the distribution equipment to the charging infrastructure.

The size of this distribution equipment will depend on the scale of the deployment. An EV charging hub with multiple rapid chargepoints or a deployment of many AC chargepoints may a require a larger area for the supply and distribution equipment, and potentially its own dedicated electrical substation.

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7.4.2 Earthing system design

Earthing is a means of fault protection designed to prevent an electric shock when touching a live metal part under fault conditions. The local authority reviewing deployment designs should ensure compliant earthing designs. There are different approaches for achieving a compliant earthing system for EV chargepoints depending on the local situation, of which the most common are TT earthing and TN systems with protective earth and neutral (PEN) fault detection devices. For full information on why specific requirements for EV charging earthing exist and how to provide a compliant earthing system, consult the latest versions of BS 7671 and the IET *Code of Practice for Electric Vehicle Charging Equipment Installation*.

7.4.3 Civil works

For most EV charging infrastructure deployments, civil engineering work will be required. The only exception may be wall-mounted EV charging infrastructure where the electrical supply can be routed to the chargepoint(s) using existing structures. For any civil works, it may be necessary to perform a survey to check for the presence of any underground services, as specified in Section 5.5. For more information on the legalities of civil works impacting upon the public highway, see Section 7.5.

7.4.3.1 Cable runs

Many EV chargepoint installations will require power supply and communications cables to be buried underground. To do this, there are two main methods:

1. **Trenching.** Excavation and subsequent reinstatement of the ground to create a slim channel in which electrical cables can be placed or ducted to connect the charging infrastructure to the electrical supply. This is the traditional option for laying buried cables. This should be in line with requirements set out in the *Specification for the Reinstatement of Openings in Highways* (SROH).
2. **Drilled holes.** For locations where excavating trenches is either difficult from a technical (such as excavating very hard surfaces) or logistical (such as where the intended cable run crosses roads or existing buildings) perspective, directionally drilled holes offer an alternative to traditional trenching. There are private companies who have expertise in such techniques. Any reinstatements should also be in line with requirements in the SROH.

7.5 Permissions and licensing

7.5.1 Streetworks

7.5.1.1 England

A statutory undertaker (SU) that needs to carry out works in England which break the surface of the public highway (carriageway and footway) needs to obtain a permit under the Traffic Management Act 2004. Applications need to be submitted in advance. Works are classified according to the expected duration of the works and different lead times apply according to this classification. This ranges from 3 days in advance of works starting for minor permits (durations of 3 days or less) to 3 months for permits for major works (duration of 11 days or more). The SU must pay an admin fee which varies according to the type of work.

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SUs are legally required to apply for permits using the Department for Transport's Street Manager digital service[17]. SUs must register with the Department for Transport to use Street Manager and must pay an annual charge which is based on the number of works it carries out each year.

The SU must abide by other legal requirements when carrying out the works that are set out in the New Roads and Street Works Act 1991, associated regulations and statutory guidance. The statutory guidance includes a safety code of practice[18] and the *Specification for the Reinstatement of Openings in Highways* (SROH). The statutory guidance on permit schemes includes more detail about their operation and the fees that apply[19].

Any other organisation that wants to carry out works which break the surface of the public highway must apply for and be granted a licence under Section 50 of the New Roads and Street Works Act 1991. This requirement is likely to apply to many of the organisations that are installing EV chargepoints. Each individual highway authority currently has their own application process, fee rates and timescales for these licences. We recommend that organisations check with the relevant authority in good time to ensure they are aware of the timelines, process and fees that apply in that area. Some authorities also have additional requirements in terms of information they need to be sent before an application will be approved. The Department for Transport recently published good practice guidance[20] for highway authorities issuing licences under Section 50 of the New Roads and Street Works Act 1991 (NRSWA).

For those organisations carrying out works under a Section 50 licence, the authority will want to be satisfied that the reinstatement following the installation works has been done correctly. They will want to ensure, for example, that the work has been done safely, it has not created any trip or safety hazards on the footway, and that the quality of the reinstatement will last for at least two years. They will also want to know which organisation will be responsible for the reinstatement and the chargepoint in case it needs to be repaired.

It should be noted that the highway authority may require other information, for example, if temporary traffic management or temporary traffic lights are needed during the installation works. Many authorities require traffic management plans and traffic light forms to be submitted.

7.5.1.2 Wales

An SU that needs to carry out works in Wales needs to submit a notice under the New Roads and Street Works Act 1991 to the relevant highway authority. Each one will have their own application route.

The SU must abide by other legal requirements when carrying out the works that are set out in the New Roads and Street Works Act 1991, associated regulations and statutory guidance that applies in Wales. The statutory guidance includes a safety code of practice and the *Specification for the Reinstatement of Openings in Highways* (SROH) version 2.

7.5.1.3 Scotland

When undertaking any road works in Scotland, you must follow the codes of practice, advice notes and guidance published on the Scottish Road Works Commissioner's website[21]. The Scottish Road Works Commissioner has deemed these to be best practice under Section 17(4)(b) of the Transport (Scotland) Act 2005. Section 118 and Section 119 of the New Roads and Street Works Act 1991 place obligations on roads authorities and undertakers respectively to follow this best practice. Failure to comply can result in a penalty of up to £100,000.

Where the work is being undertaken by non-statutory undertakers, specific permission to excavate and lay new apparatus in the road must be obtained from the relevant Roads Authority under Section 109 of the New Roads and Street Works Act 1991. In Scotland, this is the only route to obtaining permission to lay apparatus in roads, without existing statutory powers.

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17 https://www.gov.uk/guidance/plan-and-manage-roadworks
18 Streetworks safety code of practice
19 Streetworks permit schemes
20 https://www.gov.uk/government/publications/issuing-section-50-street-works-licences
21 https://roadworks.scot/home

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In either case, if you are unsure about the requirements in undertaking this work, you should contact the office of the Scottish Road Works Commissioner.

There is further guidance including Scotland's National Transport Strategy[22]. This embeds the sustainable travel hierarchy in decision-making by promoting walking, wheeling, cycling, public transport and shared transport options in preference to private car use. This guidance also details minimum clear passageway rules and wider context on reducing permanent street furniture obstructions (see Section 7.6.1).

7.5.1.4 Northern Ireland

A statutory undertaker (i.e, a utility company with a statutory right to place apparatus) that needs to carry out works in Northern Ireland which break open the surface of the public road must comply with the Street Works (Northern Ireland) Order 1995 (the Order), associated regulations and codes of practice.

Further information on road openings by utility companies can be found on the Northern Ireland Department for Infrastructure website.

Any other organisation without a statutory right that wants to carry out works which break open the surface of the road to place apparatus must apply for a street works licence under Article 11 of the Order. Further information on the street works licence procedure and application process can be found on the Department for Infrastructure website.

Organisations that are proposing to install EV chargepoints are likely to need a street works licence. The person granted a Street Works Licence (the Licensee), becomes an Undertaker for the purposes of the Order, and therefore attracts the relevant duties and responsibilities imposed by the Order and its associated regulations and codes of practice.

A traffic control permit is also required from the Department for Infrastructure for all works restricting traffic or that require a road closure before any works can take place.

Further to the above, the Northern Ireland Department for Infrastructure have provided an aide-memoire for Northern Irish Councils to follow regarding the process required to install EV charging infrastructure on the highway.

7.5.2 Traffic Regulation Orders (TROs)

Temporary, experimental or permanent restrictions can be placed on traffic by a Traffic Authority (TA) by way of a Traffic Regulation Order (TRO)[23]. A permanent TRO may be needed if an on-street parking bay is needed – the TRO will designate the parking bay, set the rules around how it should be used and it will enable the authority to enforce the parking bay as an EV charging only bay.

A temporary TRO may be required in some cases for installation works if any sort of temporary traffic management, partial lane closure, or temporary suspensions of other parking bays is needed.

TROs can only be proposed for the reasons set out in the relevant TRO legislation. The organisation carrying out the work, whether this is a statutory undertaker or another organisation, will need to apply in good time to the relevant Traffic Authority and pay a fee. Many authorities require applications for temporary TROs to be made at least 12 weeks before they are needed and can charge a fee of several thousand pounds. Applications for permanent TROs can take much longer – up to six months – and can cost more.

Traffic signs and markings must only be used as prescribed in the Traffic Signs Regulations and General Directions 2016[24]. Advice on the use of regulatory signs and markings, including those for electric vehicle recharging points, is given in Chapter 3 of the *Traffic signs manual*[25]. A failure to do so may leave a local authority open to litigation or make a TRO unenforceable.

22 https://www.transport.gov.scot/media/47052/national-transport-strategy.pdf
23 In London this is a Traffic Management Order (TMO).
24 https://www.legislation.gov.uk/uksi/2016/362/contents/made
25 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/782724/traffic-signs-manual-chapter-03.pdf

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Refer to the best practice guidance provided by the British Parking Association for more information on TROs.

7.5.3 Permitted development

7.5.3.1 England

Installations by all parties

Permitted development rights allow for the installation, alteration or replacement of chargepoints for electric vehicles without having to make a planning application. The rights cover both residential and public off-street parking and car parks. The rights are subject to limitations and conditions to control any impacts and protect local amenity. Further details on the rights can be found under Schedule 2, Part 2, Classes D and E of the Town and Country Planning (General Permitted Development) (England) Order 2015[26].

CPOs wishing to partner with local authorities to use this permitted development right should engage at the earliest possible stage, to positively plan for EV chargepoint rollout with the local authority. It is important to ensure that all relevant design standards, kerbside strategies and other relevant policies or standards are appropriately complied with to meet the needs of communities. CPOs should always have regard to relevant national guidance including the *Manual for Streets* and Inclusive Mobility Guidance alongside the government co-sponsored PAS 1899, developed with national disability charity, Motability. The standard was developed in close collaboration with industry, disabled users, accessibility experts, charities, consumer groups and the devolved administrations.

PAS 1899 provides, for the first time, specifications on designing and installing accessible public EV chargepoints, meeting the industry need for standardised guidance on what accessible public chargepoint design consists of and how it can be deployed.

In addition, it is important to note that deployment of the permitted development right does not supersede or otherwise replace, the requirement for CPOs to obtain relevant other consents and licensing, including Section 50 licences to work in the highway, and Traffic Regulation Orders where required to designate an on-street parking bay.

Installation by local authorities

Local authorities also benefit from quite broad permitted development rights, which amongst other works allows for the installation of both off-street and on-street EV chargepoints under Schedule 2, Part 12, Class A of the Town and Country Planning (General Permitted Development) (England) Order 2015. An update to this Permitted Development Right now enables chargepoint operators who are operating on behalf of a local authority to install electric vehicle chargepoints without the need to apply for planning permission[27].

7.5.3.2 Wales

Details of the permitted development rights for charging infrastructure in off-street locations can be found in Classes D & E of The Town and Country Planning (General Permitted Development) (Amendment) (Wales) Order 2019[28].

7.5.3.3 Scotland

Similar permitted development rights for off-street parking areas and for local authorities currently apply in Scotland. These can be found in Classes 9E and 9F and Class 30 of The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 as amended[29].

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26 The Town and Country Planning (General Permitted Development) (England) Order 2015 (legislation.gov.uk)
27 https://www.legislation.gov.uk/uksi/2015/596/schedule/2
28 The Town and Country Planning (General Permitted Development) (Amendment) (Wales) Order 2019
29 https://www.legislation.gov.uk/ssi/2023/35/contents/made

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7.5.4 Other licences and permissions

7.5.4.1 National Highways (formerly Highways England)

If a deployment is planned on a public highway in England that is managed by National Highways and not the local authority, a Section 50 Street Works Licence (New Roads and Street Works Act (NRSWA) 1991) must be applied for to install works on the National Highways' road network. This licence also applies to inspect, maintain, adjust, repair, alter or renew the equipment thereafter, to change its position or remove it.

Refer to the government webpage for more information and an application pack for Section 50 licences. National Highways provides a map showing the extent of their network.

7.5.4.2 Lease of local authority land

The local authority may prefer to allow a chargepoint operator to deploy infrastructure on their land via a land lease model.

7.5.5 Use of cables from homes across the footway

Some EV owners without off-street parking have been trailing their charging cables across the public footpath from their house, to charge at their cheaper domestic charge rate.

It is an offence under the Highways Act 1980 (Section 162) to trail a cable, or similar, across any part of the highway, including the footway, unprotected. Some local authorities (primarily the upper tier authorities such as county councils or unitary authorities who have responsibility for the highway) have issued guidance, offering advice on how drivers should secure their cables to ensure they are safe, for example, by using cable covers. It is for local authorities to take their own legal advice on whether these safety mitigations are substantial enough to render the cabling safe, and therefore do not contravene the Highways Act. This will be a matter of fact in each case for local authorities to assess.

If anyone was to be injured by tripping over an unsecured charging cable they may pursue the householder, or vehicle owner, under the Occupiers Liability Act, or in negligence. If it is unlikely that compensation can be recovered from this source, it is possible that the local authority could be pursued as liable for failing to enforce the Highways Act, or for issuing guidance contrary to the Highways Act. Any guidance issued by local authorities should consider the needs of those using the footpaths, particularly those with reduced mobility or visual impairment.

While trailing cables across the footway is an offence under the Highways Act 1980, some solutions have been designed to enable users to connect to a home electricity supply. As detailed in Section 4.6.3, cross-pavement solutions are available. These trenching channels can be installed to safely transport a charging cable across the footpath. Any installs need to consider the requirements of Regulation 411.3.1.1 of BS 7671, that requires simultaneous accessible exposed-conductive-parts to be connected to the same earthing system. Placement and reinstatement must also comply with the SROH or be approved by the local authority.

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7.6 Site/parking layouts

Guidance documents on chargepoint positioning, parking layout and signage referenced in this section are listed in Table 7.1.

Table 7.1 Guidance documents for chargepoint installation design

Source	Year	Document
Department for Transport (DfT)	2022	PAS 1899:2022 *Electric vehicles – Accessible charging – Specification*
	2021	*Inclusive Mobility. A Guide to Best Practice on Access to Pedestrian and Transport Infrastructure*
	2019	*Traffic signs manual.* Chapter 3: Regulatory signs
	2018	BS 8300-1:2018 *Design of an accessible and inclusive built environment. Part 1: External environment – Code of practice*
	2010	*Manual for Streets 2: Wider Application of the Principles*
	2007	*Manual for Streets*
Transport for London (TfL)	2019	*Pedestrian Comfort Guidance for London*
Living Streets	2021	*Tackling Poor Placement of Electric Vehicle Charging Points*

7.6.1 Impact on other users of the street

The UK government has established a series of key principles for the deployment of on-street charging infrastructure.

Ensuring local chargepoints are integrated into their surrounding environment:

- **(a)** Chargepoints should not obstruct footways, the road, or present a safety risk to pedestrians and wheelchair users or people with pushchairs.
- **(b)** Cables will not be allowed to trail across the footway unless adaptive infrastructure is provided to accommodate them safely (for example, cross-pavement cable channels).
- **(c)** Chargepoints must be incorporated into existing street furniture or parking bays wherever possible. In circumstances where it is not possible, priority must be given to ensuring that access to, and use of, footways is not impeded, and safety and accessibility of pedestrians is not jeopardised.
- **(d)** Parking spaces for EV charging will not be added in places where parking spaces are currently not allowed, nor where they could disrupt traffic flow, cyclists or pedestrians.
- **(e)** Chargepoint design and placement should meet accessibility standards and guidance, as set out in PAS 1899:2022 *Electric vehicles - Accessible charging - Specification.*

When deploying EV charging in on-street locations, the first choice is to decide whether to position the infrastructure in the roadway or on the footway. Where possible, public chargepoints should be placed at carriageway level rather than footway level, as this supports an inclusive design for EV drivers and other road users. Best practice guidance on accessible public chargepoints can be found in PAS 1899:2022.

The Department for Transport's *Manual for Streets* acknowledges that street furniture can contribute to clutter and that "in some circumstances, it may be possible to reduce footway clutter by placing some of these items on build-outs". Whether choosing to deploy EV chargepoints on the roadway or footway, it is key to evaluate the impact on other users.

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The typical on-street chargepoint design is a bollard shape. Solutions exist to reduce street clutter, such as integrating EV charging into street lighting, or chargepoints that are embedded into the footway. These will still have an impact on street clutter when the chargepoint is in use.

Local authorities should establish criteria for the assessment of chargepoint placement and public realm impacts. Additionally, local authorities should ensure suitable records are kept for chargepoint positioning. Recommendations for minimum clear-footway-width-post installations are listed in the following publications:

(a) The Department for Transport's *Inclusive Mobility* best practice guide which recommends that footways should be made "as wide as is practicable", as follows:
  - **(i)** 2 m width is the minimum that should be provided under normal circumstances. This allows two wheelchair users to safely pass each other.
  - **(ii)** 1.5 m width could be regarded as the absolute minimum acceptable under most circumstances, if 2 m is not possible due to physical constraints. This allows a wheelchair user and a pedestrian to pass each other.
  - **(iii)** Where there is an obstacle, such as lamp columns, signposts or electric vehicle chargepoints, the absolute minimum width should be 1 m, but the maximum length of such a restricted space should be 6 m.

(b) Energy Saving Trust's *Positioning chargepoints and adapting parking policies for electric vehicles* which recommends a minimum clear footway of 1.5 m.

(c) Transport for London's *Pedestrian Comfort Guidance for London* which provides methods to assess how infrastructure impacts upon the minimum clear width, accounting for buffer zones at the front and rear of the footway and around any infrastructure.

Whilst the guidance on clear footway width is most relevant to on-street locations, there will be many off-street locations where chargepoints are deployed on footways that are used by pedestrians. If this is the case, then the above guidance should be followed.

7.6.2 Parking layout

For useability, it is important to deploy chargepoints so they can be used from as many adjacent parking bays as possible. In all cases, it is important to consider accessibility implications for the EV driver and other road users. Best practice guidance can be found in PAS 1899:2022.

For on-street locations, Traffic Signs Regulations & General Directions (TSRGD, 2016) and PAS 1899:2022 should be followed.

7.6.3 Signage and bay marking

Signage and bay marking are required to indicate that the parking bay is for EV charging purposes only and to help prevent blocking by petrol or diesel vehicles, or EVs that are not charging. The bay will only be enforceable if the relevant TRO is in place. The requirements differ between on-street, where the allowable signage and bay marking is controlled by legislation, and off-street locations, where additional signage may be needed to direct the user to the EV charging location within a car park.

7.6.3.1 On-street locations

Signs to indicate a parking bay reserved for EV charging are prescribed in Traffic Signs Regulations & General Directions (TSRGD, 2016). Advice on their use is given in Chapter 3 of the *Traffic Signs Manual*.

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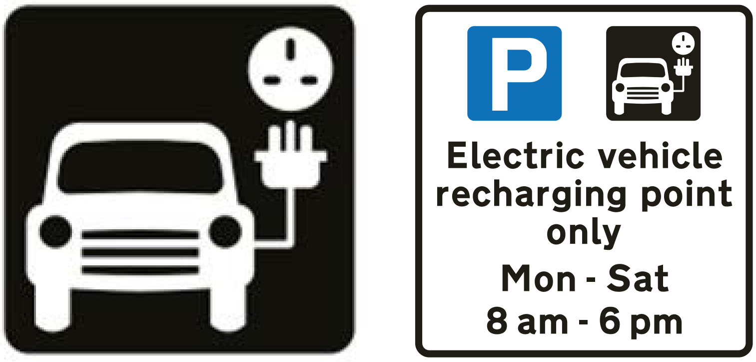
Figure 7.5 EV chargepoint symbol and example signage for on-street locations



Dedicated on-street charging bays must be indicated with bay markings as set out in TSRGD as shown in Figure 7.5.

The parking restrictions may operate at all times, or at specific times of day only. Any on-street parking provision will require a Traffic Regulation Order to put in place the restriction (see Section 7.5.2).

7.6.3.2 Off-street locations

Dedicated bay marking and signage is recommended for off-street locations. There is more flexibility on the design of both the signage and bay markings. In large car parks, it is also recommended to have additional signage to direct the user to the EV charging location.

Figure 7.6 Osprey's 16 high-power chargepoints at Salmon's Leap are compatible with every rapid-charging vehicle on the market. Reproduced by permission of Osprey Charging Network

7.6.4 Impact protection

To protect the infrastructure from impacts, it should be set back from the parking bay. In some circumstances, deploying impact protection may be appropriate. This needs to be done whilst considering accessibility issues for disabled users (see Section 7.7), earthing (see Section 7.4.2) and not at the expense of providing the minimum clear footway widths recommended for pedestrians.

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7.6.5 Considerations for commercial vehicles

Most electric vehicles available on the market are passenger cars or light commercial vehicles. However, a greater number of larger commercial vehicles (for example, vans) are becoming available, and consideration to these types of vehicles should be taken into EV charging installation designs.

The first thing to consider is whether the use case will include large commercial vehicles. Some locations, such as workplaces, can be certain that only passenger vehicles will use the infrastructure. However, for most public locations there will be an increasing demand from larger vehicles. Therefore, to future proof the installation and avoid dangerous situations, the designer should consider the following requirements:

- **(a)** larger parking bays;
- **(b)** greater space required for turning;
- **(c)** longer cable lengths required to connect to tethered chargepoints (particularly relevant to rapid charging locations); and
- **(d)** height restrictions at car park entrances may need to be addressed to ensure that larger commercial vehicles can access charging in these locations.

The British Vehicle Rental and Leasing Association (BVRLA) recently issued new guidance for local authorities to support the deployment of charging infrastructure for commercial vehicles. The BVRLA is also available to provide further experience from its members if required.

7.7 Accessibility

All public sector bodies in Great Britain, including local authorities, are bound by the Public Sector Equality Duty as set out in the Equality Act 2010. This is a duty that ensures public bodies consider the needs of individuals with protected characteristics in all aspects of decision-making. This includes in delivering services, in shaping policy and in relation to their own employees. Northern Irish councils are not covered by the Public Sector Equality Duty legislation and have their own statutory duties required by Section 75 of the Northern Ireland Act 1998.

7.7.1 The challenge for disabled EV users

One in five people in the UK reports a disability, and almost one in ten new cars in the UK is bought by, or on behalf of, a disabled person[30,31]. As the 2030 phase-out of the sale of new pure combustion cars approaches, there is a robust commercial and social case for ensuring that the transition to electric vehicles is inclusive for disabled people. Embedding inclusive design from the outset can avoid costly and logistically complex retrofitting of charging infrastructure.

There is a growing suite of research focused on ensuring accessibility of chargepoints for disabled people. Major market and industry stakeholders have undertaken research efforts that highlight the additional barriers faced by disabled people in their use of chargepoints. Tackling these barriers can also contribute to accessibility and inclusivity for other groups of consumers, including older people, and ensure that the requirements of a diverse range of people are considered.

Without action, it will be difficult for millions of people to access charging. Motability sponsored a report from the Research Institute for Disabled Consumers (RiDC) which field tested the experience of disabled drivers with EVs and identified a range of challenges.

Moreover, the scale of the problem is potentially significant. Motability's research with Ricardo Energy & Environment used parking and housing data to estimate that by 2035 there will be 2.7 million disabled drivers and passengers in the UK, with up to half, 1.35 million, reliant on public charging infrastructure.

30 https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/disability/articles/nearlyoneinfivepeoplehadsomeformofdisabilityinenglandandwales/2015-07-13
31 https://www.theaa.com/about-us/newsroom/aa-president-calls-for-more-accessible-charge-points-for-electric-vehicles

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7.7.2 PAS 1899:2022 *Electric vehicles - Accessible charging - Specification*

Considering these challenges, in 2021, Motability and the Office of Zero Emission Vehicles (OZEV) jointly commissioned the British Standards Institution (BSI) to develop a new national standard for accessible public charging (also known as a Publicly Available Specification or PAS).

PAS 1899 was published in October 2022 and sets out essential specifications that parties involved in manufacturing, operating, procuring and installing chargepoints can use to ensure that public chargepoints are accessible. It is available as a free download.

The PAS has been informed by user research with disabled drivers and developed in close collaboration with industry, disabled users, accessibility experts, charities, consumer groups and the devolved administrations. The ultimate onus of responsibility for conforming to the requirements within PAS 1899 is on the procurer of public chargepoints.

OZEV and Motability are co-sponsoring a technical working group, hosted and administered by the BSI, on the PAS 1899 standard that will run until January 2025. This group will include accessibility experts and PAS 1899 assessors, disability charities and disabled people's organisations, consumer groups, the chargepoint industry (operators, manufacturers, installers and others across the supply chain), local authorities, landowners, technical innovators, the devolved administrations and central government.

This group will consult, advise and make recommendations to industry and the government on the implementation of PAS 1899, the progress made by the industry in deploying compliant infrastructure (including feedback from disabled consumers) and emerging evidence, technological innovations and other developments to inform the 24-month review of PAS 1899 and potential upgrading to a British, European or international standard. It will also look at data points industry can share as part of the open data requirements that relate to accessibility.

7.8 Security

7.8.1 Physical security

There are key security considerations that should be taken when deploying charging infrastructure:

- **(a) User security.** This is the users' perception of how safe they are whilst using the charging infrastructure.
- **(b) Vehicle security.** This is the users' perception of how safe their vehicle is when left connected to the charging infrastructure.
- **(c) Equipment security.** How likely is the infrastructure to be vandalised or even stolen.

Measures that can be taken to address these concerns are as follows:

- **(a) Lighting.** Chargepoints that are accessible outside at night should have warm coloured lighting. This not only ensures that the chargepoints can be located during hours of darkness but also can help users to feel secure and deter criminals from the area.
- **(b) CCTV.** For some locations, installing CCTV may be necessary to deter criminal or anti-social activity. The presence of CCTV in the area may help users feel more confident in using the infrastructure and leaving their vehicles unattended to charge. CCTV systems can also be fitted with ANPR to provide parking bay enforcement functionality.
- **(c) Access.** Some sites may already have access constraints such as automatic barriers at entries and exits of car parks, or security personnel supervising the entry to workplaces or campuses.

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7.8.2 Cyber security

As well as physical security, there is a need for a smart and secure energy system. As the presence of EVs and infrastructure grows, so do the risks to the stability of the electricity supply networks surrounding chargepoints. Risks around the theft of user and financial data exist, as do the hacking of chargepoints. ETSI EN 303 645 establishes the principles for high-level security and data protection provisions of devices connected to network infrastructure. Through the EV Smart Chargepoint Regulations, private EV chargepoints (chargepoints not for public use, likely to be used in domestic and workplace settings) sold after 30 December 2022 must meet this standard, along with additional requirements on security logging and physical protection derived from PAS 1878.

7.9 Community engagement – pre-deployment

Engaging the local community on public EV charging can help develop the local authority EV strategy. Doing so can serve the following purposes:

(a) Inform existing EV users where the infrastructure will be deployed to encourage strong initial utilisation.

(b) Inform non-EV users as to the plans and their justification in terms of local air quality and wider environmental impact.

(c) Give confidence to those considering transitioning to EV that infrastructure is being deployed in. This can help encourage EV transition and gain an understanding for the need of infrastructure to non-EV owners their area.

(d) Offer the opportunity for the local community to comment, either positively or negatively, on the plans. The local authority should decide prior to release of any communications on how feedback should be responded to.

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Case study	
Name	Coventry City Council
Purpose	Community engagement – pre-installation

Coventry City Council released information on a proposed deployment of on-street residential EV charging via their physical *Street News* newsletter that was delivered to homes in the affected local area.

Figure 7.7 Coventry City Council community engagement case study. Reproduced by permission of Coventry City Council

Street news

June 2023

On-street residential electric vehicle charging point scheme: Update: **Zone BA/BB**

We recently asked for your views on plans to install on-street electric charge points in your area. We listened carefully to all your comments and have made some changes to our original proposal taking into account feedback received from residents and ward councillors. Based on the revised proposal Coventry City Council submitted a bid to the Government's Office for Zero Emission Vehicles [OZEV] for funding to install the charging bollards.

I am pleased to inform you that we have been successful in securing this funding and are now able to progress with the installation of charging bollards. The map inside shows the revised proposal that we are planning to implement.

Most of the charging points will take the form of a bollard which will be powered by connecting to a feeder pillar (an independent power supply) and will make no noise or any vibrations. The photo shows the style of charging bollards that have already been installed elsewhere in Coventry using the government grant, and the ones installed in your area will be the same as these.

There will be no parking restrictions initially placed on the use of the parking spaces next to the charging points, meaning that there will be no loss of parking. Sensors installed in each space will mean we can monitor usage and restrictions will only be considered in the future should electric vehicle ownership and usage justify such action.

We aim to start the works to install the charge points from July 2023 with all work completed by end of March 2024.

Coventry City Council

www.coventry.gov.uk

Street news

Your questions answered:

1. What are the benefits of owning or leasing an electric vehicle?

- cheaper to run
- cheaper to maintain
- better for the environment
- quiet
- there are tax savings and incentive initiatives

2. How do I charge it if I don't have off-street parking?

The Office for Zero Emission Vehicles (OZEV) has made funding available for local authorities to provide on-street charge points for residents who do not have access to an off-street parking facility. By installing charge points on-street, residents without off-street parking can enjoy the convenience and value of charging their electric vehicles at home. As more residents use electric vehicles, communities will benefit from improved air quality.

3. How much does charging an electric vehicle cost?

Coventry City Council has entered into a 15-year contract with a supplier to provide, install and maintain charge points for electric vehicles in the city. The supplier will charge 40p/kWh until March 2025.

4. How much is this scheme costing to install and who is paying?

The total project will cost £4.7m. Coventry City Council has been awarded £2.8m [60%] to install on-street charge points, with the remaining 40% funded by the charge point supplier.

5. How were the areas chosen?

Areas have been chosen where there is no off-street parking facility.

6. Who is the charge point operator and what is the tariff?

The charge point operator is Connected Kerb (https://www.connectedkerb.com/). The tariff will be 40p/kWh until March 2025. For this phase, the delivery programme is to have all the charge points operational by end of March 2024.

If you have any comments or questions, please contact **Shamala Evans-Gadgil on 07779 080846** or email her at **Shamala.evans-gadgil@coventry.gov.uk**

Coventry City Council

Street news

Zone BA: 26 bollards with 49 charging bays

Zone BB: 17 bollards with 31 charging bays

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7.9.1 EV user groups

When consulting with the community, local authorities should also consider engaging EV user groups for which there are existing national level bodies representing England (Electric Vehicle Association (EVA) England), Scotland (EVA Scotland) and Northern Ireland (EVA Northern Ireland). There may be more local groups in the local authority's area that should be consulted.

These groups will have a good understanding of the experiences and challenges faced by current EV drivers in each country and are helpful stakeholders to engage for most EV charging infrastructure projects.

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Section 8

Deployment – what processes need to be completed before going live?

This section provides guidance on aspects related to deploying EV infrastructure.

8.1 Installation

If the preparation work has been completed diligently, the process to install and commission an EV charging deployment should be straightforward. Depending on the scope and methods used for civil works (see Section 7.4.3), these may need to be done in advance of the final electrical installation and commissioning work. However, it may be possible for the infrastructure to be deployed in a single day, especially for smaller installations. Streamlining the installation process can be beneficial, particularly in busy areas where the works will cause inconvenience to other users of the area.

8.2 Commissioning

For commissioning, the installer will need to ensure:

(a) **Electrical compliance.** As part of any electrical works (including EV charging), the installer will need to complete an electrical installation certificate (EIC). This confirms the details of the work done and that the installation is compliant with regulations and therefore safe to use. The installer is required to share a copy of the EIC with the local authority.

(b) **Communications and operation of charging infrastructure.** The installed chargepoints will each have a commissioning process described within the installation manual with which the installer should be familiar and trained (if applicable). This process should be followed for each chargepoint installed to ensure that the communications are working, it is connected to the appointed back-office system and it can deliver a charge.

8.3 Notifications

Once the chargepoint(s) has been installed and commissioned, a DNO notification will need to be made. For existing connections which were eligible to connect and notify (see Section 7.1.4), the relevant DNO must be notified that the charging infrastructure has been installed using the standard notification form provided by the ENA. A separate form is provided for multi-installations (i.e., installations taking place under different Meter Point Administration Numbers (MPANs), even those located on the same site).

Additionally, the installer may need to submit evidence of the installation as required by any applicable grant funding schemes (see Section 6.11).

8.4 Approval

If a sign-off procedure has been included in the contract with the design and installation service provider(s), a representative from the local authority may wish to review installation evidence or visit the site. This ensures the installation has been completed satisfactorily as per the approved design.

For larger scale sites, the local authority and/or supplier may wish to do a soft launch of the deployment to mitigate the exposure of any early problems with the charging system.

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Section 9

Operation – how do we ensure the chargepoints operate successfully?

The guidance presented for this phase, whilst applicable to the operational phase of the project lifecycle, must be planned for much earlier in the project to ensure the right processes and systems are in place from day one.

9.1 Revenue

Mechanisms need to be designed and implemented for how the landowner will collect and invoice revenue generated at the sites delivered. This may be monthly, quarterly or yearly and should be agreed with the CPO.

9.2 User support and reliability

To provide a good user experience, it is essential that CPOs prioritise and deliver excellent customer service. CPOs must provide a 24/7 free helpline. Local authorities should consider defining customer support provision within the service levels required of a CPO. Local authorities should also consider key performance indicators for identifying and rectifying faults.

9.3 Monitoring

Combined with behavioural insights, these can help to determine the success of existing EV chargepoint installations and create evidenced plans for additional installations. Examples of performance metrics can be found in Appendix E.

9.3.1 Data protection requirements

Data collected by EV charging infrastructure and by EV chargepoint network operators is varied and can contain personal information. Data sources can be linked with KPIs, which inherently associates them with a legitimate business interest. This should ensure compliance with current general data protection regulations (GDPR) and consideration should be given to methods of securing, storing, accessing and sharing data.

9.4 Maintenance

In most circumstances across the operating models outlined in Section 6.4, the ongoing maintenance of charging infrastructure will be the responsibility of the chargepoint operator. The following information is therefore provided to indicate what maintenance may be required for the lifespan of charging infrastructure, to inform the laying of contracts at the procurement stage. When agreeing maintenance with CPOs, landowners should consider both reactive and scheduled maintenance.

The maintenance activities that may be required are:

(a) **General inspection.** The charging infrastructure should be inspected inside and out to look for signs of the following to inform the need for any preventative maintenance:
  - **(i)** damage due to vehicle impacts, misuse or vandalism;
  - **(ii)** indication of thermal effects due to overheating of electrical components;
  - **(iii)** water ingress; and
  - **(iv)** damage to electrical contactors.

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(b) **Cleaning and replacing filters.** Some charging equipment requires active ventilation (for example, via a fan). These should be cleaned and replaced as per the manufacturer's instructions.

(c) **RCD Testing.** Residual current devices (RCDs) should be tested every six months.

(d) **Coolant replacement.** Liquid cooling is used for tethered cables of ultra-rapid chargers. The coolant may need replacing as per the manufacturer's instructions.

(e) **Replacement of any exhausted/degraded modular components.** Some electronics used in EV chargepoints may degrade over time.

(f) **Wider general site maintenance. Lines, signs, bays, bollards, tarmac.** For on-street chargepoints,this will need to be agreed with the highway authority.

(g) **Reactive maintenance.** The speed in which an unsafe site (possibly due to collision) is attended and made safe, and who's responsible.

9.5 End of life

When charging equipment reaches the end of its life, assuming it is not possible or desirable to fix the existing equipment, there are three actions that can be taken:

1. **Replace.** Replacing the charging infrastructure like for like.
2. **Upgrade.** Replacing the charging infrastructure with an updated model.
3. **Decommission.** Removal of the charging equipment for resale, recycling or disposal as per the Waste Electrical and Electronic Equipment (WEEE) regulations.

Which approach is taken and which stakeholder is responsible will depend on the operating model used and the terms of the contract between the local authority and supplier.

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Appendix A

Glossary

Term	Definition
AC	Alternating current.
AEVA	Automated and Electric Vehicles Act 2018.
BESS	Battery energy storage system.
CCS	Combined Charging Standard. A standard for charging electric vehicles. It can use Combo 1 (CCS1) or Combo 2 (CCS2) connectors to provide up to 350 kW.
CPMS	Chargepoint Management System. The back-office system operated by the CPO with a database of chargepoints within the network. The CPMS monitors the status of each chargepoint and initiates and terminates charging events.
CPO	Chargepoint operator. CPOs deploy, operate and maintain a public chargepoint network.
DC	Direct current.
Distribution Network Operator	The company that owns and operates the electricity infrastructure in the power distribution network that connects businesses and homes to the national grid.
DNO	Distribution Network Operator.
Electric vehicle	In the context of this guide, electric vehicle (EV) covers all electrically propelled road vehicles with four or more wheels that are capable of accepting electrical charge from a source external to the vehicle, including plug-in vehicles (PiVs), full battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and range-extended hybrid electric vehicles/ extended-range hybrid electric vehicles (REHEVs/ERHEVs).
Electric vehicle chargepoint	The point where the EV is connected to the fixed installation. **NOTE:** The chargepoint is a socket-outlet where the charging cable belongs to the vehicle, or a connector where the charging cable is a fixed (tethered) to the EV supply equipment.
eMSP	E-mobility service provider. The eMSP provides EV charging services to the end user which can include locating EV chargepoints on maps, facilitating payment for charging services, data services for EV charging across multiple networks, and user access through apps.
ENA	Energy Networks Association.
EV	Electric vehicle.
EVI	Electric vehicle infrastructure.
E-REV	Extended range electric vehicle.
HGV	Heavy goods vehicle.
IDNO	Independent Distribution Network Operator.
kW	Kilowatt is a measure of power and is the rate at which energy is generated or used.
kWh	Kilowatt-hour is a measure of energy, contained in a fuel, or used by something over a specific period of time. 1 kWh = 1,000 watt-hours (Wh), or the energy used by a load consuming a constant 1 kW (1,000 W) for an hour.
LEVI Fund	Local Electric Vehicle Infrastructure Fund. The LEVI Fund supports local authorities in England to plan and deliver charging infrastructure for residents without off-street parking.
PEN	Protective earth and neutral.

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Appendix A – Glossary

PHEV	Plug-in hybrid electric vehicle.
PV	Photovoltaics (solar).
RCD	Residual current device.
SOC	State of charge.
Socket-outlet	A device, provided with female contacts, which is intended to be installed with the fixed wiring, and intended to receive a plug.
SU	Statutory undertaker.
TCO	Total cost of ownership.
Tethered cable	A connector where the charging cable is a fixed part of the EV supply equipment.
TMO	Traffic Management Order.
TRO	Traffic Regulation Order. Legal orders made by traffic authorities, that are needed to change a road's use or its design.
V2B	Vehicle-to-building.
V2G	Vehicle-to-grid.
V2H	Vehicle-to-house.
V2X	Vehicle-to-everything. The umbrella term capturing the concept of bidirectional power transfers, with EVs exporting energy from their battery for use elsewhere. Energy may variously be exported to homes (V2H), buildings (V2B), direct to load (V2L), or back to the grid (V2G). V2X provides an opportunity to help balance the electricity grid, making best use of renewable energy generation and reducing carbon emissions, whilst providing cost savings or revenue earning opportunities for electric vehicle owners.
Vehicle connector	Part of a vehicle coupler integral with, or intended to be attached to, the flexible cable connected to the supply network (mains).
Vehicle coupler	Means of enabling the manual connection of a flexible cable to an electric vehicle for the purpose of charging. **NOTE:** A vehicle coupler consists of two parts – a vehicle connector and a vehicle inlet.
Vehicle inlet	The part of the vehicle coupler that is integrated into the structure of the vehicle.
ZEV	Zero emission vehicle.

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Appendix B

Load management

Load management is a technique whereby charging power is controlled at a local level to avoid exceeding the maximum demand of the DNO connection.

There are different levels of complexity of load management, each with different methods, one of which utilises the 'smart' functionality of chargepoints to control power remotely.

NOTE: Load management and smart charging are two overlapping technologies but they are not the same. For a definition of smart charging, refer to Section 3.8. However, smart charging can be used to achieve load management using cloud-based load management systems (as opposed to hardware-based systems). (See Appendix B.)

The term 'load management' is not standardised and other EV charging stakeholders may use different terminology such as 'load balancing', 'power management', 'charging management', 'power distribution' and 'energy management'.

B.1 The levels of load management

Although each have the objective of maximising the usage of the local electricity network connection capacity, there are various techniques used in load management. The author classifies load management systems into levels, which can be useful when evaluating supplier proposals to distinguish and compare capabilities of different technologies.

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B.2 Summary of load management levels

Table B.1 presents a summary of load management levels.

Table B.1 Load management levels summary

	Description	Benefits	Limitations	Suitable applications
Level 0	No load management.	None.	No load management means that unmanaged charging can overload local network connection.	Should only be used where the local network connection is sufficiently large that there is no risk of the EV charging overloading the network connection, or a large number of EV chargepoints are being deployed and therefore diversity factors can be applied.
Level 1	Single chargepoint load management.	Maximise the use of power supplied and circuit design for twin output chargepoints.	Does not give any load management at a site level.	Could be used for a site deploying a small number of twin chargepoints but limited applicability for constrained sites.
Level 2	Static multi-chargepoint load management.	Can be used to ensure site connection is not overloaded. Allows chargepoint circuits to be designed to load managed power, saving cost.	Does not optimise use of available power dynamically. Difficult to implement for sites with other non-EV loads; requires an assumption to be made on the total available power for EV charging up-front.	Could be used for sites with a low number of EV chargepoints or where the total available power is not significantly less than the maximum charging demand for all chargers at full power. Easier to implement where there are no considerable non-EV loads.
Level 3	Dynamic multi-chargepoint load management.	True optimisation of the use of available power, accounting for non-EV loads and the number of EVs requesting a charge, in real-time.	More complicated system to implement.	The minimum load management standard for sites where the constraints of the network connection and the number of chargepoints to be deployed would result in an unacceptable limitation in charging power for a Level 2 static load management system.
Level 4	Dynamic multi-chargepoint load management with additional functionality integration.	Can offer a lower lifetime cost for chargepoint system.	The benefit of any additional functionality, as with load management, depends on the charging demand of the vehicles to be connected; less flexibility in charging will limit the benefit.	Most likely to be of interest for larger fleets with predictable vehicle usage and greater flexibility of when they are charged.

NOTE: For all load management systems, it is important to consider whether the user will be happy to accept a lower charging power.

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Appendix C

Site surveys

The following is a non-exhaustive list of surveys a local authority should consider when assessing and designing a site for an EV chargepoint.

Table C.1 Site survey information

<table>
<tr><th></th><th>Information captured</th><th>Description</th><th>Relevant charging locations</th><th>Desktop or on-site?</th></tr>
<tr><td rowspan="3">General</td><td>Surveyor</td><td>Name and contact details of the person completing the survey.</td><td>All</td><td>Both</td></tr>
<tr><td>Date/time</td><td>Time and date survey was completed.</td><td>All</td><td>Both</td></tr>
<tr><td>Site contact details</td><td>Name, role, phone number and email address for site contact.</td><td>Most applicable for locations with existing infrastructure, e.g. car parks, workplaces etc.</td><td>Both</td></tr>
<tr><td rowspan="5">Site</td><td>Location type and site use</td><td>Which of the location types listed in Section 4.7 best describes the site.
Description of the site usage.</td><td>All</td><td>Desktop</td></tr>
<tr><td>Location</td><td>Coordinates (latitude and longitude) of site.</td><td>All</td><td>Both</td></tr>
<tr><td>Site plan</td><td>Satellite view of site, marking out land ownership boundaries, proposed EV charging locations, electrical supply etc.</td><td>All</td><td>Desktop</td></tr>
<tr><td>Land ownership and operation</td><td>Details of who owns/operates the land between the electrical supply and the proposed EV charging location, and its purpose.</td><td>All</td><td>Desktop</td></tr>
<tr><td>Existing chargepoints</td><td>Are there any existing chargepoints on-site or nearby?</td><td>All</td><td>Desktop for public chargepoints, on-site for private.</td></tr>
<tr><td rowspan="3">Electrical</td><td>Electrical supply and distribution points</td><td>Locations of existing electrical supplies and distribution points.</td><td rowspan="3">All sites with at least one existing supply.</td><td>On-site</td></tr>
<tr><td>Meter Point Administration Number(s) (MPAN(s))</td><td>MPANs for any existing electrical supplies to site.</td><td>Desktop from energy bill(s) or on-site from meter(s).</td></tr>
<tr><td>Electrical supply import capacity</td><td>The rating (in kVA for larger sites or A for smaller sites) of any existing electrical supplies. If this is unknown or uncertain, contact your DNO (see Section 3.5).</td><td>On-site</td></tr>
</table>

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Appendix C – Site surveys

Table C.1 *cont.*

	Information captured	Description	Relevant charging locations	Desktop or on-site?
Electrical	Existing site loads	Ideally, a maximum demand meter reading. If this is not available, a load survey should be conducted of the existing circuits already supplied by the site supply. It is important to understand how loads are distributed across phases for three-phase sites. This will require a qualified electrician.	All sites with at least one existing supply.	On-site
	DNO	Which DNO is responsible for the supply to the site (see Section 3.5).		Desktop
	DNO contact details	The name and contact information for any existing contacts at the DNO the site may have.		Both
	Supply earthing arrangement	Is the earthing arrangement TN-C-S (PME), TN-S or TT?		On-site
	On-site generation	Is there any existing on-site generation? If yes, for example, details of the kWp, aspect and pitch of any roof-mounted solar PV.		On-site
Chargepoint location	Location(s)	Coordinates of proposed chargepoint location(s).	All	On-site
	Photographs	Photographs of the proposed chargepoint location(s), surrounding area and any specific points of interest.	All	On-site
	Hazardous zones or flood risk	Information on any nearby hazardous zones where flammable/combustible gases, liquids, dust or saltwater may be present, or the risk of flooding. If present, are the boundaries of the hazardous zones known/identified?	All, although more likely to apply to workplace charging at existing industrial sites.	On-site
	Existing metallic structures	Are there any metallic structures in the vicinity of the proposed charging location, and how will these impact the earthing design of the charging system? For more info see Section 7.4.2.	All	On-site
	Existing infrastructure such as street furniture	Is there any existing infrastructure that will affect the chargepoint deployment during use?	All – particularly important for on-street locations.	On-site
	Existing parking restrictions	Disabled bays, parking permit areas etc.	All public locations.	On-site

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Appendix C – Site surveys

Table C.1 *cont.*

	Information captured	Description	Relevant charging locations	Desktop or on-site?
Chargepoint location	Footway widths	How wide is the footway? Will installing EV charging infrastructure impact upon other users of the street?	On-street locations	On-site
	Highway use	Are there any dropped kerbs, cycle lanes, loading areas etc that will affect the use of the chargepoint?	On-street locations	On-site
	Parking bays	Number of existing parking bays and photographs and a plan drawing of their layout.	All	On-site
	Mobile data coverage	What is the coverage and signal strength at the proposed charging location across mobile networks?	All public sites and any private sites which require chargepoint(s) to be connected to a back-office via a mobile network.	On-site
	Site access and security	What access controls are in place for the site and are there any existing security measures? E.g. CCTV, parking permits, access barriers, lighting.	All	On-site
	Parking limitations	Are there any limitations on parking durations at the site?	All	On-site
	Chargepoint(s) mounting location	Chargepoints to be wall or ground mounted? If ground mounted, what are the ground conditions?	All	On-site
	Civil works requirements	What are the ground conditions between the existing electrical distribution point, or proposed new connection point location, and the chargepoint(s)?	All	On-site
	Underground services	Are there any existing gas or electrical supplies buried underground that could interfere with cable runs?	All – very relevant for on-street charging deployments in urban areas where there may be a high-density of services buried under footways and roads. See Section 5.5.	Both
	Biodiversity	What biodiversity is in the immediate proximity of the proposed location, and are any mitigating actions needed?	All	Both

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Appendix D

Chargepoint Management System (CPMS) procurement checklist

Table D.1 gives a checklist of specification requirements and tender evaluation criteria for CPMS.

Table D.1 CPMS procurement checklist

	Requirement description	Applicability	Options or further information	☒
Protocols and compatibility	OCPP v1.6 or later	All		☐
	Compatible hardware	All	Which OCPP hardware has already been integrated?	☐
	ISO 15118-20 ready	All		☐
Payment	Tariff structures	All billable chargepoints	Consumption-based, flat-rate etc.	☐
	Integration with other MaaS systems	All	Are you able to integrate the chargepoints into an existing MaaS system?	☐
Management	Booking and reservation	Long-stay locations	Booking mechanisms.	☐
	Monitoring – essential KPIs	All		☐
	Monitoring – additional KPIs	All		☐
Interoperability	Access from other eMSPs	All	What other eMSPs have access to your network?	☐
	Access to other CPOs	All	What other networks can be accessed from your eMSP?	☐
	Protocols	All	What protocols does the CPMS use to interface with eMSPs and roaming hubs (e.g. OCPI)?	☐
CPMS	Access to CPMS	All	Local authority access to CPMS.	☐
	CPMS user interface live information and control	All		☐
	Integrated scheduling	Private fleet locations		☐
	Integrated load management	Load management applicable locations		☐
Reliability	Minimum existing chargepoint network availability %	All		☐
Support	Support mechanisms	All	E.g. phone (including call handler location), online ticketing.	☐
	Support availability	All	Hours, days of operation.	☐

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Appendix E

Essential performance metrics

Table E.1 shows a list of essential performance metrics that can be used to monitor various aspects of an EV charging infrastructure network, including its overall utilisation, operability and efficiency.

Table E.1 Essential EV charging infrastructure KPIs, including units, data sources and purpose for each indicator

Key performance indicator	Unit	Source	Purpose
Chargepoint location	Easting/northing Longitude/latitude	Chargepoint Management System (CPMS)	To identify where the chargepoint is located
Total number of charging sessions, broken down by chargepoint	Frequency count	Chargepoint Management System (CPMS)	Overall utilisation; highlight variations in utilisation; business modelling; ongoing network development planning
Total electricity provided	kWh; MWh	Chargepoint Management System (CPMS)	Overall utilisation; business modelling
Total electricity provided, broken down by chargepoint	kWh per chargepoint	Chargepoint Management System (CPMS)	Overall utilisation; highlight locations with greater or lesser utilisation; ongoing network development planning
Average electricity provided per charging session	kWh per charging session	Chargepoint Management System (CPMS)	Customer behaviour insight; business modelling
Time series power demand data	Maximum kW demand during unit time	Chargepoint Management System (CPMS)	Customer behaviour insight; business modelling; high-level electricity distribution network planning
Average duration of charging sessions	Time (HH:MM:SS)	Chargepoint Management System (CPMS)	Customer behaviour insight; business modelling
Total electricity provided per hour of EVs being plugged-in	kW (equivalent to kWh per hour)	Chargepoint Management System (CPMS)	Overall network efficiency
Equipment uptime, broken down by chargepoint	Percentage	Chargepoint Management System (CPMS)	Assessing reliability of individual chargepoints; identify locations with most faults; enforcing terms of service-level agreement with supplier
Network uptime (equipment uptime, averaged across whole network)	Percentage	Chargepoint Management System (CPMS)	Assessing overall reliability of network; enforcing terms of service-level agreement with supplier

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Appendix E – Essential performance metrics

E.1 Additional usage metrics

Table E.2 adds a list of additional performance indicators which may be of use to expand the depth of insight into the performance of the system.

Table E.2 Additional EV charging infrastructure metrics, including units, data sources and purpose for each indicator

Key performance metric	Unit	Source	Purpose
Time series data of energy provided, broken down by chargepoint	kWh per unit time	Chargepoint Management System (CPMS)	Customer behaviour insight; business modelling; ongoing network development planning
Time series power demand data, broken down by chargepoint	Maximum kW demand during unit time	Chargepoint Management System (CPMS)	Customer behaviour insight; ongoing network development planning; site-level electricity distribution network planning
Average duration of charging sessions, broken down by chargepoint	Time (HH:MM:SS)	Chargepoint Management System (CPMS)	Customer behaviour insight; ongoing network development planning
Total electricity provided per hour of EVs being plugged-in, broken down by chargepoint	kW (equivalent to kWh per hour)	Chargepoint Management System (CPMS)	Chargepoint utilisation efficiency; targeting enforcement action at locations with most inefficient charging behaviours
Payment method usage value and frequency (where multiple payment methods are employed)	Frequency count	Chargepoint Management System (CPMS)	Customer behaviour insight; ongoing development of tariffs and payment methods; finance and budgeting
Booking system usage (where booking system employed)	Frequency count	Chargepoint Management System (CPMS)	Determining popularity of booking system
Booking system no-shows (where booking system employed)	Frequency count	Chargepoint Management System (CPMS)	Identifying negative impacts of booking system
EV-only bay occupancy	Percentage	ANPR; proximity sensors; CEOs	Determining any loss of parking provision caused due to EV-only bay enforcement
EV-only bay PCN issue count	Frequency count	ANPR; CEOs	Customer behaviour insight; determining effectiveness of EV-only bay markings and signage
EV-only bay PCN issue count, broken down by location	Frequency count	ANPR; CEOs	Customer behaviour insight; identifying site-specific issues with EV-only bay markings and signage

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Table E.2 *cont.*

Key performance metric	Unit	Source	Purpose
EV chargepoint user origin	Coarse location (no business need for full address)	Chargepoint network back-office system; MaaS system back-office	Customer behaviour insight; demonstrating value added to local economy
EV chargepoint user origin, broken down by chargepoint	Coarse location (no business need for full address)	Chargepoint network back-office system; MaaS system back-office	Customer behaviour insight; tailoring site-level service to needs of high/low-mileage users
Additional public transport usage (where MaaS system integrated)	MaaS system uses per month, before and after EV charging used Number of new MaaS system registrations that use EV charging within first month of issue	MaaS system back-office	Customer behaviour insight; determining any additional use of public transport caused by EV charging infrastructure provision

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Appendix F

Strategy checklist

The UK government has provided guidance on what an EV charging strategy should contain. This is provided in checklist form in Table F.1. This will support any local authority that is in the process of developing their strategy.

Table F.1 Strategy checklist based on government guidance

Current and potential future demand from local drivers without off-street parking and how this demand is distributed geographically.	
Current and potential future demand from visitors, particularly for areas with high levels of tourism. This is likely to vary seasonally. Working with destination management organisations will help local authorities to plan on the likely future needs of the visitor economy, enabling successful integration of transport and infrastructure.	
The local authorities' own needs for charging infrastructure, such as for public transport, and at offices and schools. Plans for electric car clubs and electric buses (for example, as part of Bus Service Improvement Plans) should be accounted for, particularly when sharing information with local energy companies. Charging infrastructure for electric bikes and motorbikes should also be considered.	
Current chargepoint provision and any known pipeline of private investment that may meet this demand, for example, at workplaces or supermarkets. This should consider a five-to-ten-year horizon and consider scaled plans delivering up to hundreds or thousands of chargepoints, depending on the needs of the area.	
Opportunities and risks for different chargepoint options for meeting this demand in different areas. This includes the availability and attractiveness of different sites, in addition to the possible types of chargepoint that would be suited to such sites.	
Potential advantages of taking action including assessing the effects on air quality, curbing environmental impacts like reducing carbon dioxide and particulate emissions, and the prospect of potential financial savings by avoiding damage costs.	
Potential sites for charging infrastructure, including (but not limited to) kerbside locations and council-owned sites such as public car parks, or potential community charging locations such as village halls, social clubs and car parks at places of worship. This should include the associated development and electricity network connection costs, and how these costs can be minimised with smart and flexible energy solutions (using information from electricity network operators and energy companies).	
Explore and determine the preferred commercial delivery options by analysing various aspects such as commercial arrangements, route to market, and funding and investment. This assessment includes evaluating the willingness of the local authority to take risks and the potential rewards associated with each option.	
Likely commercial attractiveness of chargepoints at different sites. Potential revenue opportunities for the council should be balanced with the need for equitable access and pricing for residents without off-street parking.	
Approach to enable the market to deliver these plans at scale (including the extent of council ownership, funding requirements for chargepoints which are unlikely to be commercial, contract length and financing options).	
Current and future air quality in the surrounding area. Assess how switching to the increased usage of EVs and chargepoints will impact local air quality.	

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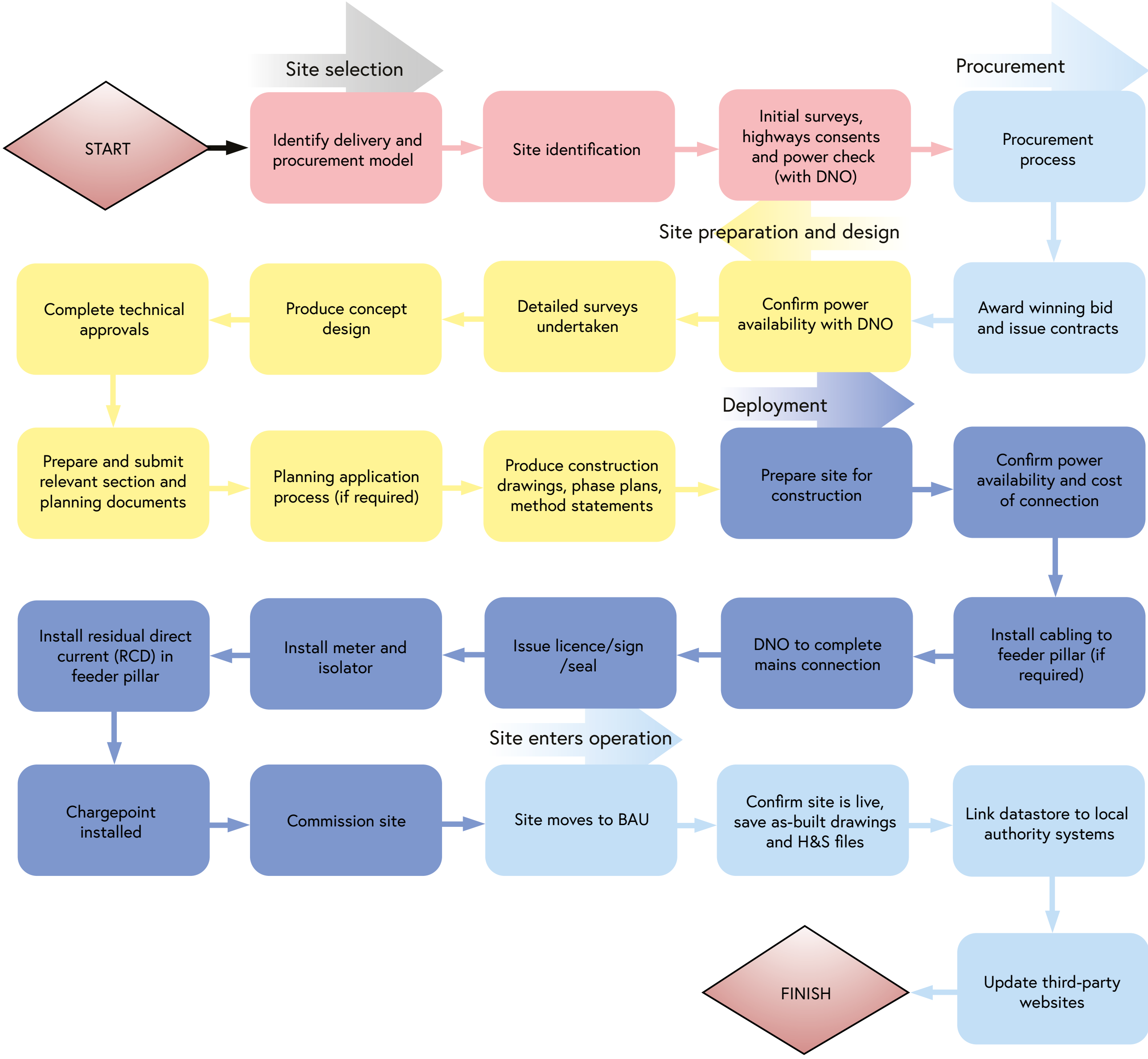
Appendix G

End-to-end overview of chargepoint delivery process

Figure G.1 presents a general overview of the end-to-end process for installing a chargepoint. This process may vary by chargepoint type and location.

Figure G.1 End-to-end process for chargepoint delivery



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Guide to **Electric Vehicle Charging Infrastructure for Local Authorities**

The UK aims to have one of the best electric vehicle (EV) infrastructure networks in the world. This means a network for current and prospective electric vehicle drivers that is affordable, reliable, accessible and secure.

Local authorities have a key role to play in supporting this vision by encouraging and assisting EV uptake. One way of doing this is setting plans to install and implement charging points for certain individuals or businesses who will rely on public infrastructure. These include (but are not limited to), people who have no access to off-street parking, taxi drivers, fleets and light delivery vehicle drivers. Local authorities also have a key role to play in electrifying their own fleets and will require the associated charging infrastructure to support this.

The local authorities face a number of barriers in planning for and deploying EV charging infrastructure successfully. This new guidance offers a single point of reference to local authorities across the UK to assist them with EV infrastructure implementation and covers the following areas:

- the fundamentals of EV charging infrastructure.
- the solution types and their applicable use cases.
- high level guidance on EV charging strategy and the opportunities and challenges associated with each solution type.
- site identification and selection.
- how to prepare for EV charging deployment by considering:
  - power provision DNO engagement;
  - installation design best practice;
  - procurement advice including ownership and operation models, specifications, funding models and contract guidance;
  - legal implications.
- the deployment process including installation, commissioning, notifications and approvals.
- operational considerations such as tariff structures, payment mechanisms, parking management and maintenance.
- examples of community engagement techniques and a look at future technologies.

This guide is designed to be accessible to all those who are involved in EV infrastructure planning and deployment.

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