# England's Economic Heartland & Transport East

## *Electric Vehicle Insight Study – Final Report*

CITY SCIENCE
delivering decarbonisation

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## Abbreviations

| Abbreviation | Definition |
|---|---|
| BSP | Bulk Supply Points |
| CPO | Charge Point Operator |
| DNO | Distribution Network Operator |
| DPS | Dynamic Purchasing System |
| EEH | England's Economic Heartland |
| ELVIS | ELectric Vehicle Insights Study |
| EV | Electric Vehicle |
| EVCC | Electric Vehicle Charging Channel |
| GSP | Grid Supply Points |
| HGVs | Heavy Goods Vehicles |
| ICE | Internal Combustion Engine |
| ICP | Independent Connection Provider |
| ICS | Integrated Care Systems |
| LA | Local Authority |
| LEVI | Local Electric Vehicle Infrastructure |
| LGV | Light Goods Vehicles |
| MRN | Major Road Network |
| ORCS | On-street Residential Charge point Scheme |
| OSHC | On-Street Home Charging |
| OZEV | Office for Zero Emission Vehicles |
| SRN | Strategic Road Network |
| SSEN | Scottish and Southern Electricity Network |
| STB | Sub-National Transport Bodies |
| TE | Transport East |
| TfL | Transport for London |
| TRO | Traffic Regulation Order |
| UKPN | United Kingdom Power Network |
| ULEV | Ultra Low Emission Vehicles |

| | |
|---|---|
| VEoE | Visit East of England |
| V2G | Vehicle 2 Grid |
| ZEV | Zero Emission Vehicle |

# 1 Executive Summary

## 1.1 Overview

To support the accelerated uptake of EVs, and align with broader net zero objectives, Transport East (TE) and England's Economic Heartland (EEH), have commissioned an ELectric Vehicle Insight Study (ELVIS).

ELVIS' overarching objectives are:

- To understand the current state of EV infrastructure deployment and EV strategy development across the two regions.
- Identify investment pipelines from public and private sectors.
- Undertake an EV strategy gap analysis..

This understanding will help the public sector determine the scale of their role in enabling and encouraging private sector investment, addressing any gaps identified, and supporting equitable access to infrastructure.

Alongside commissioning ELVIS, EEH and TE have also commissioned WSP to deliver a bespoke tool (EV:Ready). The tool will analyse predicted EV uptake and EV charge point requirements across the region, with a view to 2050. This Study acknowledges the key outputs of this project (particularly the forecasts of anticipated need) to ensure that the two workstreams, support and complement each other, and to provide consistency across the regions.

## 1.2 Local Authority Gap Analysis

### 1.2.1 Methodology

To identify the current and expected gaps in infrastructure deployment from the LA perspective, we held two themed workshops (one workshop per STB region), followed by a bespoke survey submitted to LAs and Local Transport Authorities (LTAs). The workshops and survey results were combined with a desktop analysis of readily available EV strategies to inform the development of an EV Maturity Model.

**What is an EV Maturity Model?**

The EV Maturity Model provides a quantitative analysis of the progress and experiences of LAs delivering EV infrastructure roll out. The tool was used to assess LAs preparedness for the EV transition, and to support the prioritisation of future activities that can accelerate progress.

The Model assesses seven categories including: EV Strategy, Action Plan, Procurement, Partnerships & Stakeholder Engagement, Coverage, Funding and Metrics, and Monitoring and Evaluation. Each category was split into five broad levels (ranging from 1 – 5), with level 1 representing a basic standard, whilst level 5 demonstrated a more advanced level of development.

### 1.2.2 Results

The results of the EV Maturity Model, LA survey, and workshops were used to summarise the main gaps in provision, expertise, and support across both the regions. A key finding was that a number of LAs across both regions do not currently have an EV Strategy. The two common barriers identified related to resourcing and expertise within Councils, and the often complex and overwhelming routes to procurement. This presents a clear opportunity for support and collaboration to overcome a common challenge. Finally, there was a concern amongst LAs that rural areas are typically less attractive to Charge Point Operators (CPOs), raising concerns regarding equitable charge point provision. Addressing this gap is crucial, as rural communities often have less access to public

transport, rely on private vehicles for essential journeys, and frequently suffer high levels of deprivation.

## 1.3 Private Sector Capital Investment Model

To consider the trends and emerging partnerships from a private sector perspective, we conducted a desktop review of investment reports of UK EV sector growth, one-to-one interview sessions with CPOs, and a unique survey to engage with wider private sector partners.

The desktop review revealed that site selection approaches are influenced by a variety of factors, including but not limited to:

- Charging speed
- Capital costs
- Operating costs
- Utilisation rate
- Business model
- Energy availability

The speed of the charge point infrastructure determines the power requirements, size and the utilisation risk that the CPO accepts, with energy-intensive rapid charging services typically requiring higher upfront capital costs. Additionally, the business model adopted was found to influence CPOs' strategies with regard to funding, fees, partnerships and target customer, which in turn influenced their investment decisions. The complex nature of site selection has resulted in numerous academic studies that have each developed methods to determine optimal sites for EV charging points. However, engagement with the private sector identified that the academic assumptions frequently fail to reflect real world scenarios. Direct engagement with the private sector was therefore key to understanding actual investment decisions.

Engagement with CPOs highlighted key differences between the approaches of standard and rapid operators. The central finding was that CPOs focused on the slow charging market offered more flexibility in terms of sites they deem attractive to investment, including a willingness to deploy in rural areas. In contrast, due to higher installation costs, rapid operators are more prescriptive about what constitutes a desirable site, with a greater emphasis on return on investment. Despite their differences, several commonalities were identified including the importance of energy characteristics, dwell time and the development of bespoke site selection tools. Crucially, a large proportion of CPOs have received large scale investment to accelerate their infrastructure provision. However, they lack access to land that is essential for delivery. Echoing concerns of LAs, procurement, was additionally cited as a key barrier amongst all CPOs. For instance, it was felt that specific tender requirements limit innovation.

All CPOs outlined an ambition to significantly grow their charging network. However, despite prompts, we were unable to obtain precise investment figures beyond 2030. To compliment the CPO engagement process we also conducted a desktop analysis of wider private sector ambitions. This revealed that many organisations e.g. supermarkets and fast food chains, have limited plans to support infrastructure deployment. This highlights that aside from CPOs there is currently limited wider private sector commitment to charge point roll out.

## 1.4 Electricity Supply

Electricity supply is a key consideration when developing EV infrastructure deployment plans and selecting viable sites for charge points. We engaged with the region's District Network Operators (DNOs) with the aim to identify how DNOs intend to respond to growing demand, how to enable collaboration, and considerations for new connections and infrastructure upgrades. Seven key strategies were identified as a means to increase the flexibility on the grid more generally as described in Section 6.2.

Additionally, several DNOs are already conducting a vast variety of innovative research and development projects to prepare for the widespread adoption of EVs and to enable grid flexibility.

A key emerging theme was that DNOs across the UK stress the importance of early engagement. LAs should not wait until a shortlist of sites has been derived, but instead should utilise the advice and support services offered by the DNO soon after strategy, project, or programme inception.

## 1.5 Procurement & Collaboration

Procurement emerged as a key and ongoing barrier to both the public and private sector, adding complexities and delays to delivery. We have outlined a number of procurement best practice recommendations including:

- Specifying access to a data dashboard.
- Developing and monitoring processes.
- Addressing the gap in rural infrastructure provision.
- Outlining service level requirements to support the maintenance of charge points.

During our engagement with LAs it became apparent that they are eager to learn from each other and exchange ideas. There is a clear opportunity to build on this and for the Sub-national Transport Bodies (STBs) to facilitate EV knowledge sharing. Such sessions could help address the EV knowledge gap thereby supporting the upskilling of officers. There is also an additional opportunity for collaboration around procurement – which has been frequently referenced as a key barrier to delivery.

## 1.6 Conclusions & Next Steps

The Study has identified a genuine commitment to delivering EV charging infrastructure across the two regions. It has also identified that to meet forecasted need, a strong emphasis must be placed on collaboration across public and private sectors. Whilst CPOs are backed by ambitious plans and significant financial investment, they lack access to land, and are therefore dependent on private and public sector partners to plug this gap through mutually beneficial lease agreements.

We have also identified a clear role for LAs. They have an important role to play as both land owners and as advocates for equity. These two points are clearly interconnected. Equity should be a particular area of focus for future work in ensuring adequate provision in rural geographies – a key consideration across both the EEH and TE regions.

The findings have informed the development of a clear set of roles and responsibilities (see Section 8.4), recommendations (see Section 8.5) and opportunities (see Section 8.6), relating to strategic vision, knowledge sharing, and maximising investment and delivery. This includes the STBs and LAs working together to develop a collaborative vision, for instance by developing, agreeing, monitoring and evaluating charging infrastructure delivery targets. A number of asks to central Government are also proposed, including fairer funding for rural areas to ensure that rural communities do not get left behind in the transition to EVs. These proposals provide a framework from which key stakeholders can collaborate to drive the agenda forward , ensuring both regions are prepared for the EV transition.

# 2 Introduction

**Chapter at a Glance**

This chapter outlines the broader context for the Study including the background, objectives, geographical focus, and purpose.

## 2.1 Aims & Objectives

TE and EEH are two of the UK's seven STBs established to provide strategic governance of the transport networks within their regions. TE commissioned City Science to undertake ELVIS on behalf of TE and EEH.

The overarching objective of this Study is to understand the current status of EV infrastructure deployment and EV strategy development across the two STB regions, identify investment pipelines from both the public and private sectors, and undertake a gap analysis.

This understanding will help the public sector determine the scale of their role in enabling and encouraging private sector investment, addressing any gaps identified, and supporting equitable access to infrastructure. It will also be available as a resource to assist the Office of Zero Emission Vehicles (OZEV). For instance, to support with the focusing of funding, or to enhance their understanding of what support the public sector requires. The emphasis of this work will be the near-term (2025 to 2030), with a long-term view to 2035. The ELVIS will enable EEH and TE (and potentially other) STBs to provide additional insight and data to LAs, supporting a consistent approach to developing EV strategies across the two regions.

The key objectives of the ELVIS include:

1. **Private Sector:** Understand the private sector's approach to investing in publicly accessible EV infrastructure identifying common relevant indicators that make a location likely to secure private investment.
2. **Current Context:** Understand existing EV strategies, coverage, status, commonalities and differences.
3. **Future Context:** Understand emerging trends, partnerships and likely capital investment for 2025, 2030 and 2035.
4. **Demand:** Understand how DNOs intend to respond to growing demand.
5. **Gap Analysis**: Identify the current and expected gaps in infrastructure deployment.
6. **Consistent Approach**: Inform and support local leaders to develop a consistent approach to attracting private capital and investment.
7. **Interventions:** Enable local leaders and policy makers to understand the level of interventions required to support equitable access to EV infrastructure.
8. **Ongoing Collaboration:** Facilitate collaboration and provide a deeper understanding, in particular between the public and private sectors.
9. **Procurement:** Identifying procurement best practice.

## 2.2 Study Background

In 2020 the Government announced that the sale of new petrol and diesel cars and Light Goods Vehicles (LGVs) will be phased out by 2030, with the sale of new hybrids being phased out by 2035. This supports the following national transport documents that highlight the importance of the EV transition and role of STBs, such as TE and EEH, in accelerating the EV transition including:

- Transport Decarbonisation Plan (2021): This sets the government's vision for a net zero transport system. It highlights the central role of vehicle electrification (particularly for cars and LGVs).
- EV Infrastructure Strategy (2022)**:** This Strategy further highlights the role of STBs to provide data and insight into expected demands across the regions, including engagement with DNOs, and outlines the funding that will be provided to support this.

To support authorities in accelerating delivery of these strategies, central government has provided additional funding to STBs to develop vital intelligence and digital tools. This will support LAs within the TE and EEH areas to accelerate infrastructure delivery across two projects. The ELVIS project will run in parallel with an EV Infrastructure Model, which is being developed by WSP. Further information on WSP's EV:Ready Tool is outlined in Chapter 3.

## 2.3 Introducing the Region

TE and EEH cover a large part of England, from Greater London's northern boundary to the North Norfolk Coast, and Essex to the Cotswolds. The region is very varied, with major UK towns and cities including Oxford, Cambridge, Norwich, Milton Keynes, Basildon and Ipswich, as well as large areas of rural land and national parks, and several nationally significant ports and freeports including Felixstowe and Harwich. Whilst EEH's geography is based inland, TE has almost 500 miles of coastline, including smaller coastal communities and national tourist destinations such as the Norfolk and Suffolk coasts and Southend-on-Sea. TE and EEH have a combined population of approximately 9 million people and a Gross Value Added (GVA) of £240bn (WSP, 2019). One of the unique aspects of these two STB regions is the mix of urban areas that sit on the world stage in terms of economic performance and reputation, and the vast areas of rural land with market towns and villages that are home to over a third of the TE and EEH population. Tourism and the visitor economy play an important role in the economic success of the region, with key destination cities, coastline and Areas of Outstanding Natural Beauty. These factors will shape the way that the transition to EVs is rolled out in the region and will be an important consideration when making recommendations that encompass the needs of the rural, urban and visitor communities.

## 2.4 Study Area & Geographical Focus

Figure 2-1 illustrates TE and EEH's geographical boundaries and the scope of the project.

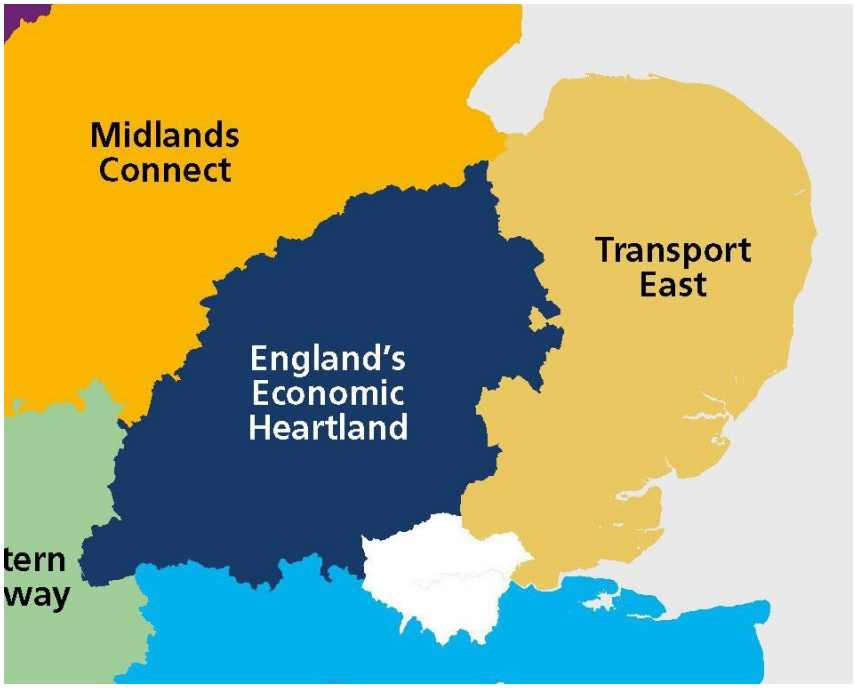


*Figure 2-1: EEH and TE Boundaries Reflecting the ELVIS Area (EEH, 2022)*

The ELVIS engaged with the LA authorities within the TE and EEH regions during project delivery. The LAs are outlined in Table 2-1.

| Transport East | EEH |
|---|---|
| Norfolk County Council | Bedford Borough Council |
| Suffolk County Council | Buckinghamshire Council |
| Essex County Council | Cambridgeshire County Council |
| Southend-on-Sea City Council | Central Bedfordshire Council |
| Thurrock Council | Hertfordshire County Council |
| | Luton Borough Council |
| | Milton Keynes Council |
| | North Northamptonshire Council |
| | Oxfordshire County Council |
| | Peterborough City Council |
| | Swindon Borough Council |
| | West Northamptonshire Council |

*Table 2-1: Transport Authorities within each STB*

## 2.5 Useful Definitions

This Study aims to be as accessible as possible, including explaining the use of technical terminology where relevant. We have also used various terms to refer to charge point infrastructure as explained below:

**Defining Different Charge Point Types**

There are a number of different types of charge point which are suitable for a range of uses. For example, slow and standard charge points are most suited for longer dwell times, such as overnight charging due to their relatively low power output. The definitions of standard and rapid chargers in both the WSP EV:Ready Tool and this Report are shown in Table 2-2. The table also explains the grouping of charger types in this Study for simplicity.

| Charge Point Type | Maximum Power Output | Charging Duration (40kWH battery) | References in the Study |
|---|---|---|---|
| **Slow** | 3.7kW | Approx. 11 hours | Standard chargers |
| **Standard** | 7.4kW | Approx. 6 hours | |
| **Fast** | 11-22kW | Approx. 2-4 hours | |
| **Rapid** | 43kW (AC) | Approx. 55 mins | Rapid chargers |
| | 20-50kW (DC) | Approx. 40 mins | |
| **Ultra-rapid** | Up to 350kW | Approx. 7-16 mins | |

*Table 2-2: Charge Point Types*

# 3 Overview of Current Electric Vehicle Evidence-Base

**Chapter at a Glance**

This chapter gives an overview of the results of the WSP EV:Ready Tool covering both the EEH and TE regions.

ELVIS is part of a wider portfolio of work to identify gaps in EV uptake and infrastructure provision. Alongside commissioning ELVIS, EEH and TE have also commissioned WSP to deliver a bespoke tool (EV:Ready) to analyse predicted EV uptake and EV charge point requirements across the region, up to 2050. This section investigates some of the key outputs from the EV:Ready Tool, so that we can later reflect how the findings of the two studies can support and complement each other. For a detailed breakdown of the results of this report, please see the WSP EV:Ready Report.

## 3.1 Methodology

The tool takes baseline data for the region, including (but not limited to) current levels of EV and non-EV ownership, reliance on on-street parking and propensity for the local population to switch to EVs. This is used alongside potential modal shift data and likely scenarios for national EV sale trends to calculate an EV uptake forecast, and subsequently an EV charge point supply demand. A full description of the methodology can be found in the WSP EV:Ready Report.

## 3.2 Results

Forecasts were derived from the National Grid Future Energy Scenarios, alongside their forecasted EV uptake until 2030, as this was felt to be the most relevant dataset for determining a UK forecast. Vehicle licensing statistics and EV ownership levels provided a starting point for developing specific forecasts for each of the EEH and TE LAs. By 2030, it is expected that EVs will represent around 45% of the total fleet within the Study area; the greatest number of vehicles is expected to be registered in Essex, and the fewest in Bedfordshire and Suffolk. Figure 3-1 shows the likely trajectory of the high and low uptake scenarios, with the gap in total vehicles registered closing between the two scenarios by the late 2040s.


*Figure 3-1: Forecast Study Area EV Registration*

The geospatial results from the model indicate that rural infrastructure provision remains a key barrier for both the EEH and TE regions, with EV uptake in both the high and low scenarios focused around urban areas, especially those closest to London. However, the gap analysis shows that almost all smaller towns and villages will have a requirement for standard charging provision by 2030. These sites are likely to be less profitable for private companies. For this reason, LAs will likely need to

support additional investment by driving provision themselves or bundling sites into lots to ensure less commercially attractive sites are tendered together with more attractive, high value sites. The results of the high and low uptake scenarios are presented geospatially in Figure 3-2.

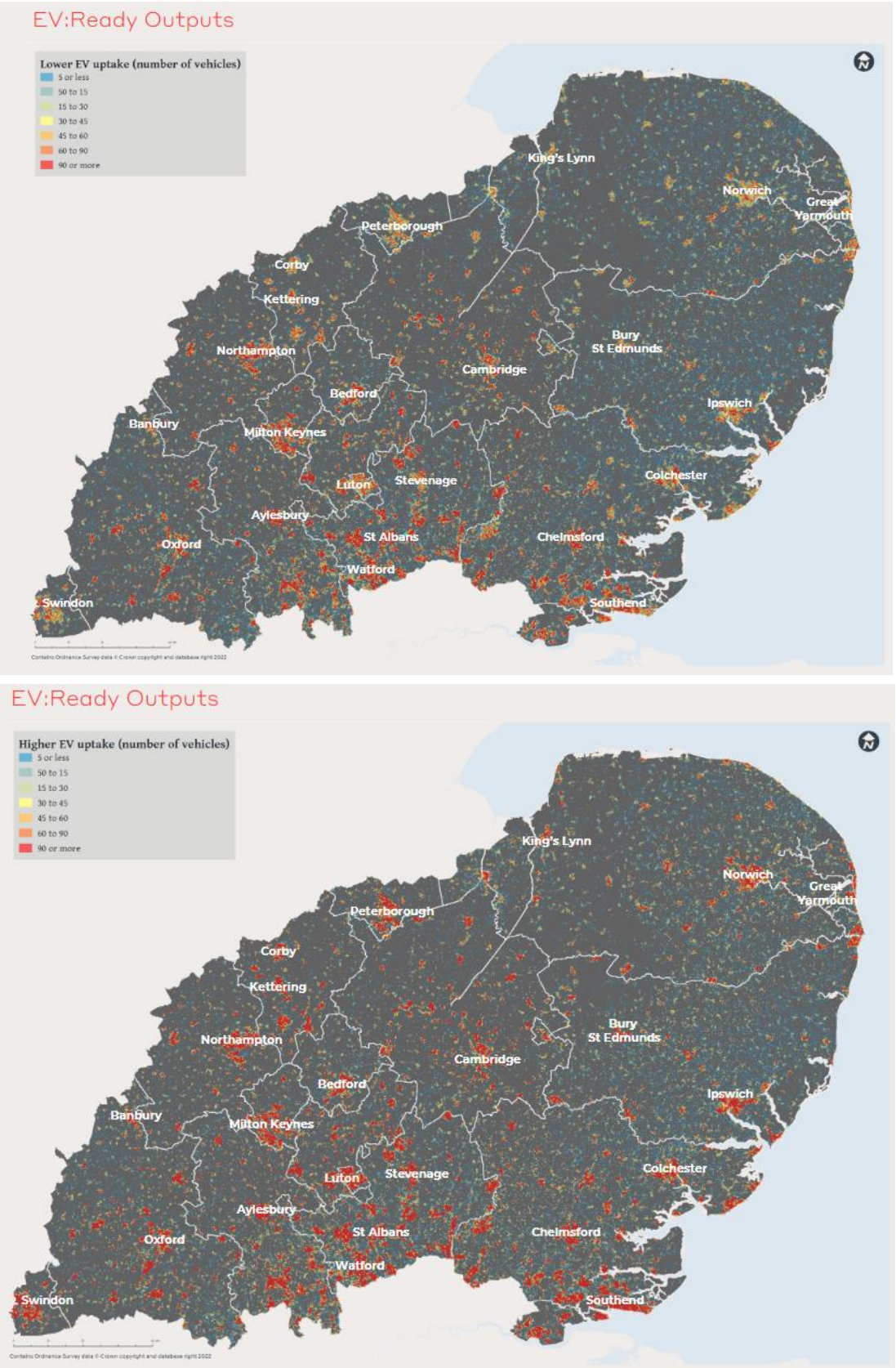


*Figure 3-2: 2030 EV Uptake Scenarios (Top: Low, Bottom: High) in Numbers of Vehicles*

The rural-urban split is also reflected in the EV trip demand results. This shows the highest level of demand (in both the high and low uptake scenarios) is on the key strategic routes in the Study area such as the M11, A14, M1 and M40. Rural areas, and some towns and cities including Peterborough and Milton Keynes, have lower enroute demand.

A gap analysis was undertaken to better understand the roles of the public and private sectors in delivering charge points across the region, the results of which are shown in Figure 3-3. The report concludes that rapid chargers are likely to be of greater interest to the private sector, and that public investment should therefore focus on delivering standard chargers, especially in smaller towns and villages.

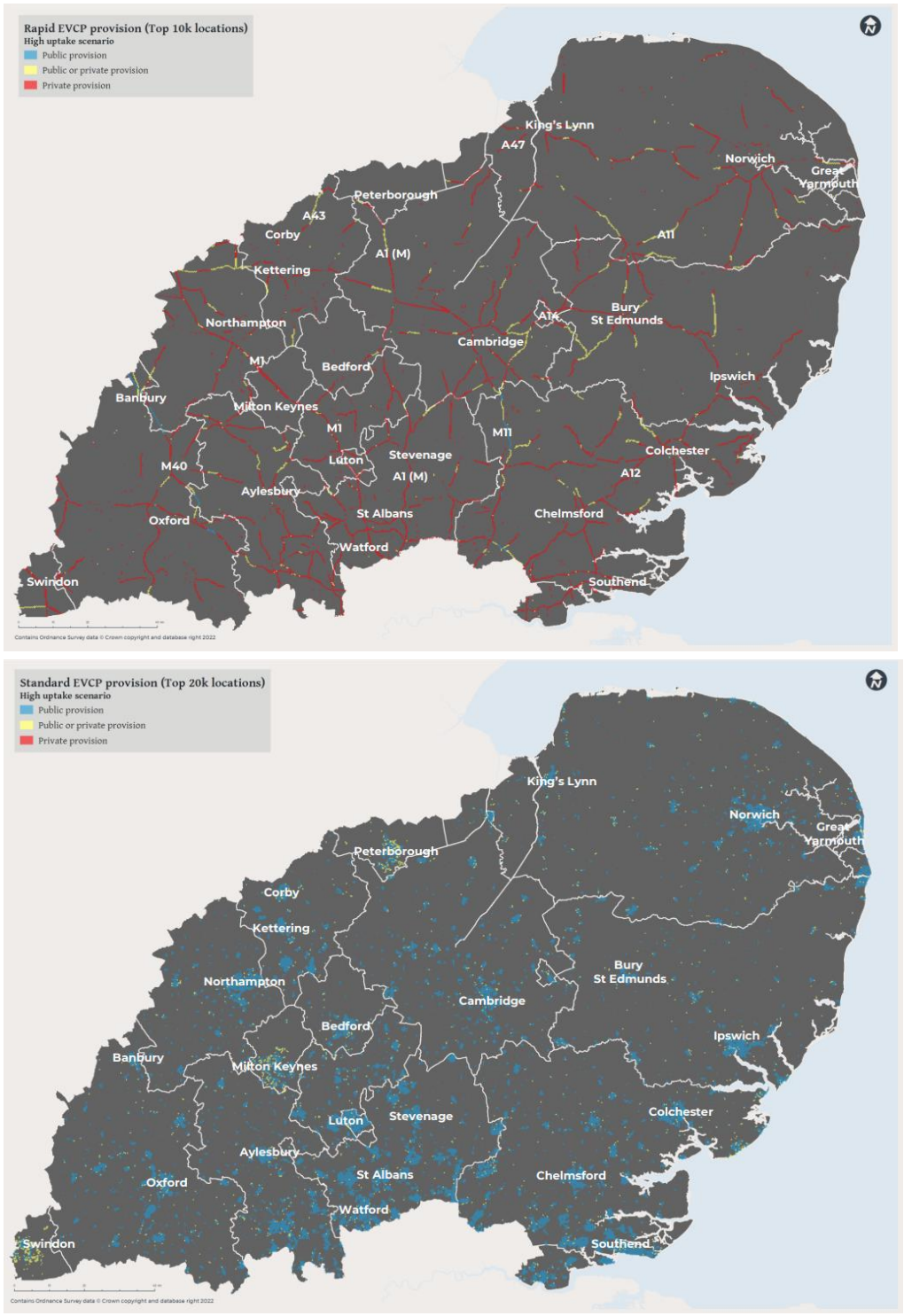


*Figure 3-3: Illustrative Rapid Charge Point Locations (Top) and Standard Charge Point Locations (Bottom)*

Overall, the EV:Ready tool forecasts expect approximately 5% of public charge point to be rapid, with the rest standard, in both the high and low uptake scenarios. Therefore, it is assumed that the majority of public sector spending will be in urban areas (rather than on the Strategic Road Network (SRN) or other major routes) where standard charging will be more appropriate. Including privately funded charge points, the proportion of rapid chargers increases to 15% in both scenarios, indicating that charge points on the SRN will largely be delivered by private funding.

The tool also delivers forecasts of charge point requirements for a number of LAs (not directly equivalent to the LAs shown in Table 2-1) in the TE and EEH areas between 2025 and 2040 as shown in Table 3-1.

| LTA | 2022 (Existing) | Low Number of EV Charge Points | | | | High Number of EV Charge Points | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2025 | 2030 | 2035 | 2040 | 2025 | 2030 | 2035 | 2040 |
| Bedfordshire | 219 | 1,556 | 2,995 | 6,029 | 8,477 | 2,235 | 4,562 | 8,019 | 9,768 |
| Buckinghamshire | 560 | 3,032 | 4,995 | 8,991 | 11,707 | 4,350 | 7,228 | 11,228 | 13,026 |
| Cambridgeshire | 264 | 2,180 | 3,966 | 7,948 | 11,109 | 3,240 | 6,207 | 10,618 | 12,823 |
| Essex | 424 | 4,083 | 7,858 | 16,584 | 23,895 | 6,318 | 12,924 | 22,906 | 28,024 |
| Hertfordshire | 367 | 3,848 | 6,421 | 11,774 | 15,563 | 5,350 | 9,276 | 14,848 | 17,444 |
| Norfolk | 341 | 1,762 | 3,672 | 8,287 | 12,420 | 2,829 | 6,290 | 11,921 | 14,863 |
| Northamptonshire | 207 | 1,697 | 3,323 | 7,039 | 10,150 | 2,265 | 5,094 | 9,484 | 11,811 |
| Oxfordshire | 331 | 2,303 | 3,923 | 7,310 | 9,717 | 3,503 | 5,960 | 9,384 | 10,947 |
| Suffolk | 272 | 1,562 | 3,225 | 7,201 | 10,686 | 2,423 | 5,461 | 10,176 | 12,679 |
| Swindon | 75 | 324 | 711 | 1,691 | 2,615 | 613 | 1,380 | 2,571 | 3,203 |
| Total | 3,060 | 22,356 | 41,048 | 82,855 | 116,339 | 33,128 | 64,483 | 111,154 | 134,587 |

*Table 3-1: EV Charge Point Requirements for Local Authorities in the Transport East and England's Economic Heartland Region*

# 4 Local Authority Gap Analysis

**Chapter at a Glance**

This chapter identifies the current and expected gaps in infrastructure deployment from the perspective of the LA. This was informed by discussions during the LA workshops, a bespoke survey circulated to the LAs and the results of the EV Maturity Model.

## 4.1 Methodology

An important part of the ELVIS is to establish existing gaps in EV charge point delivery. In this chapter we assess charge point delivery from an LA perspective, assessing their strategy, procurement, knowledge sharing and many other areas. The aim is to identify opportunities to support enhanced consistency and collaboration across the region.

The development of the gap analysis has been supported by three elements:

- LA Workshops.
- LA EV Insights Survey.
- EV Maturity Model.

### 4.1.1 Local Authority Workshops

An LA workshop was held for each STB (more details are provided in Sections 4.2.1.2 and 4.2.2.2) to gain a better understanding of the key barriers and opportunities for EV roll out. The workshops used a digital engagement tool called MiroBoard, which allowed a framework to be set up in advance to guide the discussion, and for the LA representatives to add their thoughts during and after the session.

### 4.1.2 Local Authority Survey

As a follow-up to the LA workshops, a survey was developed in collaboration with EEH and TE to gather more detailed data about EV charge point delivery progress. The survey included the status of their EV Strategy, existing relationships with CPOs and DNOs, preferred funding models, and the scope of their interventions.

The survey was open for two weeks in December 2022 and was available online via Microsoft Forms. In total, 14 responses were received, representing 65% of the EEH and TE LAs, as shown in Figure 4-1.

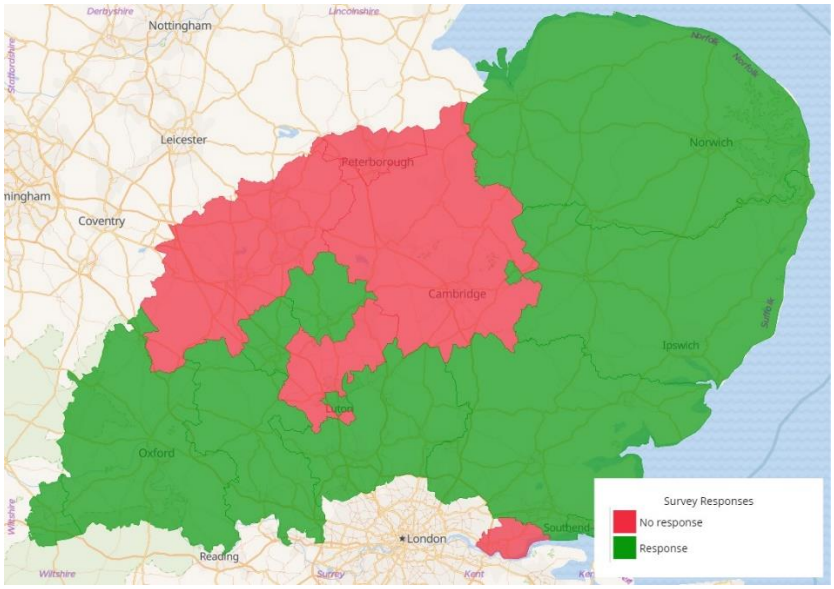


*Figure 4-1: LA Survey Responses*

The responses from the survey were used to supplement the information gathered at the LA workshop, and to support the development of the EV Maturity Model.

### 4.1.3 Electric Vehicle Maturity Model

An EV Maturity Model was developed to deliver a quantitative analysis of EV roll out progress. It is an auditing tool which can be used by LAs to identify where they sit on a spectrum of preparedness for the EV transition. It can also help to identify the gaps and activities that need to be prioritised for LAs to make further progress.

A desktop review of readily available EV Strategies was initially undertaken, followed by desktop research on those LAs for which no strategy was available, either publicly or shared in draft form. The evidence was then complemented with feedback from the LA workshops. This process supported the development of seven categories which are considered essential to the delivery of a mature EV programme. Each category was split into five broad levels (ranging from 1 – 5) as described in Table 4-1. For each category, Level 1 represents a basic standard, whilst level 5 demonstrates a more advanced level of development.

| Category | Level | Activity |
|---|---|---|
| EV Strategy | Level 1 | Organisation has acknowledged the roll of EVs in decarbonising their transport system. |
| | Level 2 | Organisation has an EV Strategy which links with existing local policy. |
| | Level 3 | Organisation has an EV Strategy and EV charge point installation targets. |
| | Level 4 | EV Strategy is fully quantified and clearly links actions and activities to expected EV uptake outcomes. The strategy has specific targets and standards for different areas/locations/charge point types. |
| | Level 5 | EV Strategy is embedded within local planning and transport policy, is fully quantified with clear and ambitious delivery targets. |
| Action Plan | Level 1 | Organisation has not made any EV infrastructure delivery commitments. |
| | Level 2 | Organisation has identified immediate actions (0-1 years) and may also have outlined potential funding / internal resource to progress these. |
| | Level 3 | Organisation has developed a full Action Plan for short and medium-term and has identified owners for each action. |
| | Level 4 | Organisation has identified long-term, multi-year actions required to deliver various targets, has quantified the total cost of delivery. |
| | Level 5 | Organisation is working actively on a strategic programme of influencing to unlock new powers and delivery mechanisms and displaying an innovative approach e.g. though ground breaking projects. |
| Procurement | Level 1 | Organisation has very limited EV procurement experience. |
| | Level 2 | Organisation is currently considering EV procurement options. |
| | Level 3 | Organisation has emerging procurement experience and expertise. |

| | | |
|---|---|---|
| | Level 4 | Organisation has developed procurement processes to assist with the roll out of EV charge points. |
| | Level 5 | Organisation is actively sharing and upskilling other authorities in the use of their procurement tool |
| Partnerships & Stakeholder Engagement | Level 1 | Organisation has reactively developed relationships with at least one CPO and the local DNO to deliver charge point infrastructure. |
| | Level 2 | Organisation is proactively seeking relationships with CPOs to anticipate the need to deliver new EV charge point infrastructure |
| | Level 3 | Organisation is actively working with the CPO(s) and DNO(s) to overcome delivery constraints such as grid capacity issues. |
| | Level 4 | Organisation is engaging with other groups (such as disability and community organisations) alongside CPOs and DNOs to ensure comprehensive and equitable delivery of charge points. |
| | Level 5 | In addition to the above, the organisation has developed relationships with local and national commercial groups (e.g. Supermarkets, hotels, shopping centres, taxi/PHV firms and freight and haulage companies) to encourage roll out of EV charge points on private (commercial) land. |
| Coverage | Level 1 | Delivery of charge points is limited to meeting the needs of Council fleets (no publicly accessible charge points). |
| | Level 2 | Roll out includes Council sites & LA car parks. |
| | Level 3 | Roll out includes Council sites & LA car parks and is now focusing on broader fleet transition needs (e.g. van drivers/fleet operators) or residential on-street. |
| | Level 4 | Roll out includes all the above plus residential areas (including new developments), SRN, workplaces and other on-street parking (including taxi ranks). |
| | Level 5 | Organisation has carried out the above and is regularly reviewing roll out to identify and proactively address gaps in the network to support a just and equitable transition plus solutions for non-standard vehicles (e.g. HGVs). This includes understanding the role of EV charging in the context of other zero emission fuels (e.g. hydrogen), and how associated infrastructure can be integrated with EV infrastructure roll out. |
| Funding | Level 1 | Organisation has no experience of the existing funding mechanisms for EV charge point roll out. |
| | Level 2 | Organisation has experience with application for government grants to support their EV Strategy. |
| | Level 3 | Organisation has experience with application for government grants to support their EV Strategy, as well as an emerging understanding of commercial models. |
| | Level 4 | Organisation has a growing relationship with private sector investors within a particular segment. |

| | | |
|---|---|---|
| | Level 5 | Organisation has obtained full funding for their current programme of EV investment and has identified innovative routes to funding their full EV Strategy. |
| Metrics, Monitoring & Evaluation | Level 1 | Organisation has developed basic metrics to help identify potential charge point sites. |
| | Level 2 | Organisation has identified likely hotspots for early EV adoption and/or households without driveways. |
| | Level 3 | Organisation has done the above, plus using existing national or regional forecasts for EV uptake to establish likely demand in their area. |
| | Level 4 | Organisation has undertaken area-specific forecasting to better understand future demand for charge points across their area. |
| | Level 5 | Organisation has undertaken area-specific forecasting and has a formal monitoring and evaluation process with frequent reviews of the strategy to ensure its ongoing suitability. |

*Table 4-1: Electric Vehicle Maturity Model Categories*

Widely available EV Strategies (including draft strategies shared with City Science for the purpose of this research), along with survey responses and publicly available information on LA websites were analysed in detail to understand what level of action had been undertaken in each category. This provides a measure of the areas that an LA demonstrates strength, and others where there are opportunities for improvement. This assessment provides a mechanism to quantitatively summarise the current state of EV strategy development, experience and activity across the two regions, and to indicate the areas in which EV ambitions can be strengthened.

### 4.1.4 Limitations

It is important to note that this gap analysis, though thorough, is not exhaustive. Limitations included a lack of information available publicly on LA websites (especially where there is no EV Strategy published). As expected, some LAs were unable to respond to the survey or attend the workshop. The compact programme for this Study and resourcing issues within LAs themselves are likely to have impacted levels of engagement.

**The challenges experienced by LAs with engaging with this Study highlight the need for additional support and investment into LA capacity and capability in order to accelerate the delivery of EV infrastructure.**

Where a strategy was not publicly available, reasonable efforts were made to validate the status of strategy development. Where no response was provided, it was difficult to ascertain the LA's true level of EV maturity. However, this approach is representative of the current external perception of the stage of EV maturity from the perspective of the public or interested stakeholders.

## 4.2 England's Economic Heartland Gap Analysis

This section uses the results of the EV Maturity Model, the LA survey, and the workshop to summarise the main gaps in provision, expertise and support for EVs in the EEH region. Seven LAs from EEH responded to the survey (with a total of eight responses between them) and eight LAs were represented at the workshop. The following sections provide some analysis of the quantitative and qualitative aspects of the data gathered.

#### 4.2.1.1 *Electric Vehicle Maturity Model*

The overall results from the EV Maturity Model show that the highest proportion of activity (across all categories) is at Level 1, and the proportion decreases to zero for Level 5 activities (i.e. no authorities are currently performing at the most advanced level). Figure 4-2 gives a full breakdown of these results. During the stakeholder engagement process LAs stated that they find EV delivery complex across all of the different categories outlined in Table 4-1, it is therefore unsurprising that 36% of the activity across the region is occurring at a basic level. This indicates that LAs have a level of awareness of the need to create conditions for increased EV uptake and charging availability, but that their progress is somewhat limited. Only four LAs have delivered on at least one Level 4 activity each.

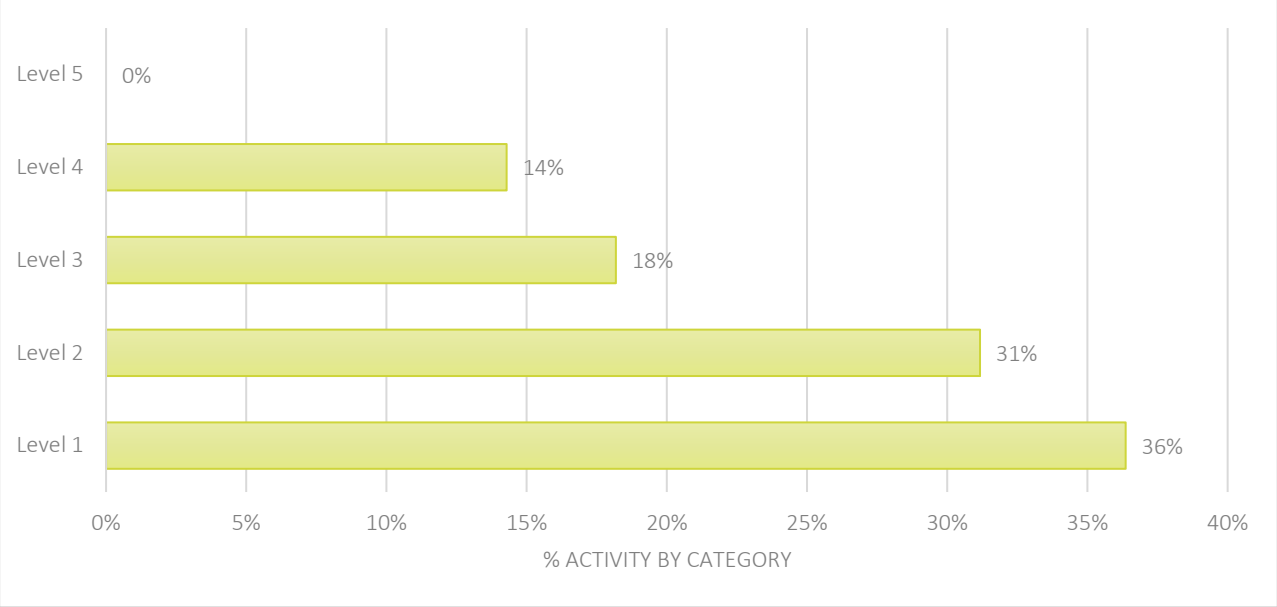


*Figure 4-2: Overall Electric Vehicle Maturity Results (EEH)*

Breaking these results down further into the seven categories provides a closer look at the areas which are proving most challenging for LAs to deliver on (see Figure 4-3).

45% of EEH LAs do not currently have an EV Strategy either published or available in draft form.

The highest level of LA activity in this category was Level 3 – an EV Strategy with targets for charge point installation. The Strategies that were available were generally of a good standard, particularly considering the metrics that had been adopted to create forecasts of uptake or charge point requirements and identify likely hotspots for early EV adoption.

The categories with the largest proportion of Level 1 activity are partnerships (64% - LA has developed relationships with at least one CPO and the local DNO to deliver charge point infrastructure) and procurement (64% - LA has very limited EV procurement experience).

Partnerships refers to established relationships with other relevant organisations, from CPOs and DNOs at Level 1 to local and national commercial groups driving forward the roll out of EV charge points on private land at Level 5. Partnerships were rarely referenced in EV Strategies, and most of the information was located on LA websites or taken from survey responses. None of the eight survey respondents reported working with the private sector to support delivery, and while all LAs reported a relationship with at least one CPO, five had no relationship with the local DNO. The challenges of procurement processes were mentioned often in the LA workshops, and this is borne out in the

evidence from the desktop research, which shows that most LAs have limited EV procurement experience. Only one LA has developed a dedicated procurement process which has been successfully used to deliver charge points in their area. For more information see the case study in Section 7.4.

Funding has a cluster of activity at Level 2, which corresponds to organisations identifying suitable sources of funding and/or having accessed government funding to support their EV roll out.

Most LAs had already secured some form of funding or made an application for government funding. None had a dedicated budget available that was clearly identified within their EV Strategy or other public documentation.

Along with metrics, coverage stands out as having over a quarter of the relevant activity at a Level 4, and the majority at Level 3. This indicates that the majority of LAs have actively delivered charge points.

Most LAs have moved beyond EV charge point roll out at council sites and LA car parks, and several EV Strategies included residential on-street charging and other publicly available on-street charging. All Strategies included the transition of the LA car fleets to EVs. No Strategy considered the need for solutions for non-standard vehicles including larger vans, Heavy Goods Vehicles (HGVs), refuse lorries or buses (although bus electrification may also be covered under an LA's Bus Service Improvement Plan). This is largely unsurprising as the technology to deliver zero emissions heavy vehicles is in its infancy. However, larger EV vans are widely available and in use, (for instance by logistics companies) and the majority of these larger EV vans will be unable to fit in 'standard' sized EV bay. Delivering freight decarbonisation is often seen as the missing link in reaching a net zero transport system because of the challenges it brings, but early consideration of potential strategies and integration of infrastructure including for larger vans in the immediate term, and HGV charging in the longer term is an important step in bridging the gap.

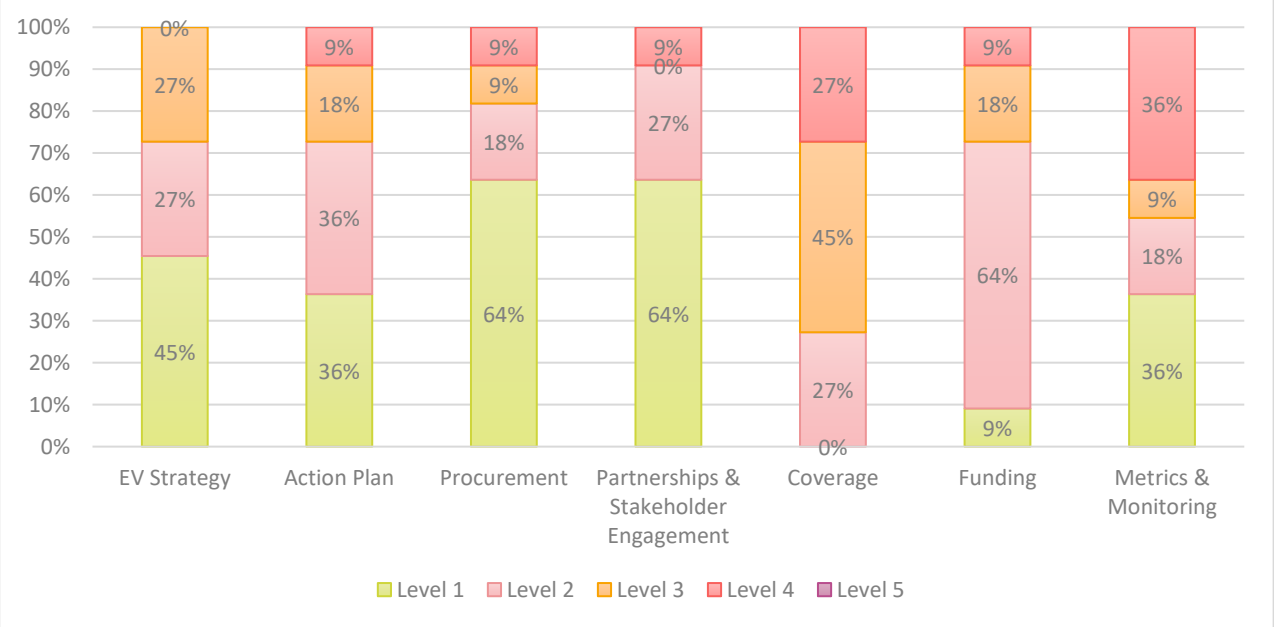


*Figure 4-3: Maturity Results by Category (EEH)*

Figure 4-4 gives an overview of the average level of response by category across the EEH region. It is clear that the scope of the EV response is a strength within this region, followed by metrics and monitoring and access to funding. There is an opportunity for a coordinated approach towards

assisting LAs with forging partnerships with DNOs, CPOs, and the private sector. Guidance from national government for a more joined up approach between private and public institutions, or the instigation of a forum for private sector organisations to share their progress with LAs and STBs, has the potential to provide knowledge-sharing opportunities and identify and address the remaining gaps in EV infrastructure roll out across the region.


*Figure 4-4: Average Maturity Results Across EEH by Category*

Table 4-2 shows the median and maximum attainment of all of EEH's LAs by category, along with the key gaps remaining for most LAs between their current activity and Level 5 activities.

| Category | Median Score | Max Score | Key Gaps |
|---|---|---|---|
| EV Strategy | Level 2 | Level 3 | • LAs without EV Strategies.<br>• Wide variation in the content of EV Strategies.<br>• Few clear targets for installation. |
| Action Plan | Level 2 | Level 3 | • No long-term targets.<br>• Cost of programme is not quantified. |
| Procurement | Level 1 | Level 4 | • Most LAs lack procurement experience.<br>• Few LAs have designed and tested an EV procurement process.<br>• Need for sharing of experience, ideas and approaches. |
| Partnerships | Level 1 | Level 3 | • LAs actively cultivating relationships with the local DNO(s).<br>• Looking for opportunities to work with private sector partners (e.g. hotels, shopping centres, supermarkets) to deliver charge points on private land. |

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| Coverage | Level 3 | Level 4 | • Considering the role of LAs in delivering fast-charging enroute, particularly on the SRN.<br>• Innovation to provide solutions for non-standard vehicles (e.g. HGVs). |
| Funding | Level 2 | Level 3 | • Relationships with private sector investors.<br>• Proof of understanding of commercial models.<br>• Funding plan for full EV Strategy. |
| Metrics | Level 2 | Level 4 | • Area-specific forecasting of demand for charge points for the long term (2050+).<br>• Clear monitoring and evaluation plan.<br>• Frequent reviews of EV Strategy to ensure it is aligned with progress and technological advances. |

*Table 4-2: Median and Maximum Scores by Category (EEH)*

#### *4.2.1.2 Qualitative Gap Analysis*

The LA workshop for the EEH region was held on Tuesday 6th December 2022. The tables below summarise the key themes which emerged during the initial stakeholder workshops.

**Risks & Barriers**

| Theme | Detail |
|---|---|
| Complexity of Delivery | • Two-tier authorities have specific challenges when it comes to aligning the views and directions of Districts with LAs, which can lead to different levels of activity and EV charge point provision across the LA area.<br>• Some LAs cited multi-agency issues which create problems with the ongoing ownership and maintenance of charge points after they are installed (e.g. Highways teams being reluctant to take on the asset management of EV charge points).<br>• There is a need to manage delivery expectations (both of Members and the public) from the start of the programme.<br>• Future-proofing the technology is challenging, but it is important to ensure that charge points do not need to be replaced on a regular basis.<br>• Maintenance and reliability are key issues for those considering switching to EVs and can reflect poorly on the LA even if maintenance is managed by the CPO. |
| Pressure to Deliver | • Political pressure (EVs are seen as a panacea/easy win for delivery of net zero).<br>• Rushing into decisions and getting tied to an unsuitable solution or supplier.<br>• Pressure from the public – people want residential charge points on footways before off-street charging has been fully rolled out.<br>• Time – a lot is expected over short timescales. |
| Expertise | • It is very difficult to recruit staff with sufficient EV experience at the LA level.<br>• It is hard to resource dedicated EV staff. Generally other transport officers must balance EV delivery with other priorities.<br>• Other internal colleagues need to be brought up to speed (e.g. highways, procurement etc) to ensure buy in from all relevant teams. |

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| Procurement | • Indecision regarding the variety of potential procurement models slows down the process.<br>• Length of CPO contracts (10+ years) is unpopular with LAs (e.g. risk-averse Members, procurement, and legal teams). |
| Cost | • High cost of delivery in rural areas.<br>• A lack of grid capacity and subsequent cost of upgrades to solve the problem.<br>• Increased grid development costs for new developments. |

Opportunities

| Theme | Detail |
|---|---|
| Partnerships | • Car club partnerships linked with the Council pool fleet.<br>• Parish and Town Councils to increase charger availability in their car parks. |
| Strategic Vision | • Linking EV Strategies with existing or forthcoming workstreams e.g. mobility hub strategies and freight consolidation strategies.<br>• Similarly, working within the context of the Local Plan allows LAs to leverage Local Plan policies for delivery.<br>• Publicly committing to a number of charge points by a given year puts pressure on Members to support delivery. |
| Procurement | • Need accurate legal advice from specialists to help navigate contracts.<br>• Access the growing body of experience with different procurement options within other LAs.<br>• Factoring in all costs (e.g. signage, space marking, barriers for protecting charging equipment) to avoid surprise costs later down the line. |
| Innovation | • Promoting charge point sharing through apps such as Co-Charger.<br>• Integration of charge points with new mobility hubs.<br>• 'Upcycling' of existing vehicles (e.g. refuse vehicles) with batteries and electric engines.<br>• Development of rigorous standards for EV charge point locations.<br>• Promotion of car clubs to remove barriers for low-income groups and discourage personal vehicle ownership. |

Priority Locations

| Theme | Detail |
|---|---|
| Car Parks | • Car parks offer the greatest opportunity for LAs to deliver charge points.<br>• Park and Ride sites are good for rapid enroute and taxi charging, and also slow chargers for those commuting using the service.<br>• Local community car parks can be used where there is opposition to on-street infrastructure.<br>• Many LA car parks are in areas with low levels of off-street parking, and these sites are being prioritised for Park and Charge schemes. |
| On-street | • For some areas, on-street is likely to be the priority for future with Local Electric Vehicle Infrastructure (LEVI) bids. |

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| | • Some LAs are building databases of where members of the public have requested charge points to be installed.<br>• Lamppost charging is being considered in areas where it is difficult to install bollards, however this is less suitable for areas where lampposts are at the back of the footway.<br>• Charging channels (such as Gul-e) are another strategy being used to deliver on-street parking. |
| Destination Charging | • Destination charging is likely to start with Council-owned locations such as libraries and swimming pools.<br>• It is seen as critical for enabling 'top-up' charging in conjunction with behavioural change and availability of slower charging facilities.<br>• An expectation that LEVI funding would be focused on destination charging, but this has not turned out to be the case.<br>• Destination charging is also important for supporting the tourist and visitor economy. |
| Enroute Charging | • This is not seen as a priority for many LAs, particularly those with limited lengths of SRN or few motorway services.<br>• It is expected that this will be covered by the private sector, and with limited resourcing there are more pressing solutions to be delivered locally. |

Gaps

| Theme | Detail |
|---|---|
| Rural Locations | • Some LAs have a high volume of small towns, parishes and villages which need to be catered for alongside larger towns and cities.<br>• Rural areas may require more LA input, for example by bundling sites to encourage CPOs to install chargers in less profitable locations, or by supporting delivery of charge points in town or parish-owned car parks.<br>• Other uses in rural areas, such as tourism and farming, must also be considered and may require a different approach. |
| Off-street Parking | • There can be challenges with planning permission for home chargers for those without a driveway.<br>• Equally, there are many areas (especially town centres) that do not have off-street parking or the required pavement width to accommodate on-street chargers.<br>• Challenge of fair distribution of on-street solutions (such as Gul-e) without designating parking bays as EV-only. |
| Less Affluent Areas | • Even with provision of on-street charging there can be a disparity in the cost of charging at a charge point versus charging.<br>• Housing associations and social housing providers can be reluctant to install charge points because of the cost, and the perception that they won't be used, despite many van/taxi drivers living in social housing. |
| Education | • Upskilling of staff to ensure they keep up with changes in technology and have a working understanding of EVs and charge points. |

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| | • Informing and educating members and the public to encourage behaviour change.<br>• Specialist legal advice at the start of the process to ensure that LAs do not become 'hostage to fortune'. |

### 4.2.2 Transport East Gap Analysis

This section uses the results of the EV Maturity Model, the LA survey and the workshop to summarise the main gaps in provision, expertise and support for EVs in the TE region. Six LAs from TE responded to the survey, including two District Councils, and four LAs were represented at the workshop. The following sections provide some analysis of the quantitative and qualitative aspects of the data gathered.

#### *4.2.2.1 Electric Vehicle Maturity Model*

The overall results from the EV Maturity Model show that the majority of activity (across all categories) is in the more basic levels (Levels 1 and 2), with only 25% of activity at the higher levels. Figure 4-5 gives a full breakdown of these results. 74% of activity is classified at this lower level, which indicates that LAs have a broad level of basic awareness of what is required to create conditions for increased EV uptake and charge point availability. However, three out of the five LAs in the TE region had evidence of at least one activity at Level 4.

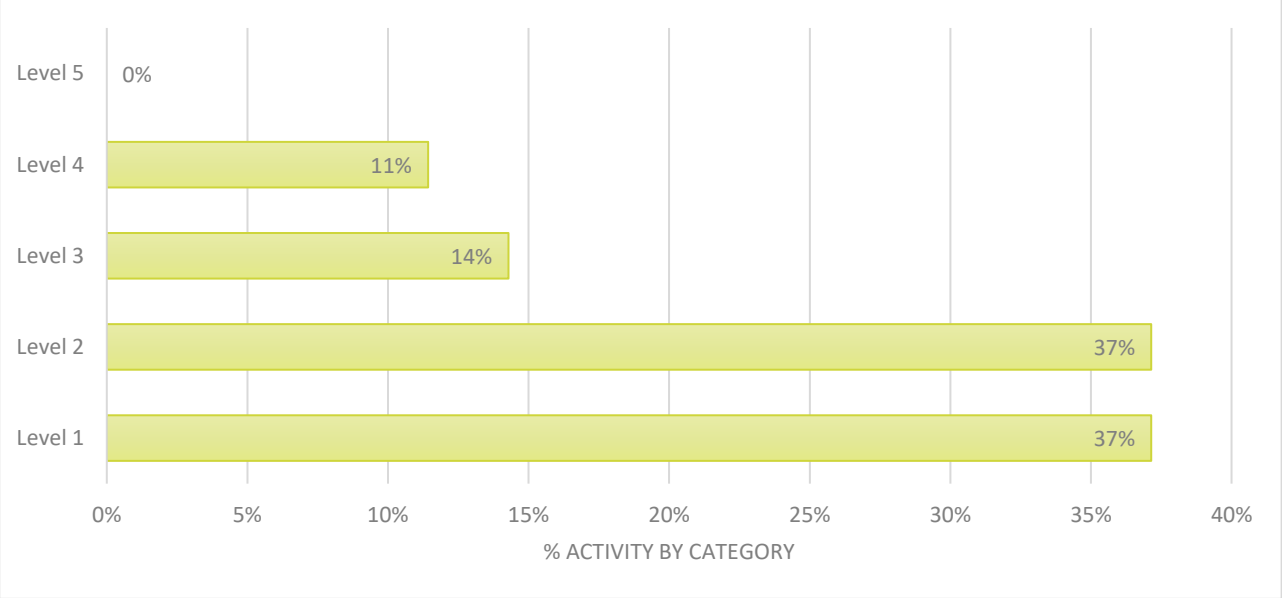


*Figure 4-5: Overall EV Maturity Results (TE)*

Breaking these results down further into the seven categories provides a closer look at the areas which are proving most challenging for LAs to deliver on (see Figure 4-6).

80% of the LAs in the TE region have an EV Strategy either published or currently in draft form.

However, 60% have no EV infrastructure commitments clearly set out in their Strategy or on their website. The highest level of LA activity in this category was Level 4 – an EV Strategy which is fully quantified, linking actions and activities to different outcomes, and with specific targets for different charge point types. The standard of the available Strategies varied significantly, from a basic acknowledgement of the roll of EVs in the decarbonisation of the transport system to full forecasting of requirements and targets.

Similar to the findings for the EEH region, the categories with the largest proportion of Level 1 activity are partnerships (80% - LA has developed relationships with at least one CPO and the local DNO to deliver charge point infrastructure), procurement (60% - LA has very limited EV procurement experience) and action plans (60% - LA has not made any EV infrastructure delivery commitments).

Partnerships refers to established relationships with other relevant organisations, from CPOs and DNOs at Level 1 to local and national commercial groups driving forward the roll out of EV charge points on private land at Level 5. Partnerships were rarely referenced in EV Strategies, and most of the information was located on LA websites or taken from survey responses. Of the six survey responses for the TE region, only half reported having a relationship with both the local DNO and at least one CPO, and none reported working with the private sector (supermarkets, shopping centres etc) to encourage delivery of EV charge points on private land.

Frustrations with procurement processes and a lack of experience were expressed in the TE LA workshop and are reflected in the findings of the Maturity Model – all LAs are at a Level 1 or 2 when it comes to procurement experience and activity. This underlines the need for sharing of experience and expertise across the region (between EEH and TE) led by LAs who have found ways forward and tested different solutions.

All TE LAs were at Level 2 for funding-related activity. This indicates experience with government grant applications, but a lack of knowledge about commercial models and engagement with private sector funding sources.

Experience with seeking and obtaining funding had a similar cluster to the EEH results. There was evidence for all five LAs that funding had either been applied for or received, indicating an awareness of the existing government funding streams. Again, as with the results from the EEH region, metrics and coverage displayed the highest levels of activity (Level 4) – there was evidence of considerations of charging at new developments, on the SRN and for taxis and other vehicles that may require on-street (non-residential) charging opportunities.

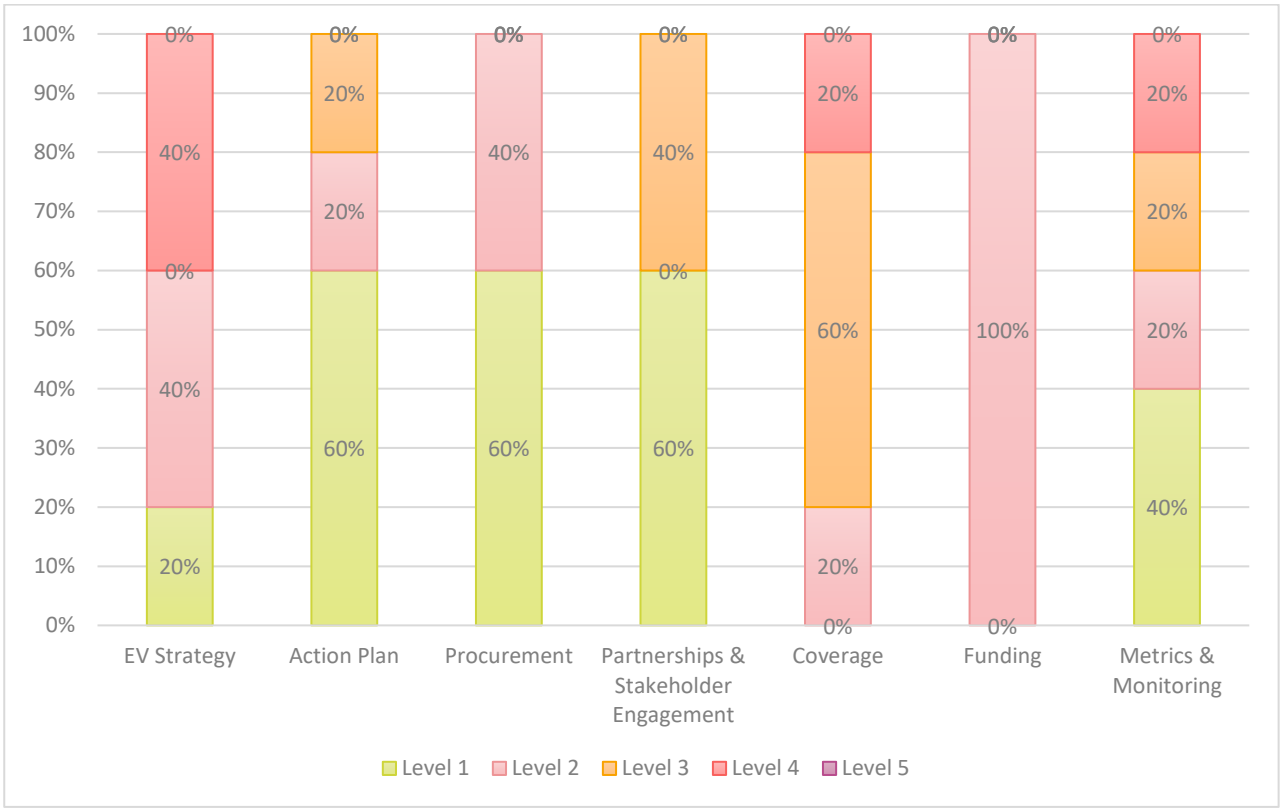


*Figure 4-6: Maturity Level Results by Category (TE)*

Figure 4-7 gives an overview of the average level of response by category across the TE region. As with the EEH results, it is clear that the scope of the EV response is a strength within this region, as well as the quality and delivery of the EV strategies themselves. It is clear, however, that more support is needed in turning these strategies into effective action plans, with targets and monitoring and evaluation built-in. Procurement is another area which requires support; a regional procurement system could support LAs which do not have the resources to develop their own systems, and provide consistency in the procurement process across the region.


*Figure 4-7: Average Maturity Results Across TE by Category*

Table 4-3 shows the median and maximum attainment of all of TE's LAs by category, along with the key gaps remaining for most LAs between their current activity and Level 5 activities.

| Category | Median Score | Max Score | Key Gaps |
|---|---|---|---|
| EV Strategy | Level 2 | Level 4 | • One remaining LA without an EV Strategy.<br>• Wide variation in the quality and content of EV Strategies.<br>• Majority have no clear targets for installation. |
| Action Plan | Level 1 | Level 3 | • Lack of ownership of tasks.<br>• Cost of programme is not quantified. |
| Procurement | Level 1 | Level 2 | • Nearly all LAs lack procurement experience in this area.<br>• Need for sharing of experience, ideas and approaches from outside of the TE area. |
| Partnerships | Level 1 | Level 2 | • LAs actively cultivating relationships with the local DNO(s).<br>• Seek out relationships with CPOs to support delivery and access funding.<br>• Looking for opportunities to work with private sector partners (e.g. hotels, shopping centres, supermarkets) to deliver charge points on private land. |
| Coverage | Level 3 | Level 4 | • Considering the role of LAs in delivering fast-charging enroute, particularly on the SRN.<br>• Innovation to provide solutions for non-standard vehicles (e.g. HGVs). |
| Funding | Level 2 | Level 2 | • Relationships with private sector investors.<br>• Proof of understanding of commercial models.<br>• Funding plan for full EV Strategy. |
| Metrics | Level 2 | Level 4 | • Area-specific forecasting of demand for charge points for the medium (2030-2050) and long term (2050+).<br>• Clear monitoring and evaluation plan.<br>• Frequent reviews of EV Strategy to ensure it is aligned with progress and technological advances. |

*Table 4-3: Median and Maximum Scores by Category (TE)*

#### *4.2.2.2 Qualitative Gap Analysis*

The LA workshop for the TE region was held on Monday 5th December 2022. The tables below summarise the key themes which emerged during the initial stakeholder workshops. Many common themes emerged during the discussions. The findings have been consolidated under the following four discussion points which were used to structure discussion at each session.

**Risks & Barriers**

| Theme | Detail |
|---|---|

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| Expertise & Resourcing | • Teams are under-resourced, and EV charge point roll out is just one part of a much larger role.<br>• There is little to no budget for staff with EV expertise.<br>• Other internal colleagues need to be educated on the role of EVs in decarbonising the transport system, and the complexities of their delivery. |
| Legal | • Insurance risks (e.g. cable trip hazard concerns).<br>• Public Liability Insurance is not available to residents. This can be a barrier for those without off-street parking who use cables near pavements which act as a trip hazard.<br>• There are concerns about liability for the Councils even if they do not own the charge point equipment. |
| Funding | • No existing internal funding to support roll out of hiring dedicated EV staff.<br>• Dependence on external funding, which has specific parameters, is competitive, and may be withdrawn in future. |
| Procurement | • No defined process.<br>• Complicated process that acts as a barrier to shorter trials and ultimately the delivery of charge points.<br>• Wide support for a regional procurement system. |
| Conflicting Messages | • Charge points that encroach on footway space deprioritise pedestrians and may affect users with mobility needs (e.g. wheelchairs, the visually impaired, pushchairs etc).<br>• A focus on EVs suggests that they are the answer to transport decarbonisation, rather than emphasising the need to avoid/reduce trips and re-mode to sustainable transport options.<br>• Whilst EVs address tailpipe emissions they do not solve the problem of particulate matter emissions from brake and tyre wear.<br>• Misses an opportunity for a transformation of the transport system that focuses on more shared vehicles and reducing car dependence. |

Opportunities

| Theme | Detail |
|---|---|
| Strategic Vision | • Linking EV strategy with other workstreams e.g. mobility hubs and freight consolidation strategies.<br>• There is broad agreement that reducing travel and mode shift must be prioritised, but that there will be a role for EVs in the future.<br>• There is also an opportunity to use the shift to EVs as a kick-start for behaviour change by altering ownership models.<br>• Making clear, ambitious commitments so there is pressure on Members to deliver. |
| Innovation | • Trials are an important mechanism for testing out different technologies and opportunities, and to gain an appreciation for some of the risks.<br>• Co-charging and sharing of home chargers are seen to be a part of the solution. |

| | |
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| | • Solutions such as Trojan Energy's Aon which allows people without off-street parking to charge at their domestic energy rate and share their charger could be one solution. |
| Revenue | • While there is little scope for revenue in the short term, there may be opportunities for revenue generation in the future as charge point usage increases.<br>• There is a need to quantify expected future revenue (for finance and procurement teams) which is a challenge for LAs. |
| Collaborative Working | • Opportunity for knowledge sharing between those who are further ahead in the process and those who have less experience.<br>• There are already some forums for LAs to share experience – expanding these and making sure they are open to all across the region will be a useful next step.<br>• Joint procurement to support infrastructure delivery may be another way of working together and reducing the burden on individual LAs. |

Priority Locations

| Theme | Detail |
|---|---|
| Car Parks | • The Plug In Suffolk scheme (see Section 7.6) has been providing charge points for car parks at village halls in Suffolk to combine solutions for off-street charging and in rural areas.<br>• Provision of charge points in car parks can be delivered through parking guidance and planning regulations.<br>• Providing charge points in car parks can also help with the delivery of multi-modal mobility hubs which integrate EVs with other sustainable modes.<br>• Placing charge points in car parks also provides another revenue stream for operators and makes the car parks more competitive compared to those without EV charge points. |
| On-street | • There is vast demand for on-street charging in urban areas.<br>• Solutions are required so that on-street charging solutions are equitable and not more expensive than home charge points for those with off-street parking.<br>• Lighting column chargers and pop-up bollards are being used, but significant insurance issues have been noted. |
| Workplaces | • While there may appear to be less demand for EV charging due to hybrid working, encouraging employers to install charge points is still important for those who do drive EVs.<br>• Some LAs do not want to encourage installation at workplaces in urban centres as they do not want people to drive in.<br>• There may be an opportunity to open schools up for public park and charge overnight, particularly in residential areas. |
| Destination | • Some LAs are relying on commercial competition between supermarkets to offer low cost or subsidised charging to encourage patronage. |

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|---|---|
| | • Charging provision in tourist areas (including businesses) is particularly important in the TE region due to the popular coastal and rural destinations. |

Gaps

| Theme | Detail |
|---|---|
| Market Towns | • Many market towns have old, terraced housing stock which is not suitable for mass car ownership and there is limited space for on-street charging.<br>• Some LAs have market town strategies, which could be integrated with the local EV strategy. |
| Ease of Use | • The requirement to pay by app for many charge points puts people with limited technological experience or without a smartphone at a disadvantage.<br>• The need for many different apps or cards to pay at different charge points is also a barrier to a seamless charging experience.<br>• Contactless payment options are needed as a minimum, but this pushes up the cost of the charging infrastructure. |
| Rural Locations | • There is a lack of incentive for market providers to install charge points in rural areas.<br>• Locations in rural areas often do not meet funding criteria.<br>• Many rural households have off-road space, which makes home charging an option. Destination charging is therefore more important in these areas to serve visitors, tourists and any residents who do not have a driveway. |
| Less Affluent Areas | • There are concerns that while the second-hand EV market may be growing, the batteries in these vehicles will be less efficient. |

## 4.3 Key Findings

The key findings from the LA engagement process are as follows:

- **A lack of resource and expertise within the Councils:** Both in the transport teams but also the wider organisation, for instance highways, procurement and Members.
- **Procurement**: Many LAs struggle to gain approval for charge point schemes from their internal procurement and finance teams. Some LAs had more experience and success in this area, and it is an important example of the value of sharing knowledge and best practice in the EV space.
- **Rural Investment**: There is concern amongst LAs that rural areas are not attractive to private sector CPOs.
    - Delivery in rural areas is critical from an equity perspective. These communities often have less access to public transport, rely on private vehicles for essential journeys, and many rural communities suffer from deprivation.
    - Many LAs cited a lack of Strategic or Major Road Network (SRN/MRN) in their authority. There are large sections of the rural road network which, while they may not be MRN or SRN, are still vital routes connecting people with major destinations. Securing rapid EV infrastructure investment at these locations should be prioritised, particularly when we consider the longer trip lengths of rural inhabitants and the needs of the visitors.

We propose that addressing the latter challenge is a key consideration for future work. A starting point would be to map traffic flows on rural roads to identify high traffic flow routes. Routes could be identified using local traffic flow counters or a highways model. The high traffic flow data could

then be overlaid with a map of existing charging infrastructure, to identify key strategic gaps. Once sites lacking infrastructure coverage have been identified engagement with CPOs is recommended. It is proposed that the traffic flow data is used to develop a business case encouraging CPO investment to plug infrastructure gaps in the network.

# 5 Private Sector Capital Investment Model

**Chapter at a Glance**

This chapter considers the trends and emerging partnerships from the perspective of the private sector. It consists of a desktop review of investment reports into UK EV sector growth. This is then complemented by one-to-one engagement sessions with CPOs. Broader private sector engagement is summarised in Appendix C.

## 5.1 Desktop Review

### 5.1.1 Overview

To gain insights into investment strategies, approaches and techniques used by the private sector to allocate sites for EV infrastructure investment, we conducted an extensive desktop review of investment reports in UK EV sector growth. Several key conclusions are outlined below, with a more in-depth analysis provided in Appendix A (See Chapter9).

### 5.1.2 Charge Point Speed

The infrastructure size, power requirements and costs vary depending on the type of charging speed the site will operate (slow, standard, rapid or ultra-rapid). Therefore, the allocation of EV infrastructure starts by determining the type of charging point being deployed, and the suitability of the surrounding location and the target consumer. Slow chargers are generally limited to places where users can accommodate long hours of charging (such as work sites and hotels) and as a substitute for home charging (Funke, 2019). In contrast, rapid chargers require shorter charging duration, and are therefore typically sited in locations with higher turnover and lower dwell time (ibid).

### 5.1.3 Economics of EV Charging

The economics of EV charging can vary depending on a number of factors, however critical inputs to the economic model for charging infrastructure included capital costs, wholesale electricity costs, operating costs, utilisation rates and onward prices to consumers. Key differences emerged between Rapid and Standard CPOs.

- **Rapid Charging:** Rapid charging services typically involve higher upfront capital costs as they require more powerful chargers, and they may need to be installed in enroute locations to attract customers (e.g. on SRN and the Major Road Network (MRN)). Whilst more expensive to install, rapid charging services generate higher revenue per charge, as customers pay a premium for the convenience of a rapid charge and the infrastructure can deliver more electricity per charge.
- **Standard Charging:** CPOs that offer standard charging services, such as those targeting residential EV owners or fleet operators, have a different set of considerations. While standard charging services typically require lower upfront investment in charging infrastructure, they may generate lower revenue per charge, as they require customers to charge for longer, therefore requiring sites where dwell times are high.

### 5.1.4 Business Models and their Impacts

Unless the use of infrastructure is guaranteed, or the capital cost of the infrastructure is reduced through grants, any investor in EV infrastructure is ultimately taking risk on utilisation. A key technique that CPOs employ to mitigate this risk is combining multiple revenue streams, “revenue stacking”, alongside the revenue generated from vehicle charging. This has resulted in a diverse range of business models emerging that can broadly be categorised into four different types (PWC, (2018):

- The 'Portfolio' Player: Companies that operate across multiple charging segments, typically offering a range of charging services, including fast-charging, rapid charging, and home charging, among others. They may also operate charging networks in multiple locations.
- The 'Specialist' Player: Companies that focus on a specific charging segment, such as rapid charging or home charging or specialising in servicing a particular type of EV market.
- The 'Network Optimiser' Player: Companies that are building future market positions across multiple charging segments. They operate charging networks in multiple locations and offer a range of charging services, but their primary focus is on optimising the efficiency and profitability of their charging networks.
- The 'Energy Supplier' Player: Companies that are seeking to build a position in EV charging to support demand for electricity. They may offer a range of charging services, but their primary focus is on using EV charging as a means of selling electricity to EV owners.

The nature of the business models adopted influences CPOs strategies related to funding, fees, partnerships and target customers, which all in turn influence their investment decisions. Location allocation is therefore complex and influenced by numerous factors outside of the standalone economics of the infrastructure.

### 5.1.5 Location Choice

The “best” location for EV charging infrastructure varies considerably by business model but, despite numerous studies into the topic, the decision-making process for allocating public charge points remains a challenging problem (Motoaki, 2019). A broad variety of characteristics are included within the site selection process ranging from sociodemographic variables (such as age, gender and income) to specific locations factors (such as parking facilities and proximity to the SRN). Exclusionary elements are also considered, such as small road widths, locations without parking spaces or pedestrianised areas that all limit where EV infrastructure can be established, leading to the site being rejected (Karolemeas, 2021).

The complex nature of site selection has resulted in numerous academic studies developing optimisation methods or novel algorithms to determine the optimal positions for EV charging points (Karolemeas, 2021). However, when these techniques are compared against decisions observed in practice, many real-word considerations are currently not accounted for in the mathematical formulations developed to date (Motoaki, 2019). Theoretical approaches are therefore not fully predicative of real-world investment behaviour, highlighting the importance of engaging with CPOs to gain a comprehensive understanding into their investment decisions.

## 5.2 Analysis of Private Sector Engagement

### 5.2.1 Overview

To complement the theoretical desk top analysis (Section 5.1) we engaged with the private sector to ensure the wider analysis was grounded in reality and reflected real world experiences and findings. The key focus was to identify common approaches to private sector investment decisions. This included, understanding desirable locations for unsubsidised infrastructure deployment, delivery ambitions, and the role of LAs in supporting these delivery goals. 10 one-to-one discussions with CPOs were conducted between November and December 2022. An overview of these sessions is outlined in Table 5-1.

| Charge Point Operator | Representative | Date |
|---|---|---|
| Ubitricity | Jordan Marsden | 16/11/22 |
| Connected Kerb | Peter Howe | 17/11/22 |

| | | |
|---|---|---|
| **Pod Point** | Tom Stebbing | 21/11/22 |
| **Charg.y** | Nick Hulin | 22/11/22 |
| **EZ Charge** | Phil Shadbolt | 23/11/22 |
| **BP Pulse** | Joe Wetherall | 25/11/22 |
| **Liberty Charge** | Shaun Quirk | 28/12/22 |
| **ESB** | Brian Carroll | 29/11/22 |
| **OSPREY** | Mark Wheeler<br>Steve Forster | 02/12/22 |
| **IONITY** | David Metcalfe | 14/12/22 |

*Table 5-1: Overview of Charge Point Operator 1-1 Meetings*

To ensure equitable representation of the market, a broad spread of CPO specialities was captured. Figure 5-1 and Figure 5-2 illustrate the range of infrastructure business models that the engaged organisations adopt, and the variety of charge point speeds that their network consists of.

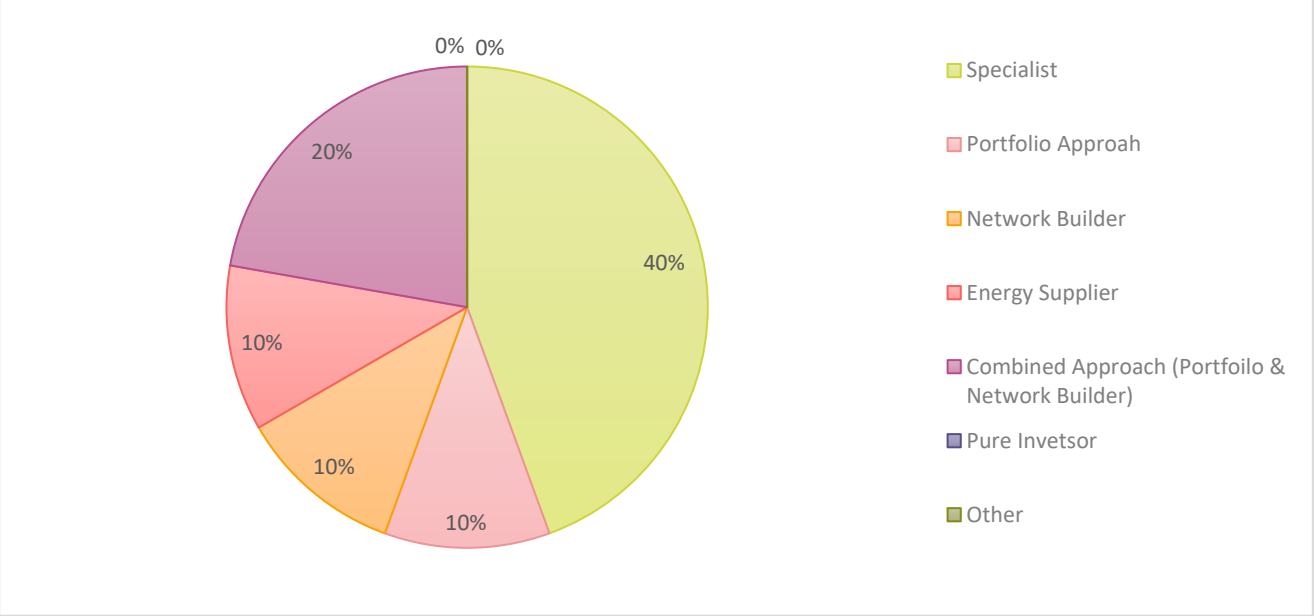


*Figure 5-1: Summary of the Infrastructure Business Model Used by CPOs*

Figure 5-1 illustrates that almost half of the CPOs engaged referred to themselves as specialists, focused on one charging segment e.g. fast-charging. All five charging segments were accounted for in this category, with CPOs offering specialist services with regards to Slow, Standard, Fast, Rapid and Ultra-Rapid infrastructure. The second most popular approach was a blended infrastructure business model consisting of Portfolio (operating across multiple charging segments) and Network Builder (developing a regional or national network) components. To grow a network to reach nationwide coverage, it is beneficial to offer a diversity of charge point speeds to clients, therefore the complementary nature of these two approaches may possibly explain why they have been adopted simultaneously. All of the CPOs interviewed operate charge points, and so did not consider themselves to be Pure Investors.

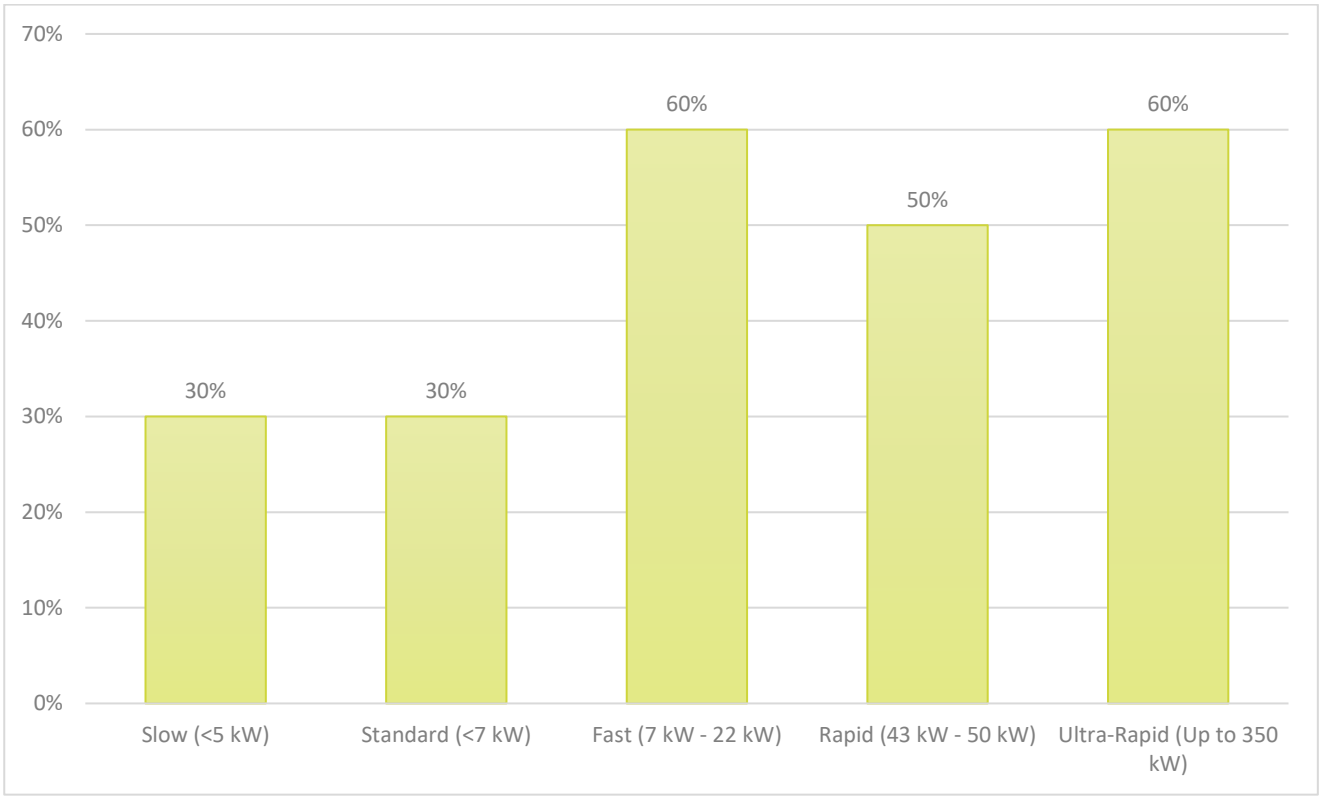


*Figure 5-2: Infrastructure Charge Point Speeds Offered by CPOs*

As shown in Figure 5-2 all charge point operating speeds were accounted for. The most prevalent charging segments were Fast and Ultra-Rapid, with over half of CPOs offering both these speeds. Figure 5-3 further classifies CPOs based on the range of charge point speeds that they offer to their clients:

- **Standard:** Refers to operators that deploy slow, standard and fast chargers
- **Rapid:** Refers to operators that deploy rapid and ultra-rapid chargers

However, the most popular approach was offering charge point speeds across both these categories, with two CPOs operating in all charging segments, from Slow to Ultra-Rapid, one who offered Slow to Rapid and another who offered Fast or Ultra Rapid charging infrastructure. The remaining CPOs we engaged with were split evenly between the other two categories, with 30% offering Standard or Rapid charging infrastructure.

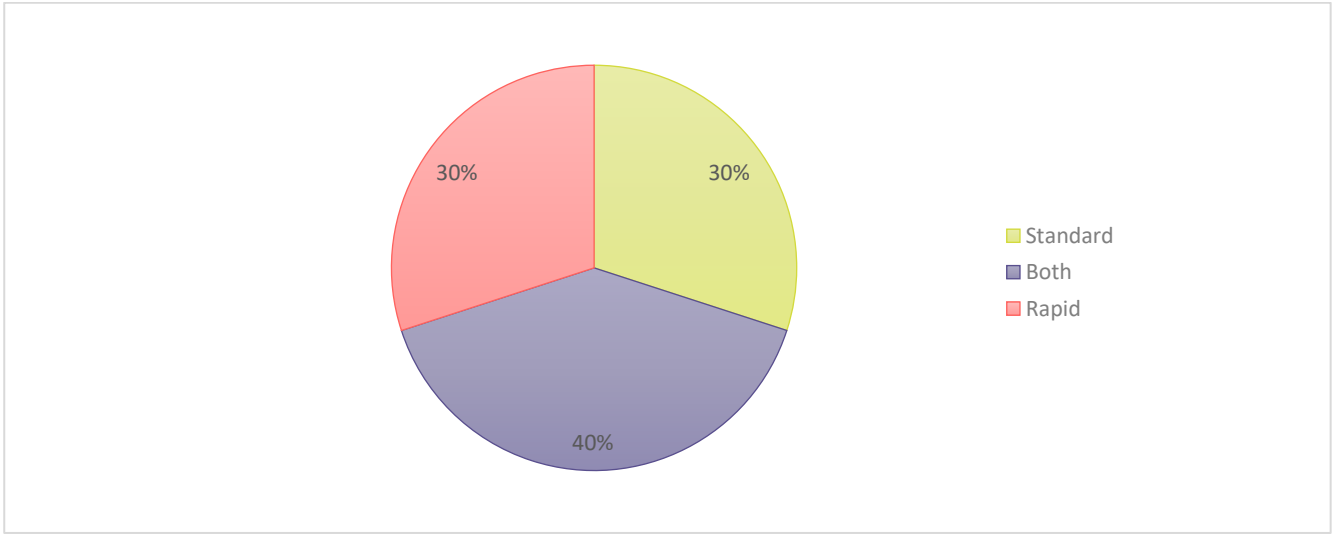


*Figure 5-3: CPOs Grouped by Infrastructure Speed*

### 5.2.2 Private Sectors Investment Approach

We noted several key differences between standard and rapid operators:

- CPOs who are focused on the slow charging market tended to be less guarded in discussion (due to commercial sensitivities) and offer more flexibility around sites they deem attractive.
- Due to larger installation costs, rapid operators are more prescriptive about what constitutes a desirable site, with a greater emphasis on return on investment.
- Due to business confidentiality and the complexities of their site selection tools (some of which feed in 110 data sources), CPOs were unable to clearly define what makes a site desirable.

Despite the above, a number of key recurring themes have emerged and are outlined in detail below.

#### *5.2.2.1 Typical Charge Point Location*

Figure 5-4 indicates that the most popular sites for charge point deployment are typically areas with averagely higher dwell times. Car Parks and Destination Sites are being utilised by 70% and 60% of CPOs respectively. On-street locations and Strategic Sites along the SRN followed closely behind with 50%.

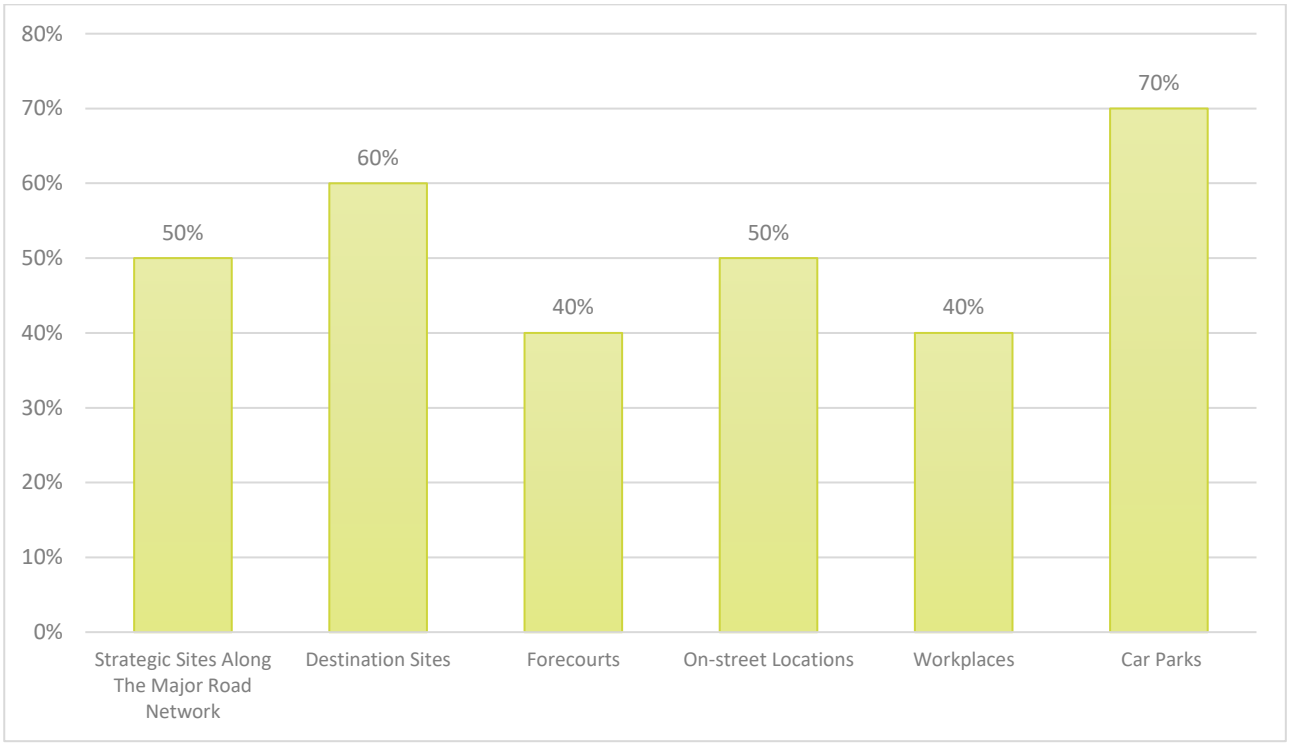


*Figure 5-4: Typical Charge Point Deployment Sites*

Figure 5-5 illustrates that typical charge point locations vary across standard and rapid CPOs. On-street locations were generally favoured by CPOs who offer lower charge point speed. Strategic sites were preferred by rapid installers. Car parks cover a diverse range of sites and a broad range of trip purposes, explaining why they are a popular site amongst installers operating across both charging segments.

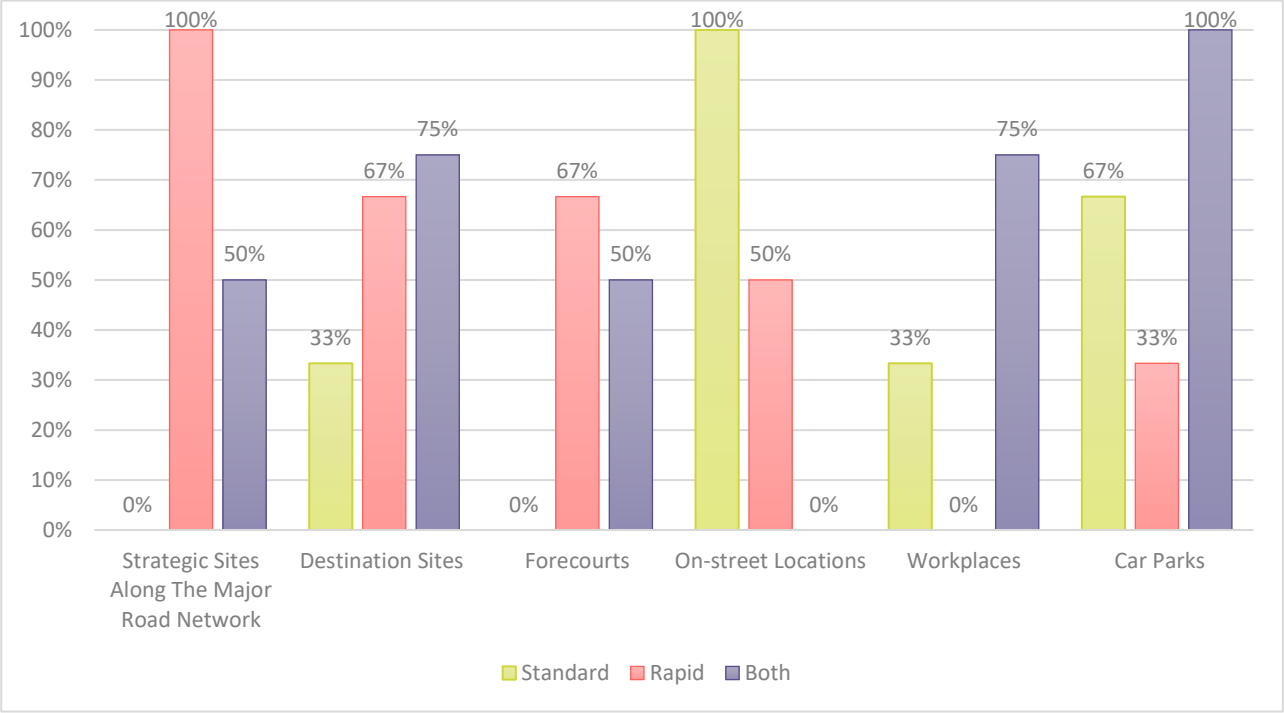


*Figure 5-5: Typical Charge Point Locations by Charge Point*

Geospatial analysis highlighted the potential disparity in preferential locations for rapid charge point provision across the region. As Figure 5-6 shows, there is a significantly lower density of strategic and major roads within the TE area, compared to EEH. This is likely due to TE's rural nature and as such the region may need further support in attracting rapid CPO investment in a variety of locations outside of the SRN. This could include an emphasis on destination sites, due to the region's high visitor economy, or promoting a forecourt style solution on the existing road network.

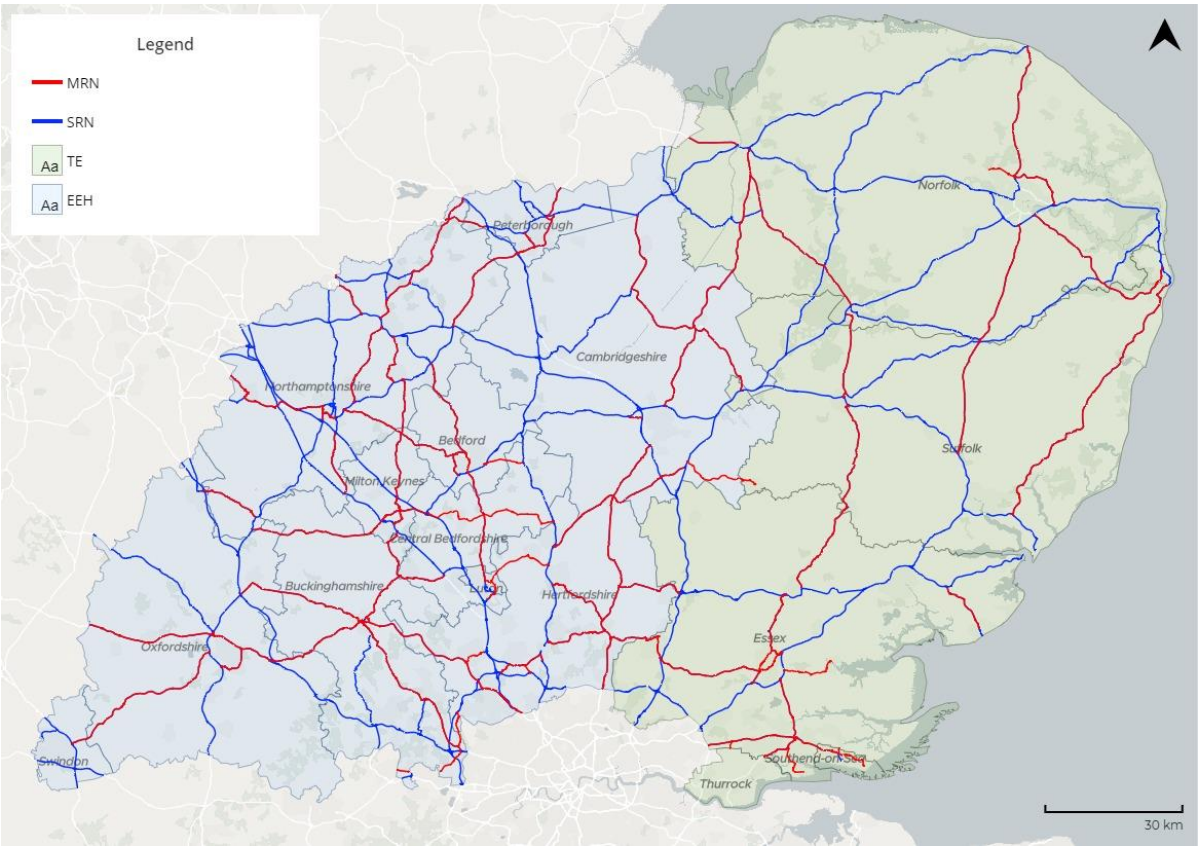


*Figure 5-6: The SRN and MRN across the Study Area*

#### 5.2.2.2 Common Characteristics Across All Infrastructure Types

Figure 5-7 summarises key characteristics that CPOs utilise when identifying suitable locations for infrastructure deployment. Sociodemographic characteristics emerged as one of the most important characteristics for all Standard CPOs, whereas energy characteristics was a priority for CPOs that offer rapid charging. These key themes, amongst others, are explored in the next chapter. Mapping the common characteristics into the EV:Ready Tool is an opportunity that the STBs could consider to help the public sector identify attractive sites for investment.

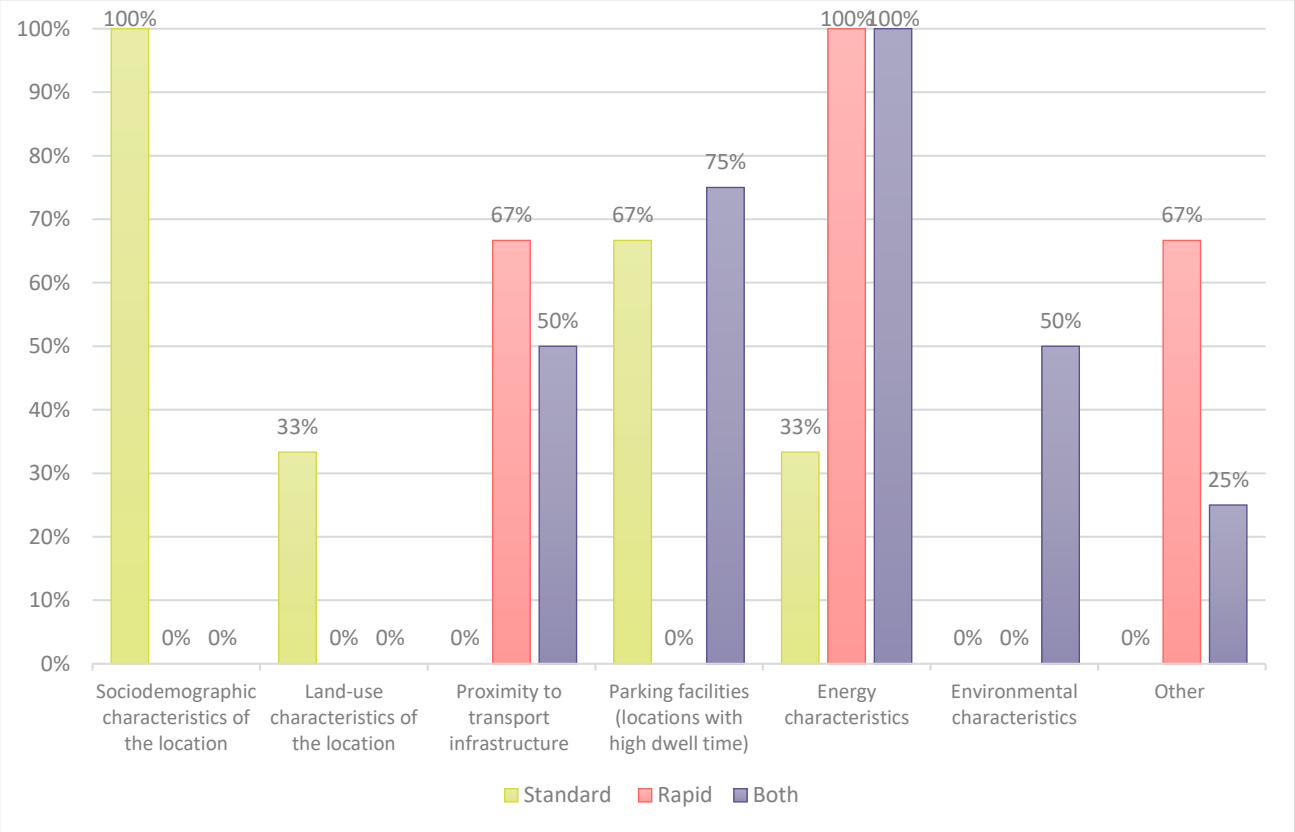


*Figure 5-7: Percentage of CPOs Citing Priority Characteristics for Site Selection by Infrastructure Speed Type*

### Energy Characteristics & Grid Connections

Energy characteristics (such as substation capacity, grid capacity and the viability of the grid connection), is a standout factor for CPOs when exploring the siting of new EV infrastructure. 80% of interviewees across charging segments stated this falls within the top three characteristics for consideration. Its importance stems from a viability and feasibility perspective, with the scale of infrastructure upgrade costs drastically influencing the overall cost of installation. This is further confirmed by 50% of CPOs expressing that a site with No Grid Capacity/Far from an Existing Grid Connection would result in ruling out investment.

Despite being a concern across all infrastructure types, rapid installers stressed the importance of the viability of grid connections, with two CPOs stating that this is the first factor considered within a decision to proceed. The two CPOs who deprioritise energy characteristics deploy slow lamppost-based charging. This type of charging taps into excess energy capacity on-site and therefore does not require new grid connections.

All the CPOs handle the grid connection process themselves (frequently on behalf of their clients), conducting an initial site survey to assess feasibility and then contacting the DNO (or alternative options) to provide the connection (See Section 6.46.4). Whilst interviewees recognised the importance of the unbiased, regulated roles of longstanding DNOs, it emerged that they have

become harder to work with and increasingly expensive. As a result, several CPOs have turned to independent connection providers (ICP) or independent DNOs (IDNOs) who provide a cheaper, quicker and more customer-focused service.

### Approach to Dwell Time and Charging Site Facilities

Locations with a high-existing dwell time (such as areas with parking and destination facilities), emerged as a prominent desirable site selection characteristic for 60% of CPOs. Despite being relevant across all charge point speeds, the preferred length of dwell time at a location varied, but remained proportional to the time taken to reach a full charge. Standard installers typically categorise their sites as on-street residential (overnight charging), car parks or destination sites, aligning with locations or facilities where vehicles would be parked between two and 11 hours (e.g. park and rides or employee car parks).

Rapid installers classified their dominant location choice as strategic sites along the SRN that have access to retail or other facilities (such as hospitality drive throughs or petrol stations). One rapid installer stressed that the "use case for the charger is one of the most important points", highlighting they prefer to pair infrastructure with facilities where an individual would want to spend their time. However, the crucial difference originates in the overall preferred dwell time of clients. This relates to their typically shorter charging times (between seven – 40 minutes) and the need to have a higher footfall due their larger capital costs. The preference for rapid CPOs was therefore an emphasis on sites with a high client turnover. This aligns with their own categorisations of their locations (e.g. petrol stations, fast-food chains or motorway services) and confirms the findings of the research outlined at the start of this chapter.

User experience emerged as a key component for repeat customers, therefore positioning EV charge points alongside useful amenities (such as toilets, hospitality sites or retail parks) increases the potential for higher utilisation rates across all charge speed segments. One rapid installer even stressed that one of their exclusion criteria is a location without a functioning toilet.

### Environmental Characteristics

The majority of CPOs stated that environmental characteristics (such as flood risk, protected habitats and archaeological sites) are accounted for in the wider feasibility assessment.

### Socio-demographic Characteristics

This section explores the socio-demographic characteristics that CPOs specifically highlighted as part of their site section process. As Figure 5-7 indicates, 100% of standard CPOs expressed that socio-demographics of the location was in their top three priority variables. Interestingly, this primarily related to existing infrastructure, with three CPOs who provide standard on-street residential charge points highlighting the importance of existing vehicle ownership (electric and petrol/diesel), and individuals' current access to private parking infrastructure. The use case for standard infrastructure is usually to provide public access to charge points in residential areas where individuals may not have access to a private home charger. Charging typically takes place overnight, due to the longer charging duration. Some standard installers employ smart charging techniques to manage grid connectivity, allowing clients to charge overnight for lower rates which helps alleviate stress on the grid. Therefore, reverse engineering statistics (such as the density of non-driveway properties and existing home charging data), allows the CPO to locate gaps in charge point provision, thus identify ideal areas for infrastructure investment.

More widely, income was the characteristic highlighted by CPOs across charging segments, but interestingly as a low priority variable and not a prerequisite for investment. Some of the CPOs used income to explore the probability of an area being prone to early EV adoption, thereby providing additional confidence. However, due to the rise in the second-hand EV market, it was noted that

income is not the most reliable metric for EV adoption, or areas of future high utilisation rates, and subsequently is regarded as a low priority variable for site selection.

One on-street fast-charging CPO stated that they explore areas with a mix of income levels. They highlighted that less affluent people tend to travel more miles and therefore have a higher charge point utilisation rate once they have switched to an EV. Another CPO highlighted that considering they don't need infrastructure to be used immediately, the current income/socioeconomic composition of the adjacent population is not important. Instead, they are interested in creating behaviour change and gaining nationwide network coverage, so would deploy in areas with varying income to achieve this.

#### *5.2.2.3 Key Themes for Rapid Installers*

##### Traffic Flows & Car Free Area

Due to larger investment costs, rapid installers typically need assurance of a higher frequency of charging events so that their sites can recoup their initial investment. We identified that traffic flow is one means of determining utilisation rates, with two CPOs highlighting that it is the first thing they assess. However, one CPO noted that higher traffic flow does not aways guarantee higher utilisation, therefore they explore origin-destination data in parallel.

The importance of high traffic volumes was reaffirmed by 50% of CPOs who provide rapid charging, stating that a car-free area would exclude a site from investment. This could create issues for equitable access to rapid chargers in areas with low population density and low traffic flows (such as rural areas), as these regions become less attractive for investment.

Standard CPOs focus on dwell times and are more flexible about what constitutes a suitable site. There was no apparent reluctance to install in rural areas and one standard installer employs a unique site selection process that ultimately encourages equitable access (See Section 5.2.2.5).

#### *5.2.2.4 Key Themes for Slow Installers*

##### Payback Period

A crucial difference between infrastructure types relates to the investment models employed, as this determines the duration of the payback period on the initial capital investment. Typically, standard installers stated they can be more flexible with site selection due to less reliance on immediate utilisation. This is due to the typically large, patient capital nature of their investment model, with one standard CPO stating they could absorb a loss on sites for up to 8 years. Another means that CPOs adopt to ensure they recoup their initial investment is through specifying longer term contracts, thereby maximising the payback period. A fast-charging specialist highlighted that they require 15 years as their baseline contract length, with the expectation that utilisation rates will be low for at least the first five years. Similarly, another CPO specialising in the fast-charging speed segment specified that a long contract period (15 years) is necessary to de-risk their return on investment, echoing similar low utilisation expectations at the beginning of the contract.

#### *5.2.2.5 Site Selection Tools*

All CPOs have invested in the development of their own in-house site selection tools to support the identification of optimal locations for charge point deployment. Rapid installers with their higher upfront costs, have developed extremely complex tools that draw upon a wide range of data sources. For example, two rapid CPOs stated that their site selection software is informed by over 100 different data sources, including utilisation rates, traffic flows and dwell time. Whilst we have been able to identify several key characteristics, rapid installers were reluctant to share detailed information about what makes certain sites attractive, frequently citing business confidentiality.

Standard installers typically used a different set of variables, focusing on areas with reduced or no access to off-street parking and areas with high dwell times. Key factors included the density of properties without a driveway, current EV ownership, footpath width and average income for the area, with one operator utilising a tool with over 34 live data points.

However, not all CPOs focus on achieving optimally economic locations. Two standard CPOs expressed that, due to the market-positioning and the patient capital nature of their business model, selecting sites that will be highly utilised today is less of a priority. Instead, the site selection process involves negotiation with the client, with the CPO factoring in preferred client sites and internal EV charge point targets into the overall return requirements. Similarly, one rapid operator stated they can work with the LA to identify a 'basket' offer, where they pair sub-optimal sites with highly utilised locations in order to deliver equitable charging infrastructure across the region. This is especially relevant for increasing rapid charge point deployment within TE, which is categorised by higher densities of rural areas in comparison to EEH.

**Ubitricity – The Right to Charge**

Outside of spatial mapping and digital tools, Ubitricity employ a needs-based approach to site selection which puts the power of selecting locations into the hands of the local residents, supporting increasingly equitable access to EV infrastructure. After a purchase order has been confirmed, they work with the LA to install an agreed number of charge points using the more traditional site selection process, driven by their own and the Council's data. However, the remaining charge points are posted onto the LA's landing page, with residents encouraged to request a charge point in their post code. If multiple requests are received for the same postcode, Ubitricity commits to installing a charge point within 300m of that site. This offer includes areas that typically would be deemed as less suitable, such as rural villages or areas with lower traffic flows.

### 5.2.3 Types of Funding Models for Infrastructure Deployment

A key aim of the project was to understand the range of charging infrastructure business models that are being deployed by CPOs, with a specific focus on unsubsidised investment opportunities (business models that are not dependent on public sector investment e.g. government grants or contributions from LAs). The following section explores the various types of funding models that CPOs currently offer to both LAs and private partners, with Figure 5-8 illustrating a high-level overview of the funding models that CPOs typically draw upon.

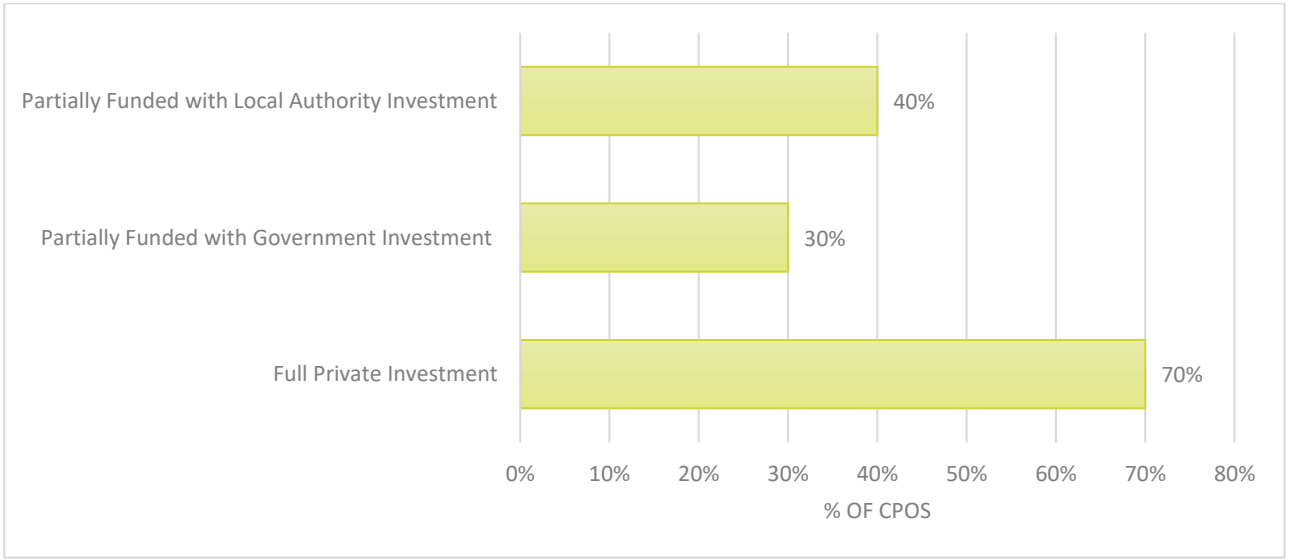


*Figure 5-8: Overview of the Funding Models Offered by Charge Point Operators*

#### 5.2.3.1 Fully Funded Private Models

As Figure 5-8 illustrates, the majority of CPOs offer fully funded private models to LAs in exchange for a lease agreement with LAs to utilise their land. The fully funded models typically cover all expenses such as the grid connection, installation, operational costs and maintenance. In return the LA would usually receive a profit/revenue share based on infrastructure utilisation rates (see Section 5.2.5.3 for more detail). Two CPOs additionally stated that they would upgrade the charge points at least once throughout the duration of the contract to account for changes in technology and to ensure their infrastructure remained up-to-date.

#### 5.2.3.2 Other Types of Funding Models

Less than half of interviewees (40%) expressed a requirement for partners (including LAs) to share the initial investment or make some contribution towards costs. In these cases, a partially funded model means that the client has more control over charge point location, what type of infrastructure is installed, the tariff that is charged and receives a higher cut of the profit/revenue share.

Finally, a third of CPOs offer partially funded models, where either the CPO or the LA draw upon public sector investment, such as match funding from the government or the On-street Residential Charge Point Scheme (ORCS).

#### 5.2.3.3 Commercial Partners & Ambitions

100% of CPOs expressed that commercial and private sector partners accounted for a proportion of their target market. They stated they were working closely with large landowners such as supermarkets, retail parks and hospitality chains in order to further expand their charge point infrastructure. Figure 5-9 illustrates the variety of industries that CPOs are currently working with and are keen to expand into, with hospitality chains, such as Starbucks and McDonalds, and retail park owners proving to be the most desirable sectors for partnerships.

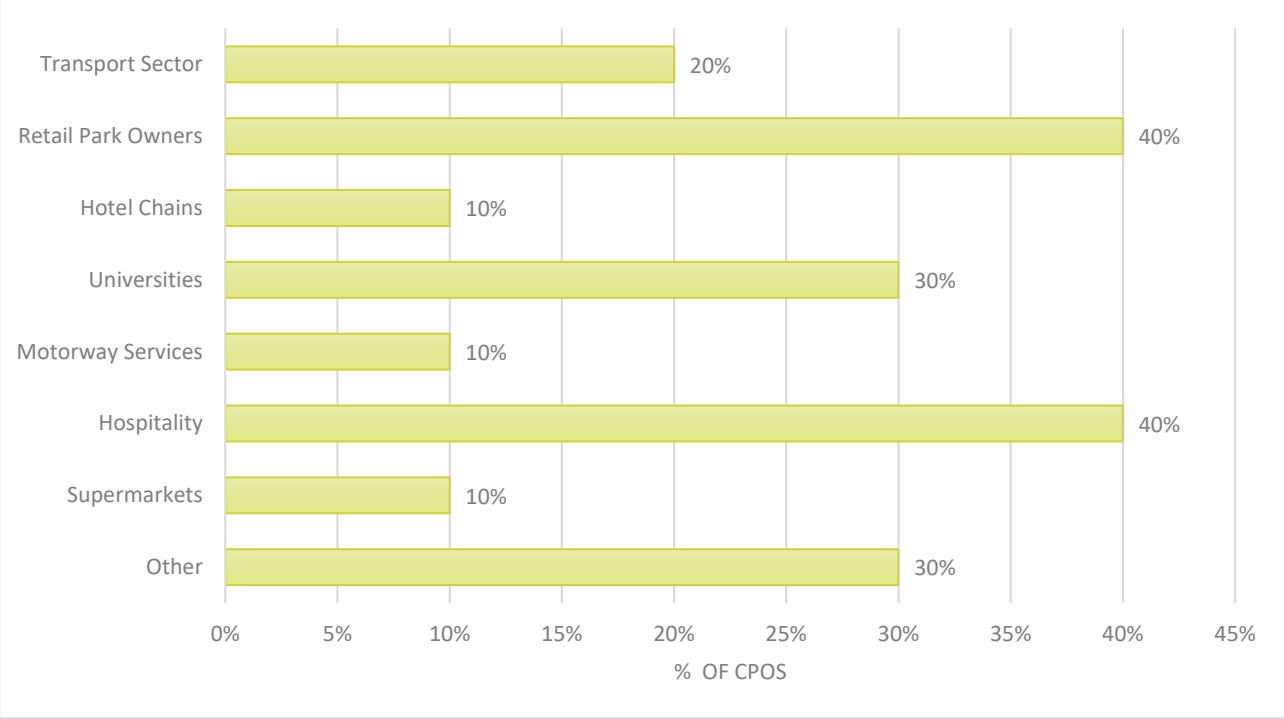


*Figure 5-9: Commercial & Private Sectors Attractive for CPO Investment*

The key benefit highlighted to future partners (who are willing to lease their land to CPOs) lies in the immediate and potential secondary stream of revenue that can be generated with installing EV charge points. Firstly, the majority of CPOs offer an immediate percentage of the utilisation rates as well as the lease agreement for operating on site as part of the standard contract. Some CPOs

provided anecdotal evidence that presence of EV charging infrastructure can increase commercial footfall and increase overall site revenue. E.g. Starbucks was stated an example where charge points drive increased footfall.

Despite the outlined benefits, many of these relationships are in their infancy. Commercial partnership development is an area that CPOs are continually working on and looking to expand. Many CPOs stated that legal and administrative timescales for lease agreements continue to be long and complex, resulting in some CPOs now looking to purchase land, with a view to then leasing space to commercial partners.

**IONITY – Increasing Footfall for Commercial Partners**

In December 2020, IONITY opened one of its ultra-rapid charging stations at a strategic location in Chippenham. It targets EV owners driving past junction 17 of the M4 in Wiltshire on their way to Devon and Cornwall. The Chippenham Pit Stop (a family-run roadside service station with a restaurant, convenience store, lorry park and a fuel island primarily for commercial vehicles), has seen a significant rise in business since IONITY has opened its site. This is due to a noticeable increase of footfall in the shop and café from EV drivers and passengers passing by and returning.

"Prior to IONITY charging stations being here, the Pit Stop was not 'on the map' for most non-commercial drivers, which they most probably assumed was for truckers only. However now we have seen a whole new customer base who can enjoy our restaurant and Nisa Local store whilst they charge their vehicle." David Hatherell, MD of Pit Stop.

### 5.2.4 Future Capital Investment

#### *5.2.4.1 Investment*

All CPOs have significant financial support/backing and funding in order to accelerate the roll out of charge points across the UK and to increase the uptake of EVs. Key investors range from oil and gas companies such as Shell and BP, investment and infrastructure companies such as Investec, Cube IM, Aviva and Zouk Capital, and car manufacturers such as BMW and Ford. All these organisations have contributed large amounts of capital to support CPOs with their ambitious targets, with CPO long term capital ranging from £6.4 million (Charg.y) to £45 billon (Osprey). Therefore, absolute levels of funding are increasing and appear to be a diminishing barrier to infrastructure roll out. However, as we have seen investment is location-preferential (i.e. for rapids being biased away from rural areas). In addition, where CPOs do wish to invest there are often complex land-ownership issues (particularly relating to lease agreements) that often need to be overcome. The general finding was that CPOs do not own land themselves and are therefore dependent on partnerships with landowners.

#### *5.2.4.2 Future Ambitions*

All CPOs expressed their ambitions to continue to significantly grow their network of charge points. Despite prompts, and a general sense of acceleration, there was limited visibility from the sector for precise investment rates beyond 2030. Interviewees all focused on short term ambitions out to 2025 or 2030, both due to shorter-term internal targets and the scale of charge point growth being highly dependent on external market factors. All CPOs acknowledged, alongside the co-benefits expanding charge point provision would have financially for their business operations, the necessity of charge

points in order to support the increased uptake of EVs over the next decade due to the ban on the sale of new internal combustion engine (ICE) vehicles from 2030.

Informed by their current network and planned growth for 2030, Figure 5-10 illustrates the forecasted cumulative charge points that the four CPOs who quantified their ambitions will have in operation by 2030. These targets ranged between 1,000 to 190,000, reflecting the variability of the market and the charge point speed that the CPO offered. These are nationwide figures as CPO were unable to disclose regional specific numbers. Growth steadily accelerates from 2025 onwards, aligning with 2025 being highlighted as the "inflection point" (EZ Charge), where rapid growth will need to occur in order to meet the markets demand for EV charging, requiring significant investment in infrastructure pre-2025.

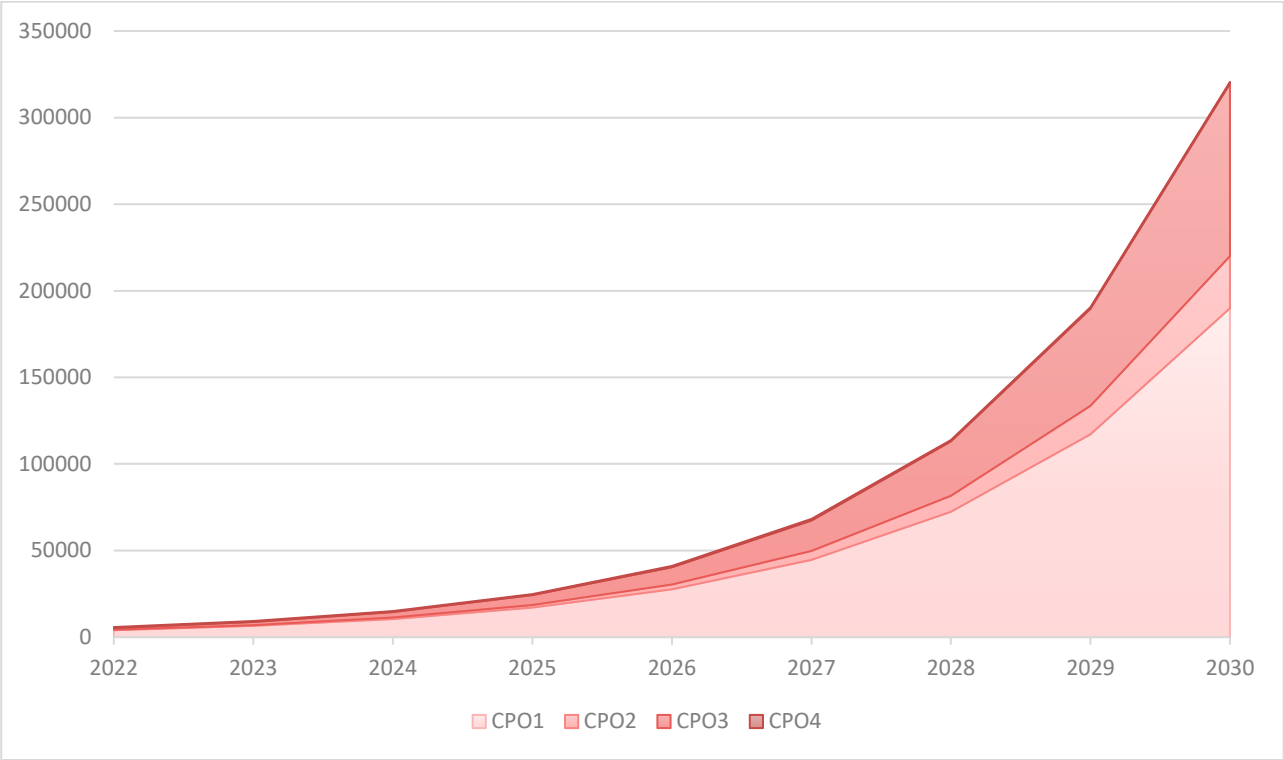


*Figure 5-10: Charge Point Growth Ambitions of Four CPOs that Provided 2030 Targets*

Table 5-2 provides an overview of infrastructure business models, charge point speeds and the expected percentage growth between the current and aspired 2030 network for the four CPOs that provided us with their 2030 target. In order to calculate the growth rates outlined below, we have assumed that 40% of the cumulative chargers were delivered in the past year. We have then calculated a constant growth factor for subsequent years in order to match the targeted cumulative growth for 2030. Interestingly, the two CPOs that aspire for higher growth rates (CPO2 and CPO3) both employ infrastructure models that operate across both charging segments, supporting increased deployment of charge points for a multitude and diverse set of locations, potentially explaining these large growth rate ambitions. Additionally, the total 2030 network targets of CPO1 and CPO4 align with the infrastructure speed they provide. CPO1, specialising in traditionally lower costing and reduced risk standard chargers, aims to deploy 190,000 charge points, the most ambitious target of all CPOs. However, CPO4 who provides rapid infrastructure, has the lowest target for 2030 with 1,000 charge points.

| CPO | Infrastructure Business Model | Infrastructure Speed | 2022 Network | 2030 Target | Annual Percentage Growth (%) |
|---|---|---|---|---|---|
| CPO1 | Specialist | Standard | 4,000 | 190,000 | 61 |
| CPO2 | Portfolio | Both | 280 | 30,000 | 82 |
| CPO3 | Network Builder | Both | 1,000 | 100,000 | 80 |
| CPO4 | Energy Supplier | Rapid | 500 | 1,000 | 5 |

*Table 5-2: Further Detail on the Four Charge Point Operators Ambitions*

Based on the WSP EV:Ready Tool, charging infrastructure is expected to grow from approximately 3,000 charge points today to between 41,000 and 64,000 by 2030. Based on our previous method, this equates to an annual growth in delivery of between 30% and 41% per annum. Table 5-2 highlights that our engagement with CPOs identified 2030 targets which indicate an indicative annual growth rate between 5% and 82%, with the majority of ambitions sitting at the higher end of this range. Optically, it appears that CPOs have aspirations that are largely aligned to the growth rates required. However, progress will need to be monitored to ensure:

- Aspirations are met and the absolute number of charging infrastructure delivered within EEH and TE matches need on an annual basis
- Appropriate charging infrastructure providing sufficient coverage of the right type and location is provided

#### *5.2.4.3 Themes*

Below is a summary of additional themes that emerged regarding CPOs expectations regarding future growth:

- **Second-hand EVs:** Due to the rapid evolution and continued innovation of EV technology, an increasing number of ultra-low and zero-emission vehicles are filtering through to the second-hand car market. As a result, EVs are becoming more affordable, which is expected to cause an additional spike in ownership post 2030.
- **Partnership & Land Ownership Concerns:** CPOs were confident that despite ambitious targets, they had the funding and assets ready to deploy to meet delivery. The key concern was finding public and private sector partnerships to facilitate this deployment and acquiring/leasing the land required to support the installation of infrastructure. One approach that some rapid CPOs are starting to explore is purchasing land rather than leasing it. This approach can de-risk their dependency on land ownership partnerships and provides them with more control. Osprey highlighted that they aim to acquire a minimum of 50 additional sites in 2023, expressing interest in partnering with LAs to relinquish sites in exchange for an upfront capital payment.
- **Behaviour Change & Risk Aversion:** The increase in EVs is acknowledged as a widespread inevitable outcome due to governmental legislation and wider environmental concerns. However, CPOs highlighted that individuals will only purchase an EV when they are confident that they will be able to charge their vehicle. Similarly, there is a hesitancy to invest from both the public and private sector when the demand for charging remains relatively low, forming a circular and complex issue.

### 5.2.5 The Role of LAs in Supporting Delivery

Whilst the key purpose of this Study was to understand private sector investment in EV infrastructure, we acknowledge the ongoing role of the public sector, particularly in terms of slower on-street charging provision to cater for households without off-street parking, and to address gaps in rural

provision. In this section we captured feedback from CPOs on the role of LAs in supporting infrastructure delivery. Both slow and rapid CPOs welcome the opportunity to continue working with LAs to support infrastructure delivery.

#### *5.2.5.1 Key Barriers*

The EV market is evolving at a rapid rate, resulting in the continual release of new technological efficiencies, terminology and best practice. Consequently, information can become quickly outdated as new ways of working emerge, leading to a disparity in understanding for individuals who are not immersed within the market. As shown in Figure 5-11, over half of CPOs (60%) cited market and technological understanding as a key issue, largely impacting initial procurement and misconceptions surrounding the resources that will need to be allocated to support a functioning network.

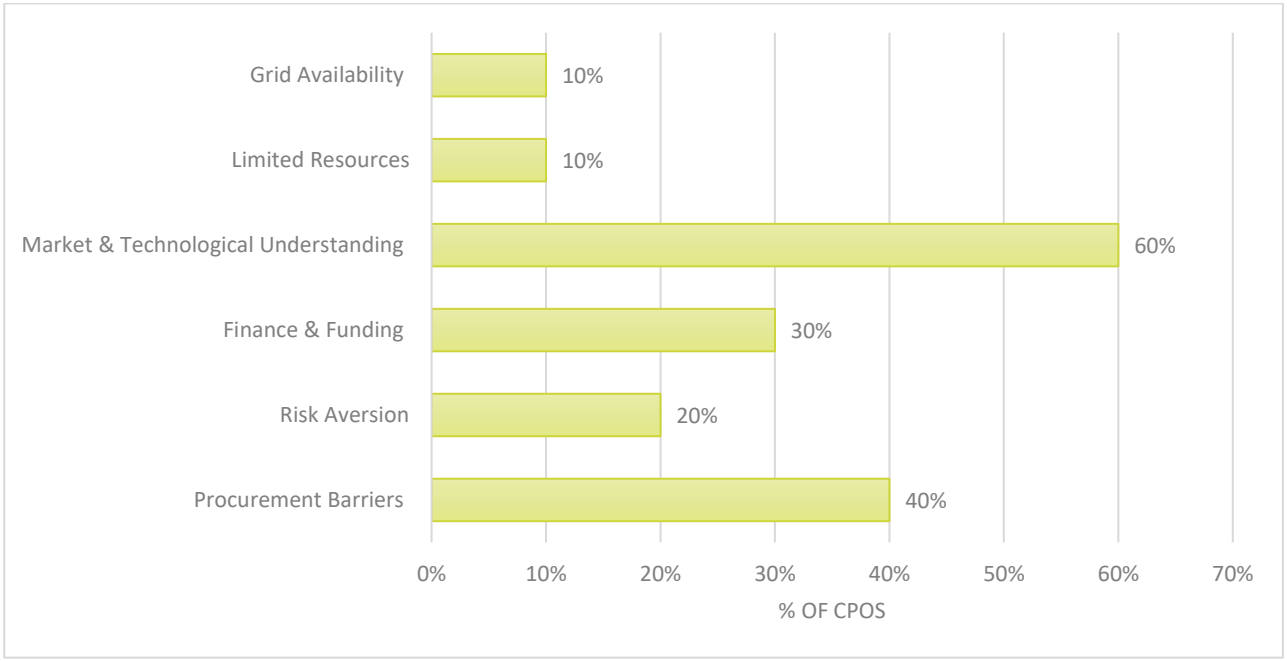


*Figure 5-11: Key Identified Barriers to Partnership*

#### *5.2.5.2 Procurement Support*

A key theme that emerged from discussions related to the procurement process, with 40% of CPOs citing it as a crucial issue when working with LAs. As Figure 5-12 indicates, restrictive tenders was the primary concern, which can largely be explained by the previously identified limited market and technology understanding within LAs. As previously discussed, CPOs have invested significant resources into developing their own site selection tools to ensure their locations are viable, and instead prefer to work with LA post-appointment or during the tender process itself to determine sites/charge point speeds to maximise utilisation rates.

The ideal contract length varied between 10-25 years, however 50% of CPOs confirmed that 15-19 years was the most desirable timeframe to recoup their initial investment. The fate of the equipment can largely be negotiated, with only 20% of CPOs specifying that they would definitely remove the infrastructure upon contract termination.

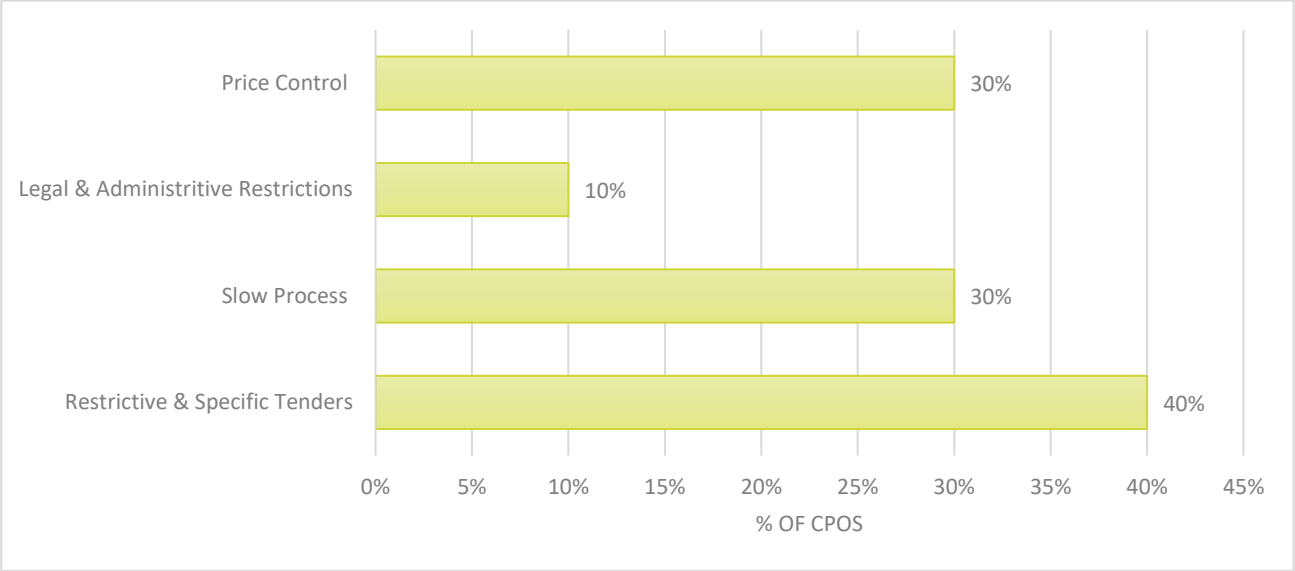


*Figure 5-12: Procurement Specific Barriers to Partnership*

#### *5.2.5.3 Revenue Share / Offer for LA*

90% of the CPOs share a portion of the profit generated from the charge point sites with the associated landowners, including LA. This typically comes in the form of a net profit or gross margin share, defined as the remaining revenue after detracting the electricity cost at a given site, rather than a direct revenue share. The percentage range of these offers started from a baseline of 5% and extended up to 20% and is usually paid on an annual basis. Other revenue avenues open to the LA that were identified included charges per socket, whereby the LA would receive £30 a per socket for a lease fee and then up to 10% of the energy sales generated on the sockets as they are utilised, and a profit-per-charge, with the LA receiving a cut of the profit from every transaction. One rapid installer stated that over a 15 year lease the income for LA could reach between £150,000 - £200,000.

Utilisation rates are the biggest determinant of the size of the overall payment to the LA, affecting the total profit of the CPO that they can share with clients, the energy sales generated on the sockets and the profit-per-charge. Because of this, most CPOs expressed that maintaining high utilisation rates is in within their own commercial interest, with user experience quoted as the "single most important factor to site utilisation". As a result, utilisation rates are monitored constantly and availability of charge points is maximised through signal alerts to support reactive maintenance, with one standard installer stating that they deploy staff to resolve any availability issues within two hours of being notified. Alongside this, to ensure the highest level of customer experience, two CPOs expressed that they upgrade the charge point technology (at their own cost) at least once during contract duration, acknowledging that sites need to be attractive and easy-to-use, as well as reliable with up-to-date technology.

#### *5.2.5.4 Data Sharing*

Aside from one ultra-rapid specialist, all CPOs provide a dashboard via which Clients (including LAs) can access a range of usage, availability and client data (in accordance with GDPR). The majority of CPOs can tailor the dashboards/data available to meet the client's needs, adapting the interface to provide a more user-friendly experience for LAs if requested. Utilisation rates and charge point availability emerged as the two most useful and sought-after variables for end-user feedback, with all CPOs (aside from one) providing this information as a baseline. Other data factors that they incorporate include plug-in time and length of plug-in time, energy flow, current tariffs and reliability.

Some CPOs expressed that they take extra measures, alongside the dashboard, to ensure that data is shared seamlessly. These steps include:

- **Weekly or Fortnightly Meetings:** This aids with data understanding and communication and is extended even to LAs they are no longer working extensively with, in order to provide updates on network usage.
- **LA Data Representative:** They ask for each LA to have a dedicated person that they exclusively work with to provide data and mitigate any concerns to support seamless communication and avoid confusion.
- **Dedicated Portals & Logins:** Each Client is given a separate login and dedicated portal to maintain client confidentiality and ease of accessing relevant data.

## 5.3 Wider Private Sector Analysis

### *5.3.1.1 Desktop Analysis*

In an aim to further understand the contribution of the broader private sector, we have conducted desktop analysis to identify charge point commitments from a wide range of organisations including supermarket and fast-food chains. The findings are outlined in the table below. We were surprised that so few organisations appear to have made announcements, and that the 2025 commitments (on the whole) are not particularly ambitious. This indicates that for much of the wider private sector, many organisations are awaiting further market development, to understand the viability and benefits of investing in EV charge points as EVs become more mainstream.

| Type of Private Partner | Organisation | Current Network | Charge Point delivery Target to 2025 | CPO |
|---|---|---|---|---|
| Supermarket | Asda | 222 (2020) | N/A | Engie |
| | Sainsburys | 112 (2020) | N/A | Podpoint |
| | M&S | N/A | 900 | BP Pulse |
| | Tesco | N/A | 2,400 | PodPoint<br>Volkswagen |
| | Lidl | N/A | 350 | PodPoint |
| | Aldi | N/A | 140 | New Motion |
| | Morrisons | 200 | 100 | GeniePoint |
| Hospitality Chains | Costa Coffee | N/A | 200 | Instavolt |
| | McDonalds | N/A | 1,300 | Instavolt<br>Podpoint |
| | KFC | N/A | 450 | Instavolt |
| | Whitbread | N/A | 600 | GeniePoint |
| Hotel Chains | Premier Inn | N/A | 1,000 | Engie |
| | Holiday Inn Express | N/A | 250 | GeniePoint |
| Motorway Services | Welcome Break | N/A | 100 | Unknown |

| | | | | |
|---|---|---|---|---|
| Car Park Operators | Q-Park | N/A | 500 | EVBox & Franklin Energy |
| Total | | | 8,290 | |

*Table 5-3: Overview of Publicly Available Private Organisation Infrastructure Commitments*

## 5.4 One-to-one Interviews

We reached out to several wider private sector partners, such as supermarket and hospitality chains and destinations sites within the region, requesting meetings to understand their charge point plans in greater detail. However, we received no responses. Two main factors working in parallel could explain the lack of engagement: the current financial landscape and the engagement period aligning with one of the retail and hospitality sectors busiest times of year – the festive period. However, we successfully secured an in-depth interview with a representative from Visit East of England, the NHS and the Rural Services Network, which provided a valuable insight into the relationship between EV charging and tourism, healthcare and rural areas in the region. Further details are provided in Appendix C.

## 5.5 Key Findings

- Infrastructure Delivery: The delivery of charge points is being very much led by CPOs. A surprising finding is that at present, the nationwide commitments from the broader private sector (e.g. retail, hospitality or supermarkets) are unsubstantial when compared to forecasted demand.
- Approach to Investment: The approach to investment varies depending on the charge point speed:
    - Rapid CPOs: Due to larger investment costs, primarily driven by grid connection costs, rapid installers typically need to guarantee a higher demand for their sites to ensure they recoup their initial investment. Each CPO have developed highly complex tools for assessing and identifying attractive sites for infrastructure deployment.
    - Standard CPOs: CPOs specialising in standard charge points, with lower capital costs, can provide more flexibility about what constitutes a suitable site. This included no apparent reluctance to install in rural areas. Investment is de-risked by a requirement for long leases (e.g. typically 15-19 years). The flexible site selection process presents an opportunity to support equitable access to charge point provision.
- Investment: There are clear commitments from CPOs who have substantial investment (ranging from £6.4 million to £45 billion) to support a significant growth in infrastructure delivery. The focus of CPOs is very much short-term targets, with 2025 identified as a clear inflection point from where they anticipate delivery rapidly upscaling. It was not possible to develop a robust conclusion regarding how investment and investment trends may change beyond 2025. This potentially reflects the lack of maturity in the EV market, and the difficulty of long-range forecasting, particularly when EV technology platforms and charging infrastructure is still rapidly evolving.
- Collaboration: Whilst CPOs have funding and vision, there is a clear barrier regarding access to land. In the near term we can therefore expect an ongoing requirement for lease agreements with the public and private sector to enable development and growth. As a result, LAs will continue to play an important role in supporting EV roll out, through facilitating charge point delivery on their land.

# 6 Electricity Supply

**Chapter at a Glance**

In this chapter we explore how DNOs plan to respond to growing demand and changes to legislation.

## 6.1 Introduction

The National Grid Electricity Transmission transmits electricity at high voltages nationwide. The electricity travels from the generation point to Grid Supply Points (GSPs) across the country. From the GSP, DNOs are responsible for distributing the electricity at lower voltages to where it is needed. Here, it is sent through Bulk Supply Points (BSPs), which cover smaller areas such as towns, and then to Primary Substations which distribute the supply to individual residential estates.

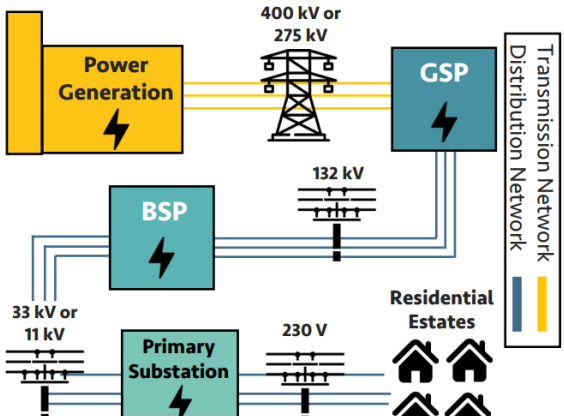


*Figure 6-1 - UK Electricity Supply (City Science, 2021)*

In the UK EV Infrastructure Strategy (DfT, 2022), the Government recognised the EV transition as both an opportunity and a risk to the UK energy system. The transition to EVs shifts demand away from fossil fuels and introduces significant additional demand on the electricity grid. When an EV is charged, it draws electricity from the grid, which can increase demand for electricity, particularly during peak times. This puts additional strain on the grid, especially if the local energy supply infrastructure is not able to handle the increased demand.

As such, electricity supply should be a key consideration when developing EV infrastructure deployment plans and selecting viable sites for charge points. The project team engaged with the region's DNOs (see Table 6-1) with the aim to identify:

- How DNOs intend to respond to growing demand.
- How to enable collaborative working to benefit the region's wider sustainability goals in addition to the wider energy system.
- Considerations for new connections.
- Infrastructure upgrades.
- The engagements have been used to inform the remaining sections of this chapter.

| DNO | Catchment Area Covered within Region | DNO Attendees |
|---|---|---|
| UK Power Networks (UKPN) | • Bedfordshire<br>• Buckinghamshire<br>• Cambridgeshire<br>• Essex<br>• Hertfordshire<br>• Luton<br>• Norfolk<br>• Peterborough<br>• Suffolk<br>• Thurrock | • Stakeholder Engagement Manager for Connections.<br>• Engineer (Smart Grids).<br>• Innovation Programme Manager. |

| | | |
|---|---|---|
| National Grid Electricity Distribution (NGED, (formerly Western Power Distribution) | • Milton Keynes<br>• Northamptonshire<br>• Oxfordshire | • System Development Engineer. |
| Scottish and Southern Electricity Networks (SSEN | • Oxfordshire<br>• Swindon | • SSEN were unable to contribute within the project timescales. |

*Table 6-1: DNO Engagement Record*

The one-to-one engagement was complemented by desk top research. The findings from the engagement and desk top research are outlined below.

## 6.2 DNOs Planned Approach for Responding to Growing Demand

In TE and EEH's EV:Ready reports (WSP, 2022), an analysis of data published by UKPN suggested that the network in the two regions have good coverage of spare capacity, however there are some areas with constraints (such as Northamptonshire and West Norfolk). Local DNOs intend to respond to growing demand by increasing flexibility in the grid. Whilst increasing flexibility does not directly increase the physical capacity of the electricity grid, it improves its ability to meet changing demand and supply conditions in a timely, cost-effective and reliable manner. The following strategies can be used to increase flexibility on the grid more generally.

- Demand-Side Management: DNOs can implement programmes to encourage customers to reduce their electricity consumption during peak periods. This can be achieved through incentives (such as time-of-use pricing), that charge customers more for electricity used during peak times. Furthermore, technologies (such as Vehicle-to-Grid and smart chargers) can be implemented to manage the electricity demand attributed to EV charging. These technologies can automatically adjust electricity usage in response to changes in supply and demand.
    - Vehicle-to-Grid (V2G): Currently in early stages of development, V2G is a technology that allows EV batteries to store energy and then discharge it back to the electricity network when it's most needed. In this way it provides grid support by balancing supply and demand, therefore minimising the grid impact of EV charging.
    - Smart Chargers: Smart chargers communicate with the EV, the charging operator, and the utility company through data connections to optimise how and when the battery draws power, ensuring that the battery is charged when electricity demand is lower (such as overnight) or when there is lots of renewable energy on the grid. This helps to smooth out electricity demand and reduces the need for additional generation capacity.
- Optimised Generation and Distribution: The implementation of advanced metering systems provide real-time information on electricity usage, allowing DNOs to better manage demand and optimise the use of generation and distribution assets.
- Distributed Generation: Encouraging the use of distributed generation technologies (such as solar panels or small wind turbines), can reduce demand on the grid by generating electricity locally.
- Energy Storage: DNOs can invest in energy storage systems (such as batteries or pumped hydro storage), that store excess electricity for use during peak demand periods. This helps to balance supply and demand on the grid and reduce the need for additional generation capacity.
- Interconnections: DNOs can explore opportunities to connect to other electricity networks or markets to access additional sources of electricity.
- Energy Efficiency: DNOs can promote the use of energy-efficient appliances and equipment, which can help reduce overall electricity consumption and lower peak demand.

- **Network Upgrades**: In the longer term DNOs can invest in upgrading the electricity grid to make it more resilient and able to handle higher levels of demand. This can include measures such as upgrading transmission and distribution lines, or installing advanced metering systems to better manage demand.

NGED, SSEN and UKPN are conducting a vast variety of innovative research and development projects to prepare for the widespread adoption of EVs and to enable grid flexibility (see Table 6-2). The main sources of innovation funding for DNOs are managed by the Office of Gas and Electricity Markets (Ofgem), the industry regulator.

| Example Flexibility and EV Readiness Projects | | |
|---|---|---|
| **NGED** | **SSEN** | **UKPN** |
| **The Smart Meter Innovations and Test Network (SMITN):** Tests a new technology that provides planners with data from smart meters to support the connection of EV chargers and heat pumps. | **Management of Plug-in-Vehicle Uptake on Distribution Networks:** Develops an industry accepted solution for managing EV uptake on distribution networks that will avoid significant costs or disruption. | **Charge Collective:** A collaborative project to demonstrate how UKPN can work with LAs to plan local, public charging networks in areas at risk of getting left behind in the net zero transition. |
| **Take Charge:** Designs, develops, constructs and installs a fast and cost-effective solution to supply rapid EV charging facilities at Motorway Service Areas. | **E-Tourism:** Understanding how increased EV uptake combined with tourist behaviour will impact on seasonal peak electric demand on the network. | **Constellation:** Will create revolutionary smart substations which free up capacity for renewable energy to facilitate Net Zero emissions. |
| **Solving Intelligent LV – Evaluating Responsive Smart Management to Increase Total Headroom:** Investigates challenges and opportunities for the Low Voltage network by identifying compliance issues caused by Low Carbon Technologies, and Distributed Generation. | **Local EV Energy Loop (LEVEL):** The project will identify ways to improve network and charging resilience to meet demand in the short-term. The project will develop the standard and specification of temporary, portable EV charging devices. | **Optimise Prime**: The project seeks to minimise the impact of commercial fleet electrification on distribution networks. It develops solutions to save customer costs (estimated £207m savings by 2030) and free up enough capacity on the network to supply 1m homes. |
| **Energy Planning Integrated with Councils (EPIC):** Developing a standardised industry first process that can be used with different LAS to create local energy plans. | **Skyline:** Developing a central asset database of domestic EV charge points providing detailed visibility of their geographical emergence as early as possible. | **Envision**: Develops a tool that generates greater Low Voltage network insights faster and more cost effectively. The project will enable increased flexibility and smart grid provision. |
| **Equitable Novel Flexibility Exchange:** Develops novel commercial arrangements and | **Equal EV:** Investigating enablers for public and domestic charging solutions | **TransPower Vehicle-to-Grid:** Investigates the network impact and flexibility services |

| | | |
|---|---|---|
| supporting technologies to unlock flexibility. | for vulnerable people. Includes V2G technology. | for V2G from domestic, commercial and public charging. |

*Table 6-2: Example DNO Flexibility and EV Readiness Innovation Projects*

## 6.3 Collaborative Working

DNOs across the UK impress the importance of engaging with them early on any projects that could impact the impact the electricity supply, such as EV infrastructure plans. LAs should not wait until a shortlist of sites has been derived, but instead should utilise the advice and support services offered by the DNO soon after project, programme, or strategy inception. The benefits of early engagement include:

- Provision of pre-application support and early consultations/surgeries where the DNO can provide access to information and data (such as open data portals).
- Enables the DNO to obtain a long-term understanding of development plans and can therefore build infrastructure upgrade requirements into their business plan and obtain required funding.
- The DNO is obligated to find the lowest cost solution for the customer. When engaged early at plan inception or before, the DNO can perform a network analysis and provide advantages and disadvantages of certain areas before resource is spent on building plans that are based on unviable sites.

For these reasons, UKPN and NGED proactively invite LAs to annual regional engagements to discuss energy system requirements. It is expected that SSEN offer the same. Where EV infrastructure plans begin to emerge between annual engagements, LAs are encouraged to proactively contact the relevant DNO to discuss emerging plan.

To enhance collaboration, it is recommended that each LA holds an initial meeting with the DNO(s) who supply their area with an aim to:

- Discuss the findings of ELVIS.
- Discuss the steps leading on from ELVIS and any future plans for development.
- Explore how to take the working relationship forward and any processes that should be put in place to enable collaborative working. For example, the LA could scope out whether the DNO could be a member of a forthcoming project working group.

## 6.4 Considerations for New Connections

In most cases, the installation of new EV charge points will require the DNO to install a new electricity connection so that the charge point can receive an adequate electricity supply. When a DNO installs a new connection, it typically involves installing new electrical infrastructure to connect a new customer or premises to the distribution network. This may include installing a new cable or other electrical equipment, such as transformers, switchgear, and protective devices. Where the proposed charge points are positioned can make a significant difference to the connections process, infrastructure required and associated costs (see Figure 6-2).

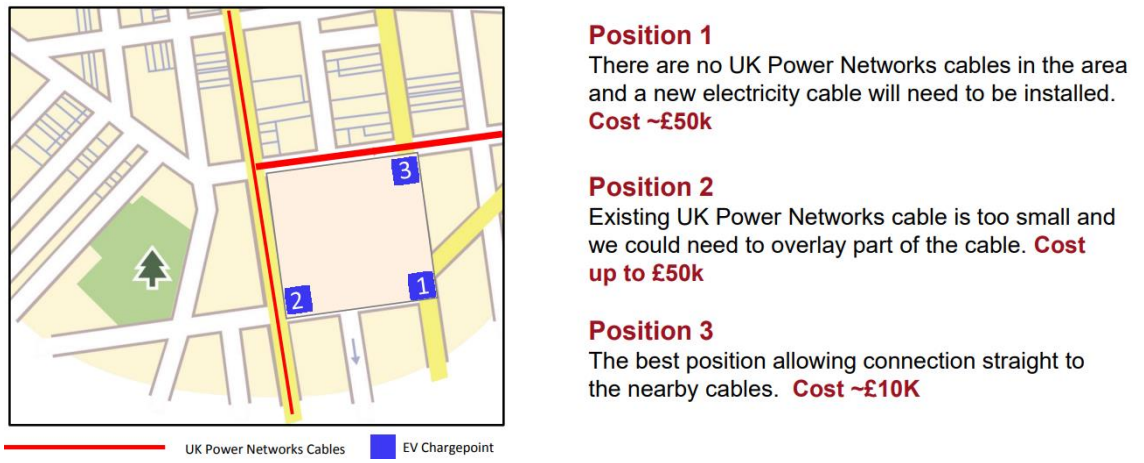


*Figure 6-2: Optimising Charge Point Location for Cost (UKPN, 2020)*

Any associated connection costs are borne by the LA. However, costs can be minimised by optimising the charge point locations via DNO engagement. The Government recognises that energy constraints present a challenge to EV infrastructure delivery. Funding is therefore available via the Governments schemes (including ORCS) to support charge point installations. The electrical connection costs should be known and included within in any grant applications. Table 6-3 provides cost estimates of new connections.

| | Charger On an Existing Lamppost | On Street Charger | Charger at a Car Park | Multiple 150 kW Rapid Chargers | 10 x 150 kW Rapid Chargers | 15+ 150 kW Rapid Chargers |
|---|---|---|---|---|---|---|
| DNO Price | N/A (if asset is suitable for conversion) | £5,000 - £10,000 | £10,000+ | £100,000+ | £150,000 | £400,000+ |
| Time to Deliver | Quick | 8 – 12 weeks | 8 – 12 weeks | 12 – 16 weeks | 16 weeks + | 20 weeks + |
| Space Requirements | Minimal | Small | Medium (2m x 1m) | Large (5m x 4m minimum) | Extra large (2 x 5m x 4m) | Extra large (2 x 5m x 4m) |

*Table 6-3: UKPN Connection Cost Estimates (UKPN, 2020)*

To ascertain whether DNO intervention is required and the cost, the LA (as the customer) must complete a connections application when intending to install new public charge points. The application should be completed once a viable site has been selected, preferably after following any advice provided by the DNO via collaborative engagement. A standard DNO application process is shown in Figure 6-3.

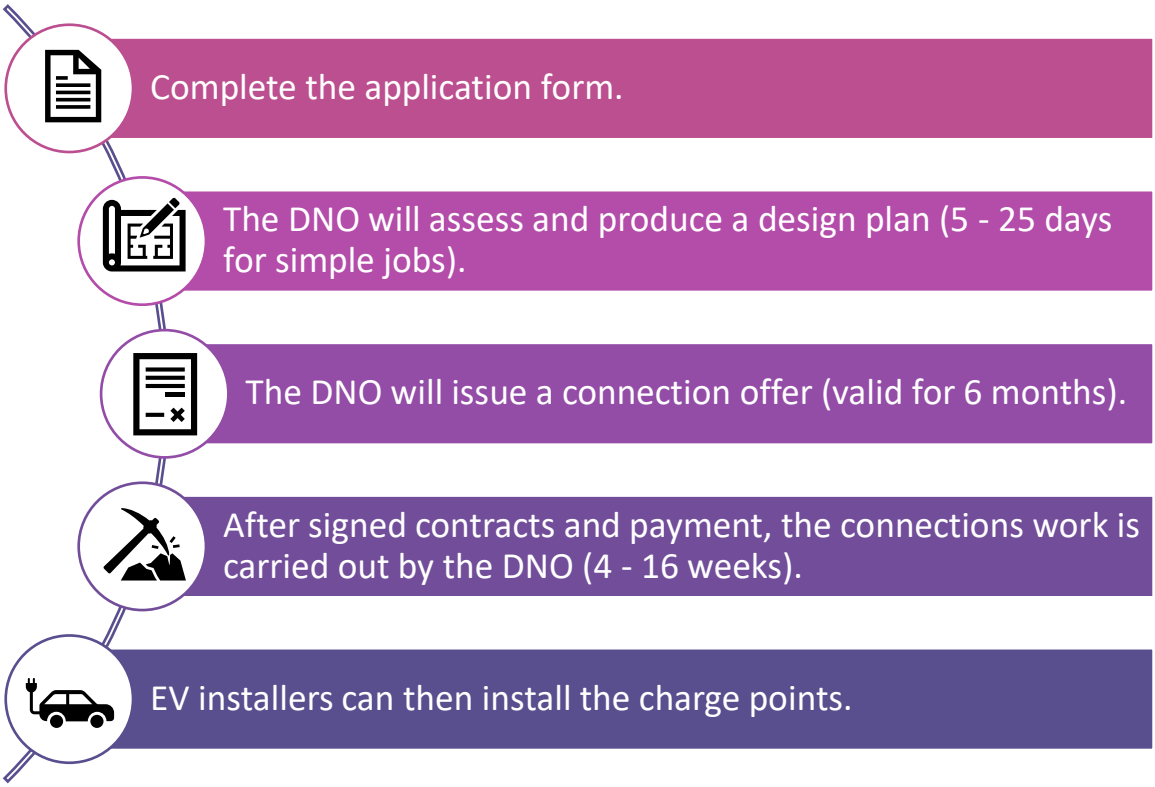


*Figure 6-3: UKPN Connections Process and Indicative Timeframes*

In some cases (such as installing a charge point to an existing street lighting column with adequate power available), it may be found that the existing connection is sufficient and that a new or upgraded connection is not required. In this case, an approved electrical contractor can install the charging infrastructure without DNO intervention (or associated cost).

There are a number of factors that can affect the connection process and timeframes for a new electricity connection. It is important to note that connection timeframes can vary depending on the specific circumstances of each case and the policies of the individual DNO. The factors include:

- Complexity: The complexity of the connection, such as the size and type of the site, can affect the time it takes to design and install the necessary electrical infrastructure.
- Permits, Approvals and Access: The need to obtain permits and approvals, road closure notices etc can add time to the connections process. If connecting works need to be carried out on or accessed via private land, gaining approval from the landowner can cause significant delays.
- Weather: Inclement weather or other unforeseen circumstances can delay the connection process.
- Location: The availability of electrical infrastructure and the distance from the nearest distribution network can affect the connection process. When choosing sites, it is therefore preferable to select those where there is an existing energy connection (such as a car park with existing electricity supply).
- Capacity: The capacity of the existing electrical infrastructure and the demand for electricity in the area can impact the time it takes to connect a new customer. It is preferable to select sites where there is sufficient available capacity at the connection to meet the future electricity demands of the proposed EV infrastructure. Where capacity is insufficient, network reinforcements may be required and may result in delayed or disrupted rollout delivery.

## 6.5 Infrastructure Upgrades

In addition to connecting infrastructure (as described above), wider network infrastructure upgrades or reinforcement may be required to meet the electricity demand of the new connection. When assessing the connection application, the DNO will investigate whether the existing network infrastructure is suitable for safely integrating the new connection without compromising the reliability or safety of the electricity supply. Insufficiency may be due to the size and type of the site being connected, the capacity of the existing electrical equipment, and the demand for electricity in the area. According to UKPN during the ELVIS engagement, around 10% - 13% of connections require wider network infrastructure upgrades.

If network upgrades or reinforcement are required, this may involve installing additional cables, transformers, switchgear, or other electrical equipment to increase capacity (WPD, 2021). Up until April 2023, the cost of required infrastructure upgrades was borne by the customer/LA and listed in the connection offer. However, from the start of the next electricity distribution price control period (RIIO-ED2) in April 2023, under new policy that is enforced by Ofgem, the customer will pay for extension assets only. Customers will no longer charged for wider network reinforcement. Instead, the cost Is borne by the DNO (and is socialised). This is a result of the Access Significant Code Review. The objective of the review was to ensure electricity networks are used efficiently and flexibly, reflecting users' needs and allowing consumers to benefit from new technologies and services whilst avoiding unnecessary costs on energy bills (Ofgem, 2022).

| Connection Costs: | Infrastructure Upgrade Costs: |
|---|---|
| The cost of extending the existing network so that it bridges the gap between the distribution network and the site of the new EV charge points.<br>Examples include new cabling, transformers, switchgear, protective devices and associated civils costs.<br>These costs are charged by the DNO and paid for by the customer. | The cost of wider network infrastructure or reinforcement that may be required when connecting new EV charge points.<br>Examples include additional cables, transformers, switchgear, other electrical equipment and associated civils costs.<br>From April 2023, these costs are covered by the DNO. |

## 6.6 Key Findings

The transition to EVs shifts tail pipe emissions away from fossil fuels and introduces significant additional demand on the electricity grid. To ensure the electricity network can meet projected demand caused by EVs (and other Low Carbon Technologies) DNOs in the region are currently conducting an array of innovative research and development projects (see Table 6-1) to increase the system flexibility and mitigate rising demand. It is vital that LAs and STBs in the region engage with the DNOs as early as possible in the planning process and utilise the support and services offered by the DNOs soon after project, programme or strategy inception.

Once planning has begun for specific charge point installations, it is recommended that the LA involves the DNOs in site selection discussions so the DNOs can advise on ballpark costs per site, lowest cost and high payoff solutions, and align the network development plan with the target areas. This engagement should lead to the selection of the most viable site. After this, the LA will be required to complete a connections application. Whilst the connections infrastructure cost is chargeable, as of April 2023, any costs associated with wider network reinforcements will be covered by the DNO. This will reduce the initial charging infrastructure cost (specifically where charging sites require

network reinforcement), therefore providing additional support that may help to unlock new charging locations.

# 7 Procurement & Collaboration

**Chapter at a Glance**

Procurement has emerged as a key and ongoing barrier to both the public and private sector, adding complexities and delays to delivery. In this chapter, we collate the procurement and collaborative opportunities that have emerged during development of the Study.

## 7.1 Procurement Guidance

The Government has commissioned procurement guidance on charge points for LAs. There is also a range of DPS frameworks which LAs can utilise to support the procurement process. In summary:

- The DfT commissioned the Energy Saving Trust to produce Procurement Guidance for LAs (Energy Saving Trust, 2019).
- Available DPS' include:
    - Government Crown Commercial Services Vehicle Charging Infrastructure Solutions DPS (Crown Commerical Service, 2020).
    - Oxford City Council's DPS for the Supply of EV Charging Infrastructure & Associated Costs (Oxford City Council, 2021), (See Section 04).

Whilst utilising a DPS won't overcome all of the procurement obstacles, they can support efficiencies and provide a tried and tested route to delivery.

## 7.2 Procurement Best Practice

During development of the Study, we have identified a number of procurement best practice recommendations:

- **Access to Dashboards:** All (bar one) of the ten CPOs we engaged with provide access to dashboards to support monitoring and evaluation of charge point usage and the availability of charge points. We recommend that access to dashboards is specified in procurement documents. This data can help inform future strategic direction, for instance by identifying high use sites.
- **Revenue Shares:** When entering into a revenue share agreement with CPOs it is important that processes and monitoring systems are developed to ensure that any revenue shares agreements are delivered. Previous experience, has identified that it is not uncommon for under resourced LAs to have overlooked the processes required to draw down funds, resulting in revenue shares being unclaimed.
- **Addressing the Gap in Rural Provision:** Midlands Connect and Transport for London (TfL) have both bundled a range of charge points site together, in a bid to ensure that the private sector do not simply target and tender for desirable sites thereby leaving the less attractive sites to be funded by the public sector. Given the rural nature of both STBs, we recommend liaising with TfL and Midlands Connect to discover more about their experience of bundling sites, so that TE and EEH can consider how this process could be replicated. Given procurement and a lack of expertise has frequently been cited as a barrier by LAs, a collaborative, pan region approach to procurement could also help overcome the inefficiencies of each individual LA developing EV expertise (for instance within both the transport and wider procurement team) and developing their own procurement routes.
- **Maintenance of Charge Points:** The majority of CPOs have developed service level agreements (SLAs) around response times to maintain faulty charge points. It is recommended that when procuring a service provider, SLAs requirements are outlined.

## 7.3 Collaboration

During the LA workshops it became apparent that Local Authorities are eager to learn from each other and exchange ideas. There is a clear opportunity to build on this and for the STBs to facilitate EV knowledge sharing. Such sessions could help address the EV knowledge gap, an item frequently raised during the workshops and via the LA survey, thereby supporting the upskilling of officers. For instance, Milton Keynes and Oxfordshire have both trialled innovative on-street residential charging solutions and were keen to have a more detailed offline discussion to exchange information. Given the numerous commonalities identified during development of this Study, we propose that there are numerous advantages to bringing the two regions together to share best practice.

During the EEH workshop there was a lively discussion which identified a number of innovative projects within the regions that could be shared and discussed further via further knowledge sharing. A short selection of the innovative solutions identified in the workshops are outlined in the case studies provided below.

As outlined in Section 7.2, there is also a clear opportunity for greater collaboration to overcome the challenges presented by the procurement process. We recommend this is something that the STBs explore further.

## 7.4 Case Study One: Oxford Dynamic Purchasing System for the Supply of EV Charging Infrastructure

| | |
|---|---|
| Key Stakeholders | EV DYNAMIC PURCHASING SYSTEM<br>DESIGNED FOR LOCAL AUTHORITIES. DRIVEN BY OXFORD CITY COUNCIL.<br>OXFORD CITY COUNCIL |
| Dates | 2021–- Ongoing |
| Location | Oxford City |
| Background | Oxford City Council (OCC) has developed a unique dynamic purchasing system (DPS) which reflects the fast-paced, innovative and ever evolving world of EV infrastructure, allowing greater flexibility and enabling access to novel technology and optimum business models. The DPS is an electronic system whereby suppliers can join at any time to any distinct number of lots, provided that quality and compliance criteria are met. The open market solution allows buyers to have access to a wide pool of preapproved candidates which, unlike traditional frameworks where once suppliers are selected the frameworks close, is a continually evolving list with suppliers continually joining or being removed over the duration of the DPS lifetime.<br>The OCC DPS covers all aspects of EV infrastructure with nine lots ranging from turnkey services to consultancy, supporting potential tender award times as quick as ten days across these areas. The DPS is open to all public sector bodies, with currently 31 suppliers enrolled, including Char.gy, EZ Charge, Liberty Charge, Ubitricity, Connected Kerb and others, alongside 24 local authorities. It has been used successfully by the London Borough of Barnet to procure for Barnet's On-Street Residential Charge Point Scheme -funded EV charging project EV500.<br>Suppliers may join the DPS at any time whilst it remains open, as long as they satisfy the selection requirements. Existing suppliers can be removed due to poor performance. There is no limit on the number of suppliers that may join the DPS, |

| | |
|---|---|
| | and suppliers may reapply, if not previously accepted, at any time during the DPS lifetime. |
| Outcome | • Uses the past 4 years' of Go Ultra Low Oxford learnings.<br>• Built in quality, regulatory and contractual compliance.<br>• Open to UK public sector organisations.<br>• Pre-qualified suppliers are all compliant with LEVI, ORCS and OZEV standards.<br>• All solutions are smart and interoperable.<br>• Set of pre-agreed contract terms so no expensive legal costs, business model agnostic.<br>• Rapid 10 day procurement process possible, no Alcatel process needed, but best practice.<br>• Numerous high quality suppliers already DPS members.<br>• Dynamic system means new suppliers can be on-boarded monthly so ensuring the latest technical solutions, business models and approaches are available.<br>• DPS application process easy to use.<br>• Free for Public Sector to use, supplier pays a small percentage to use DPS but only on award.<br>• Consultancy lot is wide ranging, offering access to services such as EV strategy work, legal and EV, battery and green-tech subject specialists, as well as delivery personnel such as project management staff. |

## 7.5 Case Study Two: Electric Vehicle Overnight Charging Park & Charge Oxfordshire

| | |
|---|---|
| Key Stakeholders | Park & Charge Oxfordshire; Office for Low Emission Vehicles; Oxfordshire County Council; zeta Specialist Lighting; Innovate UK; University of Oxford; [ui!] the urban institute |
| Dates | 2019–- Ongoing |
| Location | Oxfordshire |
| Background | Park and Charge Oxfordshire is an initiative funded by The Office for Zero Emission Vehicles and Innovate UK, and delivered by Oxfordshire County Council, Zeta Specialist Lighting, Urban Integrated [ui!]uk, EZ Charge and University of Oxford. The initiative aims to tackle the main barrier of EV adoption amongst Oxfordshire residents, which is the perception of lack of charging infrastructure.<br>The project is responding to this barrier by installing a total of 250 individual charging points (125 double charging units) in 20 car parks across the county. There are five Park and Charge hubs in each of the districts taking part, giving residents with no off-street parking the ability to park for free overnight and charge their eVs at competitive prices.<br>The basic tariff at all of the Park and Charge EV chargers is currently 43p/kW during the daytime and 38p/kW overnight (from midnight to 7am). This is the tariff available to non-members using Tap and Go/making contactless payments. For regular users, there is also the option of taking out EZ-Charge membership, which gives members access to slightly cheaper rates of 38p/kW daytime and 33p/kW overnight (midnight to 7am). |

| | |
|---|---|
| Outcome | 19 out of 20 car park EV charging hubs have been installed, with the final site went live in late 2022. The scheme provides an accessible solution for local households without off-street parking. It also demonstrates how car parks can be optimised via innovative approaches to support local net zero goals. |

## 7.6 Case Study Three: Plug in Suffolk Community Grant Programme

| | |
|---|---|
| Key Stakeholders | Suffolk Creating the Greenest County |
| Dates | 2022-Present |
| Location | Suffolk |
| Background | To support equitable access to charge points in a largely rural county, Suffolk County Council developed the Plug in Suffolk Project, developing a partnership with a local charge point manufacturer and installers. Working with local businesses and parish councils, the project seeks to plug the gap in infrastructure by supporting the roll out of charge points in predominantly rural locations, sites, generally under-represented by EV roll out. The funding covers the install costs and offering a revenue share for organisations that can provide public charging. The aim is that any visitor can use the charger and pay using the built-in contactless payment system. The locations will be where someone is likely to be parked there for an hour or two. Sockets are 'Standard' 7.4 kW Type 2 mounted in either a two or four socket configuration, then most power supply issues should be avoided. Once the equipment is up and running then it becomes the property of the site holder or Parish Council, and they operate it like any other asset. As the site holder or Parish Council will own the chargers, they will therefore be responsible for the cost of the electricity, operation and maintenance of the equipment, the supervision of the parking spaces and the insurance of the equipment the same as any other asset they own. |
| Outcome | The scheme has been hugely successful. The first phase of the Plug In Suffolk Community Grant Project is drawing to a close and has been heavily oversubscribed. Expressions of interest that were received are being re-allocated to the new, LEVI funded, second phase. The project has also garnered the interest of other counties including Oxfordshire. For instance, Watlington Parish Council installed six sockets utilising the On Street Residential Charge Point Scheme. Oxfordshire see partnerships with Parish Councils as an important opportunity to address the gap in provision currently experienced by rural communities. |

# 8 Key Findings & Opportunities

**Chapter at a Glance**

This chapter summarises the Study's key findings, outlines the roles and responsibilities of key stakeholders, provides a clears set of recommendations and identifies key opportunities that could support the acceleration of EV infrastructure roll out across the two STB regions.

## 8.1 Context

WSP's EV:Ready Tool shows the scale of infrastructure delivery required to meet projected demand. For instance, delivery needs to scale from today's 3,060 publicly accessible charge points to 22,356 by 2025 in a low EV uptake scenario, or to 33,128 by 2025 in a high EV uptake scenario. This represents a requirement for a 270 – 329% growth.

## 8.2 Key Findings

The Study findings are extensive. We have therefore summarised the key findings into the following themes:

- Local Authority perspective.
- CPO perspective.
- Broader private sector perspective.
- Energy.
- Equity.
- Technology and innovation.

### 8.2.1 The Perspective of Key Stakeholders

#### *8.2.1.1 Local Authority Perspective*

There are several key concerns that LAs consistently raised or that have been identified by the EV Maturity Model exercise:

- **EV Strategies:** The EV Maturity Model assessment has identified a strategic gap at the LA level, with 45% of EEH's LAs and 20% of TE's LAs lacking an EV Strategy. There is a clear opportunity to address this gap, as development of an EV Strategy presents an opportunity to ensure there is both a clear vision, but also a platform for gaining internal commitment and consensus.
- **Resourcing:** There is typically a lack of existing inhouse EV resource/expertise within Councils and limited funding available to bring additional resource in.
- **Risk Aversion:** LAs suggested they are averse to the legal and financial risks associated with charge point infrastructure deployment. The length of CPO contracts was frequently cited as a barrier.
- **Procurement:** The complex procurement process presents a significant obstacle.
- **Pressure to Deliver:** EV charging may be seen as the panacea to net zero transport by members of the public, however at officer level there are concerns that EV infrastructure may be prioritised over sustainable modes (e.g. walking, cycling and public transport).

#### *8.2.1.2 CPO Perspective*

Despite the aforementioned differences between CPO approaches to business models and charge point offerings, there were a number of shared key themes that emerged:

- **Land:** CPOs are largely dependent on others to provide access to land (e.g. via lease agreements) which poses a significant barrier to charge point roll out.

- **Long-Term Focus:** CPOs are backed by significant capital investment and therefore ready to significantly ramp up charge point delivery. However, their business models are geared towards generating long-term profit resulting in less attractive propositions for LAs. Many LAs find the contract lengths required for fully funded business models unappealing and a risk.
- **Rural Challenges:** Investment strategies vary dependent on charge point type. Standard charge point operators, with lower investment costs, place less emphasis on utilisation rates. Whilst rapid operators, with significantly higher capital costs, place a greater emphasis on items such as traffic flows and dwell times. These strategies highlight a challenge that is particularly pertinent to EEH and TE, which is the challenge of securing rapid roll out in rural areas.

#### *8.2.1.3 Broader Private Sector Perspective*

An assumption frequently cited by the LAs is that the private sector should lead charge point roll out. However, aside from the CPOs, there is little evidence that significant commitment is being made by the broader private sector (e.g. supermarket chains, retail, fast food operators). To develop ambitious but practical strategic visions and delivery plans, we must be clear and realistic about what we are expecting from whom. Based on the findings from the desktop research and the current economic climate, in the short to medium term we should consider limiting the expectations placed on the broader private sector.

#### *8.2.1.4 Energy*

EV roll out is dependent on local energy capacity – particularly in relation to rapid charge point roll out. Early collaboration with DNOs is therefore vital, to support the identification of sites that limit connection costs. An interesting finding was that independent DNOs (IDNOs) are increasingly used by CPOs as a more efficient and cost-effective means of securing grid connections.

#### *8.2.1.5 Equity*

Equitable access to charge points is a key consideration and priority for this Study. Key considerations include:

- Adequate provision across rural geographies.
- Meeting the needs of households without off-street parking.
- Ensuring investment is not skewed towards affluent locations, where early adopters may reside, reinforcing the view that eVs are only attainable for wealthy households.

#### *8.2.1.6 Technology & Innovation*

A number of technology and innovation opportunities have been identified including:

- CPOs have a wide range of frequently sophisticated tools to support the identification of suitable charging sites, that can be used to ease the burden on LA officers.
- EV charging technology is rapidly evolving, presenting challenges to people outside the industry (including LA officers).
- The Case Studies demonstrate that there are some innovative approaches to charge point roll out, which could be duplicated. An example is Oxfordshire's Park and Charge where Council car parks are utilised to provide a charging solution for residents without off-street parking.
- Whilst in deployment infancy, there are also several emerging technologies which can provide flexibility to the local energy network.

## 8.3 Priority Charge Point Locations

One of the objectives of this Study is to understand where charging infrastructure is required. The Study findings have identified the priority charge point locations shown in the following table.

| Location | Charge Point Type | Notes |
|---|---|---|
| 1. Major Road Network & Strategic Road Network | Rapid Chargers | Delivery ahead of need is required to mitigate range anxiety. |
| 2. Rural Roads and Community Sites | Standard | To address the equity challenge faced by rural communities, where sites may not be commercially viable to the private sector. |
| 3. Destinations | Standard | Destinations including supermarkets, car parks and visitor attractions are locations at which drivers naturally dwell and so provide an optimal site for EV chargers. |
| 4. On-Street Residential | Standard | Addressing the gap in provision for residents that do not have off-street parking. |

*Table 8-1: Priority Charge Point Locations*

## 8.4 Roles and Responsibilities

A clear challenge for EV charge point roll out is a lack of consensus on roles and responsibilities. For instance, LAs are looking to the private sector to lead delivery, and yet aside from CPOs, there are limited commitments from the wider sector. To address this challenge, we have proposed the roles and responsibilities of key stakeholders.

| Stakeholder | Sector | Roles & Responsibilities |
|---|---|---|
| STBs | Public | • Provide regional strategic direction including tools & guidance.<br>• Develop & monitor regional targets.<br>• Facilitate knowledge sharing & upskilling. |
| LAs | | • Utilise their land to support equity (e.g households without off street parking & rural sites).<br>• Active advocates for equity. |
| Broader Public Sector e.g. emergency services | | • Facilitate knowledge sharing & upskilling, including best practice. |
| National Government | | • Provide strategic direction including LA guidance and tools.<br>• Acknowledge the gaps in private sector delivery.<br>• Provide ongoing funding to support the equitable distribution of infrastructure. |
| CPOs | Private | • Build trust and confidence to overcome the barriers presented by lease agreements.<br>• Support the capacity building of partners (e.g. educating and upskilling LA officers). |

| | | |
|---|---|---|
| | | • Share their site selection expertise. |
| **Broader Private Sector e.g. car park operators, supermarkets** | | • Understand the business benefits of installing charge points (e.g. attract additional customers). |
| **DNOs** | | • Engage transparently with the industry.<br>• Support site assessment from an energy perspective. |

*Table 8-2: Roles & Responsibilities*

## 8.5 Recommendations

The Study has identified 15 key recommendations. For each action a proposed action owner has been assigned.

| Theme | Recommendation | Owner |
|---|---|---|
| **Strategic Vision** | 1. Provide a clear strategic vision for the region. | EEH & TE |
| | 2. Encourage every LA to develop an EV Strategy. | EEH & TE |
| | 3. Encourage every LA to have an EV Action Plan as a minimum. | EEH & TE |
| | 4. Work collaboratively with the LAs to:<br>• Develop clear infrastructure delivery targets for the region to complement forecasted needs.<br>• Develop and embed processes for the monitoring and evaluation of the targets including minimum service levels by place types. | EEH & TE |
| | 5. Lobby for government funding to address the rural gap e.g. EV infrastructure funding solely for the use of rural areas. | EEH & TE |
| **Knowledge Sharing** | 6. Develop an EV working group to communicate and embed the strategic vision across the region, and to support knowledge sharing between LAs & LTAs. Discuss the usefulness of sub-groups (e.g. for procurement teams). | EEH & TE |
| | 7. Develop a broader EV forum to support knowledge sharing and a partnership approach with the broader public and private sector (e.g. CPOs, DNOs, and NHS). | EEH & TE |
| | 8. Proactively utilise the EV Maturity Model on an annual basis to track and measure progress and identify areas where support is required. | EEH, TE & LAs |
| | 9. Identify and consolidate upskilling opportunities e.g. informal opportunities presented by DNOs & CPOs alongside a requirement for formal training/upskilling could be embedded into procurement requirements. | LAs, EEH & TE |

| | | |
|---|---|---|
| **Procurement** | 10. Identify best practice and consider a regional approach to procurement (e.g. a regional framework) that could support consistency and efficiencies. | EEH & TE |
| | 11. Consider a regional approach to bundling sites to support equity. | EEH & TE |
| **Harness Investment** | 12. Identify and pursue low risk opportunities to capitalise on CPO funding to support infrastructure delivery. | LAs |
| **Delivery** | 13. Actively deliver on-street infrastructure to support equity. | LAs |
| | 14. Review assets to identify suitable charge point locations (e.g. Council-owned car parks, and on-street bays). | LAs |
| | 15. Understand rural needs and actively pursue innovative solutions (e.g. community locations). | LAs |

*Table 8-3: Study Recommendations*

## 8.6 Opportunities

To complement the detailed recommendations (outlined above) we have identified several broader opportunities, that if harnessed could further enable the STBs to maximise acceleration of infrastructure delivery across the LAs.

### 8.6.1 Targets, Monitoring & Evaluation

To support cohesion, consistency, and a shared vision across the regions, we propose that the STBs and LAs collaboratively develop EV Infrastructure targets for the two regions and for individual LAs. The EV:Ready Tool's forecasted needs should be utilised to develop the shared vision and collaboratively developed annual monitoring and evaluation processes should be embedded to track progress and identify any gaps.

In addition to developing high level delivery targets we propose the STBs utilise the EV:Ready Tool's outputs to develop guidance that suggests minimal levels of service for different place types. Some urban areas (such as the London Borough of Hammersmith and Fulham), have committed to ensuring that all residents are no more than 400 metres from a charge point (Hammersmith & Fulham Council, 2021). Identifying optimal service levels for more rural areas or market towns, presents an opportunity to provide a shared vision which acknowledges that charging needs vary according to place type. For instance, rural specific targets could help to ensure that delivery in rural areas is high priority and that resources are sufficiently allocated.

### 8.6.2 Asks to Government

The two STBs should continue to work closely with central Government. This includes providing input on the optimal usage of charging infrastructure funding. This Study has identified several key opportunities:

- **Knowledge & Resource Gaps:** Many LAs are under resourced and/or have a lack of EV expertise. There is an opportunity for EV infrastructure delivery to be coordinated across traditional boundaries via embracing innovative and collaborative approaches. This includes pan regional procurement approaches and bulk tendering.

- **Fairer Funding for Rural Areas:** The business case for installing charging infrastructure in rural areas is disadvantaged by lower utilisation rates. From an equity perspective it is critical that rural areas – which often suffer high deprivation and tend to be car dependent – are not overlooked. There is an opportunity for STBs to play a key strategic role by understanding rural needs, supporting capacity, and lobbying central Government as appropriate. As an example, lobbying for a ring fenced funding pot could support the delivery of charging infrastructure in rural areas across England.

### 8.6.3 Mapping Charging Needs

We have identified opportunities to further develop and enhance existing mapping tools for EV Infrastructure needs. Mapping could focus on the following four place types: SRN, Urban, Rural settlement, and Rural route. Whilst the EV:Ready Tool largely addresses the SRN and Urban Place types, we propose the addition of an overlap based on trip lengths (through Origin and Destination analysis) that would enhance the understanding of charging infrastructure and energy needs (e.g. substations).

As has been frequently recognised, rural provision requires the most enhancement. We therefore propose the development of guidance that proposes minimal service levels across the four place types. For instance, it could outline provision targets at specific intervals in rural areas.

## 8.7 Final Conclusion

Throughout the Study's development it is evident that there is a genuine commitment to delivering EV charging infrastructure across EEH and TE regions. It has also become apparent that there are interdependencies between key stakeholders. This demonstrates that there is not a single actor who can deliver the forecasted infrastructure needs outlined in the EV:Ready Tool. Instead, the emphasis must be on a partnership approach that harnesses collaboration across public and private sectors.

We frequently heard LA officers outline that they expect the 'private sector' to respond to charging demand. Through the Study, we gained clarity on what is meant by 'private sector' delivery and it was found that CPOs are expected to deliver the bulk of charging infrastructure. Having engaged extensively with CPOs we consider this a high risk strategy. Whilst they do have significant financial backing, CPOs are not land owners and are largely dependent on private and public sector partners to plug this gap through mutually beneficial lease agreements.

The role of LAs in relation to EV infrastructure provision is clear. They have an important role to play as both land owners and as advocates for equity. These two points are clearly interconnected. A particular area of focus for future work is ensuring adequate provision in rural geographies –a key consideration across both the EEH and TE regions,

The roles and responsibilities, recommendations and opportunities that are outlined above provide a starting point from which all key stakeholders can look to work collaboratively to drive the agenda forward to ensure that the region is prepared for the transition to EVs.

# 9 Appendix A: Desktop Review – Further Detail

**Appendix at a Glance**

This Appendix gives further detail on the desktop review undertaken on commercial models within the EV infrastructure market.

### 9.1.1 The Importance of Location

EVs have the potential to greatly reduce greenhouse gas emissions and improve air quality, but their adoption has been hindered by a lack of adequate charging infrastructure (Karolemeas, 2021). Surveys have shown that the availability of charging stations is a key factor in consumers' decision to purchase an EV, as the lack of charging options can lead to "range anxiety" (Globish, 2019). Rapid charging stations, which can charge EVs more quickly, have been found to be particularly influential in reducing range anxiety and increasing the attractiveness of EVs (Neaimeh, 2017).

In addition to the overall scale and mix of EV charging points, the location of infrastructure provision is also important. A recent review highlighted that 50%-80% of all charging events occur at home, and the second most important charging location is at work, where 15%-25% of EV commuters charge (Hardman, 2018). Less than 10% of all charging events occur at the remaining locations however these locations are likely to be those where faster charging is needed most.

The site selection process of EV infrastructure must therefore start with an understanding of the type of charging speed that the site will operate (slow, standard, fast, rapid or ultra-rapid), as the physical and financial requirements differ depending on the infrastructure size, power requirements, and costs (Motoaki, 2019). Slow chargers are generally limited to places where users can accommodate long hours of charging (such as work sites and hotels) and as a substitute for home charging (Funke, 2019). By contrast, rapid chargers require shorter charging duration and are therefore typically sited in locations with higher turnover and lower dwell time (ibid). It is essential to consider the type of charging station being deployed and its suitability for the location, as the development of a comprehensive and convenient charging network is crucial for promoting the adoption of EVs.

> "We think about 60% of all energy will flow into cars at home and 30% will be at work. The remaining 10% splits between destination and enroute charging."
>
> James McKemey, Pod Point

### 9.1.2 Economics of EV Charging

The economics of EV charging from the perspective of a CPO can vary depending on a number of factors, including the type of charging service offered and the target customer. Critical inputs to the economic model for charging infrastructure include:

- **Capital Costs:** The total installed cost for the charging equipment, including the cost of the infrastructure itself, the cost of site preparation, the cost of grid upgrades (until April 2023) and the cost of installation.
- **Wholesale Electricity Costs:** The wholesale price of electricity that is delivered through the charging infrastructure to consumers.
- **Operating Costs:** Costs associated with operating and maintaining the equipment.
- **Utilisation Rate:** How regularly the charging infrastructure is used (usually expressed as a percentage).
- **Onward Price to Consumers:** The cost charged to consumers for a charging event (usually expressed as a cost per kWh).

- **Rapid Charging:** CPOs that offer rapid charging services (such as those targeting long-distance travellers), may face different economic challenges than those offering slow charging services. Rapid charging services typically involve higher upfront capital costs as they require more powerful chargers. They may need to be installed in enroute locations to attract customers (e.g. on SRNs). Whilst more expensive to install, rapid charging services generate higher revenue per charge, as customers pay a premium for the convenience of a rapid charge. CPOs that offer rapid charging services may also generate more revenue per charging event, as rapid chargers can deliver more electricity per charge.
- **Standard Charging:** CPOs that offer standard charging services, such as those targeting residential EV owners or fleet operators, have a different set of considerations. While standard charging services typically require lower upfront investment in charging infrastructure, they may generate lower revenue per charge, as they require customers to charge for longer, therefore requiring sites where dwell times are high.

Unless the use of infrastructure is guaranteed in some way, or the capital cost of the infrastructure is reduced through grants, any investor in EV infrastructure is ultimately taking risk on utilisation. For fixed capital and operational costs there is a clear relationship between the level of utilisation and the price an operator must charge to breakeven. Figure 9-1 demonstrates this relationship for Slow, Fast, Rapid and Ultra-Rapid charging infrastructure. This shows that ultra-rapids will perform better on breakeven price than slow chargers for low levels of utilisation.

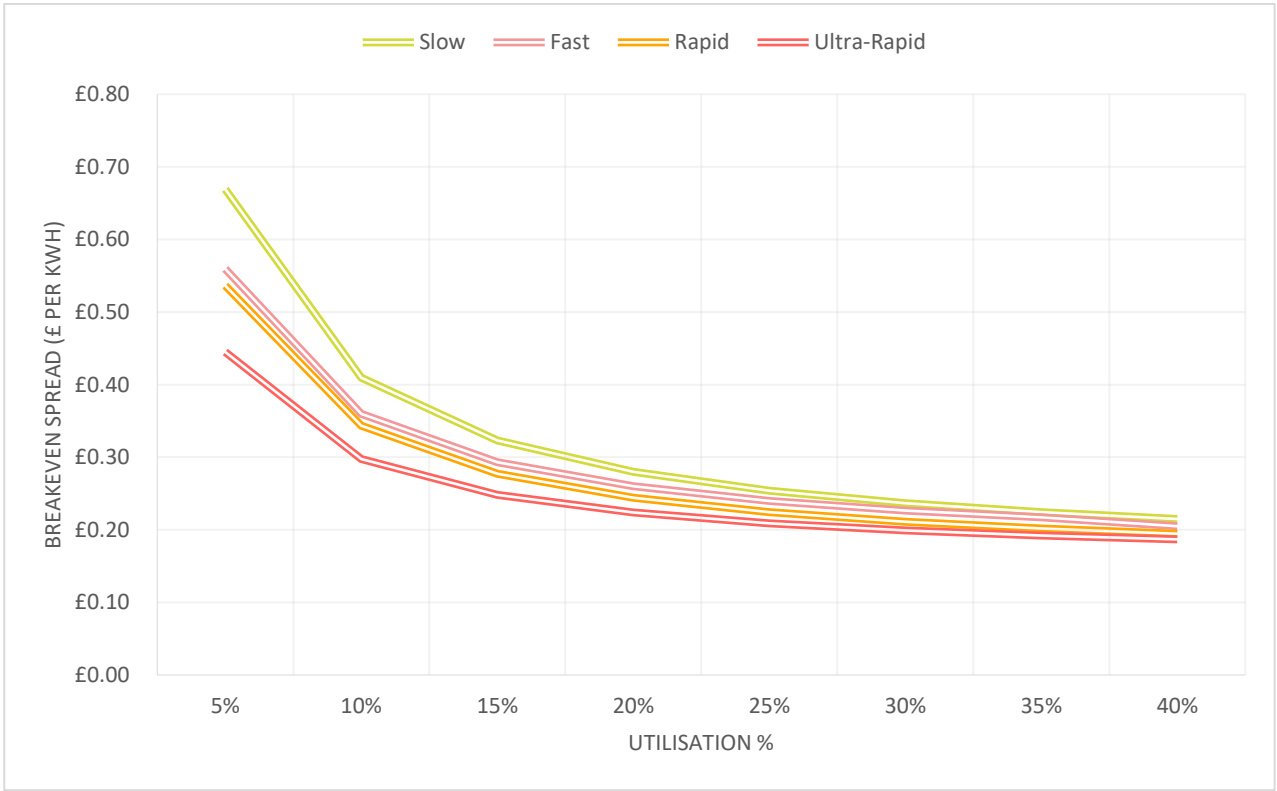


*Figure 9-1: Response of Breakeven Spread (mark-up against wholesale electricity costs) to various levels of utilisation. Adapted for the UK based on Lee 2018.*

Studies have shown that in the absence of other additional or alternative sources of income, utilisation rates are a key determinant of profitability of EV charging infrastructure (Lee, 2018). To mitigate utilisation risk, operators may also consider what is known as 'Revenue Stacking' where additional revenue streams are added alongside pure charging revenue. This need to deliver additional services to diversify risk has been highlighted in other studies, such as PWC (2018) and was noted by some operators through our surveys but may add an additional dynamic to the location choice for EV infrastructure.

### 9.1.3 Investment Decisions in Practice – Business Model Impacts

As stated above, a key risk mitigation technique for CPOs is combining multiple revenue streams alongside the revenue generated from vehicle charging, resulting in a diverse range of business models emerging. Research by PWC (2018) categorises these business models into four different types:

- The 'Portfolio' Player: These are companies that operate across multiple charging segments. These companies typically offer a range of charging services, including fast-charging, rapid charging, and home charging, among others. They may also operate charging networks in multiple locations, including at public car parks, service stations, and other convenient locations.
- The 'Specialist' Player: These are companies that focus on a specific charging segment, such as rapid charging or home charging. They may also specialise in servicing a particular type of EV market, such as EVs used in fleet or taxi services.
- The 'Network Optimiser' Player: These are companies that are building future market positions across multiple charging segments. They may operate charging networks in multiple locations and offer a range of charging services, but their primary focus is on optimising the efficiency and profitability of their charging networks.
- The 'Energy Supplier' Player: These are companies that are seeking to build a position in EV charging to support demand for electricity. They may offer a range of charging services, including home charging, fast-charging, and rapid charging, but their primary focus is on using EV charging as a means of selling electricity to EV owners.

LaMonaca (2022) adds to this list noting that a number of CPOs are also involved in the manufacture of charging equipment, in addition to the installation and development of charging infrastructure, the operation of charging networks, and the sales and marketing of charging services. Some examples of CPOs that span multiple functional areas include Tesla, Chargepoint, and EO.

The nature of the business models adopted by CPOs influences their strategies related to funding, fees, partnerships and target customers which all in turn influence their investment decisions.

- Funding Models: CPOs may themselves rely on a variety of funding models to finance their charging infrastructure and services. These can include private investment, public grants or subsidies, and revenue from charging fees or electricity sales. Some CPOs may also adopt a hybrid funding model, combining multiple sources of financing.
- Charging Fees: CPOs may charge fees for the use of their charging services, either on a per-use basis or through a subscription model. Fees may vary based on the type of charging service, the duration of the charge, and other factors. Some CPOs may offer free charging as a means of promoting the adoption of EVs or to encourage customer loyalty.
- Partnerships and Collaborations: CPOs may enter into partnerships or collaborations with other companies or organisations to expand their reach, gain access to new markets, or leverage complementary expertise and resources. Examples of such partnerships may include collaborations with car manufacturers, energy companies, or LAs.
- Customer Segmentation: CPOs may target different customer segments depending on their business models and charging services. For example, a CPO focusing on rapid charging may target long-distance travellers, while a CPO offering home charging services may target residential EV owners.

These different models mean that, in practice, investment in charging infrastructure is influenced by numerous factors, not just the stand-alone economics of the charging infrastructure.

### 9.1.4 Location Choice

As noted above, the "best" location for EV charging infrastructure may vary considerably by business model. Some of these variances can are general (for example the differences between slow and rapid charging) while others may be unique to a particular operator. It has therefore been noted that despite numerous studies into the topic, the decision-making process for allocating public charge points remains a challenging problem (Motoaki, 2019).

An extensive range of location considerations are referenced in the literature including:

- Transport hubs (Karolemeas, 2021)
- Parking spaces
- Points of interest / destinations
- Gender
- Age Group
- Education Level
- Income
- Number of vehicles per household
- Population density
- Number of households
- Number of workplaces
- Green spaces
- Points of interest
- Petrol Stations/Forecourts
- Road network
- Public transport stops
- Walking distance
- Trip origins / destinations
- Parking facilities
- Parking property
- Energy network
- Slope
- Proximity to protected areas
- Proximity to water resource

Exclusionary criteria, factors that would be used to identify undesirable locations, are also incorporated as part of the initial site selection process. For example, variables such as small road width, locations without parking spaces or pedestrianised areas limit where EV infrastructure can be established, and therefore lead to the site being rejected (Karolemeas, 2021).

Numerous academic studies have been attempted to identify the "best" location for EV infrastructure, with rapid charging being of particular interest given the greater capital cost and risk of misallocation (Motoaki, 2019). Many academic studies have followed optimisation methods or developed novel algorithms to determine the optimal positions for EV charging points (Karolemeas, 2021). Researchers have applied different types of approaches including maximising coverage of road networks while minimising cost ("node-serving"), and using vehicle flow data ("flow-serving").

Only a few papers have compared the theory against the location choice observed in practice (i.e. the majority are theoretical and not demonstrated to be predictive of real-world investment

behaviour). Those that have tried to compare theory versus reality have concluded that beyond the broad differences between rapid and slow charging, many real-world considerations are currently not accounted for in the mathematical formulations of charge-point allocation developed to date (Motoaki, 2019).

# 10 Appendix B: Infrastructure Insight Technology Review

**Appendix at a Glance**

This Appendix provides an insight review of the different types of charge point technologies available for locations including on-street (e.g. pay and display bays), in car parks and on private land. The purpose of this appendix is to provide background context to support a greater understanding around EV technology.

## 10.1 Charging Requirements

There are three main types of charge point users (residents, visitors and commuters), as set out in Table 10-1.

| Charge Point Users | User Needs |
|---|---|
| **Residents** | Consisting of residents who:<br>• Park on-street (on a public road).<br>• Park off-street (e.g. on a driveway). |
| **Visitors** | Visitors play a crucial role in the economy – particularly for Transport East. In order to respond to visitor needs, it is important that sufficient charging infrastructure is provided ahead of demand. ,. This will be vital for ensuring that tourism (and thereby the local economy) is not negatively impacted. |
| **Commuters** | Consisting of:<br>• The number of people who travel to the region for work.<br>• Businesses with EVs in their fleets which will require access to charging infrastructure. |

*Table 10-1: Charge Point Users and Their Needs*

There are five charging location categories (as shown in Table 10-2). Each charging location category differs in its typical location, user group and charging speeds. Table 10-3 provides further detail of the four main charging speeds offered by charging technologies and their attributes. To support EV uptake and meet the diverse needs of the user groups, it is vital that drivers are provided with access to a variety of charging locations and speeds. Note the focus of this Study is destination charging, enroute charging and base charging (on-street).

| Charging Location Categories | Details | Typical User Groups | Typical Charging Speeds Offered |
|---|---|---|---|
| **Destination Charging** | Enable users to charge their vehicles whilst conducting other tasks (e.g. whilst shopping or at a visitor attraction). This type of charging is commonly found in car parks or on-street parking bays where vehicles are likely to stay for longer than 30 minutes. | Residents, visitors and commuters. | Slow, standard and fast. |
| **Enroute Charging** | Enroute charge points are placed in publicly accessible locations along natural routes such as along motorways and at service stations. | Visitors. | Rapid and ultra-rapid. |
| **Workplace Charging** | Employers may provide charge points to enable staff to charge their vehicle during the | Commuters. | Slow, standard and fast. |

| | | | |
|---|---|---|---|
| | working day. This is particularly important for staff who commute considerable distances. | | |
| **Base Charging (On-Street)** | Base charging is charging at or near home. Residents without off-street parking are dependent on public charging solutions, including on-street residential charging solutions. Many LAs have rolled out on-street residential solutions (including lamppost chargers and free-standing charge points) to support the needs of these households. | Residents. | Slow, standard and fast. |
| **Base Charging (Off-Street)** | Base charging is charging at or near home. Residents with access to off-street parking (e.g. a driveway) can install dedicated home chargers. | Residents. | Slow. |

*Table 10-2: Charging Location Categories*

| | Slow and Standard Charging | Fast-charging | Rapid Charging | Ultra-Rapid Charging |
|---|---|---|---|---|
| **Power** | 3.7 kW to 7 kW (AC). | 11 kW to 22 kW (AC). | DC units 20 to 50 kW. AC units 43 kW. | Up to 350 kW (DC). |
| **Charging Duration** | Fully charges small/medium vehicles in 6 to 11 hours. | 2 to 4 hours to fully charge, depending on the power rating. | 40 to 55 minutes for an 80% charge for a standard battery size. | Typically, 7 – 16 minutes for an 80% charge. |
| **Suitable Locations** | Residences, places of work, long stay car parks. | Supermarket car parks, short stay public car parks, shopping centres. | Motorway service stations and major roads. | Motorway service stations and major roads. |
| **Connector Type** | 3-Pin, Type 1, Type 2, Commando. | Type 1, Type 2. | CHAdeMO, CCS, Tesla Type 2. | CHAdeMO, CCS, Tesla Type 2. |

*Table 10-3: EV Charging Types & Attributes*

## 10.2 Destination, Workplace and Enroute Charging Technologies

The primary charging infrastructure options for destination and workplace (slow, standard and fast chargers), and enroute (rapid and ultra-rapid chargers) include:

- Ground mounted fast chargers (see Figure 10-1).
- Wall mounted chargers (see Figure 10-2).
- Ground mounted rapid chargers (see Figure 10-3).
- Ultra-rapid chargers (see Figure 10-4).

Detailed information about each charging option is detailed in Table 10-4.


*Figure 10-1: Ground Mounted Fast Chargers*

*Figure 10-2: Wall Mounted Chargers*

*Figure 10-3: Ground Mounted Rapid Chargers*


*Figure 10-4: Ultra-Rapid Chargers*

| | Description | Key Facts | Advantages | Disadvantages |
|---|---|---|---|---|
| Ground Mounted Standard/Fast Chargers | Freestanding, ground mounted chargers are often installed in car parks and on-street. Single and dual socket options are available to allow one or two vehicles to charge from the device at any given time. Freestanding charge points require their own electricity connection.<br>Standard chargers include 7 kW chargers which are slower and suitable for long stay parking of 4 hours or more. 22 kW chargers are faster and suitable for short stay parking areas of 2 hours or more.<br>To use, driver simply parks next to device, plugs into the hardware using a standard Type 2 EV cable, and starts the charge, normally via a mobile application or RFID card. | **Funding Options:**<br>ORCS funding available for on-street charge points. Match funding is often available from CPOs.<br>**Example Infrastructure Costs:**<br>7 kW Dual Socket: £1,700 - £5,000 (UK EV Supply Equipment Association, 2019), (exc. VAT, delivery & installation).<br>**Charging Speed:**<br>Standard/Fast-charging (7 or 22 kW).<br>**Example Charging Costs for User:**<br>Pay-as-you-go: ~50p to 60p per kWh*.<br>**Subscription Services:** Offer cheaper (or sometimes free) charging. | **Dwelling:** Encourages dwelling at the location and can therefore be used to boost patronage to local businesses/tourist attractions.<br>**Proliferation:** If dual socketed, enables two vehicles to charge at a time.<br>**Grid Impact:** Can offer Dynamic Load Management (DLM) to reduce impact on the grid.<br>**Versatility:** Can be installed anywhere in car parks. Generally, have a small footprint. | **Convenience:** Offers slower charging speeds than rapid and ultra-rapid options.<br>**Installation:** More time consuming and costly to install due to the enabling works. |
| Wall Mounted Standard/Fast Chargers | Wall mounted chargers are sometimes installed in car parks. Single and dual socket options are available to allow one or two vehicles to charge from the device at any given time. Wall mounted charge points require their own electricity connection.<br>Standard chargers include 7 kW chargers which are suitable for long stay parking of 4 hours or more. 22 kW chargers are faster and suitable for short stay parking areas of 2 hours or more. | **Funding Options:** Workplace Charging Scheme for eligible places of work.<br>**Example Infrastructure Costs:**<br>7 kW Single Socket: £750 - £1,500.<br>7 kW Dual Socket: £1,700 - £2,700.<br>22 kW Dual Socket: £1,800 - £4,000.<br>(UK EV Supply Equipment Association, 2019), (exc. VAT, delivery & installation). | **Dwelling:** Encourages dwelling at the location and can therefore be used to boost patronage to local businesses/tourist attractions.<br>**Proliferation:** If dual socketed, enables two vehicles to charge at a time. | **Convenience:** Offers slower charging speeds than rapid and ultra-rapid options.<br>**Installation:** Enabling work may be required.<br>**Versatility:** Can only be installed where there is wall space. |

| | Description | Key Facts | Advantages | Disadvantages |
|---|---|---|---|---|
| | To use, driver simply parks next to device, plugs into the hardware using a standard Type 2 EV cable, and starts the charge (normally via a mobile application or RFID card). | **Charging Speed:** Standard/fast-charging (7 kW or 22 kW).<br>**Example Charging Cost for User:** Pay as You Go: ~50p to 70p per kWh*.<br>**Subscription Services:** Offer cheaper (or sometimes free) charging. | **Grid Impact:** Can offer DLM to reduce impact on the grid.<br>**Cost:** Cheaper cost compared to ground mounted units due to the reduced enabling work required. | |
| Ground Mounted Rapid Chargers | Rapid options are also available for freestanding, ground mounted chargers. Rapid options normally include dual or triple sockets so that up to two or three cars can charge at a time. These the charge point solutions are most similar to the petrol station experience drivers are familiar with. As they are a freestanding charge point, they require their own electricity connection.<br>Rapid chargers are typically rated from 43 to 50 kW with charging taking between 40 to 55 minutes. This renders them suitable for short stay car parks or at forecourts.<br>To use, driver parks next to device, takes the cable from the unit, plugs into their car and starts the charge (normally via a mobile application or RFID). | **Funding Options:** CPOs generally willing to install and operate charge points in exchange for 10-20 year lease agreements on public sector land.<br>**Example Infrastructure Costs:**<br>43 kW Dual Outlet: £15,000 - £25,000.<br>43 kW Triple Outlet: £15,000 - £30,000.<br>(UK EV Supply Equipment Association, 2019), (exc. VAT, delivery & installation).<br>**Charging Speed:** Rapid charging (43 or 50 kW).<br>**Example Charging Cost for User:**<br>Pay-as-you-go: Generally higher than fast chargers ~60p to 80p per kWh*<br>**Subscription Services:** Offer cheaper (or sometimes free) charging. | **Convenience:** Offers faster charging speeds than fast chargers.<br>**Proliferation:** Can charge up to three vehicles at a time.<br>**Grid Impact:** Can offer DLM to reduce impact on the grid. | **Impact on the Grid:** Likely to require higher DNO connection costs compared to slow/fast-charging options due to higher costs of connecting infrastructure required to support the power supply.<br>**Installation:** More time consuming and costly to install due to the enabling works.<br>**Large Footprint:** Requires more space.<br>**Planning:** Present challenges in terms of time and costs. |

| | Description | Key Facts | Advantages | Disadvantages |
|---|---|---|---|---|
| Ultra-Rapid Charging | Ultra-Rapid options are also available for freestanding, ground mounted chargers. Ultra-Rapid options normally include dual or triple sockets so that up to two or three cars can charge at a time. As they are a freestanding charge point, they require their own electricity connection.<br><br>Ultra-rapid chargers are typically rated up to 350 kW with charging taking between 7 to 16 minutes. This renders them mostly suitable for charging hubs and enroute charging stations.<br><br>To use, driver parks next to device, takes the cable from the unit, plugs into their car and starts the charge (normally via a mobile application or RFID). | **Example Infrastructure Costs:**<br>From around £35,000 (exc. VAT, delivery & installation).<br><br>**Charging Speed:** Ultra-rapid charging (up to 350 kW).<br><br>**Example Charging Cost for User:** Pay-as-you-go: Generally higher than fast chargers ~65p to 70p per kWh*<br><br>**Subscription Services:** Offer cheaper (or sometimes free) charging. | **Convenience:** Offers the fastest charging speeds.<br><br>**Proliferation:** Can charge up to three vehicles at a time.<br><br>**Grid Impact:** Can offer DLM to reduce impact on the grid | **Impact on the Grid:** Likely to require higher DNO connection costs compared to slow/fast-charging options due to higher costs of connecting infrastructure required to support the power supply.<br><br>**Installation:** More time consuming and costly to install due to enabling works.<br><br>**Large Footprint:** Requires more space.<br><br>**Unit Cost:** Highest hardware costs of all chargers. |

*Table 10-4: Summary Table of Destination, Workplace and Enroute and Charging Options*

*Costs based on desktop review at the time of writing (December 2022).

## 10.3 On-Street Base Charging Technologies

Across the UK it is anticipated that 30% of UK households do not have access to private, off-street parking (Jennings, et al., 2018). Residents without off-street parking have been underrepresented in EV adoption to-date (representing only 7% of EV owners nationally). To ensure development of inclusive charge point deployment, the needs of this group need to be met. On-street residential charging solutions are currently a key focus of Government strategy and funding. The Government acknowledges that the pace of charge point deployment is not aligned with what is required to support the transition from ICE vehicles. This is particularly true for local, low power, on-street charging which is so crucial for drivers without driveways (DfT, 2022).

In terms of on-street provision, an initial approach may be to engage with residents to identify areas where there is demand for on-street residential charging solutions, and to initially roll out provision in response to demand. However, careful consideration must be given to ensure that this approach does not reinforce existing inequalities. Spatial mapping of provision is therefore important to ensure that over time there is both a strategic and spatial approach that addresses charging deserts. This will ensure that certain neighbourhoods are not left behind.

### 10.3.1 The Charging Preferences of Drivers Without Off-Street Parking

Recent research conducted on behalf of the Government, into the charging preferences of drivers without access to off-street parking found that drivers prioritise charging convenience (DfT, 2022). The report states that 69% of non-EV drivers without off-street parking habitually park their car in front or near their house every night, 79% reported their walking time to be less than two minutes and 95% walk for 10 minutes or less.

Charging solutions targeted at households without off-street parking should therefore carefully consider solutions which meet driver's needs, which includes minimising walking distances. The Government's research highlights the importance of on-street options such as lamppost and bollard/post charging. Charge points in locations such as Council car parks may be useful and appealing to some residents living close to the town centre, but they will need to be complemented by additional on-street provision in residential areas to avoid charging deserts.

### 10.3.2 On-Street Home Charging

The On-Street Home Charging (OSHC) market is emerging to include a variety of pavement crossing solutions. These options offer a multitude of benefits to the user including convenience, reliability, and cheaper charging costs. By charging at home, residents can benefit from the lower cost of home electricity (currently capped at 28p per kWh and as low as 4.5p per kWh on an EV tariff) compared to more expensive public charge points which can range from 50p to 80p per kWh for fast/rapid charging.

Other benefits include:

- Minimise streetscape impact.
- Avoid the growing issue of on-street residents installing wall chargers without permission and dangerously trailing cables across the footway.
- Have the potential for charger sharing via apps such as Co Charger (Co Charger, 2022), therefore providing low-cost method for Councils to increase the number of publicly available charging.
- There is no requirement for dedicated parking or EV bays.
- Avoid grid connection and maintenance costs.

Some of the most developed OSHC solutions in the UK are Gul-e by ODS, Aon Charger by Trojan Energy and the EV Charging Channel (EVCC) by Green Mole Utilities, however all are in pilot stage with existing trials across the country.

As an emerging market, there are currently regulatory challenges associated with OSHC solutions. These include EV wall charger planning permission issues (whereby planning permission is difficult to obtain for properties without driveways) and the challenge of developing the relevant licensing to allow the units to be installed in the public Highway. The providers above are working with local Councils to develop and streamline the regulatory systems so that the solutions can be deployed at scale. OSHC solutions do not currently qualify for ORCS, but they do qualify for the LEVI pilot scheme. At present, OSHC providers are taking expressions of interest to conduct pilot studies in areas across the UK.

### 10.3.3 On-Street Charging Options & Costs

A comparative summary of on-street charging options include:

- Lamppost chargers (see Figure 10-5).
- Floor standing chargers (see Figure 10-6).
- Gul-e solution (see Figure 10-7).
- Green mole solution (see Figure 10-8).
- Aon charger (see Figure 10-9).

These charging options are detailed in Table 10-5.


*Figure 10-5 - Lamppost Chargers*

*Figure 10-6 - Floor Standing Chargers*

*Figure 10-7 - Gul-e Solution*

*Figure 10-8 - Green Mole Solution*

*Figure 10-9 - Aon Charger*

| | Description | Pros | Cons |
|---|---|---|---|
| Public Lamppost Chargers | The charge point socket is either directly integrated into the existing lamp column, attached to it, or are located on a nearby bollard. In all options, the charging feeds off the lamp column supply.<br>To use, driver simply parks next to the lamppost, plugs into the hardware using a standard Type 2 EV cable, and starts the charge, normally via a QR code, mobile application or RFID card.* | **Grid Impacts:** Generally suitable for slow/standard charging only therefore minimising impact on the grid.<br>**Inclusive Mobility:** Avoids additional street clutter.<br>**Grid Connection Cost:** Less likely to require DNO connection or upgrade costs as the power is drawn from the existing lamppost connection.<br>**Planning & Disruption:** Require planning permission, street works, road opening permit and likely temporary parking suspension. Therefore, highly scalable.<br>**Installation:** Fast and cheap to install.<br>**Ease:** Easy to use.<br>**Maintenance:** Typically, low cost to maintain but require specialist training. | **Convenience:** Charging speed - Generally suitable for slow/standard charging only (3.6 – 7 kW). For areas with short term parking only a small amount of charge can be gained.<br>**No Dedicated Parking:** Users are unable to guarantee that the parking space adjacent to the charger is available until they arrive.<br>**Availability:** Unless they are installed in a dedicated bay, there's the potential for ICE vehicles to block access to charge points.<br>**Inclusive Mobility:** Unless they are installed in a dedicated bay, there is the potential for users to trail cables along the pavement to access charging. |
| Public Floor Standing Chargers | Freestanding chargers can be installed on-street as floor standing units. Single and dual socket options are available to allow one or two vehicles to charge from the device at any given time. Freestanding charge points require their own electricity connection.<br>To use, driver simply parks next to device, plugs into the hardware using a standard Type 2 EV cable, and starts the charge, normally via a mobile application or RFID card.* | **Convenience:** Can offer fast-charging. **Proliferation:** Can charge two vehicles at a time.<br>**Grid Impact:** Can offer DLM to reduce impact on the grid.<br>**Ease:** Easy to use<br>**Versatility:** Can be installed anywhere (subject to Highway Law). | **Inclusive Mobility:** Creates additional street clutter where additional bollards are installed (rather than replaced). Both charger and transformer need to be accommodated on the footpath.<br>**Planning & Disruption:** Require a Traffic Regulation Order (TRO), planning permission, street works, road opening permit and likely temporary parking suspension.<br>**Installation:** More time consuming and costly to install than other on-street options. |

| | Description | Pros | Cons |
|---|---|---|---|
| Private OSHC: Gul-e | Cable channel that sits flush to the pavement and temporarily houses the charging cable.<br>The components include:<br>• Durable, galvanised steel channel.<br>• Brushes to keep the cable secure.<br>• No moving parts for minimised maintenance.<br>The user trails their charging cable from their wall charger, across their property, presses into the Gul-e and then plugs the EV in. | **Convenience & Safety:** Directly outside the user's house<br>**Grid Impacts:** Suitable for slow/standard charging only (3.6 – 7 kW) therefore minimising impact on the grid.<br>**Inclusive Mobility:** Unobtrusive design that avoids trailing cables and additional street clutter.<br>**Grid Connection Cost:** No grid connection cost required.<br>**Installation:** Relatively fast and the cheapest to install compared to other OSHC options and freestanding devices.<br>**Maintenance:** Low cost to maintain. | **Planning & Disruption:** Likely to require planning permission, street works, road opening permit and likely temporary parking suspension.<br>**Ease:** More time consuming to use than other public and OSHC options as it requires the cable to be placed in the Gul-e and removed post-charge.<br>**Availability:** No dedicated parking, a lack of signage and the unobtrusive design increases the potential for ICE vehicle drivers to park next to charge points. However, coordination with neighbours can alleviate this issue.<br>**Legislation:** Widespread legislation to support full roll out is not yet developed. |
| Private OSHC: Green Mole (Element Energy, 2022) | Cable channel that permanently houses the cable.<br>The components include:<br>• Covered channel.<br>• Gas struts in the cover for easy lifting.<br>• Chamber for coiled cable when not in use.<br>• Locked with a universal key.<br>The user pulls the charging cable put from the kerb edge and plugs in. | **Convenience & Safety:** Directly outside the user's house<br>**Grid Impacts:** Suitable for slow/standard charging only (3.6 – 7 kW) therefore minimising impact on the grid.<br>**Inclusive Mobility:** Unobtrusive design that avoids trailing cables and additional street clutter.<br>**Grid Connection Cost:** No grid connection cost required.<br>**Installation:** Relatively fast and cheap to install, compared to Trojan and freestanding devices.<br>**Maintenance:** Low cost to maintain.<br>**Ease:** Easiest to use out of all the public and OSHC options. | **Planning & Disruption:** Likely to require planning permission, street works, road opening permit and temporary parking suspension.<br>**Availability:** No dedicated parking, a lack of signage and the unobtrusive design increases the potential for ICE drivers to park next to charge points. However, the low frequency of required charging and coordination with neighbours can alleviate this issue.<br>**Installation:** Relatively fast and cheaper to install, compared to bollard chargers and the Aon Charger. |

| | Description | Pros | Cons |
|---|---|---|---|
| | | | **Legislation:** Widespread legislation to support full roll out is not yet developed. |
| Private OSHC: Aon Charger (Element Energy, 2022) | This is a bespoke piece of hardware which is fully removed and stowed by the owner when not in use.<br>There are three components to the hardware:<br>• Charge point (installed below the pavement surface).<br>• Lance (inserted into charge point with an integrated cable that connects to the vehicle for charging).<br>• Aon Box (controls the flow of electricity to the charge point via a cable laid from the property to the kerb).<br>The user inserts the lance into the connector for charging. The lance is pulled up and out from the connector when charging is complete.<br>The resident's electricity supply is installed permanently under the footway. | **Convenience & Safety:** Directly outside the user's house.<br>**Grid Impacts:** Suitable for slow/standard charging only (3.6 – 7 kW) therefore minimising impact on the grid.<br>**Inclusive Mobility:** Unobtrusive design that avoids trailing cables and additional street clutter.<br>**Grid Connection Cost:** No grid connection cost required.<br>**Ease:** As easy to use as the public options. | **Planning & Disruption:** Likely to require planning permission, street works, road opening permit and likely temporary parking suspension.<br>**Availability:** No dedicated parking, a lack of signage and the unobtrusive design increases the potential for ICE drivers to park next to charge points. However, the low frequency of required charging and coordination with neighbours can alleviate this issue.<br>**Installation:** More complex to install than other OSHC options and requires enabling work such as excavation, ducting and cabling to be laid from the charger, across the property and under the footway.<br>**Legislation:** Most complex of the OSHC options due to the permanent electricity wire passing through public and private land. |

*Table 10-5: Summary of On-Street Charging Options & Costs*

*Contactless payments are likely to be offered in the future to align with new LEVI criteria.

## 10.4 Key Findings

When developing EV infrastructure plans for the region it is important to consider the range of charging infrastructure solutions required to support the desired scale of uptake, and fulfil the needs of the region's residents, commuters and visitors. A one-size-fits-all response will not suffice and increasing the range of solutions available in the charging ecosystem is essential for removing current barriers to EV adoption.

# 11 Appendix C: Additional Stakeholder Engagement

**Appendix at a Glance**

This Appendix contains a summary of the three interviews conducted with Visit East of England, Suffolk & North East Essex NHS and ambulance service and the Rural Services Network. It also shows the results of the Visit East of England EV survey.

## 11.1 Visit East of England Survey Results

To compliment the desk top analysis (see Chapter 4), a survey was issued via Visit East of England to a list of 6,500 businesses and organisations across Suffolk, Norfolk and Bedfordshire to provide further insight into the needs and plans of the private sector. The survey focussed on existing EV charging points, future plans and the barriers and opportunities associated with installing charging infrastructure. The survey received 16 responses, from businesses within the accommodation (44% of respondents), hospitality (25%), food and beverage (13%) and retail sectors (6%).

It should be noted that due to the very small sample size, clear conclusions cannot be drawn from the results of this survey. Instead, this survey is a useful indication of the level of interest and engagement with the roll out of EV infrastructure within the private sector in the East of England.

Of the respondents, 63% said they were seeing a demand for EV charging points from their customers to varying degrees, and 44% of respondents said they had plans in place to install charging points (Figure 11-1). Of these, all (aside from one) were planning to install standard charge points. Only one business had plans to install a combination of rapid and standard charge points. Most businesses had plans to make the installations between 2023 and 2024.

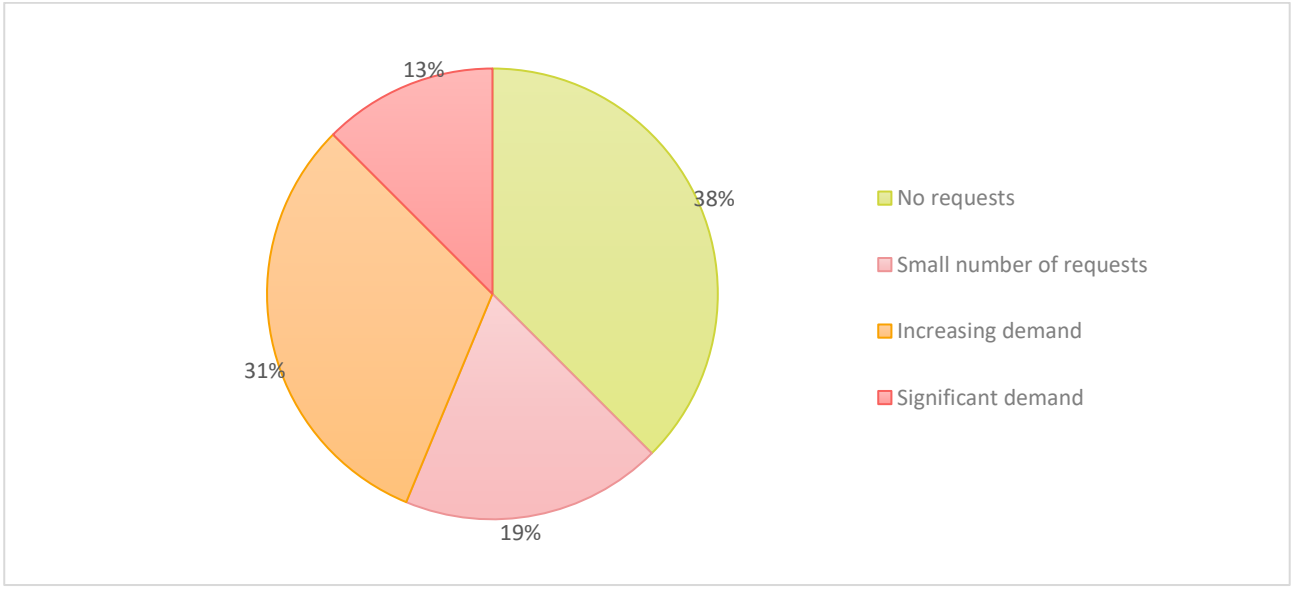


*Figure 11-1: Survey Respondents Receiving Requests for Electric Vehicle Charging*

The cost of installation was identified as the biggest barrier to delivering charging points, followed by concerns about the cost of charging to the business and lack of off-street parking (Figure 11-2).

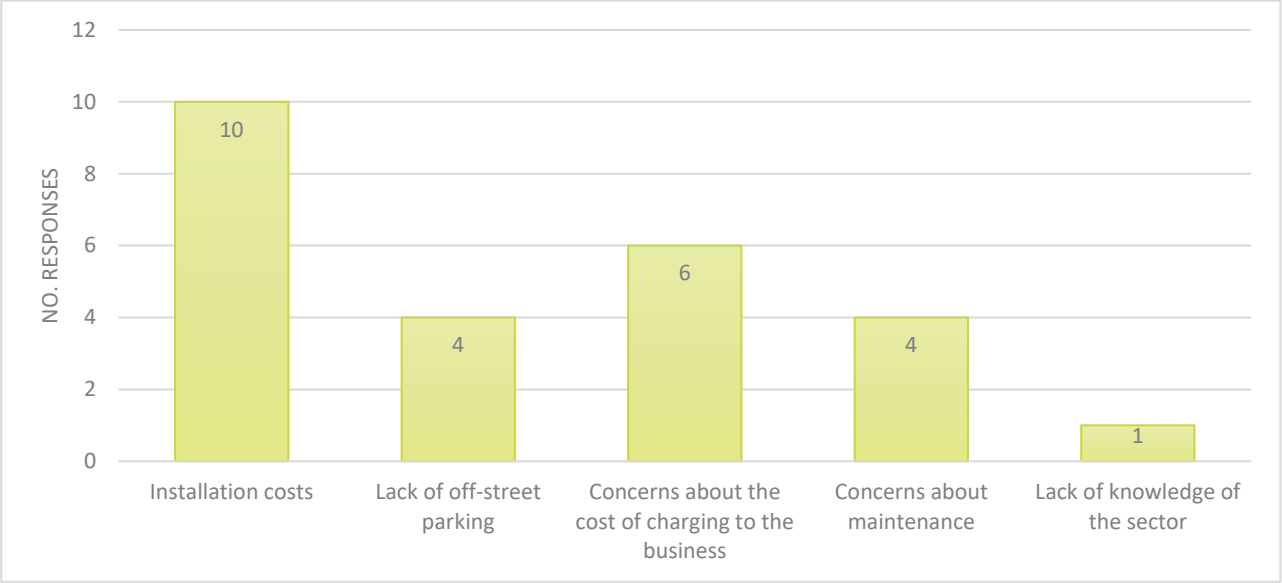


*Figure 11-2: Responses to 'What, If Any, are the Biggest Barriers to the Delivery of Charge Points on your Premises?'*

Survey respondents also outlined a desire for more charge point provision in public places - both in terms of charge point volumes and their spatial distribution across the region. Some respondents said they had accessed government grant funding, whilst others said because they needed to install on private property for their business (such as accommodation) they were unable to access the funds they needed. A lack of chargers and the associated range anxiety was noted as a possible reason for people choosing other destinations, and it having negative impacts on their businesses.

## 11.2 One-to-one Interviews

### 11.2.1 Visit East of England

Visit East of England (VEoE) is a destination management organisation that has been running for approximately three years. It is a coalition of the destination organisations in Norfolk, Suffolk, North Essex, Ely and Cambridge. VEoE is responsible for developing the year-round visitor economy in the region, capitalising on assets such as the North Norfolk coast, destination cities such as Cambridge, Norwich and Colchester, as well as international transport links including Norwich International Airport.

There are approximately 250 million visitors to the region annually. The tourism season runs between February and September. 90% of people arrive by car and continue to drive throughout the region, rather than using public transport. The majority of the visitors come from a two to three-hour drive time range.

Anecdotally, the local destination management organisations (e.g. Visit Norfolk) have been receiving increasing volumes of visitors asking which accommodation has access to a charge point, and where fast-charging infrastructure is available. VEoE is taking the step to encourage its members to update their listings with this information to improve the experience for EV drivers, and some major destinations have began proactively installing charge points on their own land, such as Holkham Hall (Coke Estates Limited, n.d.).

Investment in tourism usually comes from the private sector, but it was noted that there is a role for LAs in terms of infrastructure maintenance and development – including installing EV charge points in public car parks and other facilities available to visitors and residents alike. The Norfolk Rural Economic Strategy (Norfolk County Council, 2021) emphasises the role that EVs have to play in the continued growth of the rural economy, and the importance of investment in grid capacity and other areas to ensure that rural areas are not left behind. VEoE saw the key opportunities for EV charge

point installation at places of accommodation, and at public and private car parks near key tourist attractions.

### 11.2.2 Suffolk & North East Essex NHS / East of England Ambulance Service

The East of England has six Integrated Care Systems (ICSs) which are partnerships of organisations that plan and deliver joined-up health and care services across the region. This includes a range of organisations, from primary care to hospitals, community groups and mental health trusts. ICSs have overarching carbon reduction goals set by Greener NHS, but specific targets from the NHS Estates Team have been released regarding the delivery of EV infrastructure as part of these goals. There are incremental The targets are summarised in Table 5-3.

| Date | Vehicle Emissions Targets |
|---|---|
| From 2021 | No immediate changes. |
| From 2023 | 50% of vehicles used to deliver the contract are of the latest emission standards, Ultra Low Emission Vehicles (ULEVs) or Zero Emission Vehicles (ZEVs). |
| From 2026 | 75% of vehicles used to deliver the contract are of the latest emission standards, ULEV or ZEV. |
| From 2030 | 100% of vehicles used to deliver the contract are ULEV or ZEV, including minimum 29% ZEV. |
| 2035 | 100% of vehicles used to deliver the contract are ZEV. |

*Table 11-1: Non-Emergency Patient Transport Vehicle Decarbonisation Timeline*

The key challenges for decarbonising the NHS fleet in this region, and providing EV charging opportunities for staff and patients, were highlighted. Grid capacity at NHS sites is often an issue, and often new EV charging installation requires grid upgrades which increase the cost of the project. There is significant development occurring at some sites, including a £40m urgent treatment centre at Ipswich Hospital, and while there are opportunities to integrate EV charging into these new facilities, they are also likely to take up the majority of spare grid capacity on site. It was acknowledged that ongoing engagement with DNOs is required to support cohesion and readiness.

The nature of some services means that for patient transport including ambulances, journeys can be unpredictable and yet longer term enroute access will be necessary. There are currently 11 fully electric ambulances and a number of hybrids in the East of England Ambulance Service. The service has partnered with Bedfordshire Fire and Rescue to trial electric rapid response vehicles, and to purchase additional chargers. Mobile charging is another potential solution for ambulances, and three fully electric ambulances will be trialled with mobile chargers by the end of 2023.

Knowledge-sharing and an integrated approach across the region and the NHS is vital to ensure that decision-makers have access to all of the information, and that investment is being made in a coordinated manner. Progress is already being made via NHS-wide procurement framework, something STBs and LAs can learn from. The rural challenge is particularly relevant in the East of England context; range anxiety and lack of adequate infrastructure in rural areas affects patient and voluntary transport services, and results in staff and patients relying on cars rather than public transport or active travel to access medical facilities. There is wider work ongoing to encourage modal shift within the patient and staff communities, however the alternatives are not always available, and this underlines the importance of developing an effective EV Infrastructure Strategy within the NHS for the East of England.

### 11.2.3 Rural Services Network

The Rural Services Network (RSN) represents rural LAs across England, as well as around 200 bodies (e.g. health trusts, independent fire services, Age UK) that deliver services for rural areas. The key areas of interest for the RSN are health and care, rural transport, rural housing and the economy. The RSN also campaigns for fairer funding in rural areas; delivering services costs more in rural areas, and this is not always reflected in the division of government funding.

This unequitable division of funding has resulted in rural LAs having fewer resources to spend on discretionary and strategic projects such as EV charge point infrastructure, as they receive less funding than urban areas. This is compounded by the use of Green Book Appraisals to calculate the value for money of various schemes, and subsequently award funding – lower population density means that fewer people benefit from the new infrastructure, and therefore the value for money figure is lower. However, it is possible that installing EV charge points in these areas may have wider economic benefits such as increased footfall in market towns and working with community buildings (such as village halls and places of worship) to provide services in a model which allows the building owners to receive payback from hosting the infrastructure, and invest it back into the community. Rural deprivation is often overlooked as it exists in patches next to very affluent areas, and ensuring that EV infrastructure roll out is publicly accessible and inclusive will be vital to preventing charging 'deserts' as EVs become mainstream. It was also noted, however, that for many people living and working in the rural economy wages are low and the biggest barrier to owning an EV is the upfront cost. There is also a larger elderly population in rural areas and the transition to EVs may result in some of these communities becoming more isolated and left behind if they are not confident with the technology and using an app to charge their car.

There were other infrastructure-related concerns raised by the RSN, such as the resilience of the electricity network in rural areas especially in the context of rural areas being pushed to install ground source and air source heat pumps up to ten years earlier than urban areas, which will put additional pressure on the grid. In addition, many areas do not have mobile phone signal which is a problem for EV charge points which require the use of an app.

There are a number of organisations which focus on the needs of rural communities (e.g. Action with Communities in Rural England, the Countryside Business and Land Association, the Rural Coalition and the Plunkett Foundation) that could be engaged to develop a set of key asks to government regarding support for EV infrastructure roll out in rural areas. This could include specific policies that address the concerns listed above, or a ringfenced fund to support rural LAs in delivering charge points. Other potential avenues identified to support rural areas include nominating digital champions in rural LAs to increase capacity for programmes of EV charge point roll out, and to consider needs of the older population and those living in deprived areas who may lack access to broadband, smart phones and the confidence with technology to allow them to use these new facilities.

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