EV Charging Strategy

Strategy Report

July 2023

Working for a brighter future together

Cheshire East Council

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Abbreviations

Abbreviation	Meaning
AEVA	Automated and Electric Vehicles Act
BEV	Battery Electric Vehicle
CCC	Committee on Climate Change
CEC	Cheshire East Council
CO_2	Carbon Dioxide
COP	Conference of the Parties
DNO	Distribution Network Operator
EPBD	Energy Performance in Buildings Directive
EqIA	Equalities Impact Assessment
E-REV	Extended Range Electric Vehicles
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicles
HGVs	Heavy Goods Vehicles
ICE	Internal Combustion Engine
IEC	International Electrotechnical Commission
IMD	Index of Multiple Deprivation
kWh	Kilowatt Hours
LA	Local Authority
LCV	Low Carbon Vehicle
LEVI	Local Electric Vehicle Infrastructure
LGVs	Light Goods Vehicles
N_2O	Nitrous Oxide
NCR	National Charge Registry
ORCS	On-Street Residential Charging Fund
OSCP	Open Smart Charging Protocol
OZEV	Office for Zero Emission Vehicles
PHEV	Plug-in Hybrid Electric Vehicle
PIV	Plug-in Vehicle
PM 2.5	Particulate Matter 2.5
SAE	Society of Automotive Engineers
SMMT	The Society of Motor Manufacturers and Traders
TRO	Traffic Regulation Order
UK	United Kingdom
V2G	Vehicle to Grid
VAT	Value Added Tax
WPD	Western Power Distribution

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Foreword

I am delighted to present Cheshire East Council's ambitious strategy for guiding the roll out of electric vehicle chargepoints across the borough. By delivering on this strategy, we aim to enable our residents, visitors and businesses alike to make journeys by electric vehicles.

The transition of cars, vans and buses to electric vehicles presents a significant opportunity to support decarbonisation in our borough. Our Corporate Plan commits to leading our communities to protect and enhance our environment, tackle the climate emergency and drive sustainable development. As a Council we have committed to be carbon neutral in our own operations by 2025 and to support carbon reduction across the wider borough by 2045.

The measures within this strategy outline how we will work with stakeholders and the wider industry to guide the provision of high quality electric vehicle chargepoints. Our Council is investing significant time and funds to improve the network of chargepoints across Cheshire East, however joint working with partners and industry is essential to realise our ambitions.

A key element of our strategy is ensuring the whole borough is supported and the right charger will be provided in the right place, at the right time. This means that residents across our diverse borough will be supported to make the change to electric vehicles in a fair and equitable way.

We do however recognise the transition to electric vehicles alone will not fully achieve our ambitions for decarbonisation and wider aims. We are also investing in improving walking, cycling and public transport journey options. The provision of electric vehicle chargepoints will be complementary to our sustainable transport programme, with the aim of delivering an integrated and high quality transport network.

I would like to thank the many individuals and stakeholders who responded to the consultation on our strategy. Understanding local views and needs for electric vehicle charging has enabled us to develop a strategy that is tailored to the diverse needs within our borough.

I am confident that by working alongside partners to deliver this strategy we will support and guide the provision of a high quality network of chargepoints. This will support residents, visitors, and businesses, across our whole borough, and play a vital role in achieving our aims of delivering a fair and green Cheshire East.

Councillor Craig Browne
Chair of the Highways and Transport Committee

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Executive Summary

Why develop an electric vehicle infrastructure strategy for Cheshire East?

First and foremost, this strategy aims to guide the provision of a high quality electric vehicle (EV) charging network for our residents, visitors and businesses. There are already significant numbers of electric vehicles using the road network within Cheshire East and this is forecasted to increase further.

To support current EV drivers and facilitate future growth an increase in the number and quality of chargepoints is needed. Cheshire East Council (CEC) has already invested in EV chargepoints but there are notable gaps in the network, for example in Macclesfield and more rural areas. The current supply of chargepoints is insufficient to support the future uptake in EVs, particularly given that the sale of new petrol and diesel cars will be phased out by 2030.

A key benefit of transitioning vehicles to electric is reducing carbon emissions. CEC has committed to be carbon neutral in our own operations by 2025 and to influence carbon reduction across the wider borough. The UK is committed to reducing greenhouse gas emissions to net zero by 2050 in response to recommendations from the Committee on Climate Change. EVs have a lower whole-life carbon footprint than petrol and diesel vehicles and given the UK's progress towards greener electricity generation these benefits will increase further in the future.

Additionally, CEC is committed to improving air quality as outlined in the 2018 Air Quality Action Plan. EVs reduce emissions, particularly in congested urban areas where, stopping and starting, idling, and over-revving of petrol/diesel vehicles in queues produces high concentrations of emissions.

Decarbonising of transport will require a broad range of actions as set out in CEC's Local Transport Plan. This includes improving journey options for walking, cycling and public transport, with opportunities to electrify the vehicle fleet. It is however recognised that car based travel will continue to play an important role in the transport network in Cheshire East, particularly as the borough has many rural areas.

What are the objectives of this strategy?

Following a review of data, other local and government strategies, and through engagement with a wide range of stakeholders a number of objectives have been set. These objectives have been used to guide development of this strategy and will be important for informing how CEC commissioned chargepoints are provided in the future. These objectives are designed to ensure the roll out of chargepoints is tailored to the needs of Cheshire East and is complementary to wider initiatives.

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Cheshire East Council's objectives for this EV Strategy and the future roll out of chargepoints

Reducing inequalities in charge point provision to enable all of our communities to transition to electric vehicles in a timely way.

To contribute towards reduced carbon emissions and improved air quality from transport.

To support the uptake of electric vehicles by individuals, businesses, and organisations within Cheshire East.

To help ensure infrastructure makes a positive contribution to the streetscape through sensitive placement and appearance, avoiding negative impacts on other highway users, particularly pedestrians.

To guide the provision of infrastructure that is safe, easy to use and represents good value for money both on installation and throughout its life.

Supporting electric vehicles in the context of a wider transport system that encourages mileage reduction, active travel, and public transport.

Cheshire East Council to lead the way in transitioning fleet vehicles to EV and supporting organisations across the wider borough

Are EVs a practical option for most people?

Currently, there is a major industry shift from diesel / petrol engines to EVs which currently is the only mature technology offering a workable alternative to Internal Combustion Engine (ICE) vehicles. The UK Automotive Council has developed long-term technology roadmaps for electric passenger car, bus, and commercial vehicle technology, representing the vision of vehicle manufacturers to 2040. These

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roadmaps show electric drivetrain technology as a focus area for passenger cars and light vans to 2050.

This shift is being partly driven by consumer demand amongst early adopters and also UK government legislation that is phasing out the sales of new ICE vehicles by 2030, with plug-in hybrid engines phased out by 2035.

Early EV models were limited to low mileage ranges which presented issues for people making longer journeys and gave rise to the term 'range anxiety'. Owners of these early EVs tended to have off-street parking enabling them to charge at home overnight, although this capability is greatly curtailed in some residential areas, particularly flats and terraced housing without access to off-street parking often in the denser urban areas. However, in recent years EV technology has improved significantly with newer models having significantly longer mileage ranges that are typically above 200 miles. This means the large majority of daily trips can be catered for and EVs are becoming a more practical option, however improvements in the chargepoint network are needed to complement these better vehicle capabilities.

What type of chargepoints are needed?

EVs require their batteries to be recharged. Where this occurs, the duration of the charge and time of day will vary to meet users' needs. For these reasons a mix of different chargepoint types will be needed to cater for varying needs.

Slow, fast, rapid, and high-power chargers suit different locations and charging behaviours. Slow and fast chargers suit charging patterns where the driver looks to recharge at a location that they will be leaving the vehicle for a considerable amount of time such as at a residential location, supermarkets or places of work. Rapid and high-power chargers' suit on-route charging, quick recharging at destinations, and support fleet vehicles due to their high-speed capabilities.

How many EVs are there in Cheshire East?

Table ES1 Total registered and PIV registrations in Cheshire East for Q2 2022

District / Area	Total Registered Cars & Light Goods Vehicles as of Q2 2022	Total Registered Plug In Vehicles as of Q2 2022	Plug In Vehicles as % of Total Registered Vehicles as of Q2 2022
Cheshire East	250,667	5,285	2.11%
UK	37,715,246	901,488	2.39%

The figures outlined in Table ES1 includes vehicles registered at residences and also businesses who register their fleet vehicles at locations within Cheshire East. In addition, many EVs travel into and through Cheshire East daily with key traffic routes such as the M6, M56 and A-roads carrying significant levels of traffic.

What is the expected growth rate of EVs within Cheshire East?

The numbers of EVs registered in Cheshire East have grown steadily through the previous decade. As we move towards the phase out of new ICE vehicles from 2030 the growth in EV numbers is expected to accelerate. By 2030 there is forecasted to be around plug-in vehicles registered in Cheshire East, a very large increase on current numbers. By 2030 there is forecasted to be around 96,000 plug-in vehicles registered in Cheshire East, a very large increase on current numbers. This means CEC needs to plan for increasing demands and support the installation of new chargepoints.

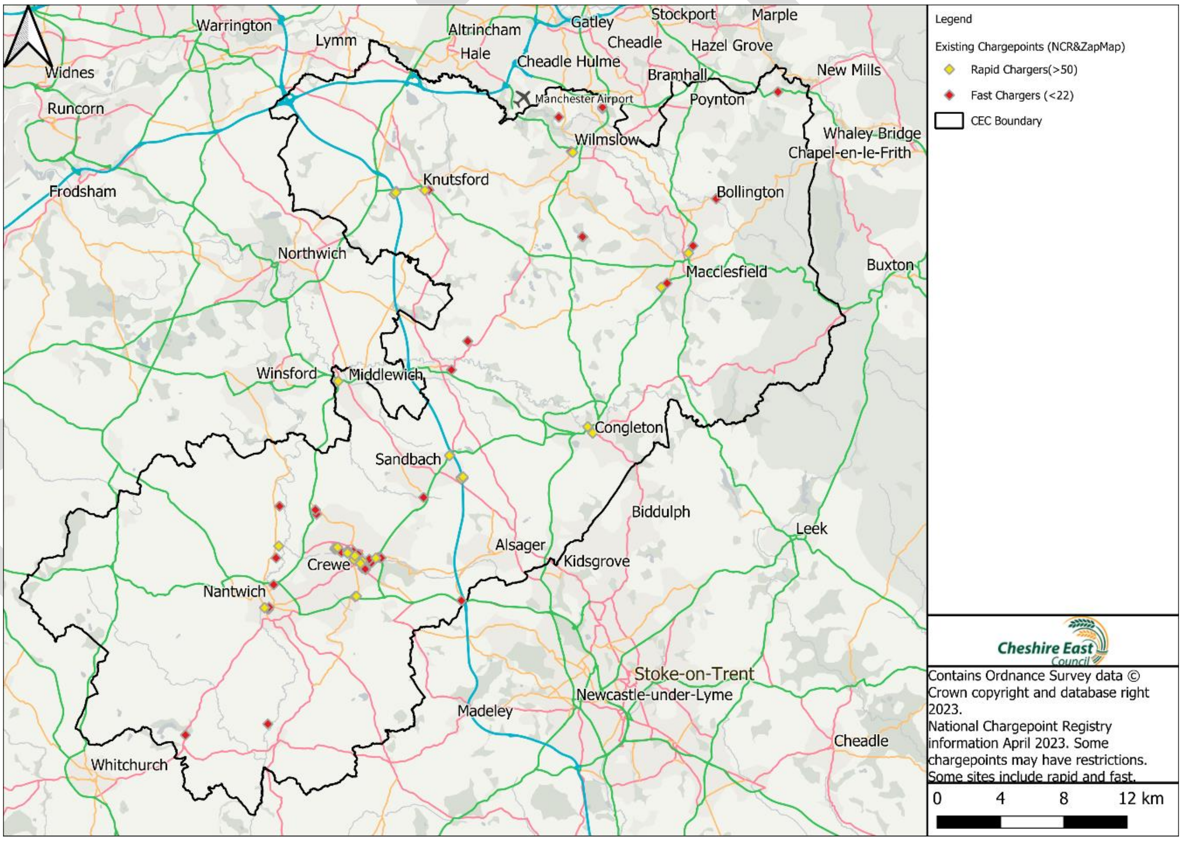
What chargepoints are publicly available in Cheshire East currently?

To understand the current situation with coverage of chargepoints across the borough, publicly available charge points in Cheshire East and surrounding areas are shown in **Error! Reference source not found.**.

The majority of publicly available chargepoints in Cheshire East have been funded and are operated by commercial Charge Point Operators (CPOs) independently of CEC. In general, there is a reasonable spread of publicly available chargepoints across the borough and a mix of fast chargers and rapid chargers.

However, there are areas of Cheshire East in which the current network is lacking including Macclesfield Town Centre, Congleton, Poynton and many rural areas. In these areas CPOs may be unwilling to invest due to less opportunity for generating profits in the short to medium term. Additionally, CPOs need land on which to install chargepoints. In both of these cases, CEC can play a role in supporting and guiding improvements in the charging network.

Figure ES1-1 Existing Chargepoints in Cheshire East (note: this map was produced at the time of writing and is subject to change)



In addition, analysis of housing types in Cheshire East has found that many properties do not have off-street parking and the potential to install a personal chargepoint at home. This was reported as an issue for some residents in responses to the consultation on this strategy. Clusters of this housing are predominantly located in urban areas including Macclesfield, Crewe, Nantwich, Knutsford, and Wilmslow. At present there are limited charging options for these residents.

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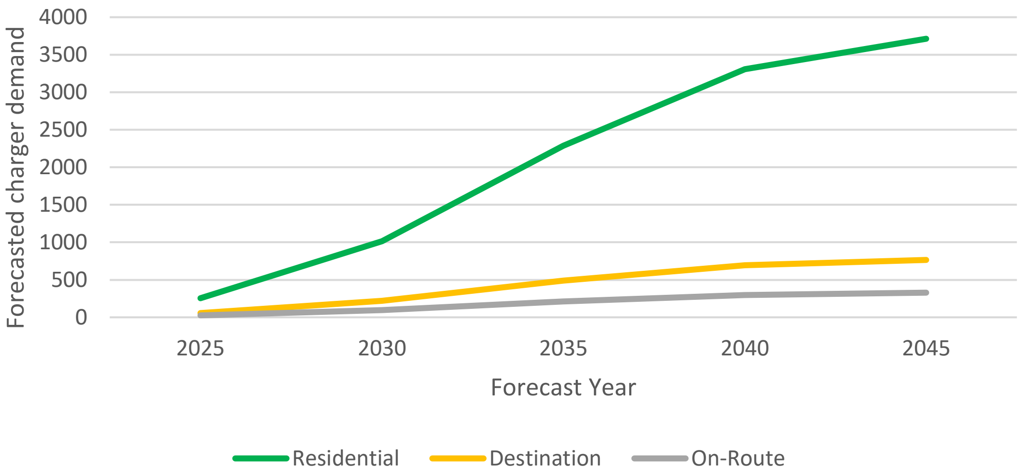
As part of the consultation on this strategy respondents also noted issues with the reliability and availability of existing chargepoints. Although CEC has no influence over chargepoints provided on a commercial basis on private land, CEC will ensure chargepoints commissioned by the Council will be well maintained. This coupled with new legislation by the UK Government aimed at improving the reliability of chargepoints is expected to lead to substantial improvements.

How many chargepoints will Cheshire East need in the future?

Forecasts of the number of chargepoints that are needed to serve the anticipated number of EVs in Cheshire East have been produced. This shows that approximately 300 publicly available chargepoints are needed by 2025 rising to around 1300 chargepoints by 2030. This is a large increase on the current number of publicly available chargepoints which according to UK Government figures was 153 in April 2023.

Figure ES1-2 Forecasted publicly available charger demand for Cheshire East



What action will be taken to improve the chargepoint network in Cheshire East?

CEC recognises the challenge ahead to provide a high quality charger point network that serves all residents, visitors and businesses. To meet this challenge a range of measures have been identified alongside timescales over which these will be delivered and the key responsibilities of CEC and partners. The strategic measures are outlined in

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Table ES2.

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Table ES1 Strategic measures and key responsibilities

<table>
<tr><th>Measure</th><th>Short term (0 – 2 years)</th><th>Medium term (2 -5 years)</th><th>Longer term (5+ years)</th><th>Key Responsibilities</th></tr>
<tr><td>Providing charging points in CEC car parks at key destinations (e.g., key and local service centres).</td><td>✓</td><td colspan="2" rowspan="5">Continuous monitoring of chargepoints usage and commercial provision to determine when / if further phases of Council-led chargepoints are required</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure funding from both the private and public sector
• CPO to deliver, maintain and operate these chargepoints</td></tr>
<tr><td>Providing charging points to support residents with no access to residential off-street parking, in line with the framework set out in this strategy.</td><td>✓</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure funding from both the private and public sector
• CPO to deliver, maintain and operate these chargepoints
• Where residents have access to private off-street parking it will be the responsibility of the resident / property management to install chargepoints</td></tr>
<tr><td>Providing on-route charging points to serve key traffic routes.</td><td>✓</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure investment from the private sector
• CPO to deliver, maintain and operate these chargepoints</td></tr>
<tr><td>Providing chargepoints in rural areas.</td><td>✓</td><td>• CEC to engage Parish Councils and communities
• CEC to consider funding opportunities and community ownership models</td></tr>
<tr><td>Introduce chargepoints for the Council's own fleet and grey fleet.</td><td>✓</td><td>• CEC to deliver ringfenced chargepoints at key locations</td></tr>
<tr><td>Consider the need for further planning policies to support the roll out of the chargepoint network.</td><td>✓</td><td>✓</td><td>✓</td><td>• CEC to review and update planning policies as necessary</td></tr>
<tr><td>Work in partnership with District Network Operators to enable capacity in the power network for all of</td><td>✓</td><td>✓</td><td>✓</td><td>• CEC to engage with DNOs (Scottish Power Energy Network, Electricity North West and Western Power Distribution) to collaboratively plan electricity</td></tr>
</table>

Measure	Short term (0 – 2 years)	Medium term (2 -5 years)	Longer term (5+ years)	Key Responsibilities
Cheshire East's needs including cost effective chargepoints.				requirements, particularly in the areas of Macclesfield and Congleton which are known areas of constrained capacity • DNOs to work within statutory framework to deliver strategic network strengthening
Engage with taxi industry and providing charging infrastructure for taxis in convenient locations.	✓	✓	✓	• CEC to further engage with taxi operators and procure CPO partner to deliver, maintain and operate these chargepoints
Engage with bus operators and consider providing charging infrastructure for buses.		✓	✓	• CEC to continue engaging bus operators and consider future funding opportunities
Encourage and where possible support the introduction of commercially provided charging forecourts.	✓	✓	✓	• CEC to consider making land assets available to CPOs to deliver locations through their own investment
Introduce chargepoints for HGVs should appropriate technology come forward in the future.			✓	• CEC to monitor technology developments and requirements for infrastructure.

How will improvements to the chargepoint network be delivered?

Cheshire East Council is investing significant resources to develop and deliver this strategy. CEC understands the important role we play and is committed to guiding and supporting future improvements in chargepoint network. However, CEC cannot deliver the improvements needed alone. Large scale investment is needed to expand and improve the chargepoint network in Cheshire East and given the constraints on CEC finances, it will be important to secure funding from external sources.

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CEC is proactively seeking funding from central government. Recently, CEC secured £155k from the On-street Residential Chargepoint Scheme and the Council is engaging with central government to prepare for the forthcoming Local Electric Vehicle Infrastructure Fund. A key requirement of these central government funding schemes is that CEC also secures match funding from the private sector. CEC is also aware that in some instances the private sector will fully fund the installation, maintenance, and operation of chargepoints.

A key action will therefore be CEC engaging with CPO and investors to build a long term partnership using a concession model that will deliver the improvements needed to the chargepoint network. When installing rapid or ultra-rapid chargepoint hubs, a land lease approach may be more suitable. The preferred approach is one that retains an element of control over the location of sites and their operation whilst working collaboratively with the private sector to leverage investment funding and access up-to-date technologies throughout the life of a contract or concession. The scope of such an agreement would include the installation, maintenance and operation of electric vehicle infrastructure on behalf of the Council.

As part of this strategy a range of CEC car parks have been assessed for their suitability for EV charging. These assessments provide a guide for future investment programmes. More detailed assessments, engagement with stakeholders, and technical work will be conducted as part of future phases of chargepoint delivery.

CEC will also work with a supplier to install and operate chargepoints for CEC's fleet vehicles. This approach will entail CEC funding the purchase, installation and operation of the chargepoints and retaining full control over the assets.

How will CEC ensure the roll out of chargepoints is undertaken in a fair and equitable way?

It is crucial the roll out of EV chargepoints does not negatively impact on other users of the highway, particularly pedestrians and people with disabilities using footways and with a need for the chargepoints to visually fit into the streetscape. Within this strategy care has been taken to identify how chargepoints should be installed so the footway is not obstructed. Additionally, chargepoints commissioned by CEC will be accessible to all users through their design and functionality.

A key issue with the current network is that chargepoints have been installed in locations which are more likely to be well used. This means that areas of Cheshire East which are less attractive to investors such as more rural areas and urban areas with lower levels of EVs are lacking in provision. This strategy outlines how CEC will work to secure funding and guide CPOs to install chargepoints in these areas to ensure there is a balanced and equitable network.

Next Steps

CEC has already started progressing a number of actions set out in this strategy, including securing funding from central government and engaging a wide range of stakeholders to develop more detailed plans for the delivery of chargepoints. CEC will continue this work over the coming years alongside partners to progress short and medium term actions.

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1. Introduction

Cheshire East Council (CEC) is committed to reducing carbon emissions and improving air quality as outlined in the *Cheshire East Borough Council Air Quality Action Plan (AQAP) (2018)*. CEC noted that Parliament had declared a climate emergency in May 2019 and committed to being carbon neutral as an organisation by 2025 whilst supporting decarbonisation of the wider borough by 2045. This EV Charging Infrastructure Strategy has been developed to directly support CEC's aim of reducing carbon emissions by accelerating the transition to electric vehicles (EVs), and supports the ambitions outlined within the Cheshire East Local Transport Plan 4 Strategy.

1.1 Structure

Following this introduction, this strategy consists of the following chapters:

- **Chapter 2: Policy, Legislation and Guidance Review –** A review of current national, regional, sub-regional and local policy and legislation in relation to EVs and charging infrastructure.
- **Chapter 3: Technology Review Summary –** A review of EV and charging technologies.
- **Chapter 4: Cheshire East EV Baseline –** A review of background data regarding of EVs in Cheshire East, including key trends and demographic data.
- **Chapter 5: Strategic Priorities** − Outlines the measures to be implemented as part of this strategy, including consideration of sequencing and future uncertainties.
- **Chapter 6: Cheshire East Council's Residential Charging Framework –** summarises the background research undertaken, the options for residential charging infrastructure and outlines the framework for decision-making.
- **Chapter 7: Prioritising Charging Locations –** Assesses locations for charging infrastructure in car parks, as well as leading areas for consideration of on-street residential charging points.
- **Chapter 8: EV Charging Commercial Models –** Details potential options for how charging infrastructure can be delivered, operated and maintained, and identifies the chosen approach.
- **Chapter 9: Implementation –** Outlines a high-level timeline of recommended measures and key strategic actions to be taken.

1.2 Electric Vehicle Terminology

Throughout this strategy, the term 'EV' is used for simplicity even though in most cases only plug-in EVs are referred to. In general, EVs use an electric drivetrain, the drivetrain of a vehicle includes the transmission, the driveshaft, the axles, and the wheels. Simply put, it works in conjunction with the engine to move the wheels. EVs that use an electric drivetrain to power the wheels produce lower tailpipe emissions, less noise and encourage a smoother driving style than Internal Combustion Engine (ICE) vehicles. EVs have additional benefits in urban areas, where, stopping and starting, idling, and over-revving of ICE vehicles in queues produces high concentrations of emissions.

Ultra-Low Emission Vehicles (ULEVs) are currently associated with reducing road transport emissions. However, there are many acronyms used to refer to vehicles that which produce lower emissions than pure ICE vehicles. Table Table 1-1 provides a brief explanation of different low emission vehicle types and**Error! Reference source not found. Error! Reference source not found.** illustrates some of these vehicle types.

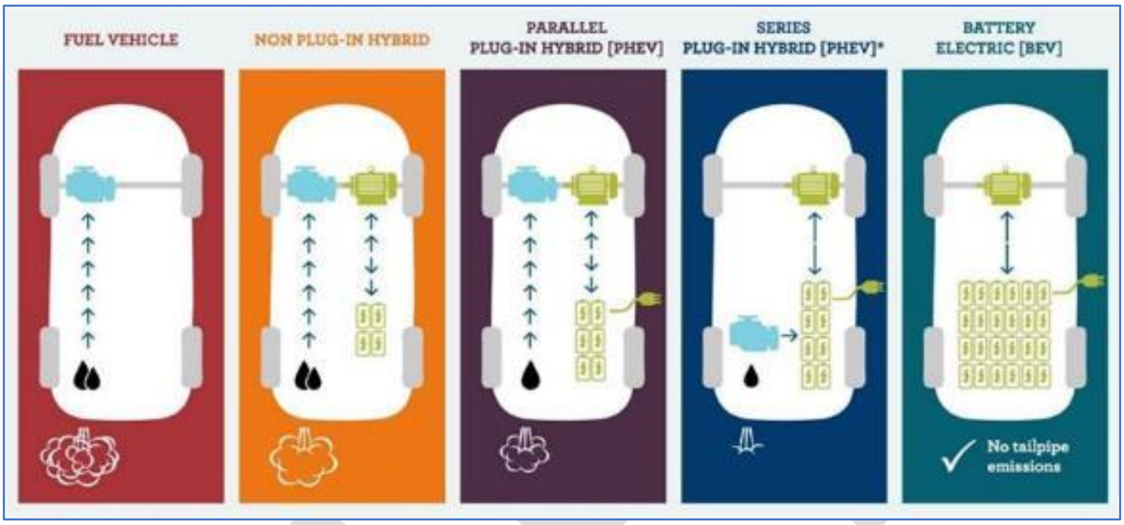
Table 1-1 Definitions of different low emission vehicle types

Acronym	Fully Written	Description
ULEV	Ultra-Low Emission Vehicle	This term is used in the UK to refer to any motor vehicle emitting extremely low levels of emissions, currently set at 75g CO_2/ km driven or less. UK targets are set for ULEV uptake and statistics are reported quarterly at local authority level[1].
EV	Electric Vehicle	Driven by an electric motor, powered from a battery, which must be plugged into an electricity source to recharge. Full EVs do not have ICEs and therefore have zero tailpipe emissions. These pure EVs are sometimes referred to as Battery Electric Vehicles (BEVs).
PHEV	Plug-In Hybrid Electric Vehicle	Combines a plug-in battery and an electric motor with an ICE, either of which can be used to drive the wheels. Therefore, total tailpipe emissions vary depending on how much of the journey uses the battery. They are required to plug-in to recharge their battery.
PIV	Plug-In Vehicle	A collective term used to cover all vehicles that can be plugged into an external electrical outlet to recharge their battery. PIVs form a subset of ULEVs, which includes both BEVs and PHEVs as well as Fuel Cell Electric Vehicles (FCEV). All PIVs require infrastructure to recharge their batteries, so understanding this category's needs is key when planning charging networks.
HEV	Hybrid Electric Vehicle	Uses more than one form of on-board energy to achieve propulsion (usually a petrol or diesel engine plus electric motors and a battery). Some HEVs use the electric motor to make more efficient use of petroleum fuel, but the motor cannot power the vehicle alone.
AFV	Alternative Fuel Vehicles	These include electric, solar, biodiesel, ethanol, propane, compressed air, hydrogen, liquid natural gas and liquid petroleum. Because this term focuses on the way a vehicle is propelled rather than its emission levels, an AFV is not necessarily less polluting than a conventional ICE.

[1] https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01

FCEV	Fuel Cell Electric Vehicle	These are vehicles that use a fuel cell, in combination with a battery, to power an electric motor. The fuel cells generate electricity to power the motor, generally using oxygen from the air along with compressed hydrogen.

Figure 1-1 Vehicle Types (Source: Better NZ Trust)



2. Policy, Legislation and Guidance Review

There are many policies and strategies at national, regional, sub-regional and local levels that are creating an increasingly supportive framework for the transition to EV as outlined in the following sections. Selected key examples are summarised in this chapter, helping to set out the policy and legislative foundation for this strategy. The full Policy, Legislation and Guidance Review can be found in Appendix G.

2.1 Recent National and International EV Developments

The UK government is committed to achieving net-zero by 2050 through the changes made to the Climate Change Act 2008[2] in 2023. The inclusion of shipping and aviation will also mean a focus on domestic emissions such as transport. The UK's transport sector has made the least contribution to a reduction in emissions to date (approximately 5%[3]), making it a prime target for future regulation.

The European Union's Directive for Alternative Fuels Infrastructure requires Governments to adopt national policy frameworks for infrastructure roll-out. The UK Government has committed to achieving at least these goals following its departure from the EU.

As stated in the UK Electric Vehicle Infrastructure Strategy[4], the UK Government's ultimate vision is to end the sale of new petrol and diesel cars and vans by 2030 and for these types of vehicles to be fully zero emission at the tailpipe by 2035. For Heavy Goods Vehicles (HGVs) all new medium sized trucks up to and including 26 tonne will be zero emissions from 2035, with the heaviest, above 26 tonnes by 20404. The UK's current objectives are set out in "Decarbonising Transport – A Better Greener Britain"[5].

To this end, the UK's Committee on Climate Change (CCC) targeted the Ultra-Low Emission Vehicle (ULEV) market to reach 9% share of new vehicle sales by 2020 and 60% by 2030. The UK exceeded its 2020 target, with PHEV and BEV totalling 10.7% market share in December 2020.

2.2 Key National Strategy, Policy, and Guidance

The Department for Transport's Decarbonising Transport Plan (2021) recognises that transport is the largest contributor to UK domestic greenhouse gas emissions, and that most of these emissions come from passenger cars. It notes that domestic greenhouse gas emissions from transport have been broadly flat over the last 30 years, even as those of other sectors have declined. In fact, the UK's transport sector has made the least contribution to a reduction in emissions to date (approx.5%[3]), making it a prime target for future regulation. It confirms the Government's plan to end the sale of polluting road vehicles by 2030, with all new

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[2] https://www.legislation.gov.uk/ukpga/2008/27/contents
[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/984685/transport-and-environment-statistics-2021.pdf
[4] https://www.gov.uk/government/publications/uk-electric-vehicle-infrastructure-strategy

[5] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1009448/decarbonising-transport-a-better-greener-britain.pdf

cars and van sold to be fully zero emission at the tailpipe from 2035 and sets an ambition to phase out all new non-zero emission road vehicles by 2040, from motorbikes to HGVs. However, it also notes that a transition to zero emission cars and lorries alone will not be sufficient to meet national climate goals, nor address other harms such as congestion or road danger, and that increasing car occupancy and the share of trips taken by public transport, cycling and walking is therefore also critical.

The UK Net Zero Strategy (2021) echoes this message, and states that future Local Transport Plans produced by local authorities will need to demonstrate how local areas will deliver quantifiable carbon reductions in line with net zero targets. This confirms the approach set out in the Government's Ten Point Plan for a Green Industrial Revolution (2020).

The National Electric Vehicle Charging Infrastructure Strategy "Taking Charge" (2022) sets out a plan to remove charging infrastructure as both a perceived and a real barrier to the adoption of electric vehicles. It recognises that predictions of the future mix and number of charge points is uncertain but aims to make EV charging cheaper and more convenient than refuelling at a petrol station. It states that there should be around 300,000 public charge points as a minimum in the UK by 2030 "but there could potentially be more than double that number". It sets out plans for a £950m Rapid Charging Fund to support the rollout of at least 6,000 across England's motorways and major A-roads by 2035, and a further £500m to support local authorities to plan and deliver public EVCI.

The PAS 1889:2022 Accessible Charging specification for electric vehicles provides guidance on accessibility requirements for EV chargepoints, EV parking spaces and the built environment surrounding chargepoints. This includes aspects such as available footway space, user interface, space to manoeuvre from the vehicle to the chargepoint among other things. Both the BSI Group and the British Standards Institute encourage all chargepoint operators within the borough to adopt these specifications as far as practicable.

2.3 Regional Strategy and Policy

Transport for the North's (TfN) *Strategic Transport Plan* (2019) outlines a robust case for transformational transport investment across the North, including a rapid increase in the number of public charging points across all areas of the North to ensure that EV drivers can easily locate and access EV charging infrastructure that is affordable, efficient, and reliable.

Building on this, their *Transport Decarbonisation Strategy* (2021) sets out how TfN and partners across the North are committing to a regional near-zero carbon surface transport network by 2045. This supports TfN's key aims for improving localised air quality, which are:

- A 55% reduction in emissions from 2018 to 2030, achieved mostly through mode-shift and demand reduction, and;
- A 95% reduction in emissions from 2018 to 2040, reflecting longer-term decarbonisation measures, such as a high proportion of zero emission vehicles in the vehicle fleet.

The Cheshire & Warrington Energy and Clean Growth Strategy (2018) sets out the energy challenges facing the sub-region, and how to meet the challenge of delivering 'affordable energy and clean growth'. The strategy notes that the Cheshire and Warrington Local Enterprise Partnership (LEP) has a role in promoting low carbon technologies and making new development sustainable, including promoting EV charging infrastructure.

2.4 Local Strategy and Policy

The *Cheshire East Local Transport Plan 4 (LTP4)* published in 2019 outlines a long-term strategy for travel and transport within Cheshire East. The LTP4 was adopted during October 2019 and covers the period of 2019 to 2024. The LTP4 includes a high-level parking strategy that highlights the potential to install on-street charging points, alongside the wider roll out of EV infrastructure. The CEC *Corporate Plan (2021)* states that by 2025 CEC wants investment in EVs in the key service centres which requires securing a supplier and installing chargepoints in Cheshire East car parks. The success of this will be measured as all CEC-owned car parks in key service centres having at least one EV chargepoint. Enabling the transition to EV will contribute to priority outcomes:

- GREEN – through proposals that would improve EV charging provision across the borough, the Council will further encourage the early adoption of EVs which will positively contribute both to our response to the climate emergency and also to reducing the incidence of air quality problems, especially in urban areas.

- FAIR – the proposals are intended to create greater consistency and availability of access to EV charging, removing some of the long-standing barriers to purchase and use of EVs within the borough.

The *Environment Strategy 2020-2024* published in 2020 outlines the Council's response to their climate emergency declaration and becoming carbon neutral by 2025. The strategy highlights the commitment to producing this EV Infrastructure Strategy to outline the ambition to increase electric charging infrastructure provision and seek funding opportunities and initiatives which encourage the uptake of EV usage. The Strategy will also determine the most appropriate locations across the borough depending on the need, land availability, power provision and types of charging points to be installed.

Additionally, the *Local Plan* published in 2017 is the Statutory Development Plan for Cheshire East and is the basis for determining planning applications. The Local Plan document sets out the overall vision and planning strategy for development in the borough and contains planning policies to ensure that new development addresses the economic, environmental, and social needs of the area. It also identifies strategic sites and locations that will accommodate most of the new development needed.

2.5 Summary

This policy review has shown that there is support for CEC's transition to EVs at all spatial levels, and an increasingly supportive policy and legislative framework is emerging. Specific aspects of the above policies and strategies have also informed later chapters of this document covering the evidence base and option development.

3. Technology Review Summary

This chapter summarises the various EV and charging technologies available, as well as current trends in the development of this technology. More detailed analysis is provided within Appendix A.

3.1 Electric Vehicle Trends

Currently, there is a major industry shift from diesel / petrol engines to EVs which currently is the only mature technology offering a workable alternative to Internal Combustion Engine (ICE) vehicles.

This shift is being partly driven by consumer demand amongst early adopters and also UK government legislation that is phasing out the sales of new ICE cars/vans by 2030, with plug-in hybrid engines phased out by 2035.

Early research shows that EV consumers preferred to charge at home overnight or at work during the day. Most early EV adopters have off-street parking enabling them to charge at home overnight, although this capability is greatly curtailed in some residential areas, particularly flats and terraced housing without access to off-street parking often in the denser urban areas.

Table 3-1 shows the growth for BEVs and PHEVs since 2013. This shows that there is still a low national population of BEVs (633,051 end of 2022 (SMMT)), which represents 2.91% of the UK car population, and indicates that the UK is still at the early adopter stage. There was a clear increase in the number of BEV sales during 2022, but this only accounted for 267,791 out of approximately 2.2 million vehicles sold that year.

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Table 3-1 SMMT Figures

Year	BEV	PHEV	Total	Volume	% BEV	% PHEV	% Total	BEV Growth	PHEV Growth
2013	2,512	1,072	3,584	2,264,737	0.11%	0.05%	0.16%	-	-
2014	6,697	7,821	14,518	2,476,435	0.27%	0.32%	0.59%	4,185	6,749
2015	9,934	18,254	28,188	2,633,503	0.38%	0.69%	1.07%	3,237	10,433
2016	10,264	26,643	36,907	2,692,786	0.38%	0.99%	1.37%	330	8,389
2017	13,597	33,666	47,263	2,540,617	0.54%	1.33%	1.87%	3,333	7,023
2018	15,474	44,437	59,911	2,367,147	0.65%	1.88%	2.53%	1,877	10,771
2019	37,850	34,734	72,584	2,311,140	1.64%	1.50%	3.14%	22,376	-9,703
2020	108,205	66,877	175,082	1,631,064	6.63%	4.10%	10.73%	70,355	32,143
2021	190,727	114,554	305,281	1,647,181	11.58%	6.95%	18.53%	82,522	47,677
2022	267,791	149,764	417,555	2,183,908	12.26%	6.86%	19.12%	77,064	36,210
Total	**663,051**	**497,822**	**1,160,873**	**22,748,518**	2.91%	2.19%	5.10%	-	-

3.2 Electric Vehicle Technologies

UK policy is encouraging the development and uptake of all forms of transport to reduce urban air pollution and greenhouse gas emissions.

3.2.1 Electric Vehicle Technology Roadmaps by Vehicle Type

The UK Automotive Council has developed long-term technology roadmaps for electric passenger car, bus, and commercial vehicle technology, representing the vision of vehicle manufacturers to 2040. These roadmaps show electric drivetrain technology as a focus area for passenger cars and light vans to 2050, given the drivers towards reducing emissions.

3.2.2 Cars

The passenger car technology roadmap applies to private consumer vehicles, taxi and private hire fleets, car share, individual business, and pool cars. Many EVs are now available to support these use cases with more models scheduled for release by manufacturers in the coming years. The quoted range on a full battery varies by model, and with driving style and weather conditions. Table 3-2 provides some examples of ranges for currently popular EVs. It should be noted that currently EVs are comparatively more expensive to purchase/lease than ICEs, however there is a downward trend and price parity is expected to be reached by the mid to late 2020s.

Table 3-2 Current EV Market (Cars)

EV Model	Price	Battery Capacity	Range
Vauxhall Corsa-E	£25,805	50 kWh	209 miles
Nissan Leaf	£26,995	39/ 59 kWh	140/ 239miles
Renault Zoe R110 ZE40	£26,795	52 kWh	195 miles
Vauxhall Mokka-E	£29,365	50 kWh	209 miles
BMW i3 120 Ah	£31,305	37.9 kWh	145 miles
Kia E-Niro ('2')	£32,445	64 kWh	230 miles
Hyundai Kona	£32,550	64 kWh	245 miles
Kia Soul EV	£34,995	64 kWh	280 miles
Volkswagen ID.3 (Tour)	£38,815	77 kWh	280 miles
Kia EV6	£40,945	77.4 kWh	328 miles
Volkswagen ID.4	£41,430	77 kWh	320 miles
Hyundai Ioniq 5	£43,000	73 kWh	298 miles
Nissan Ariya	£43,140	63 kWh	223 miles
Volvo C40 Recharge	£44,800	78 kWh	273 miles
Tesla Model 3	£44,990	57 kWh	235 miles
Ford Mustang Mach-E	£47,580	91 kWh	379 miles
Tesla Model Y (Long Range)	£54,990	75 kWh	331 miles
Audi e-Tron	£61,310	95 kWh	252 miles

3.2.3 Vans

Light vans can also make use of EV and hybrid technologies, providing an important opportunity for reducing urban emissions from local delivery solutions and business vans. Table 3-3 provides examples from the current market range and includes the load capacity to provide an indication of each vans size.

Table 3-3 Current EV Market (Vans)

EV Model	Price	Battery Capacity	Range	Load Capacity (m^3)
Peugeot Partner/Citroen Berlingo	£ 23,030	50 kWh	171 miles	3.3-3.7
Peugeot e-Expert/Citroen e-Dispatch/ Vauxhall Combo-e/ Vauxhall Vivaro-e	£ 25,000	50/ 75 kWh	143/ 211 miles	>6.6
Peugeot e-Boxer/Citroen e-Relay	£ 49,395	37/ 70 kWh	73/ 169 miles	8
Fiat E-Ducato	£ 59,699	47/ 79 kWh	142/ 224 miles	10-17
Ford E-Transit	£ 42,695	68 kWh	196 miles	15.1
LEVC van (PHEV)	£ 46,500	31 kWh	61 miles	5
Maxus EV80	£ 24,614	56 kWh	120 miles	10.2
Maxus e Deliver 3	£ 22,800	35/ 52.5 kWh	150/ 213 miles	6.3
Maxus e Deliver 9	£63,000	51.5/ 72/ 88 kWh	112/ 146/ 185 miles	9.7 - 11
Mercedes e Sprinter	£ 51, 950	35 kWh	71 miles	10.5
Mercedes e Vito	£ 39,895	35 kWh	93 miles	6.6
Nissan eNV200	£ 20,005	40 kWh	124 miles	4.2
Renault Kangoo ZE	£ 24,480	33 kWh	143 miles	4.6
Renault Master	£ 57,040	33 kWh	124 miles	13
Renault Zoe E-Tech Electric Van	£28,740	52 kWh	245 miles	1
Toyota Proace Electric	£41,195	75 kWh	205 miles	5.3
VW ABT e-Transporter	£ 42,060	37.3 kWh	82 miles	6.7

3.2.4 Heavy Duty Commercial Vehicles

Heavy duty commercial vehicles remain a challenge for EV technology primarily due to their weight, payload, and range requirements. Several companies are now investing in alternative technology solutions to reduce emissions from heavy freight, such as:

- Creating all-electric powertrains;
- Adding self-driving features; and
- Adding new fleet logistics systems to standard rigs to improve efficiencies and emissions.

3.2.5 Buses

The UK Government has provided funding towards the deployment of low emission buses. A variety of EV technologies are already used on buses, including battery electric, hybrid, plug-in hybrid, hydrogen fuel cell and biomethane models. This enables operators to choose appropriate low carbon technology solutions to meet their needs.

CEC's Bus Service Improvement Plan (BSIP) supports a shift to low- and zero-emission in total bus fleet. The council commit to working with industry partners to retrofit their entire bus fleet to Euro VI standards by 2030 (or before) or where appropriate have new technologies operating on key services across the borough.

3.3 Electric Vehicle Availability

This section provides a summary of current plug-in availability in the UK. As of December 2022, there were 188 plug-in car models registered in the UK – a 63% increase on 2021 figures. Of which, there were 86 BEVs and 97 PHEVs. The second-hand EV market is also growing with the number of BEVs transactions rising by 37.5% and PHEVs 3.6% in 2022 compared to 2021 figures despite the number of overall second-hand transactions falling by 8.5%. One factor that is likely to result in a rise of EV sales for the area in future is the adoption of clean area zones which are operational in some of the UK's larger cities including Birmingham, Bristol and London and is currently being considered for Greater Manchester. Adjacent to Cheshire East, if adopted this would affect residents and travel behaviour in both areas.

3.3.1 Battery Capacity

Analysis of the BEV vehicles on the market shows how battery capacity is growing; the Electric Vehicle Database states that the average range of electric vehicles is 225 miles (Electric Vehicle Database, 2023). However, there will be lower capacity batteries within the fleet from models sold in previous years that consequently have lower mileage ranges. Whilst this will affect the average range of current BEVs, it will become less of a concern as the existing fleet grows because more recent models have a longer range.

3.3.2 Battery Charging Capabilities

Prior to 2016, most EVs charged at 3 kW AC (alternating current), called slow charging, which was adequate to fully recharge most batteries (typically up to 24 kWh) overnight. Rapid charging DC (direct current) technology has developed much faster than AC technology, giving consumers a faster method to recharge. However, only some plug-in models prior to 2016 are capable of rapid charging; while all new UK plug-in models to 2021 are capable of being rapidly charged.

Most vehicle manufacturers now use the Combined Charging System (CCS) or CHAdeMO[6] DC socket/ plug for rapid charging. The latest development in charging technology introduces charging at powers between 100 kW and 350 kW DC, referred to as 'high-power charging'. However, there are relatively few Plug-in Vehicles (PIV) currently available in the UK that are capable of charging at this rate. The majority of high-power charging solutions use the CCS DC socket/ plug; however, and the remaining manufacturer using the CHAdeMO socket/ plug (Renault) is transitioning to CCS DC.

The roll-out of high-power chargers at 150 kW+ for public use is now beginning in the UK. Most are designed to also deliver 50 kW DC charges to rapid chargeable vehicles to combat the current lack of high-power charging demand. Slow and fast AC charging solutions will continue to be required in the UK to support the recharging needs of the existing EV fleet and residential / destination charging use cases. Of those currently available rapid chargeable PIVs, approximately 50% require the CHAdeMO connector. Therefore, new rapid chargers installed over the

[6] This is an abbreviation of 'CHArge de MOve'.

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coming years will require both DC CCS and CHAdeMO connectors. The improvement in battery capacity, together with reduced charging times, is likely to affect consumer behaviour over the coming years.

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4. Cheshire East EV Baseline

This section describes the existing levels of EV uptake, the level of charging infrastructure and electricity supply network in Cheshire East, as well as a comparison against the EV charging infrastructure progress being made by similar local authorities within the UK. To inform potential future locations of charging infrastructure, this section also presents a review of the key factors that can influence charging demand in Cheshire East, including areas of limited off street parking, household type and income levels across the borough, as well as commuter journey patterns.

4.1 Cheshire East Plug-In Vehicle Uptake

Since the volume of PIVs registered in an area drives the demand / viability for recharging services, we have summarised the current vehicle statistics for the Cheshire East area using the latest available DfT data, which reports vehicle uptake by Local Authority (LA) area to Q2 2022.

Table shows PIV uptake to Q2 2022 in Cheshire East. The table presents Cheshire East and UK overall figures for comparison. PIV registration is slightly below the national average but as ratio where 100% is full adoption comparing 2.11% with 2.39% is not significant.

Table 4-1 Cheshire East PIV Adoption

District / Area	Total Registered Cars & Light Goods Vehicles as of Q2 2022	Total Registered PIV as of Q2 2022	PIV as % of Total Registered Vehicles as of Q2 2022
Cheshire East	250,667	5,285	2.11%
UK	37,715,246	901,488	2.39%

Table summarises the population and vehicle density figures for Cheshire East and the UK, gross Disposable Household Income (GDHI) and percentage of dwellings without off-street parking. Lack of off-street parking spaces in residential areas limits the ability of PIV drivers to recharge their vehicles at home and suggests the requirement for more public charging facilities in the future as PIV uptake rises.

Table 4-2 Relevant Demographic Data for Cheshire East

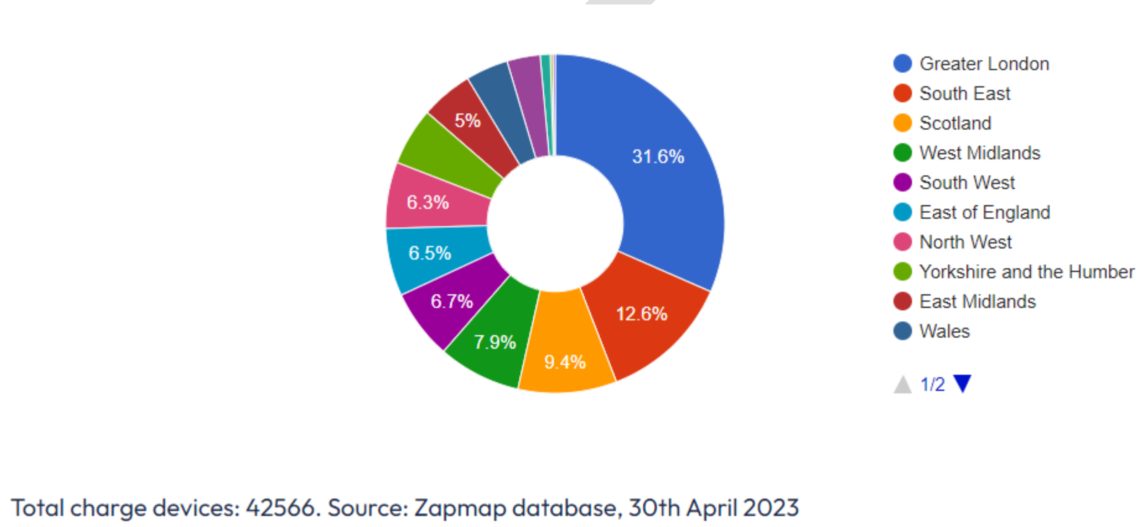
District / Area	Estimated Population Mid-2019	Vehicles / head of population	% Of Terraced homes and flats unlikely to have off street parking	£ GDHI
Cheshire East	384,152	0.634	10.89%	£24,524
UK	66,796,807	0.55	22.07%	£21,109

Table demonstrates that Cheshire East has a higher-than-average number of vehicles per head, a higher gross disposable household income per head, and the area's percentage of dwellings without off-street parking is lower in comparison with the UK average.

4.2 Existing Charging Infrastructure / Electricity Supply Network

Error! Reference source not found.Error! Reference source not found.Error! Reference source not found. illustrates recent Zap-Map data from different regions of England. This data suggests the North West region is comparable to other regions outside of the populous South East, namely the West Midlands, East of England and South West.

Figure 4-1 Total Connectors by Nation and Region (source: Zap-Map)



According to the National Chargepoint Registry (NCR), the UK has 29,118 charging outlets provided for public use, while Zap-Map (**Error! Reference source not found.Error! Reference source not found.**) reports 68,512 connectors from 42,566 devices in 24,909 locations. This variation can be explained because there is no requirement to report chargepoints to the NCR except in circumstances such as government grant funding, whereas ZapMap has an interest in being maintained up to date because it is a commercial resource meaning that chargepoint operators may increase the use of their chargepoints by being registered with ZapMap.

Figure 4-2 UK Publicly Accessible Chargepoints Summary (Source: Zap-Map)

Forecasts of the number of chargepoints that are needed to serve the anticipated number of EVs in Cheshire East have been produced as part of this EV Charging Strategy. This shows that above 300 publicly available chargepoints are needed by 2025 rising to around 1300 chargepoints by 2030. This is a large increase on the current number of publicly available chargepoints which according to UK Government figures was 153[7] in April 2023.

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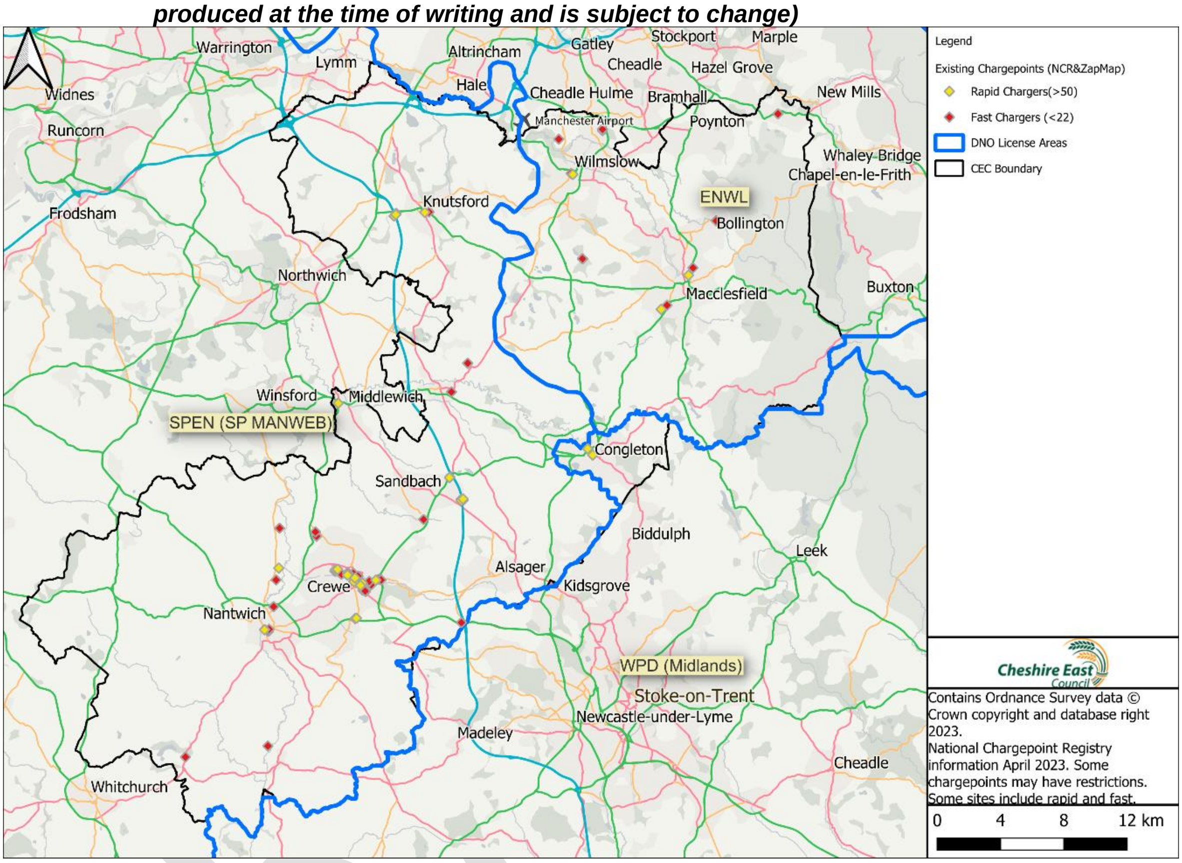
[7] https://maps.dft.gov.uk/ev-charging-map/index.html

Error! Reference source not found. Error! Reference source not found.shows the locations of the existing publicly accessible EV charging points in Cheshire East. This map has been created using National Chargepoint Registry and Zap-Map data, where the only available information are their charging speed and their coordinates.

Figure 4-3 Existing Publicly Accessible Chargepoints and DNO boundaries (note: this map was produced at the time of writing and is subject to change)



The figure also shows the boundaries of the three Distribution Network Operators (DNOs) covering parts of Cheshire East:

- Western Power Distribution (WPD);
- Scottish Power Energy Networks (SPEN); and
- Electricity North West Limited (ENWL).

It is important to identify the electricity network provider covering an area where EV charging infrastructure is proposed. This is because every DNO has different procedures that must be followed in proposing a potential location, and successful engagement with the DNO can reduce costs incurred in proposing locations where network capacity is too low to facilitate an additional charger.

The existing charging infrastructure in Cheshire East includes Sandbach motorway services which features rapid chargers on each side of the motorway, however these chargepoints will be more suitable for longer distance journeys than serving local residents. A survey of rapid chargers in Cheshire East also revealed that the private sector is installing chargers including some KFC, Morrisons, Lidl, Sainsburys, Shell and BP locations, as well as other establishments such as hotels and a health club.

There is a notable lack of charging infrastructure in the east of the borough and the Macclesfield, Congleton and Poynton areas in particulars. There are also limited numbers of chargepoints in rural areas.

Initial discussions with the respective DNOs for Macclesfield and Congleton have also identified these areas as having constrained capacity in the electricity network. This issue could limit the potential to provide EV charging in these areas and is a key area for future investigation to develop solutions to overcome these constraints.

To understand how the existing level of infrastructure provision in Cheshire East compares with other local authorities, shows**Error! Reference source not found.** a comparison of chargepoints in Cheshire East against a number of similar sized authorities, in terms of population. When comparing with authorities if a similar size, Cheshire East has a higher number of devices per 100,000 than the average of 34 devices (taken from the authorities listed below). Despite this, the number of devices per 100,000 people in Cheshire East (38) is below the UK average of 60 (ZapMap, 2023), indicating that more infrastructure is required to satisfy and stimulate demand.

Table 4-3 CEC Area Charging Outlets Against Comparative Areas (Source: NCR, December 2020)

District/ Area	Population (mid-2023)	Total Number of Devices	Number of Devices per 100,000
Cheshire East UA	400,528	153	38
Cheshire West and Chester	357,699	114	32
East Riding of Yorkshire	343,143	123	36
Wakefield	353,802	112	32
Leicester	366,018	114	31
Bournemouth, Christchurch, and Poole	300,109	124	31
Dorset	381,292	156	41
United Kingdom	68,901,184	42,566	1,619

4.3 Committed chargepoint installations

The CEC has secured funding from Office for Zero Emission Vehicles (OZEV) and as part of the On-Street Residential Charging Fund (ORCS) programme has committed to install chargepoints at the locations in Table 4-4Table below in the first half of 2024. A technical assessment was then conducted on the long list of potential locations to identify feasible sites that meet the Government's criteria for receiving funding through ORCS.

Sites for the installation of chargepoints are a mixture of on-street locations and car parks that are conveniently located near to residential properties that do not have off-street parking. 7kWh chargepoints are planned at each location in line with Government guidance, as these enable users to conveniently charge their vehicle for longer periods of time near to their residence.

The proposed locations for installation of chargepoints as part of this phase of delivery are detailedTable below:

Table 4-4 ORCS Chargepoint Locations

Sites	Area	Postcode	Location Type
Fairview Car Park	Alsager	ST7 2AE	Off-street
Antrobus Street Car Park	Congleton	CW12 1HB	Off-street
Wrexham Terrace Car Park	Crewe	CW1 2ND	Off-street
Bulkeley Street	Crewe	CW1 6ET	On-street
Edleston Road Car Park	Crewe	CW2 7DG	Off-street
Hope Street Car Park	Crewe	CW2 7DR	Off-street
King Street Car Park	Knutsford	WA16 6DX	Off-street
Tatton Street Car Park	Knutsford	WA16 6AG	Off-street
Brook Street	Macclesfield	SK11 7AW	On-street
Churchill Way Car Park	Macclesfield	SK11 6AY	Off-street
Whalley Hayes Car Park	Macclesfield	SK10 1BS	Off-street
Southway Car Park	Middlewich	CW10 9BL	Off-street
Snow Hill Car Park	Nantwich	CW5 5LS	Off-street
Chapel Street Car Park	Sandbach	CW11 1DH	Off-street
The Carrs Car Park	Wilmslow	SK9 4AA	Off-street

Another CEC-led committed site of note which will include EV charging infrastructure is the Royal Arcade development, which is located in Crewe town centre. The Royal Arcade is a leisure-led mixed-use development agreement which will have a new bus station and multi-storey car park. There are plans for EV charging infrastructure to be included within the multi-storey car park.

It should be noted the sites proposed in this report are the next phase of delivery, and in parallel a wider programme of EV chargepoint delivery is being developed through a strategic procurement exercise. This parallel work is positioning CEC to apply for the Government's newly announced Local Electric Vehicle Infrastructure (LEVI) fund and will consider further locations for the delivery of chargepoints.

The LEVI fund is anticipated to include the flexibility to install further chargepoints for residents who do not have off-street parking and other types of chargepoints in town centres to fill key gaps in the network. This wider programme is also linking with other workstreams across CEC including decarbonisation of the Council's fleet vehicles and plans to establish a car club.

4.4 Baseline conditions influencing future demand

A range of key factors can influence charging demand in different areas, including access to off-street parking spaces, demographics, and key traffic routes. As such, a review of these factors has been completed for the Cheshire East area in order to inform potential future locations of charging infrastructure.

4.4.1 Household Type

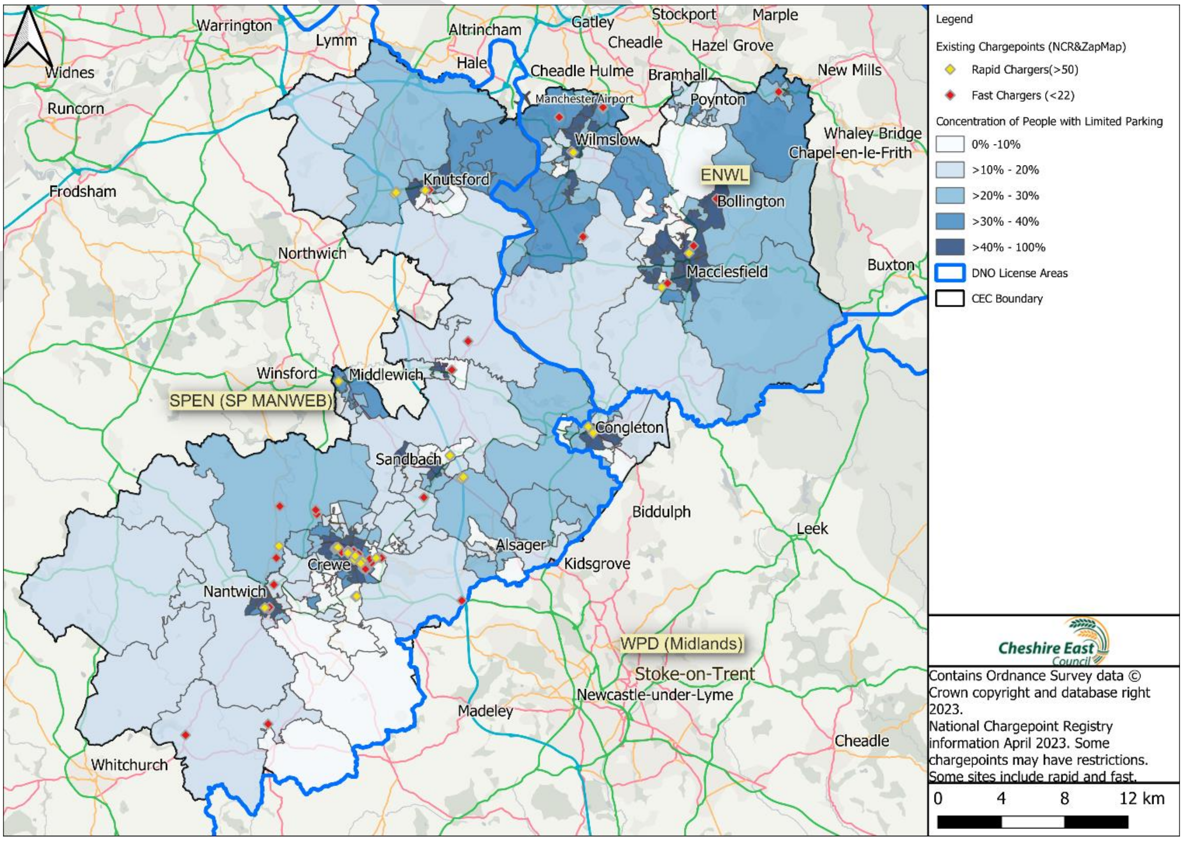
Not every household in Cheshire East has access to off-street parking, which can accommodate individual charging points. People without access to off-street parking might therefore be discouraged to shift to EVs because of this reason. This section of the report presents the local household access to off-street parking and identifies potential areas where higher demand for on-street charging demand may exist.

To carry out this analysis, Census household data has been gathered. This has included a review of household characteristics to identify types of dwellings likely to have access of driveways and garages. The following dwelling types were considered to have limited off-street parking availability:

- Whole house or bungalow: Terraced (including end-terrace);
- Flat, maisonette or apartment: Purpose-built block of flats or tenement;
- Flat, maisonette or apartment: Part of a converted or shared house (including bed-sits);
- Flat, maisonette or apartment: In a commercial building; and
- Caravan or other mobile or temporary structure.

The output of this analysis has been mapped in **Error! Reference source not found.** and**Error! Reference source not found.** shows the density of dwellings with limited off-street parking in the principal towns and key service centres in Cheshire East, along with the existing charging points.

Figure 4-4 Existing Charging Points and Limited Off-Street Parking Availability (note: this map was produced at the time of writing and is subject to change)



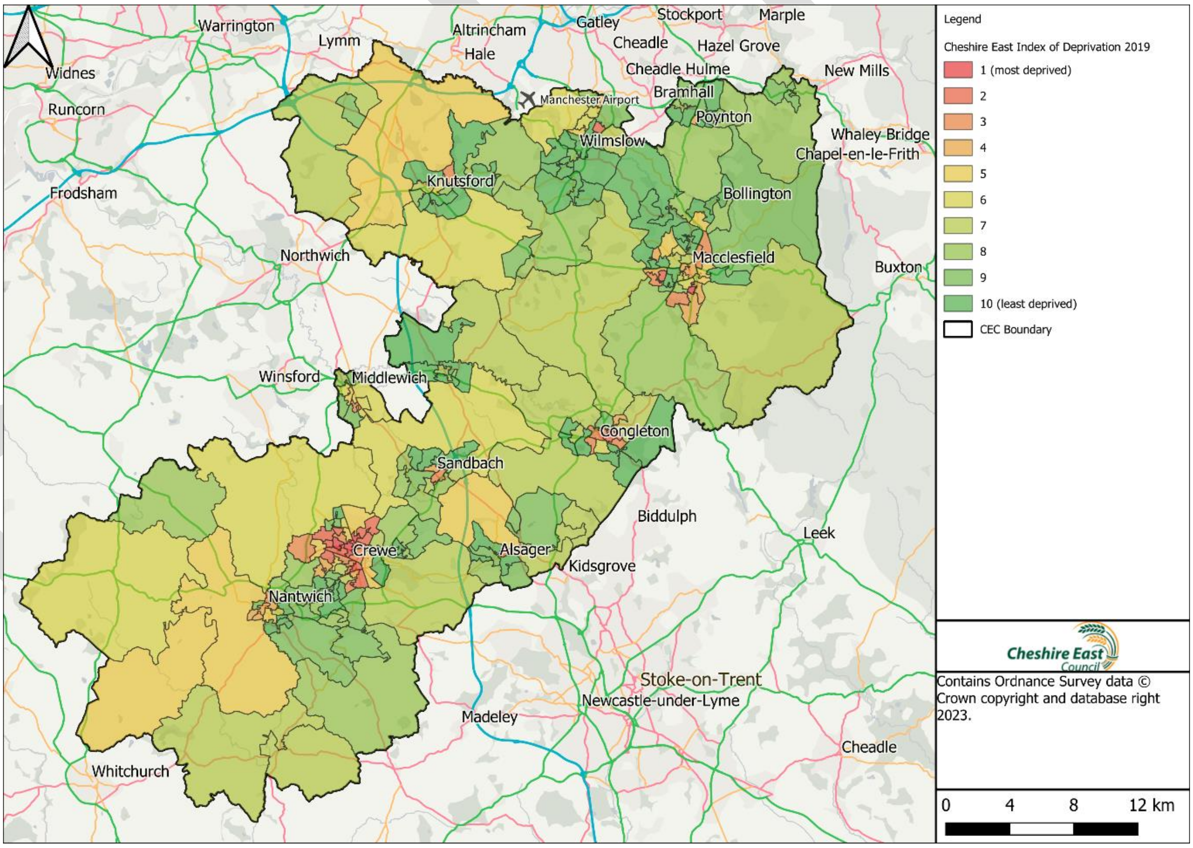
As expected, most areas without off-street parking are in the denser urban areas. Examples include Macclesfield, Crewe, Nantwich, Knutsford, and Wilmslow. The area to the north-east of Poynton is more rural in nature and has the Macclesfield canal passing through it, so may represent a high concentration of dwellings with limited off-street parking such as caravans and boat houses.

4.4.2 Demographic Analysis

There is an established link between income levels and the uptake of EVs in large part due to the higher cost of EVs versus Internal Combustion Engines and the limited second-hand market. Price parity for EVs is expected to be achieved by the mid to late 2020s due to the falling price of batteries and increasing supply of vehicles. For the purposes of understanding where stronger uptake of EVs may come forward, data regarding income levels has been analysed, however this strategy also considers how a balanced network can be provided across the borough.

Error! Reference source not found.Error! Reference source not found. shows the Index of Multiple Deprivation (IMD) across Cheshire East. The IMD is the official measure of relative deprivation for small areas in England and ranks every area from 1 (most deprived area) to 32,844 (least deprived area).

Figure 4-5 Index of Multiple Deprivation in Cheshire East (note: this map was produced at the time of writing and is subject to change)



Error! Reference source not found.Error! Reference source not found. suggests the most deprived areas of Cheshire East can be found within the inner parts of the large urban centres including Crewe, Congleton, and Macclesfield. The least deprived areas are outside of the centre of the principal towns, within the rural areas, and in the north of Cheshire East including Wilmslow, Knutsford, and Holmes Chapel.

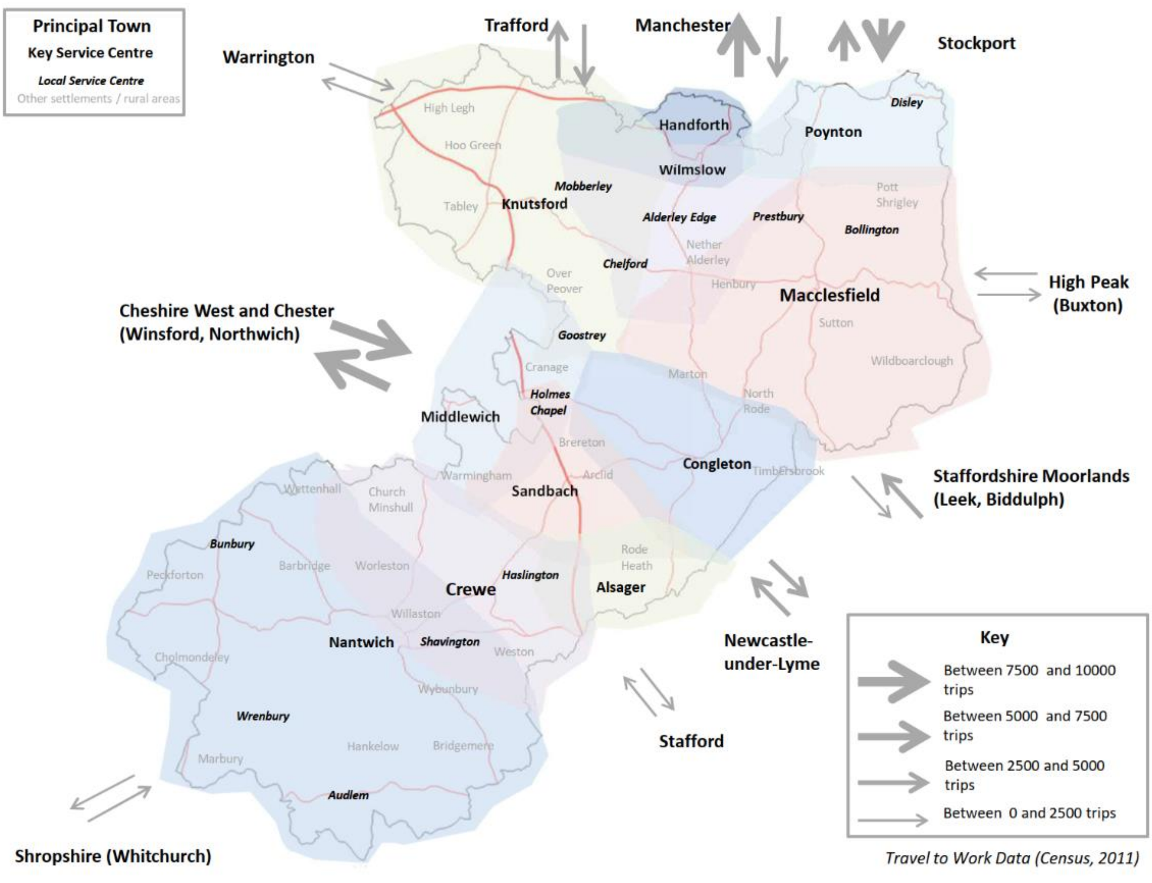
4.4.3 Commuter Journeys

To understand the possible demand for rapid charging, an analysis of commuter journeys has been undertaken to identify key routes across the borough and between adjacent areas. These routes are expected to experience a higher volume of traffic and there may be a requirement for EV top up charging.

Analysis of travel to work data contained in CEC's Local Transport Plan has been pulled through into this strategy to understand the dominant movements to and from Cheshire East. The spatial nature of journeys in and out of Cheshire East is displayed in Figure 4-6**Error! Reference source not found.Error! Reference source not found.** below.

From this analysis, it can be seen there are a high number of commuting trips to and from Cheshire West and Chester. Journey flows to and from the north, mainly Manchester and Stockport, are also high, with lower traffic demand to/from the south and east of Cheshire East.

Figure 4-6 Travel to Work flows (Census, 2011)



The amount of charging points should also be influenced by the mode share and distance travelled. Table Table andTable Table summarise the information extracted from Travel to Work data within the Census 2011, which gives an idea of these two key factors within Cheshire East. This data alongside information regarding demographics has been fed into the classification tool presented in section 4.5.

Table 4-5 Commuter Mode of Transport (Census 2011)

Mode	Principal Towns / Key Service Centres										
	Alsager	Congleton	Crewe	Handforth	Middlewich	Poynton	Knutsford	Macclesfield	Nantwich	Sandbach	Wilmslow
Work from Home	7%	9%	4%	7%	8%	9%	12%	7%	11%	6%	10%
Under-ground, metro, light rail, tram	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%
Train	2%	3%	2%	5%	2%	5%	2%	3%	2%	3%	5%
Bus, minibus, or coach	2%	1%	3%	2%	1%	1%	1%	2%	1%	2%	1%
Taxi	0%	0%	0%	1%	0%	0%	0%	1%	0%	0%	0%
Motorcycle, scooter or moped	1%	1%	1%	0%	0%	0%	0%	1%	1%	1%	0%
Driving /passenger in a car or van	76%	75%	71%	73%	79%	71%	72%	71%	73%	78%	72%
Bicycle	1%	1%	5%	2%	2%	4%	4%	2%	3%	2%	1%
On foot	6%	9%	12%	9%	7%	7%	9%	13%	9%	8%	9%
Other method of travel to work	1%	1%	0%	1%	1%	1%	1%	1%	1%	0%	1%

Table 4-6 Distance Travelled to Work (Census 2011)

Mode	Principal Towns / Key Service Centres										
	Alsager	Congleton	Crewe	Handforth	Middlewich	Poynton	Knutsford	Macclesfield	Sandbach	Wilmslow	Nantwich
Less than 2km	9%	18%	23%	16%	12%	11%	13%	23%	16%	14%	13%
2km – 5km	7%	9%	27%	17%	6%	10%	8%	16%	6%	11%	7%
5km – 10km	21%	6%	11%	17%	18%	22%	12%	11%	24%	16%	20%
10km – 20km	26%	28%	11%	20%	21%	23%	23%	14%	18%	22%	14%
20km – 30km	6%	8%	5%	4%	11%	5%	10%	9%	7%	6%	7%
30km – 40km	4%	5%	4%	2%	5%	2%	3%	2%	6%	2%	5%
40km – 60km	3%	2%	3%	2%	2%	2%	2%	1%	2%	2%	5%
Over 60km	4%	3%	3%	3%	3%	2%	3%	2%	4%	4%	4%
Work from home	12%	14%	8%	12%	14%	15%	20%	13%	11%	16%	17%
Other	7%	8%	6%	7%	7%	8%	7%	7%	7%	7%	7%
Average Distance (km)	18.2	17.6	14.8	16.8	21.1	16.4	19	15	18.2	19.4	20

4.5 Future EV Uptake

This section outlines the EV uptake model used when forecasting the future uptake of EVs in Cheshire East. The full details can be found in Appendix H.

4.5.1 Uptake Model Overview

EV uptake focuses on two characteristics as outlined in the table below.

Table 4-7: Characteristics defining model diffusion of new vehicles

Characteristic	Description
The rate at which new vehicles are purchased.	This determines the 'churn' of vehicles within the fleet overall. If few new vehicles are being purchased (due to a recession, say) then there will be a substantial slowdown in the transition to EVs as the population of vehicles is not being replaced
The probability of new vehicle purchases being an EV	If the fleet is to transition to EVs, the probability of each new vehicle being an EV should increase to 100%. This aligns with the 2030 target that has been set by the UK Government.

For the first characteristic, the data for income for each Middle Layer Super Output Area (MSOA[8]) and the ratio of new vehicle to existing vehicle registrations was used to generate a probability of new vehicle purchase. This variable alters with income due to the strong relationship between average income and new vehicle purchase rates.

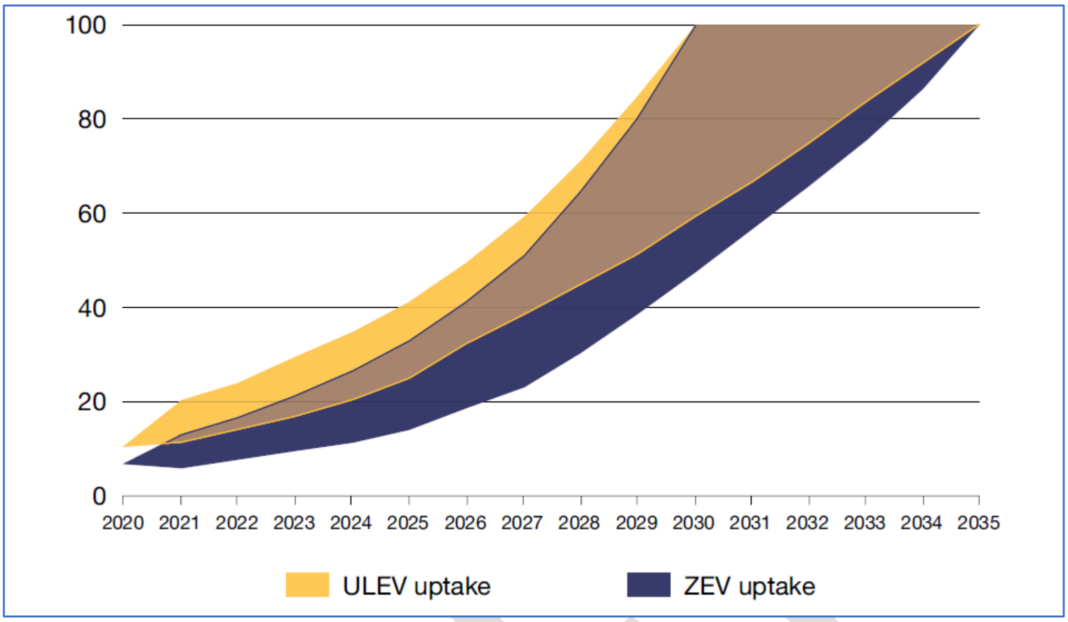
Regarding the second characteristic, a choice model was used which is a technique for providing a systematic method of choosing between multiple options, each of which may have benefits associated with it. The model allows the calculation of the probability of choosing between two distinct, and exhaustive[9] options.

A range of scenarios have been considered to account for the level of uncertainty around available data, modelling variables, and advances in technology to understand what different futures might look like. These cover 'Low', 'Medium' and 'High' vehicle uptake projections that generally align with the range of potential pathways, set out in the 'Transitioning to zero emission cars and vans: 2035 delivery plan' (HM Government, 2021), to achieve their ambitions for 2030 and 2035. **Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.** illustrates these potential pathways for both ULEV (PHEV) and zero emission vehicle (ZEV) private car uptake, showing a predicted range of distribution for each vehicle type (shaded in yellow and blue) and the level of uncertainty (shaded in brown).

[8] MSOA – A government defined area used for aggregation of census statistics

[9] meaning that the options represent the only options available to the purchaser, and they must choose one

Figure 4-7 Potential pathway – Percentage of new car sales accounted for by Ultra Low Emission Vehicles (ULEVs) and Zero Emission Vehicles (ZEVs)



The uptake of new company EVs has historically been at a faster proportional rate than the private market by approximately two years. The same curves have been accelerated by two years to calculate projections for company car and LGV uptake of ULEV (PHEV) and ZEV (BEV).

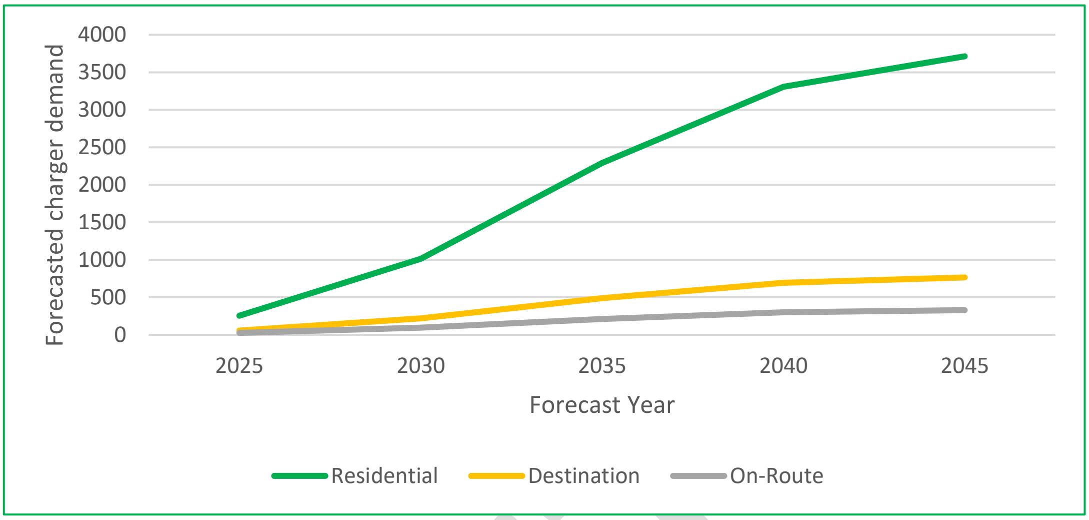
4.5.2 Forecasted Charger Demand for Cheshire East

Forecasted charger demand for Cheshire East is outlined in Table 4-8 below and illustrated in Figure 4-8. By 2030 it is estimated that approximately 1,300 chargepoints will be necessary to meet the demand needs associated with the forecasted EV uptake for Cheshire East. This is across all publicly available charging location types including residential, destination and on-route.

Table 4-8: Forecasted publicly available charger demand for Cheshire East

Residential Parking Type	**Charging Location**		
	Residential	Destination	On-Route
2025	255	57	26
2030	1015	220	96
2035	2289	488	212
2040	3309	693	299
2045	3713	765	329

Figure 4-8 Forecasted publicly available charger demand for Cheshire East



By 2045, an estimated 4,800 chargepoints, nearly 4 times the 2030 figure, will be needed to meet the rising demand for chargepoints to accommodate for the forecasted higher level of EV uptake at that time.

5. Strategic Priorities

This chapter sets out the objectives and outcomes of this strategy, measures that could contribute to meeting these objectives, and an assessment of what measures are most appropriate to be taken forward in the short, medium, and long term.

5.1 Strategy Objectives and Outcomes

Through engagement with industry stakeholders, CEC officers, and a review of relevant data, strategies and policies, the following objectives for the strategy have been set:

- Reducing inequalities in chargepoint provision to enable all of our communities to transition to electric vehicles in a timely way:
- To contribute towards reduced carbon emissions and improved air quality from transport:
- To support the uptake of electric vehicles by individuals, businesses, and organisations within Cheshire East:
- To help ensure infrastructure makes a positive contribution to the streetscape through sensitive placement and appearance, avoiding any negative impacts on other highway users, particularly pedestrians.
- To guide the provision of infrastructure that is safe, easy to use and represents good value for money both on installation and throughout its life;
- Supporting electric vehicles in the context of a wider transport system that encourages mileage reduction, active travel, and public transport: and.
- Cheshire East Council to lead the way in transitioning fleet vehicles to EV and supporting organisations across the wider borough.

The above objectives have guided the development of this strategy and will continue to guide implementation of the key measures set out within it.

Like the Cheshire East Local Transport Plan this strategy will aim to contribute towards the six outcomes of the Council's Corporate Plan[10]:

- **Outcome 1:** Our local communities are strong and supportive;
- **Outcome 2:** Cheshire East has a strong and resilient economy;
- **Outcome 3:** People have the skills and education they need in order to thrive;
- **Outcome 4:** Cheshire East is a green and sustainable place;

[10] https://moderngov.cheshireeast.gov.uk/documents/s72257/Local%20Transport%20Plan%20-%20app%201.pdf

- **Outcome 5:** People live well and for longer; and
- **Outcome 6:** A Responsible, Effective and Efficient Organisation.

5.2 Stakeholder Engagement

EV stakeholders are many and varied, each with their own interests and objectives affecting the EV charging market. During November – December 2022 CEC undertook a consultation on the Draft Electric Vehicle Infrastructure Strategy. This includes engagement with the following stakeholders:

- **Vehicle users** with personal and/or business needs (including taxi and bus operators);
- **Suppliers** of equipment and charging services;
- **Parking services** with responsibilities for car parks where chargepoints are located;
- **Facilities management** with responsibilities for car parks where chargepoints are located;
- **Landowners** – promote the EV charging opportunities available to landowners through Local Authority business forums, workshops, and events;
- **Electricity suppliers** – through Local Authority centralised electricity procurement;
- **DNO grid operators** – Investigate localised areas of power constraint and availability before surveying proposed charging locations;
- **Neighbouring LAs and Town/Parish Councils** – Seeking to work alongside neighbours as well as parish Councils to develop a consistent strategy that works for everyone's emissions reduction objectives. Each organisation will have its own priority locations, but users are likely to span the entire area, so consistent and interoperable charging methods, access and payment tools, fees and parking arrangements are preferable; and
- **Local community** – Consult with the community through the development of the strategy, share information, raise awareness, and improve understanding of the need of an EV charging infrastructure strategy.

Further information on replies to the consultation and details of the Council's subsequent responses can be found in Appendix D: Draft Strategy Consultation.

5.3 Summary of Measures

Table 5-1 below outlines EV infrastructure measures that could contribute to meeting the proposed objectives of this strategy. The rationale and future uncertainties for each proposed measure are also noted.

Table 5-1 Potential Measures

Theme	Potential Measure	Rationale for Measure	Future Uncertainty
Increase number of chargepoints	Provide charging points at car parks for key destinations (e.g., Town Centre, railway stations station, retail parks, leisure centres, libraries and at major employment sites).	Evidence shows that the public highly value the opportunity to top-up at publicly accessible chargepoints to complement the bulk of charging which is carried out at home. Without the public charging infrastructure in place, this could delay the uptake of EVs. Evidence demonstrates that some of the most popular publicly accessible locations for charging EV are key destinations where drivers can park for a significant period of time. A high proportion of current vehicles (and in the short term) are anticipated to be plug-in hybrids which have relatively short ranges and older BEVs have relatively small batteries. Therefore, top up charging at key destinations will support journeys to work and for other everyday purposes such as retail and leisure, at least in the short term.	There is uncertainty regarding the rate of EV uptake due to manufacturing capacities. In addition, price parity between EV and ICE is not expected until the mid to late 2020s which may continue to affect rates of transition. With increasing battery sizes and range the requirement for destination charging may reduce in the medium to long term. With increasing battery sizes and quicker charging times via higher powered chargers the requirement for charging at home may reduce with a move to a situation similar to Internal Combustion Engine refuelling. At present there is no firm evidence for this scenario however and the situation should be monitored as EV technology develops.
	Provide charging points to support residents with limited access to off street parking provision and charging.	Homes in areas with limited off street parking may not have the option to introduce a household charging point and therefore will require alternative public charging points. From the baseline analysis there are notable areas of flats and terrace housing clustered in the town centres which are likely to require on-street charging or alternative public charging car parks close to homes.	

	On-route charging points on the Major Road Network.	As noted above, the opportunity for top up charging is highly valued, particularly for when longer distance journeys are required. Without the infrastructure in place, this could delay the uptake of EVs.	
	Provide chargepoints in rural areas.	Residents of rural areas often have further distances to travel and may experience range anxiety when considering EVs due to a lack of chargepoint infrastructure in the area. It is also quite common for income levels in rural areas to be higher than in urban areas, which may indicate that more people are able to afford an EV, therefore requiring chargepoints.	
	Consider the need for further planning policies to support the roll out of the chargepoint network.	Increase the deployment of chargepoint infrastructure by utilising planning policy to ensure that chargepoints are being provided at new developments where appropriate.	
	Introduce chargepoints for the Council's own fleet and potentially the grey fleet.	This will support the uptake of EVs within the Council's own fleet and any grey fleet.	Price parity is not anticipated to be achieved by the mid to late 2020s however lower operating costs may offset this higher vehicle cost.
Engagement with the District Network Operator	Establish a coordinated approach to continuous engagement and joint working with the District Network Operators (Scottish Power Electricity Networks, Electricity North West, Western Power Distribution) to enable capacity in the power	Scottish Power has conducted the "Charge" project that merges electricity and transport planning to create an over-arching map of where EV chargepoints will be required and where they can be best accommodated by the electric grid. The project will also determine where future upgrades to electricity supply capacity are required to futureproof the network and feed into future business cases to secure investment as part of broad network development. If these locations can be	As noted above, significant uncertainties regarding the supply and uptake of vehicles alongside the availability of V2G technology will affect the level of power required from the grid. Joint work with the DNOs should explore the impact of varying uptake scenarios to inform an assessment of likely upgrades to the network.

	network for all of Cheshire Easts needs including cost effective chargepoints. This will require strategic strengthening of the power network, particularly in Macclesfield and Congleton where capacity is constrained. There is also an opportunity to investigate how distributed renewable energy solutions such as solar power may contribute to addressing power constrictions.	identified this will avoid costly investment later which hinders the business case for charging infrastructure. Similarly, engagement with Electricity North West and Western Power Distribution will be crucial to overcome some of the key electricity power constraints within the Cheshire East area.	
Engagement with taxi industry	Increase provision of rapid charging infrastructure for taxis in convenient locations.	Taxis contribute to air quality issues and carbon emissions, particularly near taxi ranks and key routes into town centres. Engagement with the Hackney carriage (HC) and Private Hire Vehicle (PHV) industry elsewhere in the UK shows that quick top-up charging using rapid chargers in convenient locations is important to enable taxi transition to EV.	If technology around wireless charging develops further into a commercial proposition for taxis, charging infrastructure could be incorporated within taxi ranks or feeder areas.

Engagement with bus operators	Provide charging infrastructure for buses.	In line with the Government's Bus Back Better strategy there is a desire to strengthen local buses and accelerate the move away from diesel to zero-emission buses. The strategy for England reflects the government support to Net Zero bus services.	There is still some uncertainty regarding whether electric or hydrogen will become the dominant technology for buses. Additionally, there is also uncertainty regarding the financial sustainability of local bus networks in some areas of the country and the capacity to incorporate new technology.
Commercial forecourts	Introduce charging forecourts.	Significant sized charging forecourts are being installed in a number of locations on a commercial basis. At present the business case for larger and more extensive hubs is uncertain due to questions regarding the uptake of EV in the short to medium term and how owners will charge their vehicles in the future.	There is uncertainty regarding the rate of EV uptake due to manufacturing capacities. In addition, price parity between EV and ICE is not expected until the mid to late 2020s which may continue to affect rates of transition.
Future technology	Introduce chargepoints for HGVs.	HGVs comprise a significant proportion of traffic and are contributing to air quality issues and carbon emissions. However, at present there is a lack of commercially available EV options for HGVs.	There is significant uncertainty regarding whether electric or hydrogen technology can serve HGVs in the future, what shape this technology would take and the timescales involved.

5.4 RAG Assessment and Sequencing

Following on from the identification of the potential measures, a **R**ed-**A**mber-**G**reen assessment has been conducted for effectiveness against the strategy objectives, and for deliverability. This is reported in the Table below alongside a recommendation for whether the measures are brought forward in the short, medium, or long term.

Table 5-2 RAG Assessment of Potential Measures

Theme	Potential Measures	Effectiveness	Deliverability	RAG Rating Justification
Increase number of chargepoints	Provide charging points at car parks for key destinations (e.g., Town Centre, railway stations station, retail parks, leisure centres, libraries and at major employment sites).			Providing charging infrastructure at key locations will give people the confidence to transition to EVs. A mixture of slower and rapid chargepoints could be delivered at particular sites depending on the length of stay of users.
	Provide charging points to support residents with limited access to parking provision and home charging.			This measure would increase the visibility of charging infrastructure and may increase confidence amongst residents for investing in EVs. However, introducing on-street charging may be met with resistance from some residents, particularly if EVs have parking priority in spaces with charging infrastructure. Concerns have been raised regarding cables trailing across pavements and solutions will be needed to ensure charging infrastructure does not negatively impact on accessibility for highway users. Detailed planning and engagement is required to identify appropriate locations.
	On-route charging points on the Major Road Network.			Public surveys point to the availability of top up charging being key to the uptake of EVs. This option is deliverable due to Council land ownership. There is also likely to be a need for fleet vehicles who need to charge whilst operating.

Theme	Potential Measures	Effectiveness	Deliverability	RAG Rating Justification
	Providing chargepoints in rural areas			At present there is market failure with limited numbers of chargepoints in rural areas in Cheshire East. There is therefore a need for the Council to improve the situation and offer options for residents and other stakeholders.
	Introduce chargepoints for the Council's own fleet and potentially the grey fleet.			This measure is already being delivered by the Council in a phased way.
	Consider the need for further planning policies to support the roll out of the chargepoint network.			Updating planning policy will assist in shaping and developing the chargepoint network.
Engagement with the District Network Operator	Establish a coordinated approach to continuous engagement and joint working with the District Network Operators (Scottish Power Electricity Networks, Electricity North West, Western Power Distribution) to enable capacity in the power network for all of Cheshire Easts needs including cost effective chargepoints. This will require strategic strengthening of the power network,			Although this strategy is identifying feasibility for the short-term provision of sites it is clear from initial discussions with the DNOs that strategic investment is required in particular for Macclesfield and Congleton to address a general lack of electricity capacity in the network. Additionally, further network strengthening may be required more widely within the borough in the longer term to support the large-scale uptake of EVs. Investigation of the potential for distributed renewable energy solutions could be conducted to address constrained power supply at key locations.

Theme	Potential Measures	Effectiveness	Deliverability	RAG Rating Justification
	particularly in Macclesfield and Congleton where capacity is constrained. There is also an opportunity to investigate how distributed renewable energy solutions such as solar power may contribute to addressing power constrictions.			
Engagement with taxi industry	Increase provision of rapid charging infrastructure for taxis in convenient locations.			A greater number of strategically located charging points for taxis would encourage operators that reliable and accessible charging infrastructure is in place. This measure would benefit from being developed as part of a broader EV Taxi Strategy. Although charging infrastructure cannot currently be sited on taxi ranks engagement with the taxi trade can identify locations at which breaks are regularly taken where rapid charging infrastructure could quickly recharge batteries.
Engagement with bus operators	Provide charging infrastructure for buses.			Further engagement is required with industry stakeholders to determine the deliverability of transitioning buses to EV. Detailed consideration would also be required as to whether there is scope to install charging infrastructure at bus depots.
Commercial forecourts	Encourage and where possible support the introduction of charging forecourts.			Due to uncertainties regarding the uptake of EV in the short to medium term there is a question mark regarding the business case for large charging hubs. There is evidence that drivers prefer the use of hubs due to availability and convenience. In the short term it is recommended that smaller clusters of charging infrastructure are provided (linking to the use cases outlined above) to give users the confidence a chargepoint will be available for use. The Council could however engage with

Theme	Potential Measures	Effectiveness	Deliverability	RAG Rating Justification
				partners who may seek to develop larger facilities on a commercial basis.
Future technology	Introduce chargepoints for HGVs.			Due to there being limited commercially available EV options for HGVs this measure is not recommended at this time, however the situation should be kept under review to understand future developments for electric or hydrogen technology.

Table 5-3 Sequencing of measures

Theme	Potential Measure	**Sequencing**
Increase number of charging points	Provide charging points at car parks for key destinations (e.g., Town Centre, railway stations station, retail parks, leisure centres, libraries and at major employment sites).	Short – medium term
	Provide charging points to support residents with limited access to off-street parking provision and charging.	Short – medium term
	On-route charging points on the Major Road Network.	Short – medium term
	Working with partners to provide charging in rural areas.	Short – medium term
	Introduce chargepoints for CEC's own fleet and potentially the grey fleet.	Short – medium term
	Consider the need for further planning policies to support the roll out of the chargepoint network.	Short term
Engagement with the District Network Operators	Establish a coordinated approach to continuous engagement and joint working with the District Network Operators (Scottish Power Electricity Networks, Electricity North West, Western Power Distribution) to enable capacity in the power network for all of CEC's needs including cost effective chargepoints. This will require strategic strengthening of the power network, particularly in Macclesfield and Congleton where capacity is constrained. There is also an opportunity to investigate how distributed renewable energy solutions such as solar power may contribute to addressing power constrictions.	Short – long term
Engagement with taxi industry	Increase provision of rapid charging infrastructure for taxis in convenient locations.	Short – medium term

Theme	Potential Measure	**Sequencing**
Engagement with bus operators	Provide charging infrastructure for buses.	Medium term
Commercial forecourts	Support the introduction of charging forecourts.	Medium term
Future technology	Introduce chargepoints for HGVs.	Short term

The approach to implementing the measures explained in this chapter can be found in Chapter 9.

6. Residential Charging Framework

The Council has received a variety of requests to facilitate on-street charging for residents that do not have private off-street parking.

These requests are seeking access to charge an EV from their own electricity supply either through a cable directly from their dwelling or via a socket on the public highway. To respond to these requests this chapter summarises the evidence base that the Council has gathered with respect to options and their benefits and disbenefits. It then goes on to outline how decisions will be taken to support residential charging. The full evidence base is presented in Appendix E.

6.1 Background Research

This section outlines the findings of desktop research (Table) carried out into the approach taken by other local authorities and organisations to address on-street charging issues. Issues considered by local authorities when making these decisions must include, for example

- Liability;
- maintenance impacts; and
- planning consent.

This highlights that loose cables trailed across the footway are not permitted, with only limited examples of permission to accommodate this with a raised cable cover. Solutions deemed more acceptable to other local authorities are hubs in car parks and on-street and more disparate public on-street chargepoints. Gullies are accepted by several local authorities although the priority given to them over other solutions varies. While it is acknowledged that they can provide the opportunity to charge an EV at a resident's home electricity tariff this is balanced against the impact on the highway and potential risks to users of the footway.

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Table 6-1 Summary of best practice background research into potential residential chargepoint solutions

Local Authority	Potential Solutions									
	Trailing Cables	**Cable gullies**	**Workplace chargepoints**	**Public on-street chargepoints**	**Residential charging hub**	**EV car club and e-bike hire facilities**	**Cable protectors**	**Lamp column chargers**	**Carriageway buildouts**	**Local car parks**
Solihull	×	✓	✓	✓						✓
West Sussex	×				✓			×		
Greater Manchester	×				✓	✓			✓	✓
Norfolk	×						✓			
Devon	×	✓		✓			✓	✓		
Oxford	×	✓						✓		
Oxfordshire	×	✓		✓	✓			✓		
Warrington	×			✓						✓
Buckinghamshire	×									✓
Camden	×									
Central Bedfordshire	×	✓								

6.2 Accessibility Considerations

6.2.1 Accessible Chargepoints

Although chargepoint technology and design has improved over the last 10 years, challenges remain for people with disabilities and the overall consumer experience does not always meet expectations, with many frustrations reported by EV owners.

To address these issues, BSI published new specification, PAS1899:2022[11], for EV chargepoints in 2022 to ensure they are accessible and meet consumer's needs. The specification is important for improving the overall customer experience and to ensure people with disabilities can access chargepoints.

6.2.2 Key findings of the Equality Impact Assessment

An Equality Impact Assessment (EqIA) was carried out for the future provision of EV infrastructure in Cheshire East as part of this EV Infrastructure Strategy. This section summarises the findings, in Table 6-2-2, that specifically relate to the potential impact of installing on-street EV charging infrastructure on people with protected characteristics and differing accessibility needs. The potential mitigation measures that could possibility combat the negative impacts are also considered.

Table 6-2 EqIA Accessibility Considerations and their Potential Mitigation Measures

Potential Accessibility Consideration	Protected Characteristics Groups (PCG's) Affected	Potential Mitigation Measures
Trailing cables across the footway can pose a trip hazard and/or a barrier for all footway users.	*People with disabilities* • People with mobility issues • People with visual impairments *Being pregnant or on maternity leave* • People with buggies/ prams *Age* • Footway users in all age groups but particularly older people	• Many local authorities are choosing to ban trailing cables across public footways and highways. • Use cable gullies/ channels to remove the need for trailing cables. • Install charging infrastructure as close to the kerbside of the footway as possible, with an allocated EV charging bay, to prevent the need for trailing cables.
Areas of restricted width/ uneven surfaces (through the use of cable protectors or raised EV charger bases)	*People with disabilities* • People with mobility issues • People with visual impairments • Wheelchair users and their carers	• Many local authorities are choosing to ban the use of cable protectors on public footways. • Install charging infrastructure as close to the kerbside of the footway as possible, with

[11] https://www.bsigroup.com/en-GB/standards/pas-1899/

Potential Accessibility Consideration	Protected Characteristics Groups (PCG's) Affected	Potential Mitigation Measures
on the footway can impact accessibility and force people into traffic flow areas to manoeuvre around uneven surfaces on the footway.	*Being pregnant or on maternity leave* • People with buggies/ prams	an allocated EV charging bay, to prevent the need for cable protectors. • Only install charging infrastructure on-street if there is sufficient footway space for all footway users to pass comfortably and safely. • Ensure all EV charging infrastructure is installed flush with the footway surface.
Advances in technology used in charging infrastructure.	*People with disabilities* • People with learning disabilities. • People with visual impairments *Age* • Older people	• High visibility with colour coded key features, ambient lighting, and a tap to pay interface that removes the requirement for touchscreens and apps.
The weight of charging cables.	*People with disabilities* • People with physical impairments/ disabilities or mobility issues *Age* • Older people	• Ensure charging infrastructure is of high quality with cable weight considered – consider infrastructure that provides an automatic, motorised cable management system that allows the charging cable to coil and uncoil without manual force needing to be applied. • Install EV chargers as close to the kerb as possible so charging cables do not have to be carried a long distance to the EV.
Chargepoints located in dark areas that are not overlooked.	*Age* • Older people *People with disabilities* • People with visual impairments that require sufficient lighting to improve vision *Gender* • Women or anyone that may feel unsafe alone after dark	• Ensure all chargepoints are installed in well-lit and overlooked areas to ensure all chargepoint users feel safe using the facilities and leaving their car unattended for various periods of time.

Accessibility concerns must be considered for other groups in addition to the Protected Characteristic Groups (PCG's), such as for people in low income households. This is due to the cost disparity associated with charging an EV using the public chargepoint network compared to a domestic charger powered from the home electricity supply.

It is more costly to charge using the public chargepoint network than a domestic charger as tariffs for home electricity supply are usually cheaper and domestic charging infrastructure also has the capability of charging overnight when electricity is cheapest. People from low income households are less likely to be able to afford an electric vehicle, which is a barrier in itself to EV uptake, however if they do own an EV for work and they are unable to afford to have an EV chargepoint installed at home they will need to use the more expensive public chargepoint network.

It is important to acknowledge that it is not the role of CEC to remove structural cost barriers to motoring. This would not be consistent with the current market led approach to fuel for ICE vehicles. Nor is such an approach supported by policy or within the budget of CEC to facilitate. CEC will however seek to reduce inequality of access to chargepoints, which is consistent with the objectives of this strategy.

6.3 Options RAG Assessment

A RAG assessment of options (set out in Appendix E) has been conducted to assess their suitability against various criteria e.g., feasibility, liability, cost, etc. These criteria are contained in Table Table below. The RAG assessment has helped to identify the most appropriate approach for CEC. The final RAG assessment rating and the associated rationale is outlined in Table .

Table 6-3. RAG Assessment Criteria

RAG Rating	Colour	Rationale behind each RAG Assessment Criteria								
		Safety	Liability	Planning Consent	Accessibility	Cost	Practicality	Connectivity	Susceptibility to vandalism	Fit within the landscape
Red		Viewed as unsafe in terms of road safety, perceptions of safety after dark, due to trip hazards, or remaining footway space after installation.	It is unknown/ not clear who will be liable for any injuries caused, damage or costs.	Difficult to obtain due to footway space, accessibility concerns or proximity to street furniture etc.	Accessibility to the chargepoint infrastructure is negatively impacted for PCG's and people on a low income.	High cost to install, maintain or for users to operate.	Difficult to achieve due to footway space, upkeep or maintenance required, legalities, or safety concerns.	Power connection is not possible.	Highest potential to be vandalism due to the infrastructure design or the location the potential option is most likely to be used in.	Potential option does not integrate well into the surrounding environment due to size, design or the ability for it to blend in and be visually unintrusive.
Amber		There is potential for safety concerns for specific groups of people depending on the scenario the potential option is used.	It is unclear/needs to be decided who will liable.	May need extra consideration before planning permission can be obtained.	There are some potential accessibility concerns that can be mitigated – scenario and infrastructure dependent.	Average EV infrastructure cost.	Potential for some practicality issues but it is scenario and infrastructure dependent.	A new connection to the DNO is necessary.	Vandalism is possible due to the nature of the infrastructure design or the location.	Potential option is not overly intrusive on the landscape but doesn't integrate as well as other options.
Green		Safety is not a concern for the potential option.	It is clear who is liable.	Planning consent is not necessary or easy to obtain due to there being no major constraints for the potential option.	The potential option does not impact accessibility for footway users or PCG's.	Low cost to install, maintain or for users to operate.	Relatively easy to achieve and raises no practicality concerns.	Power supply is already available.	Not likely to be subject to vandalism.	Potential option integrates well into the surrounding environment and is not visually intrusive.

Table 6-4 RAG Assessment for CEC On-street Charging Options

Theme	Potential Option	RAG Assessment Metrics									Final RAG	Rationale
		Safety	Liability	Planning consent	Accessibility	Cost	Practicality	Connectivity	Susceptibility to vandalism	Fit within the landscape		
Home chargepoints	Trailing cables											Legal, safety and accessibility concerns as trailing cables are an obstruction to the footway. However, low cost and convenient for the EV owner and can use home electricity supply for cheaper EV charging.
	Cable gullies											Only remove trip hazard when gullies sit flush with the footway and planning permission may be difficult to obtain in a conservation area. Low cost option to reduce legal, safety and accessibility concerns and allows for home electricity supply to be used for cheaper charging.
	Cable protectors											Legal, safety and accessibility concerns as cable protectors are an obstruction to the footway. They are difficult to move around and create obstacles for people with mobility issues, visual impairments or pushing prams and buggies. However, low cost and convenient for the EV owner and can use home electricity supply for cheaper EV charging.
	Removable Lance (Trojan Energy AON)											A new DNO power connection will be required and as lances are removed when not in use, this feature reduces safety concerns and the risk of trip hazards. It is cheaper usage costs as the AON is powered from home electricity supply, however the infrastructure is expensive to install and may require frequent maintenance.
Residential charging hub	Standard fixed bollard chargers in CEC-owned car parks											A new DNO power connection will be required. Car parks located nearby areas with no off-street parking will provide a sufficient alternative to on-street charging infrastructure. Eliminates the issues associated with installing on-street such as footway space, trip hazards, and also liability, however the chargepoint infrastructure is more susceptible to vandalism as it is not as overlooked as on-street chargers.
	EV car club charging bays incorporated with e-bike hire facilities											A new DNO power connection will be required. Provides an alternative to private car ownership and e-bike facilities encourage active travel however the chargepoint infrastructure, and car club vehicles, is more susceptible to vandalism as it is not as overlooked as on-street chargers.
	Rapid DC public chargepoints											An alternative option for when all other solutions are not possible in one particular area. Will allow EV owners to charge their

Theme	Potential Option	RAG Assessment Metrics									Final RAG	Rationale
		Safety	Liability	Planning consent	Accessibility	Cost	Practicality	Connectivity	Susceptibility to vandalism	Fit within the landscape		
												vehicle in 20-40 minutes but are more expensive than slow/ fast standard chargers. A new DNO connection will be required, and the chargepoints are more susceptible to vandalism as the car parks may not be overlooked.
Residential on-street chargepoints	Lamp column chargers											There are liability concerns for the cable however it is assumed liability lies with the owner. Chargepoints can be powered from the lamp column power supply and they fit well within the streetscape due to the design. The use of a satellite bollard removes the risk associated with trailing cables if the lamp column is set at the back of the footway.
	Rising bollards											Rising bollards require a new DNO power connection and are costly infrastructure to install. They may also be costly to maintain due to the retracting mechanism. Rising bollards fit well within the landscape as they retract when not in use and therefore have a minimal impact on the footway.
	Removable lance (Trojan Energy Hub)											Removable lances are a costly infrastructure to install and may require frequent maintenance. However, they do not take up much space on the footway as they are removed by the owner when not in use, reducing their susceptibility to vandalism. As part of a Trojan Hub, removable lances require a new DNO power connection and can be used in any dock on the residential street removing the need for dedicated parking spaces.
	Buildouts into carriageway											Does not impact footway space however build outs reduce carriageway space and may not be feasible in residential areas with narrow carriageways. Build outs often take up an on-street parking space which may be controversial among residents if parking space is already limited.
Workplace chargepoints	Standard chargers in workplace car parks											Useful for people that travel to work every day however not a viable solution for EV owners working from home. Charge time is also limited to work hours and during the week. Employer is responsible for installing infrastructure and liable for any costs providing they own the car park.

Cheshire East Council

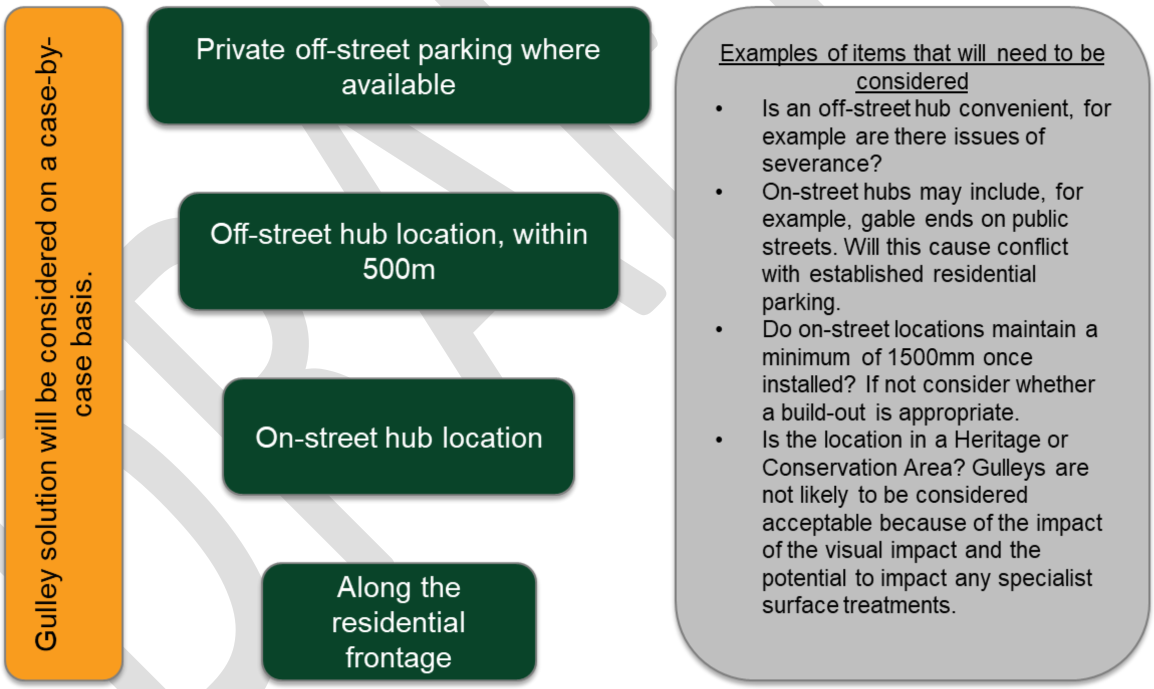
6.4 Cheshire East Council's Policy

A hierarchy has been developed that will inform decision making for the provision of residential charging. This will apply both where CEC has funding that it can use to support the rollout of infrastructure and also to inform private investment decision.

Under its duty under the Highway Act 1980, CEC considers that cables trailed across the footway and use of cable covers are not acceptable. Users may be liable to prosecution including for any incidents arising because of careless placement of cables and use of cable covers that present an obstruction of the highway.

The hierarchy to inform decisions is provided in **Error! Reference source not found.**. The hierarchy does not imply a strict process to inform decisions. At each location where need is identified it will be considered on a case-by-case basis. This will need to consider some of the items listed in **Error! Reference source not found.**-1, but also the timescale for roll-out of nearby EVCI, where this is known.

Figure 6-1 Residential Charging Hierarchy



Where there is no practicable way to deliver charging infrastructure based on the hierarchy in **Error! Reference source not found.**-1 a remote rapid charger may be considered. This will enable residents to quickly charge their EV where there are facilities such as a coffee shop. However, it is expected that this type of infrastructure would typically be provided commercially through CPO investment. CEC will only consider supporting this infrastructure when funding is available and the site may be less commercially attractive, particularly in the short term.

Private charging solutions enable residents to use their own electricity supply. This enables residents to benefit from household electricity rates where private charging solutions can be installed safely, and with reference to the function of the street. CEC currently considers that gullies are likely to be the most appropriate because other solutions that may require the electrical connection to be permanently embedded in the highway may be a challenge to monitor in the long term when utility works are required. However, CEC is not determined to deliver based on a single solution and will consider different and emerging technology on their own merits.

When considering the suitability of private charging solutions at any location CEC must consider the long-term implications such as for maintenance. For some councils the solution to this is a subscription service to use a gulley, with an annual fee that covers administration and maintenance costs. CEC will investigate the feasibility of this and associated models more closely before widespread roll out of private charging solutions begins.

It must be noted that the public highway is a public space. Any provision of access to private charging solutions on the highway does not imply allocation of parking space on the highway to a single household.

Other points that will be considered when assessing the appropriate solution for residential charging are:

- Focus on providing a safe and accessible EV infrastructure chargepoint network on-street for Cheshire East that does not negatively impact the function of the footway for all users; and
- Each chargepoint installed throughout Cheshire East will be visually sensitive to the surrounding environment. Less visually intrusive chargepoints will be used wherever possible.

7. Prioritising Charging Locations

In Chapter 5, provision of EV charging infrastructure was confirmed as a potential measure that will be pursued as part of this strategy to encourage the uptake of EVs in Cheshire East. Chapter 4 set out Cheshire East's baseline EV context including where charging points exist as well as the demographic factors affecting likely future EV charging demand across the borough. This information has been considered in identifying the highest priority locations for installation of new EV charging infrastructure in Cheshire East, as set out in this chapter. These assessments provide a guide for future investment programmes. More detailed assessments, engagement with stakeholders, and technical work will be conducted as part of future phases of chargepoint delivery.

The review of potential sites carried out for this strategy began with Council-owned car parks, as well as broader areas where on-street charging infrastructure will be considered. Some of the car parks considered are located so as to be attractive to people wishing to charge their EVs whilst visiting leisure and shopping areas, or for commuters wishing to charge while at work. Others are better located for residential use, or even for mid-journey topping up along key routes through the borough. Many of the recommended car park locations could serve more than one of these use cases.

The different charging use cases were considered as part of the key criteria for the assessment of each potential site, along with the security of the location, energy grid capacity, and whether demand for the proposed charging point would be impacted by other existing or likely future commercial charging facilities.

It should also be noted these assessments will not preclude CEC from seeking the provision of socially necessary chargepoint sites to ensure a geographically balanced network is created to serve all residents. Through specific procurement exercises and funding bids CEC will seek to provide this balanced network.

Before setting out the highest priority car park locations, this chapter begins with a discussion of the three main use cases for EV charging infrastructure: Destination, Residential, On-Route charging.

7.1 EV Charging Use Cases / Location Types

In considering where EV charging infrastructure should be located, it is necessary to consider the different reasons why drivers may find themselves seeking a charge in each location. The following sections explore the main types of uses in more detail, including issues to consider when addressing the demand.

7.1.1 'Destination' charging

'Destination' charging occurs in public locations where there is a high footfall of people typically spending two hours or more. This could include high streets, leisure and cultural facilities, tourist attractions, shops, and retail outlets. At these locations, at least a 'Fast' charger (7-22kW) would be needed, though in some cases a 'Rapid' charger (up to 50kW) may be more suitable. For destination charging, the preferred locations are off-street, prime town centre locations and points of interest.

A focus on destination charging in town centres would be a key recommendation for the foundations of a joined-up strategy across the area. If the town centre locations do not have chargepoints present, a strategic option would be to begin by installing one ‘double-headed’ chargepoint per location (able to charge two vehicles simultaneously), and to monitor subsequent demand. By taking a phased approach, the charging network can be grown according to demand, providing a visible asset to the community but also avoiding under-utilisation. There are many benefits of focusing on town centres, as chargepoints can support multiple use cases including workers, shoppers and visitors, some residential areas, as well as raising the profile of EVs.

7.1.2 ‘Residential’ charging

‘Residential’ charging focuses on provision for residents without access to off-street parking where charging at home is not possible. Residential charging is often located in areas where there is a high percentage of terraced housing and apartments/flats where there is no dedicated parking facility. At residential charging locations, the chargepoint type is usually ‘Slow’ (3-5kW) or ‘Fast’ (7kW).

7.1.3 ‘On-route’ charging

As described in Chapter 4, the modelling exercise carried out as part of this strategy has considered where journeys are being taken to, from and through any part of Cheshire East. Also in consideration are factors such as the likelihood of the driver of each journey to choose an EV for their journey (based on a demographic analysis of their residential area), how far they are travelling, and where other charging opportunities exist. There may also be a requirement for top-up charging for fleet and grey fleet vehicles during daily operations. The result is a picture of where EV drivers are likely to find themselves in need of a top-up charge while driving within (or through) Cheshire East.

Motorway services are the ideal form of ‘on-route’ charging, and such facilities already exist within Cheshire East on the M6 near Sandbach. These facilities are usually installed by private sector operators without the need for local authority support or involvement. However, where gaps exist in the charging network such as along the A34, A51 and A6, and suitable Council-owned car parks exist in convenient locations, ‘Rapid’ and ‘Ultra-rapid’ chargepoints (50kW or more) could be provided to satisfy this demand.

7.1.4 ‘Commuter’ charging

‘Commuter’ charging occurs in any public car park that links to an alternative form of transport such as a railway station, transport interchange or park-and-ride facility. Providing commuter charging in these types of location could have the benefit of removing cars from town centre locations and encouraging the majority of the journey to be taken by public transport, thus being consistent with multi-modal sustainable transport strategies.

Due to the likely length of stay, slower charging can be provided at these locations. There is little difference in cost between ‘Slow’ (3kW) and ‘Fast’ (7kW) charging, and the average EV battery size is increasing along with the time required to achieve a full charge. ‘Fast’ (7kW) chargepoints are therefore considered most suitable at locations where commuters are likely to wish to charge.

Council-owned car parks have been considered for their appeal to potential 'commuter' chargers as part of the modelling exercise carried out within this strategy. However, where a commuter car park is not Council-owned, it may be possible to engage with the station owner regarding the provision of charging infrastructure there.

7.2 Recommended Charging Locations

Providing on-street EV chargers is more expensive than off-street and requires a longer lead-in time particularly due to the need to consult the public on a Traffic Regulation Order (TRO) to reserve the parking bay for the exclusive use of drivers wishing to recharge their EV. For this reason, the first opportunity to explore for installation of EV charging infrastructure within the borough is the Council's many car parks located throughout the borough. The next section sets out the car parks that have been determined to be the most suitable locations for EV charging points.

On-street charging points also have a role to play, particularly where off-street provision is unfeasible. The most appropriate areas for implementation of on-street charging points are therefore considered immediately following the discussion of car park charging locations.

7.2.1 Car Park Charging Locations

As outlined above, the assessment provides a list of which car park locations have scored best in the assessment and therefore should be taken forward for further consideration. Table shows a total of 39 high-ranking specific car parks spread out across 17 areas within Cheshire East. Table 7-2Table presents the same proposed car park locations ranked within the context of the town they are located in, to show the assessment in terms of providing a balanced network.

The full assessment of car parks and the rationale behind the ranking is set out in Appendix B. The overall ranking is based on the combined score of a number of key criteria which are outlined below:

- Likely demand resulting from nearby leisure and shopping destinations
- Likely demand resulting from nearby employment destinations
- Likely demand resulting from nearby residential areas (considering demographics as well as housing types and presence of off-street parking)
- Likely on-route demand resulting from journeys passing nearby
- Avoiding conflicts with existing or likely forthcoming commercially provided chargepoints
- Security of the location
- Capacity of the energy grid to power new charging points within the car park

The assessment of grid capacity is indicative at this stage, with all DNOs currently working to improve the strategic information they offer about grid capacity to assist in the process of shaping charging networks. Based on the information available to date, it appears that grid capacity in Macclesfield and Congleton is constrained. If this is the case, it may be difficult to provide rapid chargers in the highest-priority car park locations (or indeed in any Council-owned car parks or even in on-street locations) within these towns. Both towns are high priorities for charging point provision due to a lack of existing infrastructure at the moment, but collaborative working with the DNOs covering these towns (ENW for Macclesfield and WPD for Congleton) may lead to the identification of car parks that are suitable for rapid chargers, or otherwise the most suitable car parks for 22kW fast chargers.

Appendix C includes the assessment of 14 other potential car park locations that were considered as part of this analysis, but which were not determined to be among the most suitable car parks within each town. In addition, several other sites were considered but eliminated before the assessment began, due to the possibility of future re-development or practical issues such as limited size of the car park.

One specific car park site that was omitted from the analysis was the Royal Arcade multistorey car park in Crewe, which is in the process of being developed already with the inclusion of EV chargepoints.

Please note that the site assessment provided in the section constitutes an initial high level assessment to give an indication of the best use of the available council owned car parking sites. This should be considered a starting point rather than final assessment and, where other investment funding has been sought (e.g. ORCs and LEVI) further more detailed site assessment will be undertaken.

Table 7-1 Highest Ranking Car Park Locations

Overall rank	Car Park	Town
1	Spring Street	Wilmslow
=2	Exchange Street	Macclesfield
=2	Gas Road	Macclesfield
=2	Railway Station	Macclesfield
=2	Pickford Street	Macclesfield
=2	The Carrs	Wilmslow
=3	South Drive (additional chargepoints should monitoring data show high utilisation)	Wilmslow
=3	Broadway Meadow	Wilmslow
=3	Princess Street	Knutsford
=4	Fairground	Congleton
=4	Antrobus Street	Congleton
=4	Back Park Street	Congleton
=4	Civic Hall	Poynton
=4	Princess Street*	Congleton
=4	Booths Knutsford	Knutsford
=5	Springfields	Prestbury
=5	South Street	Alderley Edge

Overall rank	Car Park	Town
=5	Tatton Street	Knutsford
=5	Victoria Centre	Crewe
=6	Community Centre	Disley
=6	King Street	Knutsford
=6	Shirleys	Prestbury
=7	Delamere Street	Crewe
=7	London Road	Holmes Chapel
=7	School Road	Handforth
=7	Westfields	Sandbach
=7	Fairview	Alsager
=7	Wilmslow Road	Handforth
=8	Snow Hill	Nantwich
=8	Pool Bank	Bollington
=8	Station Road	Alsager
=8	Cheshire Street	Audlem
=8	Chapel Street	Sandbach
=8	Civic Way	Middlewich
=9	Civic Centre/Library (Rapid chargers to complement current Type 2 chargers)	Crewe
=9	Scotch Common	Sandbach
=9	Brookhouse Road	Sandbach
=10	Love Lane (additional chargepoints should monitoring data show high utilisation)	Nantwich
=10	Civic Hall	Nantwich

* Cheshire East are currently trying to keep the chargers in this location, if permitted.

It can be seen from Table that towns like Wilmslow, Macclesfield and Congleton appear more likely to experience greater demand for charging. However, there is likely to be some level of demand in every town, so it is intended that investment will be spread across the borough. Following a period of monitoring, the areas where demand is highest may require further investment to increase the number of chargers available. At that stage it will need to be determined if more chargers should be added to existing charging hubs in those towns, or whether new charging hubs should be created to broaden the coverage of the charging network in the town.

Table lists the potential car park sites in alphabetical order by town and includes an initial assessment of which charging use cases should be considered for the site. This required charger speed can then be assumed is based on the length of stay that would be likely at each location, with destination and on-route demand indicating a need for rapid chargers, and residential and employment / commuting locations being able to benefit from a number of less expensive and slower chargers to serve those likely to stay longer or overnight. In most cases, it appears worth providing both types of chargers.

Table 7-2 Highest Ranking Car Park Locations by Town

Town	Town Priority	Car Park	On Route	Destination	Residential
Alderley Edge	1	South Street	✓	✓	✓
Alsager	1	Fairview		✓	✓
	2	Station Road		✓	✓
Audlem	1	Cheshire Street	✓	✓	
Bollington	1	Pool Bank		✓	✓
Congleton	=1	Fairground	✓	✓	✓
	=1	Antrobus Street	✓	✓	✓
	=1	Back Park Street	✓	✓	✓
	4	Princess Street*		✓	✓
Crewe	1	Victoria Centre	✓	✓	✓
	2	Delamere Street	✓	✓	✓
Disley	1	Community Centre	✓	✓	✓
Handforth	1	School Road		✓	✓
	2	Wilmslow Road		✓	✓
Holmes Chapel	1	London Road	✓	✓	✓
Knutsford	1	Princess Street		✓	✓
	2	Booths Knutsford		✓	✓
	3	Tatton Street		✓	✓
	4	King Street		✓	✓
Macclesfield	=1	Exchange Street	✓	✓	✓
	=1	Gas Road	✓	✓	✓
	=1	Railway Station	✓	✓	✓
	=1	Pickford Street	✓	✓	✓
Middlewich	1	Civic Way	✓	✓	
Nantwich	1	Snow Hill		✓	✓
	2	Love Lane***		✓	✓
	3	Civic Hall		✓	✓
Poynton	1	Civic Hall		✓	✓
Prestbury	1	Springfields	✓	✓	✓
	2	Shirleys	✓	✓	✓
Sandbach	1	Westfields	✓	✓	✓
	2	Chapel Street	✓	✓	✓
	=3	Scotch Common	✓	✓	
	=3	Brookhouse Road	✓	✓	
Wilmslow	1	Spring Street	✓	✓	✓
	2	The Carrs	✓	✓	✓
	3	South Drive***	✓	✓	✓
	4	Broadway Meadow	✓	✓	✓

* Cheshire East are currently trying to keep the chargers in this location, if permitted.
** Rapid chargers could complement current Type 2 chargers at Crewe Civic Centre / Library car park.
*** Additional chargepoints could be considered should monitoring data show high utilisation of existing points at Nantwich Love Lane or Wilmslow South Drive car parks.

Installing EV charging infrastructure is not just for facilitating the charging of vehicles – it also helps to provide assurance to potential EV buyers that they will be able to charge their EV should they make their purchase. Providing at least one charger in each key town or local area may not maximise use of the resulting charging network but would be beneficial in unlocking the potential demand for EVs and helping potential buyers to overcome their hesitations. Depending on the supplier and the commercial model underlying the network, this decision may need to be made with the supplier during the procurement process (discussed further in the following chapter).

7.2.2 Residential Charging Locations

In addition to the car park locations prioritised above, on-street charging provision is considered for residential areas where Council-owned car parks are unlikely to be suitable, and where demand from residents is likely to be particularly high due to demographic factors as well as a lack of off-street parking. The highest priority residential areas for on-street charging are shown in Table 7-3.

The modelling exercise carried out as part of this strategy has highlighted that the highest priority areas for potential provision of on-street charging points include parts of Alderley Edge, Wilmslow, and Macclesfield. The assessment focused on propensity of residents to purchase an EV, areas where a higher-than-average number of homes were of a type that would often not have access to their own off-street parking (where private chargers could be installed), and gaps in existing charging point provision (including consideration of the likelihood of the private sector providing charging infrastructure nearby in the future, as discussed later in this chapter).

Table 7-3 Highest priority residential areas for on-street charging

Rank	Town	Residential Area
1	Alderley Edge	East of Village Centre
2	Wilmslow	Town Centre
3	Macclesfield	Town Centre
=4	Alsager	North East of the Town Centre
=4	Nantwich	Town Centre
=4	Knutsford	North of Town Centre
=7	Holmes Chapel	North and East of Town Centre
=7	Handforth	Town Centre
9	Congleton	Town Centre
10	Sandbach	Town Centre
11	Crewe	Town Centre/East/South

It should be noted that provision of EV charging in number of locations listed above have been addressed through secured ORCS funding as outlined in Section 4.3, with a programme committed to install 7kWh chargepoints.

7.2.3 Next Steps

Following the initial high-level assessment of locations and the charging needs they could fulfil as outlined above, there are steps which would need to be taken to further develop the site selection and ultimately procure new EV charging infrastructure. These steps are outlined below in general terms which apply across the board as well as some specific steps relevant to particular use cases:

General

- Consider highest priority car park locations suiting each of the charging use cases, and procure and deliver chargepoints where suitable;
- Review proposed high-priority car park locations to assess parking regulations, opening times, space availability and accessibility;
- Agree approach to parking fees, charging fees, enforcement and maintenance;
- Undertake site surveys to identify exact locations and costs;
- Engage further with the relevant DNO to confirm power capacity and secure a quote for connection to the grid;
- Undertake procurement for proposed chargepoints, followed by installation; and
- Promote availability of charging points through resident communications as well as Zap-Map and other databases.

Residential

- Investigate opportunities for OZEV residential charging grants to secure funding for chargers in specific residential locations (further information provided in chapter 7).
- Promote to developers the implications of new building regulations for developments (consultation outlined in further detail in Appendix D) to accelerate the private provision of residential chargers for new homes.

On Route

- Coordination with the Council's fleet and other public sector fleet operators for on-route/worktime charging requirements.

7.3 Other Future EV Charging Provision Needs

As part of future work to develop and implement EV charging infrastructure, other use types and users can be considered. Taxis, buses, and workplaces are some examples of areas that the Council may be able to influence and support. An indicative guide to charging for these use types is provided below. The section concludes with a high-level assessment of potential locations within the borough where commercial charging points may be likely to be provided.

7.3.1 Taxis

Some Council-owned car park locations could serve taxis in the future, and in the future, it may be possible to provide charging at taxi ranks and stands as technology develops. Charging provision for taxi drivers tends to require at least a ‘rapid’ solution due to the fact that taxi drivers require minimal downtime so as not to impact on their shift.

Engagement with local taxi companies would be required before any infrastructure can be provided specifically for the taxi industry.

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Next steps

- Engage with local taxi companies to understand EV transition strategies and highest priority locations
- Explore opportunities for securing funding through the next round of OZEV taxi funding if announced

7.3.2 Buses

Most bus operators running electric buses would only make the transition to electric if they could provide their own charging infrastructure within a depot or bus station for overnight charging. For this purpose, slower chargers may be adequate. However, some bus services may require topping up once or twice during a typical day using rapid chargers in locations that are more convenient to the route being run.

Engagement with bus service providers would be required to understand the most appropriate places for charging facilities to be provided, as well as any future plans to roll-out EV fleets within Cheshire East.

Next steps

- Engage with local bus operators to understand their current and potential future charging needs including locations and charging constraints

7.3.3 Workplaces

Workplace charging is an ideal alternative for EV drivers who drive to work but do not have access to off-street parking at home. Workplace chargepoints could be used for both fleet vehicles as well as employees and visitors, and OZEV workplace grants are still available for any individual businesses wishing to install chargepoints. Chargepoints at workplaces can be 'Fast' (7kW) due to the long stays that are likely for employees.

Next steps

- Understand the implications for new development areas of changes in building regulations and communicate this to developers.
- Integrate the findings of the Council's fleet review into the charging strategy, which has identified further opportunities to convert vehicles to electric.
- Integrate the work on charging requirements for new Council fleet, grey fleet and pool car EVs and identify suitable locations at Council offices, as well as charger types for specific uses.
- Explore the potential role of the council in the coordination of charging at business parks, where shared charging may be an option.

7.3.4 Potential Commercial Chargepoint Sites

Many private companies with car parking space are beginning to pursue the opportunity to either make money by offering charging infrastructure (such as motorway services or petrol stations), while others are seeing the potential to attract customers to their core business by offering free or discounted EV charging.

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Although this portion of the EV charging network is likely to happen largely on its own without Council involvement, the Council may be able to accelerate the process to help more people make the transition to an EV faster. In addition, knowing more about the plans these companies may have to roll-out charging infrastructure will help to avoid any duplication of infrastructure, or investment in chargers that are unlikely to be used.

The following land uses are those most likely to increase their charging point offer in the near future:

- Supermarkets
- Service / petrol stations
- Privately managed car parks
- Other large retail / shopping centres

7.3.5 Council Fleet Charging

There is an opportunity for the Council to lead by example and work towards achieving net zero emissions by transitioning fleet vehicles to electric for cars and light vans (with an alternative hydrogen powertrain being considered for heavy goods vehicles).

The Council and its main service providers, have a number of charging points already available for both fleet and grey fleet (business use). These sites, and others across the borough are also currently being investigated to assess the practciality of increasing or adding charging points.

Table 7-4 Council Fleet Chargepoints

Location	Type	Current Provision
Environmental Hub, Middlewich (Ansa)	Depot	2 Fast Chargers
Brunswick Wharf (Ringway Jacobs)	Depot	2 Fast Chargers
RJ - Macclesfield Depot (Ringway Jacobs)	Depot	
West Park (Ansa)	Depot	
Wardle Depot (Ringway Jacobs)	Depot	2 Fast Chargers
Crewe Crematorium	Depot/Destination	
Macclesfield Cemetery	Depot/Destination	
Westfields, Sandbach	Office/Destination	2 Fast Chargers
Macclesfield Town Hall	Office/Destination	2 Fast Chargers
Delamere House, Crewe	Office/Destination	2 Fast Chargers

The following locations are also being assessed to provide a strategic network of charging points for the Council's fleet during the day and for those vehicles parked overnight in town centres. However, not all of these locations will be required.

Table 7-5 Further Potential Council Fleet Chargepoints

Location	Type
Sandbach Leisure Centre	Destination/Worktime
Holmes Chapel Leisure Centre	Destination/Worktime

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Congleton Leisure Centre	Destination/Worktime
Macclesfield Leisure Centre	Destination/Worktime
Poynton Leisure Centre	Destination/Worktime
Wilmslow Leisure Centre	Destination/Worktime
Nantwich Swimming Baths	Destination/Worktime
Shavington Leisure Centre	Destination/Worktime
Tatton Park	Destination/Worktime
Alsager Library	Destination/Worktime
Civic Way Car Park for Middlewich Library	Destination/Worktime
Fairground Car Park for Congleton Library	Destination/Worktime
Wilmslow Library	Destination/Worktime
Knutsford Library	Destination/Worktime
Nantwich Library	Destination/Worktime
Jordangate Multi Storey Car Park	Overnight/Worktime
Crewe Multistorey/Delamere Street	Overnight/Worktime

Although these charging points will primarily be to support the conversion of the Councils fleet, including the grey fleet (business travel), a number of these sites overlap with those being considered for the provision on public chargepoints. We will coordinate between the two workstreams as part of the next phase of feasibility, design and procurement activities. Due to the risk of distorting the local EV charging market, chargepoints avaliable for use by the public will be at a charge /kWh that is comparable to the local commercial market.

8. EV Charging Commercial Models

This chapter details the options considered and the option selected for the process of purchasing, installing, and maintaining charging infrastructure, that the Council funds or facilitates. It includes funding opportunities and other considerations during delivery.

The long-term financial business model for recharging services relies on demand, based on the number of EVs in circulation. The successful model selected needs to create value, both to the chargepoint operator (to help them make a return on their investment), and to the driver (who wishes to use the service at a price they believe is reasonable). This therefore presents a challenge in selecting a model which could balance supply and demand to achieve an acceptable return on public investment, as well as achieve local emission reduction objectives.

New charging facilities will have a fee applied from the outset. A fee encourages consumers to recognise the value of the service and provides revenue for ongoing maintenance and operation. However, if fees are too high, this suppresses demand for charging services and could slow-down EV uptake, ultimately limiting emissions reduction.

This section will focus predominantly on public EV charging infrastructure and the commercial models most suited for this purpose. However, there will also be some commentary on council fleet charging and how the different commercial models are more suited in this instance.

Appendix F details a range of considerations that were assessed in developing the preferred commercial model, and in testing the market for preferred models amongst potential operators.

8.1 Summary of UK EV Commercial Models and Selected Approach

There is a variety of potential commercial models which could be followed in delivering or expanding an EV charging network. Table 8-1

outlines the key features of three models that were assessed, setting out how they work and the risks for a Local Authority.

Several commercial models can coexist in a single Local Authority area. For instance, existing charging points from an early pilot project might remain in operation under the direct management of a Local Authority (Model 1 'In-House Management' below), while new charging points might be 'purchased' or implemented in partnership with a newly procured private sector charging network operator (Model 2 'Partnership' below). Meanwhile, private-sector network operators could build up charging networks of their own using private land without the approval or even the awareness of the LA (Model 3 'Commercially-Led' below).

Table 8-1 Summary of EV charging commercial models – UK

Model	**Features / *Risk***
1. **In-House Management –**	• Purchase could include installation and ongoing maintenance

LA selects locations, purchases charging points and keeps any revenue	• OZEV grant funding could be used for residential on-street charging points • Potential to ensure equity through providing in areas of market failure. • Appropriate for workplace and fleet installations where demand is assured. • Income for the authority. • *If under-utilised, financial risk falls on the LA* • *Interoperability with other provision needs to be factored in.*
2. **Partnership / Concession –** LA leases public highway or off-street parking bays to private suppliers / operators	• Annual permit price plus possible up-front charge and/or revenue share • Operator selects own locations through negotiation with LA and LA consults / approves / makes traffic order • Publicly owned car parks / land could be considered under this model • *Financial risk divested to suppliers / operators but LA retains an element of control*
3. **Commercially-Led** – Private-sector suppliers use private land with limited or no LA involvement	• Rapid / ultra-rapid charging points purchased and installed on private property (such as petrol station forecourts, private car parks, supermarkets, highway services, etc) • Requires sufficient capacity in the electricity network • *No financial risk to LA however this approach will likely lead to gaps in provision where locations are less commercially attractive*

In the early years of UK charger deployment, the public ownership model was favoured for slow and fast chargers due to the availability of capital funding for Councils from Office for Low (now Zero) Emission Vehicles (OLEV / OZEV). However, this model left Councils with an ongoing operating cost burden without the funds to support it, causing poor reliability and availability with the associated customer dissatisfaction.

Recognising this, private charging suppliers began offering to cover the operation and maintenance costs if the Council or private organisation paid the capital and electricity costs. In this way the Council can maintain asset ownership while passing on responsibility for operation and maintenance for a fixed period, usually with the option of extension, in the supplier's contract. This requires a Service Level Agreement (SLA) with the clear requirements for maintenance response and reporting, against which performance should be monitored.

Meanwhile, Public-Private-Partnership models (PPP) were used to establish national networks of rapid chargers, led by vehicle manufacturers with some funding from the European Union and the UK government. The PPP model is now favoured by many Councils for all public charging provision. This is a form of model 2 in Table
.

8.2 Public Sector Funding

The UK Government's early 100% funding grants to kick-start charging deployment have reduced in recent years, and Government is keen to encourage private investors into the market. There are several funding opportunities that CEC can consider, outlined in the following sections.

8.2.1 EV Charging Infrastructure Investment Fund (CIIF)

This Public-Private fund launched in 2018 provides a £200m cornerstone investment by government to be matched by the private sector. The Fund is now managed on a commercial basis by a private sector fund manager, Zouk Capital. CIIF supports faster expansion of publicly accessible EV chargepoints along key road networks, in urban areas and at destinations. Its intention is to increase capital invested in the sector to increase EV adoption. The fund is planned to have a 10-year life, up to March 2030 but with a deadline for new investments ending in March 2024. The fund directly invests in Charge Point Operators, who then in turn invest in chargepoints within local authority areas.

8.2.2 OZEV's On-street Residential Chargepoint Scheme Grant

This grant (ORCS) now offers LAs a maximum of 60% of government funding towards the capital costs of procuring and installing chargepoints for residential areas, which must be available 24/7 and with dedicated parking bays covered by Traffic Regulation Orders (TROs) being encouraged for on-street locations. The remaining 40% of funding must be provided by the Council or sourced from the private sector, with ongoing operating and maintenance costs covered by either party. This presents an opportunity for LAs wishing to provide charging facilities in areas where private off-street parking is limited, promoting equitable access to charging.

CEC has secured £155k of funding from the Office for Zero Emission Vehicles (OZEV) for this scheme and is now working towards delivery at 15 locations including in 13 car parks across the borough.

8.2.3 OZEV's Workplace Grant

This grant is a voucher-based scheme designed to provide eligible applicants with support towards the upfront costs of the purchase and installation of EV chargepoints. The contribution is limited to the 75% of purchase and installation costs, up to a maximum of £350 for each socket, up to a maximum of 40 across all sites for each applicant. Although not able to be directly accessed by a local authority, promotion of this grant scheme to employers within Cheshire East could help to complement the public charging network with workplace-based chargepoints, increasing opportunities for EV owners to charge their vehicles.

8.2.4 Local Electric Vehicle Infrastructure (LEVI) Fund

The LEVI Fund supports Local Authorities in England to plan and deliver chargepoint infrastructure for residents without access to off-street parking. The Fund comprises of capability funding, to ensure that local authorities have the staff and capability to plan and deliver chargepoint infrastructure, and capital funding, to support chargepoint delivery. The capability fund aims to increase the capacity and capability of every Tier 1 Local Authority to plan and deliver EV infrastructure and supports them in the development of a published EV Infrastructure Strategy for their area.

CEC has provisionally been allocated capital funding of approximately £2.2million and is actively engaging with CPOs to develop its proposals for and maximise

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investment in EV charging infrastructure across the Borough. Before the funding is released to CEC a business case will be submitted and approved that meets the requirements of the LEVI fund.

8.3 Private Sector Funding

The Government is eager to encourage a Market-led Approach for the investment and delivery of chargepoint infrastructure across the UK. This is to ensure a robust charging infrastructure is in place to match expected demand for EVs, in time for ICE vehicle phase out in 2030. This approach would allow private investment and business in a competitive market framework to lead the building and facilitation of EV charging infrastructure. According to the UK Government (2022), in 2021 on average 100 new rapid chargepoints were added to the UK EV chargepoint network every month and there have been new commitments for thousands of chargers at workplaces, supermarkets, petrol stations and on local streets. This is due to the certainty of phase-out dates driving private sector investments of hundreds of millions of pounds accelerating the pace of deployment[12]. Local Authorities are ideally placed to recognise the charging needs of residents and the feasibility of chargepoint deployment across their constituencies, but they can be short of dedicated resource and expertise in the EV market.

Government public funding schemes are now encouraging partnership models, where both Local Authorities and private CPOs, alongside other private sector businesses contribute capability and capital to deploy charging infrastructure in areas across the UK. Examples of these schemes can be seen above, in Section 8.2 Public Sector Funding.

The benefits of public sector investment in chargepoint rollout include the stimulation of UK investment and business, and creation of jobs across the country. Institutional investors, among others, will take advantage of the market's large growth potential and future demand certainty. Additionally, competition on both the rapid and local networks is expected to drive new delivery models for consumers.

8.4 Tender evaluation

It is critical that when selecting suppliers through its procurement process the tender process encourages CPOs to deliver the objectives of this strategy. For example, flexible products which can be kept up-to-date and easily replaced as technology advances should be encouraged, whereas those which are not accessible to people of all abilities would be less preferable. Higher-quality products are likely to save money and time in the long run, and to provide a better user experience for residents of and visitors to the borough. This process began with the initial engagement with suppliers to outline the Councils needs and objectives, and to seek input from CPOs that can support investment across the Borough. Alongside this, it is important to ensure that the Council can support value for money for residents while charging, by not over specifying chargepoints.

Developing requirements for EV infrastructure includes consultation with key partners, including the DNO. It is important for tenderers to outline how they will seek to manage the demand for charging across the day, including considering the

[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1065576/taking-charge-the-electric-vehicle-infrastructure-strategy.pdf

capacity of the electricity network. Where CEC has information about this it will share it with the CPOs.

8.5 Preferred Commercial Model for Public EV Infrastructure

To support its delivery of EV chargepoints using ORCS and LEVI funding, CEC has engaged with CPOs prior to issuing a tender for contract. After assessment of the above factors, it was decided that the selected approach for Cheshire East would be a Concession Model (see Model 2, Table), where network creation will be funded partly by CEC/grant funding from central government and private sector investment. Under this model the CPO will own, operate and maintain all equipment and infrastructure. The appointed CPO will also be legally responsible for all equipment and electricity bills. At the end of the contact, it is required that the CPO will remove the chargepoint or hand it over to CEC at a reasonable cost, subject to agreement. However, in some circumstances, such as for rapid or ultra-rapid chargepoint hubs, a land lease approach may be a more suitable option.

The Concession Model approach retains an element of control over the location of sites and their operation, while working collaboratively with the private sector to leverage investment funding and access up-to-date technologies throughout the life of the contract or concession. The commercial model will be reviewed over time to ensure that it remains the best approach for CEC and its residents as time progresses.

8.6 Considerations for Fleet EV Infrastructure

In order to support the transition of CEC's own fleet to electric vehicles, there will also be a need for the procurement of EV charging infrastructure to address this use case.

In this instance, as the profile and volume of EV charging can be fully understood by the council, based on their transition timetable and associated fleet usage plans, then a CEC fully owned commercial model is being applied.

This will involve the council fully funding the charging infrastructure for their own fleet based on the predicted need. This level of ownership will also enable the council to have full control of the charging tariffs and how this as well as any can be incorporated within the council's budget.

As outlined earlier in Table this commercial model has the most amount of financial risk falling on CEC, however this can be mitigated as long as there is a full understand on the council fleets charging needs and future transition plan.

In some locations chargepoints provided for the use of CEC fleet vehicles may be opened up to the wider public where there is mutual benefit. This will be considered on a case by case basis.

9. Implementation

This strategy sets out the key recommended measures to be pursued by CEC in supporting the creation of an effective EV charging network across the borough. The strategy seeks to consider the private sector's likely role in creating parts of this network, focusing the Council's attention and resources on those aspects of the network that are unlikely to be served adequately by the private sector without guidance and a contribution of resources from the Council.

9.1 Design of charging hubs

When designing charging hubs, the following issues will be considered:

- **Site survey −** A physical survey of proposed charging sites will be carried out to ensure the location is suitable.
- **Physical space –** Enough physical space must be allocated to the charging hub to allow the chargers and electrical cabinets to be installed and maintained whilst retaining safe pedestrian access.
- **Layout –** Location and orientation of charging bays must accommodate the quantity of charger outlets proposed. Locations for each charger and feeder cabinet must be assigned to ensure the number of chargers purchased will indeed fit in the space. Underground cable routes and distances must be considered. All locations should be recorded.
- **Obstructions –** Any underground services, trees or existing street furniture that may cause obstructions will be identified, along with any mitigating actions.
- **Lighting –** Establish whether sufficient lighting is available to allow use of the chargers without daylight, including consideration of personal security and perceived security, with additional lighting installed if required.
- **Health and safety –** Specialist advice will be secured regarding electricity and earthing systems to ensure all installations are safe as well as compliant with relevant standards; and
- **GPRS signals –** For the purposes of monitoring, maintenance, and payment, it is essential that an adequate mobile signal is present at each proposed location.

The first steps in implementing this strategy are recommended to be as follows:

- Engage with key stakeholders and carry out public consultation on this strategy;
- Seek funding for new charging points via government grant applications;
- Carry out market testing and procurement of a delivery partner or partners;
- Agree proposed priority locations with delivery partner/s once appointed;

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- Oversee delivery of the first tranche of charging infrastructure and monitoring usage; and
- Investigating and pursuing the other key measures to increase EV uptake.

9.2 Key Measures for the Short, Medium and Long Term

Along with charging infrastructure provision, there are a number of other measures that the Council can pursue to help support EV uptake across the borough. Table 9-1 below outlines the potential measures that have been identified, including the timeframe within which they will be considered and pursued.

Table 9-1: Proposed sequencing of key measures

<table>
<tr><th>Measure</th><th>Short term (0 – 2 years)</th><th>Medium term (2 -5 years)</th><th>Longer term (5+ years)</th><th>Key Responsibilities</th></tr>
<tr><td>Providing charging points in CEC car parks at key destinations (e.g., key and local service centres).</td><td>✓</td><td rowspan="5" colspan="2">Continuous monitoring of chargepoints usage and commercial provision to determine when / if further phases of Council-led chargepoints are required</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure funding from both the private and public sector
• CPO to deliver, maintain and operate these chargepoints</td></tr>
<tr><td>Providing charging points to support residents with no access to residential off-street parking, in line with the framework set out in this strategy.</td><td>✓</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure funding from both the private and public sector
• CPO to deliver, maintain and operate these chargepoints
• Where residents have access to private off-street parking it will be the responsibility of the resident / property management to install chargepoints</td></tr>
<tr><td>Providing on-route charging points to serve key traffic routes.</td><td>✓</td><td>• CEC to procure a Charge Point Operator (CPO) partner and secure investment from the private sector
• CPO to deliver, maintain and operate these chargepoints</td></tr>
<tr><td>Providing chargepoints in rural areas.</td><td>✓</td><td>• CEC to engage Parish Councils and communities
• CEC to consider funding opportunities and community ownership models</td></tr>
<tr><td>Introduce chargepoints for the Council's own fleet and grey fleet.</td><td>✓</td><td>• CEC to deliver ringfenced chargepoints at key locations</td></tr>
</table>

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Measure	Short term (0 – 2 years)	Medium term (2 -5 years)	Longer term (5+ years)	Key Responsibilities
Consider the need for further planning policies to support the roll out of the chargepoint network.	✓	✓	✓	• CEC to review and update planning policies
Work in partnership with District Network Operators to enable capacity in the power network for all of Cheshire East's needs including cost effective chargepoints.	✓	✓	✓	• CEC to engage with DNOs (Scottish Power Energy Network, Electricity North West and Western Power Distribution) to collaboratively plan electricity requirements, particularly in the areas of Macclesfield and Congleton which are known areas of constrained capacity • DNOs to work within statutory framework to deliver strategic network strengthening
Engage with taxi industry and providing charging infrastructure for taxis in convenient locations.	✓	✓	✓	• CEC to further engage with taxi operators and procure CPO partner to deliver, maintain and operate these chargepoints
Engage with bus operators and consider providing charging infrastructure for buses.		✓	✓	• CEC to continue engaging bus operators and consider future funding opportunities
Encourage and where possible support the introduction of commercially provided charging forecourts.	✓	✓	✓	• CEC to consider making land assets available to CPOs to deliver locations through their own investment
Introduce chargepoints for HGVs should appropriate technology come forward in the future.			✓	• CEC to monitor technology developments and requirements for infrastructure.

10. References

Limited residential off-street parking

- Data on dwelling types was gathered from dataset on https://www.nomisweb.co.uk/: **KS401EW - Dwellings, household spaces and accommodation type**
- The following dwelling types were considered to have limited off-street parking availability (i.e., likely absence of driveways and garages):
  - Whole house or bungalow: Terraced (including end-terrace);
  - Flat, maisonette or apartment: Purpose-built block of flats or tenement;
  - Flat, maisonette or apartment: Part of a converted or shared house (including bed-sits);
  - Flat, maisonette or apartment: In a commercial building; and
  - Caravan or other mobile or temporary structure.
- The total of each dwelling type was calculated for each CEC LSOA and displayed as a % of the total number of dwellings.

Car ownership data / income data

- EV ownership calculation – this can be used to calculate an estimate as a number or percentage on a postcode district level;
- VEH0134 (see tables VEH0134b and VEH0134c) : Licensed ultra-low emission vehicles by postcode district: United Kingdom (ODS, 936KB) – used for the total numbers of ULEVs, BEVs and PHEVs;
- VEH0122: Licensed vehicles by postcode district and body type (ODS, 3.27MB) – used for total number of cars in the postcode; and
- The numbers for relevant postcodes were converted to LSOA before plugging them into GIS.

Charging point locations

- National Chargepoint Registry was used for chargepoint coordinates
- https://data.gov.uk/dataset/1ce239a6-d720-4305-ab52-17793fedfac3/national-charge-point-registry

Distance to chargepoints

- https://www.gov.uk/government/statistical-data-sets/journey-time-statistics-data-tables-jts

Appendix A: Technology Review

This appendix summarises the various EV and charging technologies available, as well current trends in the development of this technology.

Throughout this appendix, the term ‘EV’ is used for simplicity even though in most cases only plug-in EVs are referred to. In general, EVs that use an electric drivetrain to power the wheels produce lower tailpipe emissions, less noise and encourage a smoother driving style than ICE vehicles. EVs have additional benefits in urban areas, where, stopping and starting, idling, and over-revving of ICE vehicles in queues produces high concentrations of emissions.

Electric Vehicle Trends

Transport is currently standing at the greatest period of change since the mass adoption of private transport. The drive towards decarbonisation, as the fundamental reason behind EV uptake, will lead to an increasingly varied vehicle fleet over the coming decade.

Currently, there is a major industry / purchasing shift from Internal Combustion Engines (ICE) including diesel and petrol. Both petrol and diesel engines have environmental impacts and removing both options (in combination with uptake of other sustainable options such as active travel and public transport) will improve both air quality and reduce carbon emissions.

EVs are currently the only mature technology offering a workable alternative to ICE vehicles for cars and smaller vehicles; however, uptake in the UK is still at the early majority stage. Generally, uptake is led by relatively affluent and environmentally conscious buyers who are keen to:

- Adopt new technologies;
- Reduce their personal transport impacts; and
- Purchase an EV for tax reasons/ company policy.

Early research shows that EV consumers prefer to charge at home overnight or at work during the day which suggests a low current demand for public recharging services. Most early EV adopters have off-street parking enabling them to charge at home overnight, although this capability is greatly curtailed in some residential areas.

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Electric Vehicle Technologies

EVs are an alternative to ICE vehicles and help to reduce emissions, particularly in congested urban areas were stopping and starting, idling, and over-revving of ICE vehicles in queues produces high concentrations of emissions. EVs use an electric drivetrain to provide power to the wheels rather than carbon-based fuels, so they generate zero exhaust emissions and less noise whilst driving. Despite the increased electricity requirement, EV have a lower whole-life carbon footprint than ICE vehicles and given the UK's commitment to decarbonise the electricity grid by 2035 these benefits will increase further in the future. EVs also produce less noise pollution and encourage a smoother driving style than ICE vehicles which increases driving efficiency by reducing the power required per km driven and creates lower particulate emissions from brake and tyre wear. It should however be noted that heavy batteries and the trend for larger vehicles will still result in particulate emissions from EVs.

EVs are, in general, a mature technology and the impacts of increasing battery size, taking range from 100 to 200+ miles, will lead to a step change in user acceptability in the future.

EV Terminology

There are many acronyms used to refer to vehicles that can emit lower emissions than pure ICE vehicles. A brief explanation of different low emission vehicle types is provided below.

App Table 1 EV Terminology

Type	Acronym	Description
Ultra-Low Emission Vehicle	ULEV	This term is used in the UK to refer to any motor vehicle emitting extremely low levels of emissions, currently set at 75g CO_2/ km driven or less. UK targets are set for ULEV uptake and statistics are reported quarterly at local authority level[13].
Zero Emission Vehicle	ZEV	A vehicle with zero tailpipe CO_2 emissions.
Electric Vehicle	EV	Driven by an electric motor, powered from a battery, which must be plugged into an electricity source to recharge. Full EVs do not have ICEs and therefore have zero tailpipe emissions. These pure EVs are sometimes referred to as Battery Electric Vehicles (BEVs).
Plug-In Hybrid Electric Vehicle	PHEV	Combines a plug-in battery and an electric motor with an ICE, either of which can be used to drive the wheels. Therefore, total tailpipe emissions vary depending on how much of the journey uses the battery. They are required to plug-in to recharge their battery.

13 https://www.gov.uk/government/statistical-data-sets/all-vehicles-veh01

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Type	Acronym	Description
Plug-In Vehicle	PIV	A collective term used to cover all vehicles that can be plugged into an external electrical outlet to recharge their battery. PIVs form a subset of ULEV/ZEV, which includes both BEVs and PHEVs as well as Fuel Cell Electric Vehicles (FCEV).
Hybrid Electric Vehicle	HEV	All PIVs require infrastructure to recharge their batteries, so understanding this category's needs is key when planning charging networks.
Alternative Fuel Vehicles	AFV	Uses more than one form of on-board energy to achieve propulsion (usually a petrol or diesel engine plus electric motors and a battery). Some HEVs use the electric motor to make more efficient use of petroleum fuel, but the motor cannot power the vehicle alone.
Fuel Cell Electric Vehicle	FCEV	Consultation/ lobbying is ongoing to ban these vehicles post 2030. This is an important point as mini-cab and private hire drivers use the Toyota Prius hybrid.

EV Technology Roadmaps by Vehicle Type

The UK Automotive Council has developed long-term technology roadmaps[14] for electric passenger car, bus, and commercial vehicle technology, representing the vision of vehicle manufacturers to 2040. These roadmaps show electric drivetrain technology as a focus area for passenger cars and light vans to 2050, given the drivers towards reducing emissions.

Cars

The passenger car technology roadmap applies to private consumer vehicles, taxi and private hire fleets, car share, individual business, and pool cars. Many EVs are now available to support these use cases with many more models scheduled for release by manufacturers in the coming years. However, this increasing model choice must be widely promoted to encourage consumers to consider adoption due to various concerns outlined later in this strategy.

14 https://www.automotivecouncil.co.uk/technology-group-2/automotive-technology-roadmaps/

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App Table 2 Selected Examples of Current EV Market (Cars)

EV Model	Price	Battery Capacity	Range
Nissan Leaf	£25,995	37/56 kWh	140/ 200 miles
Renault Zoe R110 ZE40	£26,795	52 kWh	195 miles
BMW i3 120 Ah	£31,305	37.9 kWh	145 miles
Kia E-Niro ('2')	£32,445	64 kWh	230 miles
Hyundai Kona	£32,550	64 kWh	245 miles
Volkswagen ID.3 (Tour)	£38,815	77 kWh	280 miles
Tesla Model 3	£44,990	57 kWh	235 miles

Vans

Light vans can also make use of EV and hybrid technologies, providing an important opportunity for reducing urban emissions from local delivery solutions and business vans.

App Table 3 Selected Examples of Current EV Market (Vans)

Make	Price	Availability	Mileage	Rapid Charge	Capacity (m3)
Peugeot Partner/Citroen Berlingo	£23,030	Now	106 (NEDC)		3.3-3.7
Peugeot e-Expert/Citroen e-Dispatch/Vauxhall Vivaro-e	£49,465	Now	205 (75KWh) 143 (50KWh)		>6.6
Peugeot e-Boxer/Citroen e-Relay	£49,335	Now	>169 (62KWh)		9
Fiat E-Ducato	£59,699	Now	>224 (79KWh)	No	10-17
Ford Transit (PHEV)	£24,395	Now	35 (EV)		6
LEVC van (PHEV)	£46,500	Now	58 (EV)		5
Maxus EV80	£24,614	Now	119		11.6
Maxus e Deliver 3	£22,800	Now	150		6.3
Mercedes e Sprinter	£51,950	Now	71		10.5
Mercedes e Vito	£39,895	Now	93	No	6.6
Nissan eNV200	£20,005	Now	124		4.2
Renault Kangoo ZE	£24,480	Now	143		4.6
Renault Master	£57,040	Now	124		13

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VW Abte-Transporter	£42,060	Now	82		6.7

Heavy Duty Commercial Vehicles

Heavy duty commercial vehicles remain a challenge for EV technology primarily due to their weight, payload, and range requirements. Several companies are now investing in alternative technology solutions to reduce emissions from heavy freight, with some focussing on creating all-electric powertrains and hydrogen FCEVs while others are adding self-driving features and new fleet logistics systems to standard rigs to improve efficiencies and emissions.

Buses

A variety of EV technologies are already used on buses, including battery electric, hybrid, plug-in hybrid, hydrogen fuel cell and biomethane models, enabling operators to choose appropriate low carbon technology solutions to meet their needs. The UK Government has provided funding towards the deployment of low emission buses through the Department for Transport’s Low Emission Bus schemes and Clean Bus Technology fund. There are two main types of electric bus − those that take power continuously from a source outside of the bus whilst travelling (e.g., overhead wires), and those that use energy stored on-board (usually in batteries). Hybrid electric buses use a combination of ICE and electric propulsion.

Electric Vehicle Availability

EV uptake is currently limited by the volume produced. Manufacturing capacity will need to accelerate if the goals of 2030 and 2035 are to be met. the predicted future trends in manufacturing and battery production will be outlined in this chapter.

There are now over 180 plug-in car models available on the UK market, comprising approximately 86 BEVs and 97 PHEVs. The second-hand EV market is growing. the number of BEVs transactions rising by 37.5% and PHEVs 3.6% in 2022 compared to 2021 figures despite the number of overall second-hand transactions falling by 8.5%.

A factor that is likely to encourage EV uptake is the future adoption of clean area zone charges, which are being considered for several of the UK’s larger cities on the fringes of East Cheshire, such as in Greater Manchester.

Battery Capacity

Analysis of the BEV vehicles on the market shows how battery capacity is growing (see table below). However, there will be lower capacity batteries within the fleet from models sold in previous years that consequently have lower mileage ranges. Whilst this will affect the average range of current BEVs, it will become less of a concern as the existing fleet grows because more recent models have a longer range.

App Table 4 Distribution of vehicles along the battery range

Battery Range	Number of Vehicles	Typical Range
Up to 40 kWh	13	Up to 160 miles
40 to 50 kWh	24	160 - 200 miles
50 to 70 kWh	29	200 - 280 miles
70 to 90 kWh	59	280 - 365 miles
90 to 100 kWh	7	365 - 400 miles
100 kWh +	5	400 – 500 miles

Battery Charging Capabilities

Prior to 2016, most EVs charged at 3 kW AC (alternating current), called slow charging, which was adequate to fully recharge most batteries (typically up to 24 kWh) overnight. Rapid charging DC (direct current) technology has developed much faster than AC technology, giving consumers a faster method to recharge. However, only some plug-in models prior to 2016 are capable of rapid charging; while all new recent UK plug-in models are capable of being rapidly charged.

Most vehicle manufacturers now use the CCS or CHAdeMO DC socket/ plug for rapid charging. The latest development in charging technology introduces charging at powers between 100 kW and 350 kW DC, referred to as ‘high-power charging’. However, there are few PIVs currently available in the UK that are capable of charging at this rate. The majority of high-power charging solutions use the CCS DC socket/ plug; however, a few have maintained the CHAdeMO socket/ plug.

The roll-out of high-power chargers at 150 kW+ for public use is now beginning in the UK. Most are designed to also deliver 50 kW DC charges to rapid chargeable vehicles to combat the current lack of high-power charging demand. Slow and fast AC charging solutions will continue to be required in the UK, including throughout Cheshire East, to support the recharging needs of the existing EV fleet. Of the currently available rapid chargeable PIVs, approximately 50% require the CHAdeMO connector. Therefore, new rapid chargers installed over the next five years will require both DC CCS and CHAdeMO connectors. Past this period, all manufacturers, with the exception of Tesla, have committed to transitioning to CCS.

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PIV Supply Constraints

The lack of production capacity is a global issue, originating in vehicle production plants and battery production facilities across the world. The technology trajectory is still uncertain, the associated costs and plant changeover timelines are high, and both battery technology and supply are a key determinant. This presents major financial and reputational risks for vehicle manufacturers since one of the key constraints (batteries) is out of their control.

The supply constraints are associated with global manufacturing, both in terms of cost and production capacity. These constraints are outside of the Council's control and in some cases the UK Government. However, it is important that sufficient infrastructure is in place for current EV owners, and further infrastructure is providing in a timely way to allay the fears.

The current limited uptake of EVs is posing a problem for both legislators and supporting businesses. The UK Government has responded by offering purchase incentives for ULEVs since 2011. However, these have been reduced in recent years and now funding has ceased, although there are still some tax benefits. The availability and cost (though less so than a few years ago) of Lithium-ion (Li-ion) batteries are limiting factors in supply. Li-ion technology is currently the preferred choice for due to the capital cost and reliability.

Alternative volume-ready technologies such as solid-state batteries are not forecast to reach the EV market until between 2028 and 2030. Many new battery manufacturing plants will need to supply the EV volumes required to meet European targets, requiring significant investment and long-range planning. Therefore, there is still a substantial risk that EV supply will constrain achievement towards transport emission reduction targets in the UK.

Global, European and National Challenges

PIV Production

UK car production has dropped over the last three years with the SMMT stating that a total of 775,014 cars were built in 2022. This is almost a 10% decrease from the 2021 levels of 859,575 and 40.5% lower than pre-covid levels of 2019. This fall in output has been mainly attributed to the lack of availability of semiconductors as well as other contributing factors such as staff COVID cases the need for self-isolation.

This shortage in the availability of new vehicles makes it more difficult to predict the year-on-year growth of the EV market although the percentage of EVs continues to rise in the UK with 234,066 EVs, BEVs, PHEVs and HEVs produced in 2022 – a 4.5% increase on the 2021 levels.

Battery Production

EV battery capacities have continued to increase gradually as new vehicles enter the market. Initially average battery capacity was in the region of 20kWh whereas at the beginning of 2023, it is approximately 70kWh. The number of vehicles that can be manufactured depends heavily on the availability of batteries. As battery capacities increase so does the need for increased manufacturing capacity globally to meet both the demands of the car manufacturers and to ensure Government Net-Zero targets can be achieved.

Envision AESC in Sunderland has the capacity to produce batteries for 100,000 EVs per year with plans to expand further. As battery manufacturing capacity increases inevitably the cost should reduce, consequently reducing the vehicle cost making the purchase of EVs accessible to more of the population.

Benchmark Minerals Lithium-ion Battery Gigafactory Assessment (September 2018) reported Europe's battery cell capacity to be at 120GWh by 2030 – enough cells for 2.2m EVs. Overall, Benchmark is now forecasting Europe to have a capacity of 789.2GWh by 2030, little over 14% of the global total of 5,454GWh. By the end of 2022, Europe is set to have 7 active lithium-ion battery producers of which the top five by capacity (and Gigafactory location) are:

- LG Chem (Poland): 32GWh;
- Samsung SDI (Hungary): 20GWh;
- Northvolt (Sweden): 16GWh;
- SK Innovation (Hungary): 7.5GWh; and
- Envision AESC (UK): 1.9GWh.

It is important at this point to make clear that the capacity of the plants is in GWh and not number of batteries. The table below shows the impact of creeping battery capacity size has on vehicle supply. In simple terms the larger the battery the less vehicles produced.

App Table 5 Impact of battery capacity on vehicle volumes

GWh	kWh	Number of vehicles (millions)
789.2	50	15.7
789.2	60	13.1
789.2	70	11.2
789.2	80	9.8

A further challenge is that not all batteries produced will either go into vehicles with some batteries going into static storage. The current level is not known. Also, the balance of trade in terms of EVs imported into Europe and exports is unknown.

Achieving a target of all new vehicles being EVs by 2030 could only be achieved from currently committed manufacturing capacity if batteries get no larger than 50kWh, all produced batteries go into cars and vans, every proposed battery plant gets built, and no material supply problems occur. If PHEV, with smaller batteries, make up a larger proportion of the new car market this would help, however the market is quickly moving to full BEV. Therefore, a significant increase in manufacturing capacity is required.

This demonstrates the challenge with achieving EV registration targets and why providing public charging infrastructure is only part of the picture.

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Chip availability

A shortage of microchips around the globe is influencing almost every industry. The automotive sector is no exception, and car production has reduced across the world due to the lack of microchips. Ford itself has said it expects the production of 1 million of its own cars to be hit by the shortage. An acute lack of computer chips has left dealers struggling to supply many new conventional models let alone EVs.

These are critical components in modern cars, being used in areas such as engine management and emissions control, emergency braking, airbags, entertainment systems and navigation. A modern car can use between 1,500 and 3,000 semiconductors. The motor industry also faces intense competition for the chips that are available from other sectors, particularly the consumer electronics industry.

EV Charging Technology

Although EV charging points are often discussed as the technology that is required to allow EVs to recharge, there is a lot of other technology involved in the process. This section explains the need for recharging infrastructure, and summarises the technologies used in the UK.

The need for recharging infrastructure

Electric Vehicle Supply Equipment (EVSE) is the collective term used to refer to all equipment used to deliver energy from the grid to a PIV. EVSE includes plugs, sockets, conductors, power outlets and devices that allow communication between the recharging apparatus and the vehicle.

BEV or PHEVs require their batteries to be recharged. Where this occurs, the duration of the charge and time of day will vary to meet users' requirements. Consumer preferences and habits also have a role to play in recharging behaviour. However, their preferences for charging have not yet been established, which means strategies and delivery plans need to be flexible and account for these uncertainties.

Slow, fast, rapid, and high-power chargers suit different locations and charging behaviours. Slow and fast chargers suit destination charging patterns, where the driver looks to recharge at a location that they will be leaving the car for a considerable amount of time such as at supermarkets or places of work. Rapid and high-power chargers' suit on-route charging, quick recharging at destinations, and support the taxi and delivery/ logistics (LGV only) trades due to their high-speed capabilities.

Chargepoints

The most well-known element of EVSE is the chargepoint – also called a charging post, charging point or charging station. There are many specifications of chargepoint in the marketplace, differentiated by power output, communication protocol, type, and number of charging outlets. They can typically be installed mounted onto a wall or as free-standing units installed in the ground. Most ground mounted chargepoints can be installed with retention sockets to ease swap out for

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future maintenance, repair, or replacement. Table 3-7 provides a summary of the different types of chargepoint currently available in the marketplace.

Chargepoint design is evolving rapidly. Six years ago, only single outlet 3kW AC slow chargepoints were available. This suited early EVs, which were only capable of drawing a 3kW power supply. Recently, the Type 2 socket has been developed to reduce charging speeds. This has been followed by the development of 50kW rapid chargers, which were only initially suited to a few PIV models, but now have multi-standard variants. This widens their use to most rapid charge-enabled vehicles.

App Table 6 Types of EV Chargepoint

Common Chargepoint Names	Power Output (kW)	Current / Supply Type	Socket / Plugs	Charging Duration (24kW battery)	Use Cases
Slow	<7	AC	Type 2 Socket	6-8 hours	Destinations
Fast	7 – 22	AC	Type 2 Socket	4-6 hours	Destinations
Rapid	43 -50	AC	AC – Type 2	30 minutes to 80%	On-route
		DC	DC – CHAdeMO		
		DC	DC – CCS Captive cables with plugs attached		
High Power	100	DC	Tesla 120kW	TBC depending upon vehicle	On-route
		DC	CCS 150kW+		

Charging Rate

The most significant advances in BEV are the emergence of 800 V electrical systems which achieve much faster charging and reduced weight, allowing them to travel further between charges. Such systems enable greatly reduced charging times, as long as they are using fast chargers capable of working at up to 270 kW.

Charging operators are now preparing for higher powered charging. The pictures along the top row Figure 3.2 shows normal 50 kWh rapid chargers at a motorway station, of which there are normally two, being replaced by 12 x 350 kWh. These new chargers allow approximately 100 miles of range to be added in less than five minutes. The pictures shown below also show a similar progression by Shell from a single 50 kWh charger to a forecourt of 10 x 175 kWh chargers.

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App Figure 1 Examples of Charging Forecourts

Charging Connectors

The International Electrotechnical Commission (IEC) standard 62196 specifies the plugs, sockets and outlets required for conductive recharging, covering charging modes, connection configurations and safety requirements for the operation of EV and recharging facilities. EV recharging connectors are specialised for automotive use.

PIV cars and light vans are supplied with a charging cable used to connect the vehicle to slow or fast chargepoints. This cable has a plug specific to the vehicle on one end, and a suitable plug on the other end to connect to slow/fast chargepoints in the UK. Some vehicles have separate charging sockets for slow/fast and rapid charging solutions, whilst some manufacturers have standardised around one vehicle-side socket for all charging solutions. The following section, taken from the Zap-Map website, show the variety of charging connectors (plugs) and sockets used for the different types of PIVs in the UK. Charging cables are typically supplied with a Type 2 plug to connect to slow and fast chargepoints in the UK.

Charging cables are also available fitted with standard UK three-pin plugs intended for infrequent use where Type 2 charging solutions are not available, incorporating power protection limiting delivery to 3kW due to the risk of 3-pin plugs overheating when delivering power over prolonged periods.

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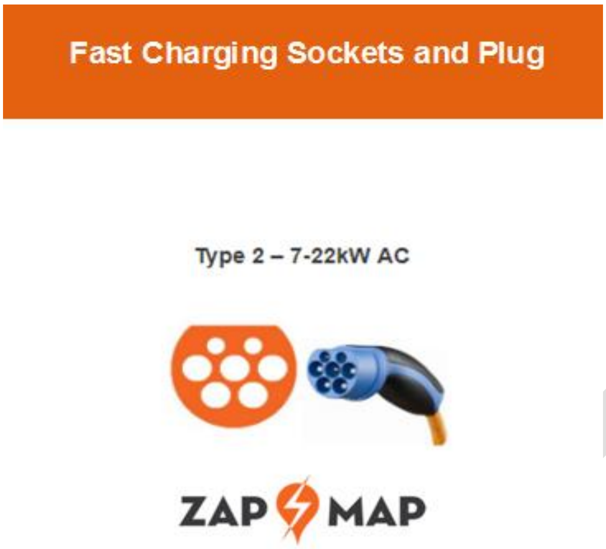
App Figure 2 Type 2 socket and plug for slow and fast charging in UK



Rapid and high-power chargers do not use the cable supplied with the vehicle. Instead, these chargers are fitted with tethered cables and connectors that plug directly into the vehicle due to the high power being delivered. There are four socket/plug formats used for rapid and high-power charging in the UK, as shown below.

App Figure 3 Sockets and plugs for rapid and high-power charging in the UK

Most vehicle manufacturers use the CHAdeMO or CCS DC socket/plug for rapid and high-power charging. Only Renault retains the 43kW AC system.
Tesla's 120kW supercharger socket/plug was designed to suit their bespoke battery solution. Tesla provides superchargers for public use.

Charging Protocols

The charging protocol governs how the vehicle communicates with the recharging equipment. It could also potentially communicate with a wider network of equipment and services such as payment systems, energy, communications, and other services. The use of the Open Chargepoint Protocol (OCPP) is promoted as the best way to enable the functionality required for widely available and accessible recharging networks of the future.

If all vehicle and charging manufacturers adopt the same communications protocol, then the global recharging network will become:

- Accessible for all EV drivers;
- Flexible to needs of various stakeholders; and
- Cost less to run as new developments are shared easily and quickly.

Upgrading Existing Charging Infrastructure

In some instances, it may not be possible to upgrade existing charging infrastructure to be OCPP compliant. In these cases, depending on age, use and cost of ongoing maintenance, older chargepoints will eventually need to be replaced with new OCPP compatible infrastructure. Ensuring all stock is OCPP compliant would improve functionality, reduce maintenance costs, and improve the customer experience. More importantly, it would allow an easier transfer of assets to any new chargepoint operators operating platform should there be a need to change suppliers in future.

Existing charging infrastructure should be reviewed to identify any non-OCPP compatible infrastructure. Where possible, the cost to upgrade the non-OCPP compatible infrastructure should be included in the review and the infrastructure should be scheduled for future replacement. In the long-term, CEC or partners can choose to pay for the upgrades or enter into a contractual agreement with a supplier who will pay for any necessary upgrades. These options depend on:

- The expectation for the network;
- The attractiveness of the charging infrastructure to commercial partner;
- Available investment funding; and
- The available timeline including disposal of assets, physical upgrade where possible, or replacement of stock.

Smart charging

Electric mobility will become an integral part of the UK's smart energy environment because the electrification of transport is key to decarbonising the economy. So smart charging solutions are a key enabler of a sustainable recharging market in the UK.

Smart charging could benefit both consumers and electricity networks by incentivising consumers to shift recharging demand to less expensive periods when there is plentiful clean, renewable electricity available. This may reduce the need for expensive electricity network reinforcement.

Regular (non-smart) charging commences as soon as the PIV is plugged in, drawing the maximum amount of power available from the supply until the battery is fully charged. For large fleets, this could overload the available power supply causing practical power outages on-site and financial penalties from the energy supplier. Alternatively, smart charging allows the monitoring and management of the charging session to enable remote control of when, for how long and how rapidly the PIV recharges. Smart charging uses the OCPP charging protocol (v1.6 and beyond) to maximise charging flexibility and to mitigate the need for high-cost power supply upgrades. Although smart charging increases recharging infrastructure cost somewhat, it can provide multiple benefits:

- **Power peak reduction:** schedule and automatically control each vehicle's charging cycle to avoid peak power demand times and avoid exceeding maximum power supply capacity.
- **Reduce investment costs:** make optimal use of the existing power supply by controlling the charging speed of each chargepoint to prioritise specific vehicles and balance the available power across chargers to ensure each vehicle is fully charged ready for the next shift's activity.
- **Energy cost reduction:** cost-effectively schedule charging times to take advantage of time-of-use energy tariffs to reduce operating costs.
- **Increase flexibility:** use prioritised load balancing to deliver only the energy required to suit each vehicles' next shift requirement, and allow for extended shifts, increased range, late start/finish times, etc.
- **Demand response:** respond instantly to dynamic energy pricing and accelerate or reduce the energy consumption of the fleet accordingly to reduce operating costs.
- **Integration of batteries and renewable energy sources:** use stationary batteries as energy stores, charging them from renewable generation sources and/or when energy cost is low, and subsequently use that stored energy to recharge vehicles when energy costs are high.
- **Reduce manual labour:** removes the time-consuming and error-prone need to manually plug/un-plug vehicles at specific times.
- **Improve PIV battery health:** smart charging results in slower charging over the battery's life cycle, preserving its state of health and reducing long-term operating costs and environmental impacts.

There are currently three levels of smart charging available:

- Basic load balancing distributes the available power capacity equally between all chargepoints to prevent overloading and high energy costs at peak times. For example, if there are 10 vehicles charging simultaneously each vehicle would receive 10% of the total available power.
- Scheduled/static load balancing can also optimise charging schedules to take financial benefit from time of use energy tariffs. For example, chargepoints can

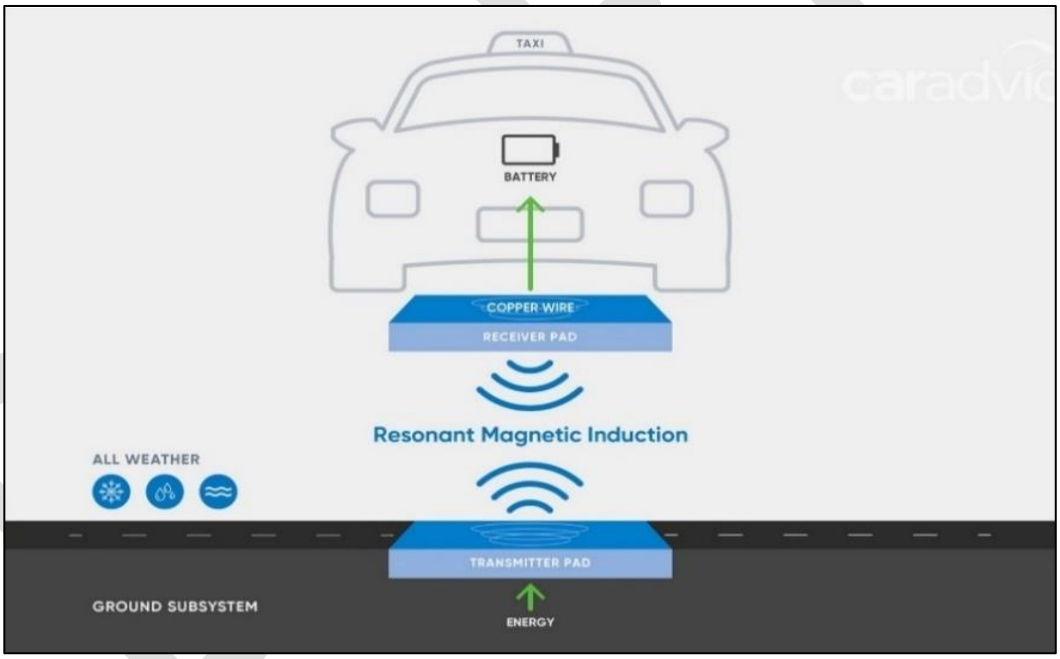
be programmed via an app to charge EVs such as at night when there is a surplus of inexpensive green energy.

- Dynamic load balancing can combine both static and dynamic data such as bus routes, next day plans and dynamic energy pricing to ensure the entire fleet is charged in time for individual departure at the lowest cost. In practice this means directing more power to those vehicles that most require it, such as buses doing longer routes. While also charging the vehicles during the most affordable periods.

Emerging Wireless / Induction Charging Technology

The EV industry has seen substantial technological development in recent years. Another advancement already in train is induction, or wireless, EV charging. Induction charging is fairly simple − electricity is transferred through an air gap from one magnetic coil in a transmitter pad to a second magnetic coil fitted to a receiver pad on the vehicle. All that is required is that the vehicle is positioned in the right place so that the coils are aligned, and charging will begin.

App Figure 4 Induction Charging



Wireless EV charging via magnetic resonance technology delivers the same power, efficiency levels and charge speeds as conventional plug-in charging methods. Charging can be done through water, snow, ice, concrete, granite, etc., without any concerns regarding cable connections. Most Level 1 or 2 consumer plug-in EV chargers operate in the 88% to 95% efficiency range end-to-end, from grid to the battery. Leading wireless EV charging technologies today operate in that same range, at 90% to 93% efficiency.

Wireless charging also makes always-available bi-directional charging possible. Making EVs available as local on-demand energy storage is critical as utility companies look for an increased mix of renewables in the electrical grid. Bi-directional charging, otherwise known as vehicle-to-grid (V2G) technology, can help utilities handle increasing peak demand. For V2G to work seamlessly, the cars need

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to always be available on demand, and the reality is that most owners do not plug in when their battery is well-charged. Wireless V2G solves that as whenever the vehicles are parked, that stored power is available, and provides a new source of value for the EV owner. Wireless charging will be crucial in the successful introduction of autonomous vehicles.

Battery Swap

The Chinese vehicle manufacturer NIO has launched the first battery swap station in Norway[15]. The first second-generation Power Swap Station was introduced in April 2021 and has 14 battery slots, 13 battery packs (versus five in the first-generation version) and an empty slot to pick up a discharged battery, or old/ previous generation battery when upgrading. Currently, the battery swap stations only support EVs from NIO, which are all built to be compatible with the battery swap system.

In China, NIO have more than 700 battery swap stations and are planning to install 4,000 by 2025, including 1,000 outside China. NIO installed their first Power Swap Station in Germany in September 2022. Germany has the largest European EV market and this new modern facility, the size of a double garage, has a connected power of 550kW and was initially designed for more than 100 swaps a day.

Induction Trials

A number of trials of induction charging are currently underway:

- **England, Nottingham:** Wireless charging for electric taxis waiting in their rank is to be trialled in Nottingham. The UK Government is putting £3.4m towards fitting five charging plates outside the city's railway station. The six-month pilot project will see 10 electric taxis fitted with the necessary hardware, and the scheme could be rolled out more widely if successful. Officials said EVs were 'vital' to improving city air quality and making charging convenient was key. The Department for Transport said wireless charging was more convenient and avoided the clutter of cable charging points. (*Source: BBC News online)*

- **Scotland, Edinburgh:** Heriot-Watt University, located near Edinburgh, Scotland, is planning a trial of wireless charging using electric delivery vans. It is a joint project with the City of Edinburgh Council and Flexible Power Systems (FPS), and will involve specially adapted vans, with charging equipment from Momentum Dynamics. Innovate UK provided funding for the trial. The trial will also explore the concept of charging hubs, which could be shared among multiple fleet operators. "The project is testing the sharing of charging hubs among logistics, retailers, local government and university-owned commercial vehicles," said FPS Managing Director Michael Ayres. "These charging hubs require high use to be economically viable. The project uses powerful wireless charging to shorten the time vehicles need to be in the charging hubs." (*Source: The Scotsman)*

- **Germany, Cologne:** In the German city of Cologne, an inductive (wireless) charging project for taxis is being set up called the Taxi Charging Concept for Public Spaces (TALAKO, based on the German title). This is part of the SMATA

15 https://insideevs.com/news/561903/norway-nio-first-battery-swap/

feasibility project, launched in October 2020. For the new TALAKO project, six LEVC (London Electric Vehicle Company) electric taxis are to be converted for inductive charging. LEVC is responsible for making the famous London electric taxi cabs specially developed for the taxi industry. The vehicle has an electric range of 130 km and a range extender on board to extend the range by 500 km if necessary. When the Cologne project is in operation, six vehicles will be able to charge simultaneously. *(Source: electrive.com)*

- **Norway, Oslo:** Jaguar Land Rover will provide 25 Jaguar I-PACE models to Cabonline, the largest taxi network in the Nordics. The brand's performance SUV has been designed to enable Momentum Dynamic's wireless charging technology, making it the ideal vehicle to drive the initiative. A team of engineers and technicians from both Momentum Dynamics and Jaguar Land Rover were engaged to help in testing the solution, and Cabonline signed up to operate the fleet as part of Oslo's ElectriCity programme. Taxi drivers need a charging system that does not take them off route during their working hours. Multiple charging plates rated at 50-75 kilowatts each are installed in the ground in series at pick-up-drop-off points. This allows each equipped taxi to charge while queuing for the next fare. The system, which uses no cables and is situated below ground, requires no physical connection between charger and vehicle, engages automatically and provides on average 6-8 minutes of energy per charge up to 50kW. *(Source: jaguarlandrover.com)*

It is not clear at this time how the COVID-19 pandemic may have affected the progress of these trials.

Wireless Induction Charging Capability of EVs

Most, if not all, of the top vehicle manufacturers have stated that they are likely to offer wireless charging capability in the future. However, wireless charging is yet to be built into any model of PIV to date. BMW had planned to offer this technology on its 530e plug-in hybrid saloon back in 2018, but this decision was reversed, and the current generation battery does not support it. In Germany, it was a €3205 (£2700) option for consumers.

It is difficult at this time to ascertain when this technology would be likely to be introduced. Availability of relevant infrastructure will surely play a major role in determining possible introduction.

Further thoughts to be answered or considered regarding wireless / induction charging:

- If wireless charging is initially offered as an aftermarket add-on, then the required vehicle retrofit may have an impact on both vehicle warranty and insurance. The cost of installing the required infrastructure may suggest that installation will only be feasible as a hub consisting of multiple charging bays rather than single chargepoints in and around cities.

- The chicken and egg scenario − will car manufacturers want to introduce this option on vehicles if insufficient infrastructure exists? Likewise, will anyone want to introduce the infrastructure if no vehicles exist to use it? The vehicle manufacturers had to 'invest' in the current EV charging infrastructure, so are they likely to want to do it again?

- To go mainstream, wireless charging will need international standards. The Society of Automotive Engineers (SAE) recently announced the first global standard for wireless EV charging, which could help accelerate the technology's rollout. The standard, SAE J2954, applies to inductive charging systems up to 11 kilowatts. As with existing SAE standards for other charging methods, J2954 will harmonise new systems, allowing for increased interoperability between hardware and vehicles from different manufacturers.

The Hydrogen Project

Use of Hydrogen in the UK

Hydrogen is increasingly used for transport across the world, especially in northern Europe. In the UK, the use is increasing – currently there are 12 hydrogen refuelling stations. There are an increasing number of Councils using hydrogen powered refuse collection vehicles, including Fife and Westminster. These are mainly in the south of England. Our project will be the first 'green' hydrogen refuelling station in the north west of England, although it is not open to the public.

Cheshire East Councils Hydrogen Project

CEC are piloting the single site production, storage and use of hydrogen for their refuse vehicles, with the aim of becoming a carbon neutral council by 2025.This project is running for three years, during which time CEC will evaluate its success and consider it for the future. CEC will also be keeping an eye on any developments in EV technology to see if they can be used at the Environmental Hub. It is a holistic system, producing green hydrogen from on-site electrolysis primarily from solar panels, but with a green electricity backup. The hydrogen equipment is on the south side of the Environmental Hub, close to the existing fuelling area. This has suitable clearances around it and is shielded from sight by a neighbouring building.

The vehicles are dual fuel so that the hydrogen is used alongside diesel at blends up to 80% hydrogen at low speeds, which is typically when they are collecting and so reduces air pollution.

Project partners

CEC and Ansa have partnered with Storengy UK, who are industry experts on hydrogen. They will provide the technical expertise on hydrogen and maintain the equipment which has been supplied by Logan Energy and Ulemco. The Cheshire and Warrington Local Enterprise Partnership has also provided funds.

Appendix B: Development of Location Assessment Model

Local Assessment Model

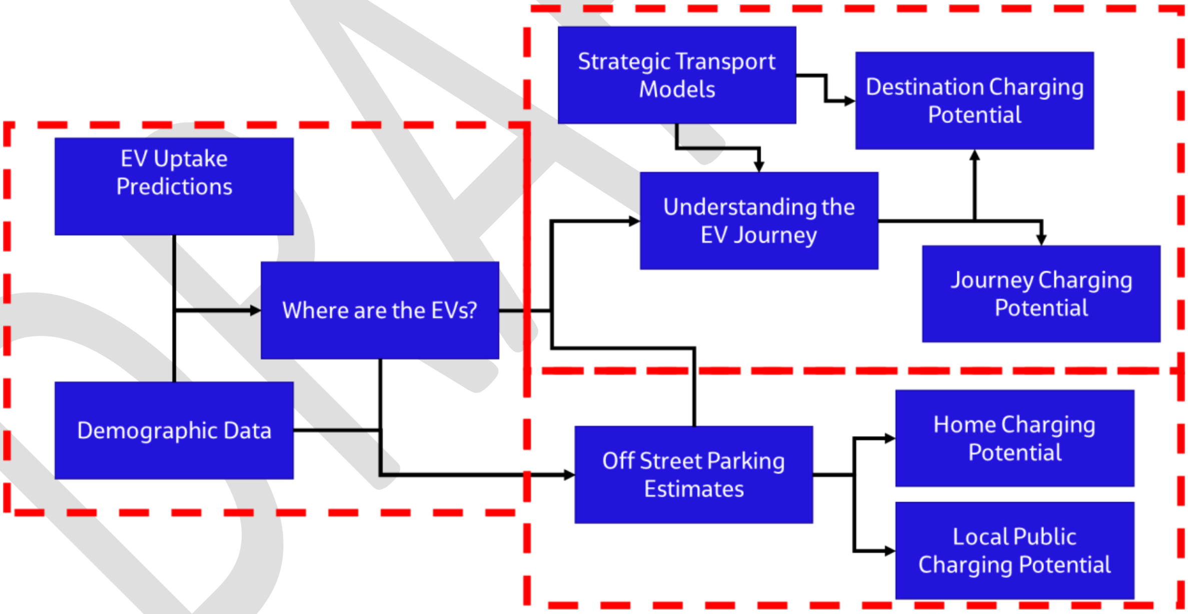
Jacobs has developed a Spatial Distribution Model to inform a classification tool which ranks the suitability of potential charging sites based on three usage cases for EV charging: residential, destination and on route.

The model is fundamentally based upon answering two basic questions:

- How many EVs will there be?
- Where will those EVs charge?

The answers to both questions are informed by a series of interconnected models, which can be independently altered to suit the needs of the specific question being answered.

App Figure 5 Broad Structure of the EV Mode



The figure above**Error! Reference source not found.** shows the broad structure of the EV classification model. The model is broken down into three separate components, each of which deals with a separate independent component of the overall model. As part of this model, data regarding travel patterns, demographics and housing stock type in Cheshire East has been used to assess the suitability of potential locations for hosting chargepoints. Output from the model has informed the appraisal of potential sites.

Local Charging Potential

To understand how local charging may vary, it is necessary to include spatial variation in the model, the differing demographic across the area is used. For spatial variation in EV uptake, the two most important demographics are:

- The total number of vehicles within each OA as this determines the baseline probability of owning a vehicle. This ensures that inner city areas, with fewer vehicles in general, are not over-represented.

- The income levels of each area determine both the probability of purchasing a new vehicle, and also the probability of that vehicle being an EV due to the price differential.

The income for each area is fed into the overall EV uptake model to generate an individual EV uptake prediction for each area of interest. The total number of vehicles within each OA provides a hard cap on the number of EVs.

However, this simply provides the total number of EVs for each area, it does not contain any information on where we expect those EVs to charge, for this we need to include information on the ability of the EVs to charge at home.

Almost all research has shown that, if given the choice, people will overwhelmingly prefer to charge their EVs at home. However, this is not possible if there is no off-street parking, and so it is also necessary to assess this capability within the model.

This has been achieved through using the house type from the census data to form a broad understanding of the dwelling type and the capacity for off street parking. For example, if most houses are detached, then we would expect more off-street parking.

This information is combined with EV uptake to form an overall assessment of public charging potential.

The model combines each of the previous elements into a single UI.

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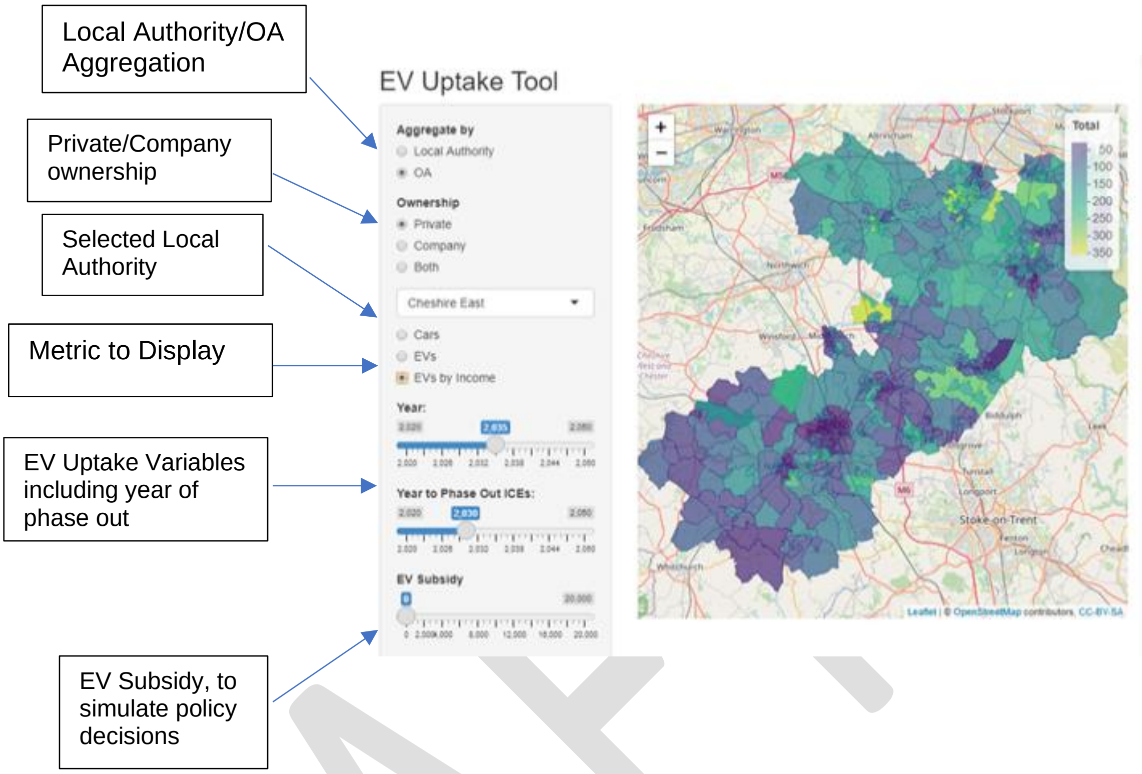
App Figure 6 Elements of the Model



The interactive model is designed to display the data generated by the underlying model and to enable proof of concepts for each idea to be quickly tested.

For example, the above image shows the total number of EVs within Cheshire East, with the income distribution model, a 2035 phase out, no EV subsidy and for the year 2030.

Journey Charging Potential

Understanding the potential for charging within a journey, is a different and much more in-depth proposition than for localised charging. In addition to accurately assessing the general uptake and distribution of EVs, it is also necessary to understand where those vehicles are going to be driving and the probability of those vehicles charging on the way.

This data will be used to generate information on each link within the Major Road Network (MRN) within the area of interest.

The basic process used to generate the traffic flow for each link is as follows:

1. Determine the shortest path between the origin-destination (OD), in terms of the road network. The shortest path has been determined by creating a graph network from the road network, and then using an A* Pathing algorithm to determine the shortest journey time between the OD pair.

2. For each OD pair, create a data point with the OD information and the full path information. This information will contain an identifier for the OD pairs

which will allow us to alter the EV demographics of the OD pairs, without needing to rerun the shortest path algorithm.

3. For each network link, sum up the total number of vehicles that use this link, aggregated by the necessary factors that we believe are important in determining the propensity to charge.

From this data, it is then possible to map predicted number of vehicles, segregated by the factors that it is believe will determine the given probability of any vehicle to charge on the vehicle network.

App Figure 7 A schematic of the process used to derive aggregate journey statistics

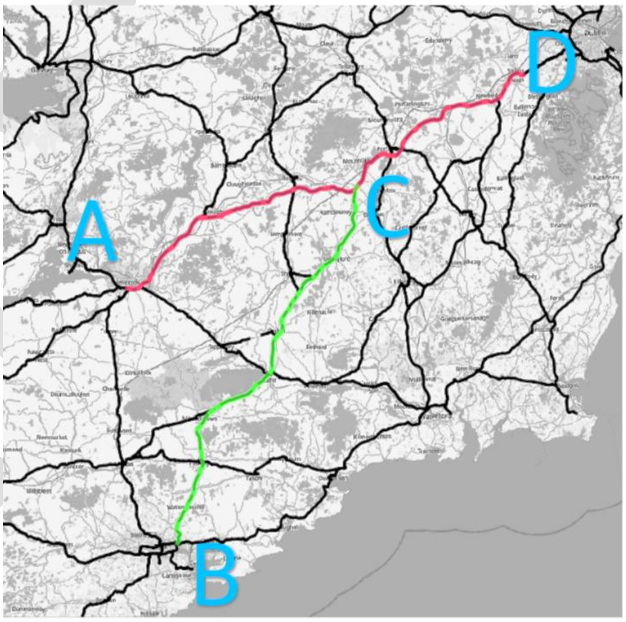
By aggregating routes derived from Origin-Destination pairs, we can derive a likely fleet population for every link on the road network

A:C Each link on this route is populated by a fleet determined by the vehicle population at A

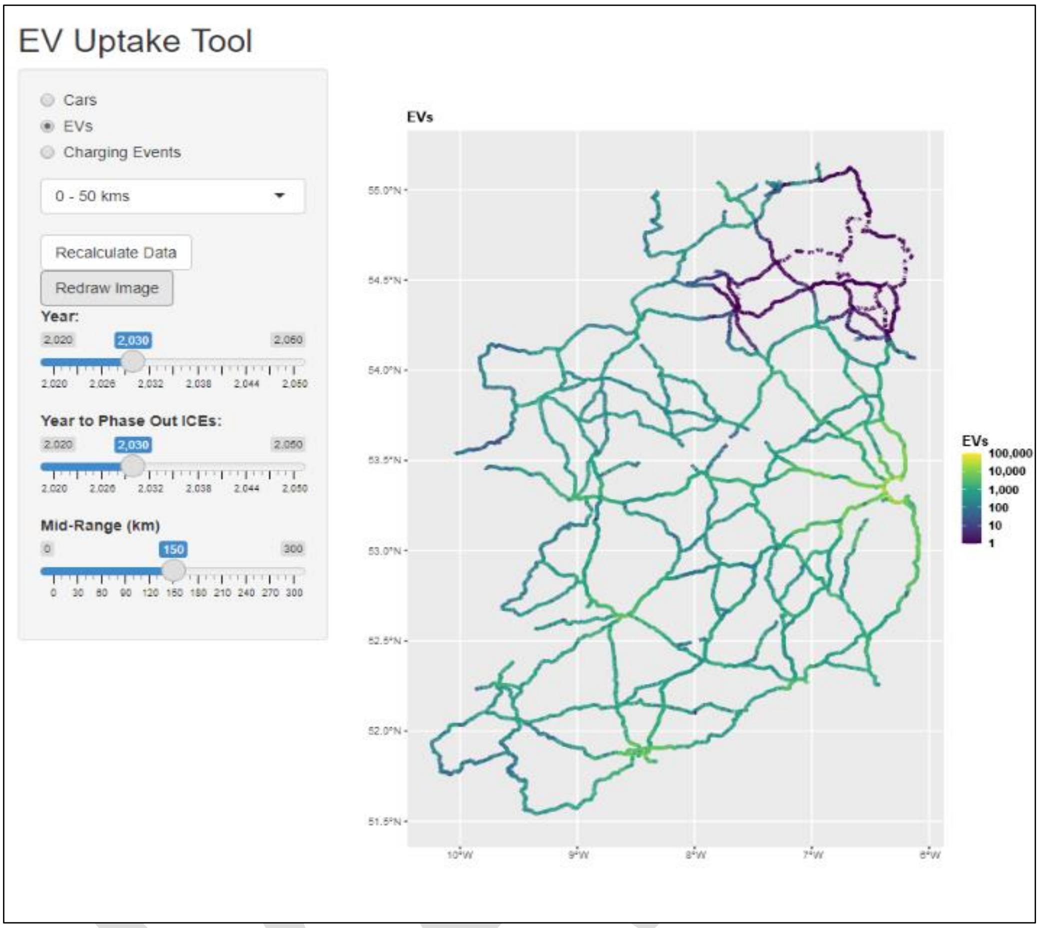
B:C Each link on this route is populated by a fleet determined by the vehicle population at B

C:D Each link on this route is populated by a fleet determined by the vehicle population at both A and B

This is replicated for each possible set of Origin-Destination pairs



App Figure 8 Example of Road Network Analysis



From this data, it is then possible to generate a complete picture of the number of EVs which will be expected on any link with the network as a whole.

By connecting the network data, with the detailed origin EV uptake data, it is possible to construct a complete model of the movements of vehicles within the network.

An example of this complete network is shown above for the road network of Ireland. This particular model shows the results for all 0-50km journeys and as might be expected, the vehicle flow is more concentrated around the major population centres. If the 50-100 kms journeys were selected, then this would expand out into the connecting roads between those centres.

The data from this model feeds into understanding the potential for capturing journey charging events.

Assessing Model Outputs

It is possible to utilise the EV Uptake model to systematically create metrics which can be used to assess the suitability of different potential chargepoint locations.

Due to the ongoing uncertainty around all EV metrics, it was decided to assess the metrics on a purely ranking order. This would allow for a relatively easy comparison between different sites under potential different EV uptake scenarios, and also removes the necessity to decide what constitutes a “good” level of EV uptake. Each site is ranked from 0-6 with 0 representing the lowest ranked sites, and 6 the highest.

Whilst the generation of each individual metric is an objective process, the ranking and weighting of each metric is fundamentally subjective and relies upon a degree of knowledge as to the appropriate level of importance for each assessment. This is captured within the assessment longlist through the inclusion of a series of adjustable weights for each metric, allowing for a rapid iteration through the subjective assessment process whilst maintaining the objectivity of the previous metric derivations.

The data used within the assessment has been aggregated (or generated) at the LSOA level, as there is an abundance of data available at this level whilst also providing that data at the required spatial fidelity.

In addition to the directly derived model assessment outputs, we have also incorporated two manual assessments for security of location and the existence of other chargepoints within the area. These two assessments are more subjective than the quantitative model assessments.

Journey Assessment

Within the Journey Assessment we are assessing the potential for each site to capture charging events from vehicles which are in the middle of a journey. Essentially, this assessment is geared towards drivers who may be undertaking a longer journey who will need to stop and charge their vehicle en-route to their destination.

This will likely lead to a fundamentally different usage profile than would be expected for those using local public charging infrastructure. There would typically be a preference for rapid/ultra-rapid charge stations combined with a potentially greater willingness to pay a premium for the speed of charge.

A typical example of the sort of chargepoints which would service this need, would be the Braintree all electric forecourt operated by Gridserve.

The data used to generate this assessment comes from the Journey Profiling component of the model, with additional input on the likely EV uptake for the origin points generated by the EV Uptake component of the model. Due to the ranking nature of the assessment (rather than being based on an absolute value) the assessment is based on the number of EVs passing through any particular link within the assessment LSOA, rather than a direct calculate of the number of chargepoints.

Job Assessment

If a vehicle is going to take on a significant amount of energy, then it needs to either use a rapid charging system or remain in the same position and use a chargepoint with a lower capacity. In addition to when the vehicle is parked at home, the other major time when a vehicle will be stationary is when the vehicle is parked whilst the driver is at work. So, by assessing the total number of jobs within a particular area, it is possible to understand the potential level of charging demand.

However, when compared to journey charging, the typical chargepoint needed for employment-based charging will be of a lower necessary capacity as the vehicle will remain connected to the chargepoint for longer.

The distribution across time for work-place charging will typically follow the arrival and departure patterns of workers, with an unmanaged charging profile peaking in the morning.

The data used to determine this is derived from the census data and as such is aggregated to the MSOA level. However, typical MSOAs will be approximately 1km across within a typical urban area and so can be used to assess chargepoint areas.

The metric used is the total number of jobs within each MSOA.

Retail/Leisure Assessment

In addition to work-place charging, a second possibility for longer term parking is from retail and leisure-based transport. This is parking induced by either shopping or leisure opportunities such as the cinema or sports events.

The typical dwell time for retail/leisure will be typically less than for employment-based charging. Whilst the maximum dwell time could be comparable, the average and minimum time will be substantially less. There is therefore a greater opportunity for a mix of more standard, fast, and rapid chargers.

As well as the retail/leisure area being the fundamental destination, it may also be possible to use the charging area to develop a limited retail/leisure area.

The data used in this assessment was derived from the census data at the MSOA level, similarly to the Job Assessment. However, the breakdown of different employment types has been used to generate the data for Retail/Leisure compared to the general employment levels.

The metric used is the total number of Retail/Leisure jobs within each MSOA.

EV Uptake Assessment

The EV Uptake Assessment uses the raw EV numbers generated by the model, aggregated from the OA level to the LSOA level to understand how EV numbers increase across Cheshire East. Whilst it would be possible to use the OA numbers, there can be quite extensive OA variation across an LSOA.

Whilst there is an extensive amount of detail which goes into the generation of this data the fundamental metric is straightforward, it is simply the number of total EVs in each LSOA.

Whilst it would be possible to generate a more sophisticated model of EV uptake, incorporating such factors as total EVs per person, total EVs per standard vehicle etc., the level of charging necessary will be essentially entirely dependent on the raw EV total and so it is this simpler metric which is used.

The metric used is the total number of EVs within each LSOA.

EV Off-street Assessment

Although the total charge required within an area, will be determined by the total number of EVs, understanding the location type of chargers required, necessitates a greater degree of understanding of the metrics involved. If the EVs are concentrated within areas with extensive off-street parking then it may not be necessary to provide localised public charging, as that need will already be met privately.

Therefore, it is necessary to understand not just the total number of vehicles within each LSAO, but also the total number of dwellings without off-street parking as it is this number, when compared to the total number of EVs, which will determine the need for localised public chargepoints.

This information is already contained within the model, using the house type as a proxy to determine the probability if a particular house has on or off-street parking.

The metric used is the number of EVs per Off-Street parking space within each LSOA.

Security of location

The Security of Location is a metric designed to look at the general safety/security of each chargepoint, with particular consideration given to the perceived safety of the user rather detailed statistics about the actual level of potential risk within the area.

This metric does not consider the potential for accidents within the site.

The assessment was performed through a combination of Google Street View searches plus satellite imagery to identify possible issues which may lead to either a greater confidence in the site or be a cause for concern. For example, a site which is well lit and in full view of offices is likely to be of perceived greater security than a dark chargepoint which is hidden from view.

The metric is an individual assessment for each charging point, rather than at the LSOA level.

Charging Conflicts

The final assessment looks at the potential for conflicts with existing or planned future chargepoints. This is an important assessment as an area which is highly rated in other aspects, may not actually need a chargepoint if there is already sufficient provision within the local area.

For example, in Wilmslow the South Drive Short Stay car park scores incredibly highly across all the potential assessments and so would be an ideal place for a chargepoint. Unfortunately, there is already an existing rapid chargepoint within the car park itself.

This is an assessment criterion which will require careful weighting as the existence of current chargepoint does not necessarily preclude the installation of an additional chargepoint, particularly if the current chargepoint is well used.

Similarly, to security, the metric used is a manual assessment for each potential location rather than at the LSOA level.

Combining Model Assessments

After each location has been assessed, both through the model and through the manual assessment process, the scores are combined within an Excel Spreadsheet. This allows for the weighting to be directly applied to the scores and adjusted in-situ. A typical example of this is shown in the table below.

App Table 7 Example of the scoring system used within the assessment

Weighting							
1	1	1	1	1	1	1	
Journey Assessment	**Job Assessment**	**Retail/ Leisure Assessment**	**EV_Assessmen t**	**EV_Offstreet_A ssessment**	**Security of location**	**Charging Conflicts**	**Score**
1	4	4	5	5	5	0	24
1	4	4	5	5	4	3	26
1	4	4	5	5	4	3	26
1	4	4	5	5	2	3	24
1	4	4	5	5	4	2	25
3	4	4	1	0	3	5	20
3	2	4	0	1	2	1	13

The final score is then used to perform the initial assessment of the potential chargepoint sites.

Appendix C. EV Charging Point Long List – Car Parks and On-Street Areas

Overall Rank	Car Park	Town	Town Rank	Capacity (spaces)	Type of Settlement	DNO Supplier	Jobs Assessment	Retail/Leisure Assessment	Highest Destination Score	EV Off-street Assessment	Journey Assessment	EV Assessment	Security of location	DNO Capacity	Charging Conflicts	Score	Charger Type/s
1	Spring Street	Wilmslow	1	308	Key Service Centre	ENW	4	5	5	5	5	5	5	4	1	30	Rapid + Fast
=2	Exchange Street	Macclesfield	=1	107	Principal Town	ENW	5	5	5	5	4	3	5	2	5	29	Rapid + Fast
=2	Gas Road	Macclesfield	=1	45	Principal Town	ENW	5	5	5	5	4	3	5	2	5	29	Rapid + Fast
=2	Railway Station	Macclesfield	=1	57	Principal Town	ENW	5	5	5	5	4	3	5	2	5	29	Rapid + Fast
=2	Pickford Street	Macclesfield	=1	110	Principal Town	ENW	5	5	5	5	4	3	5	2	5	29	Rapid + Fast
=2	The Carrs	Wilmslow	2	60	Key Service Centre	ENW	4	5	5	5	5	5	2	4	3	29	Rapid + Fast
=7	Duke Street	Macclesfield	5	261	Principal Town	ENW	5	5	5	5	4	3	4	2	5	28	
=7	South Drive Short Stay	Wilmslow	3	330	Key Service Centre	ENW	4	5	5	5	5	5	5	3	0	28	Rapid + Fast
=7	Broadway Meadow	Wilmslow	4	100	Key Service Centre	ENW	4	5	5	5	5	5	4	3	1	28	Rapid + Fast
=7	Sunderland Street	Macclesfield	6	40	Principal Town	ENW	5	5	5	5	4	3	4	2	5	28	
=7	Waters Green	Macclesfield	7	42	Principal Town	ENW	5	5	5	5	4	3	4	2	5	28	
=7	Town Hall	Macclesfield	8	80	Principal Town	ENW	5	5	5	5	4	3	4	2	5	28	
=13	Leisure Centre	Wilmslow	5	100	Key Service Centre	ENW	4	5	5	5	5	5	2	4	1	27	
=13	Princess Street	Knutsford	1	54	Key Service Centre	SPEN	4	4	4	5	1	5	4	5	3	27	Rapid + Fast
=13	Fairground	Congleton	=1	97	Key Service Centre	WPD	5	5	5	4	5	3	4	5	1	27	Rapid + Fast
=13	Rex/Hoopers	Wilmslow	6	132	Key Service Centre	ENW	4	5	5	5	5	5	2	4	1	27	

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Overall Rank	Car Park	Town	Town Rank	Capacity (spaces)	Type of Settlement	DNO Supplier	Jobs Assessment	Retail/Leisure Assessment	Highest Destination Score	EV Off-street Assessment	Journey Assessment	EV Assessment	Security of location	DNO Capacity	Charging Conflicts	Score	Charger Type/s
=13	Antrobus Street	Congleton	=1	84	Key Service Centre	WPD	5	5	5	4	5	3	3	5	2	27	Rapid + Fast
=13	Back Park Street	Congleton	=1	98	Key Service Centre	WPD	5	5	5	4	5	3	2	5	3	27	Rapid + Fast
=13	Victoria Centre	Crewe	1	482	Principal Town	SPEN	5	5	5	5	3	3	5	3	3	27	Rapid + Fast
=20	Civic Hall	Poynton	1	204	Key Service Centre	ENW	3	4	4	4	1	4	5	3	5	26	Rapid + Fast
=20	Christchurch	Macclesfield	9	82	Principal Town	ENW	5	5	5	5	4	3	2	2	5	26	
=20	South Street	Alderley Edge	1	47	Local Service Centre	ENW	1	3	3	5	2	5	4	2	5	26	Rapid + Fast
=20	Whalley Hayes	Macclesfield	10	258	Principal Town	ENW	5	5	5	5	4	3	3	1	5	26	
=24	Princess Street	Congleton	4	90	Key Service Centre	WPD	5	5	5	4	5	3	3	5	0	25	Rapid + Fast
=24	Booths Knutsford	Knutsford	2	261	Key Service Centre	SPEN	4	4	4	5	1	5	5	3	2	25	Rapid + Fast
=24	Springfields	Prestbury	1	61	Local Service Centre	ENW	1	2	2	4	4	5	4	1	5	25	Rapid + Fast
=24	Community Centre	Disley	1	40	Local Service Centre	ENW	0	2	2	5	2	5	4	2	5	25	Rapid + Fast
=24	Delamere Street	Crewe	2	99	Principal Town	SPEN	5	5	5	4	3	3	2	5	3	25	Rapid + Fast
=29	Commercial Road	Macclesfield	11	59	Principal Town	ENW	4	3	4	4	3	3	3	2	5	24	
=29	South Drive Long Stay	Wilmslow	7	45	Key Service Centre	ENW	4	5	5	5	5	5	1	3	0	24	
=29	Tatton Street	Knutsford	3	144	Key Service Centre	SPEN	4	4	4	5	1	5	4	2	3	24	Rapid + Fast
=29	Shirleys	Prestbury	2	61	Local Service Centre	ENW	1	2	2	4	4	5	3	1	5	24	Fast only

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Overall Rank	Car Park	Town	Town Rank	Capacity (spaces)	Type of Settlement	DNO Supplier	Jobs Assessment	Retail/Leisure Assessment	Highest Destination Score	EV Off-street Assessment	Journey Assessment	EV Assessment	Security of location	DNO Capacity	Charging Conflicts	Score	Charger Type/s
=29	Westfields	Sandbach	1	95	Key Service Centre	SPEN	2	4	4	2	3	3	3	5	4	24	Rapid + Fast
=34	King Street	Knutsford	4	125	Key Service Centre	SPEN	4	4	4	5	1	5	4	1	3	23	Rapid + Fast
=34	London Road	Holmes Chapel	1	32	Local Service Centre	SPEN	2	2	2	3	2	3	3	5	5	23	Rapid + Fast
=34	Snow Hill	Nantwich	1	247	Key Service Centre	SPEN	5	5	5	3	0	4	4	4	3	23	Rapid + Fast
=34	Cheshire Street	Audlem	1	59	Local Service Centre	SPEN	0	2	2	0	4	3	3	5	5	22	Rapid only
=34	Chapel Street	Sandbach	2	100	Key Service Centre	SPEN	2	4	4	2	3	3	3	3	4	22	Rapid + Fast
=39	Fairview	Alsager	1	288	Key Service Centre	ENW	2	3	3	3	1	4	0	5	5	21	Rapid + Fast
=39	West Street	Congleton	5	216	Key Service Centre	WPD	5	5	5	2	5	3	2	3	1	21	
=39	Scotch Common	Sandbach	=3	140	Key Service Centre	SPEN	2	4	4	1	3	3	4	2	4	21	Rapid only
=39	Brookhouse Road	Sandbach	=3	147	Key Service Centre	SPEN	2	4	4	1	3	3	2	4	4	21	Rapid only
=43	Station Road	Alsager	2	60	Key Service Centre	ENW	2	3	3	4	0	5	2	1	5	20	Rapid + Fast
=43	Civic Way	Middlewich	1	84	Key Service Centre	SPEN	4	4	4	0	3	3	3	2	5	20	Rapid only
=43	Civic Centre/Library	Crewe	3	89	Principal Town	SPEN	5	5	5	4	3	3	0	5	0	20	Rapid + Fast
=46	School Road	Handforth	1	48	Key Service Centre	ENW	3	3	3	3	0	2	4	4	3	19	Rapid + Fast
=46	Pool Bank	Bollington	1	71	Local Service Centre	ENW	2	2	2	5	0	3	2	2	5	19	Rapid + Fast
=46	Love Lane	Nantwich	2	124	Key Service Centre	SPEN	5	5	5	2	0	4	3	5	0	19	Rapid + Fast
=46	Thomas Street	Congleton	6	46	Key Service Centre	WPD	2	3	3	0	3	3	3	5	2	19	

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Overall Rank	Car Park	Town	Town Rank	Capacity (spaces)	Type of Settlement	DNO Supplier	Jobs Assessment	Retail/Leisure Assessment	Highest Destination Score	EV Off-street Assessment	Journey Assessment	EV Assessment	Security of location	DNO Capacity	Charging Conflicts	Score	Charger Type/s
=46	Wrexham Terrace	Crewe	4	102	Principal Town	SPEN	2	5	5	1	3	3	2	3	2	19	
=51	Wilmslow Road	Handforth	2	56	Key Service Centre	ENW	3	3	3	3	0	2	2	5	3	18	Rapid + Fast
=51	Civic Hall	Nantwich	3	151	Key Service Centre	SPEN	4	4	4	2	0	4	4	3	1	18	Rapid only
53	Chapel Street	Congleton	7	52	Key Service Centre	WPD	5	5	5	1	1	3	2	3	2	17	
On-street areas (scores for on-street areas only used off-street assessment, EV assessment and charging conflict criteria)																	
1	East of Town Centre	Alderley Edge	N/A	On Street	Local Service Area	ENW				5		5			5	15	Slow / Fast
2	Town Centre	Wilmslow	N/A	On Street	Key Service Area	ENW				5		5			4	14	Slow / Fast
3	Town Centre	Macclesfield	N/A	On Street	Key Service Area	ENW				5		3			5	13	Slow / Fast
=4	North East of the Town Centre	Alsager	N/A	On Street	Key Service Area	SPEN				3		4			5	12	Slow / Fast
=4	Town Centre	Nantwich	N/A	On Street	Key Service Area	SPEN				4		4			4	12	Slow / Fast
=4	North of Town Centre	Knutsford	N/A	On Street	Key Service Area	SPEN	Not assessed for residential chargers			4	N/A	5	For later assessment		3	12	Slow / Fast
=7	North and East of Town Centre	Holmes Chapel	N/A	On Street	Local Service Area	SPEN				3		3			4	10	Slow / Fast
=7	Town Centre	Handforth	N/A	On Street	Key Service Area	ENW				5		2			3	10	Slow / Fast
9	Town Centre	Congleton	N/A	On Street	Key Service Area	WPD				2		3			4	9	Slow / Fast
10	Town Centre	Sandbach	N/A	On Street	Key Service Area	SPEN				1		3			4	8	Slow / Fast
11	Town Centre/East/South	Crewe	N/A	On Street	Principal Town	SPEN				1		3			2	6	Slow / Fast

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Appendix D. Draft Strategy Consultation

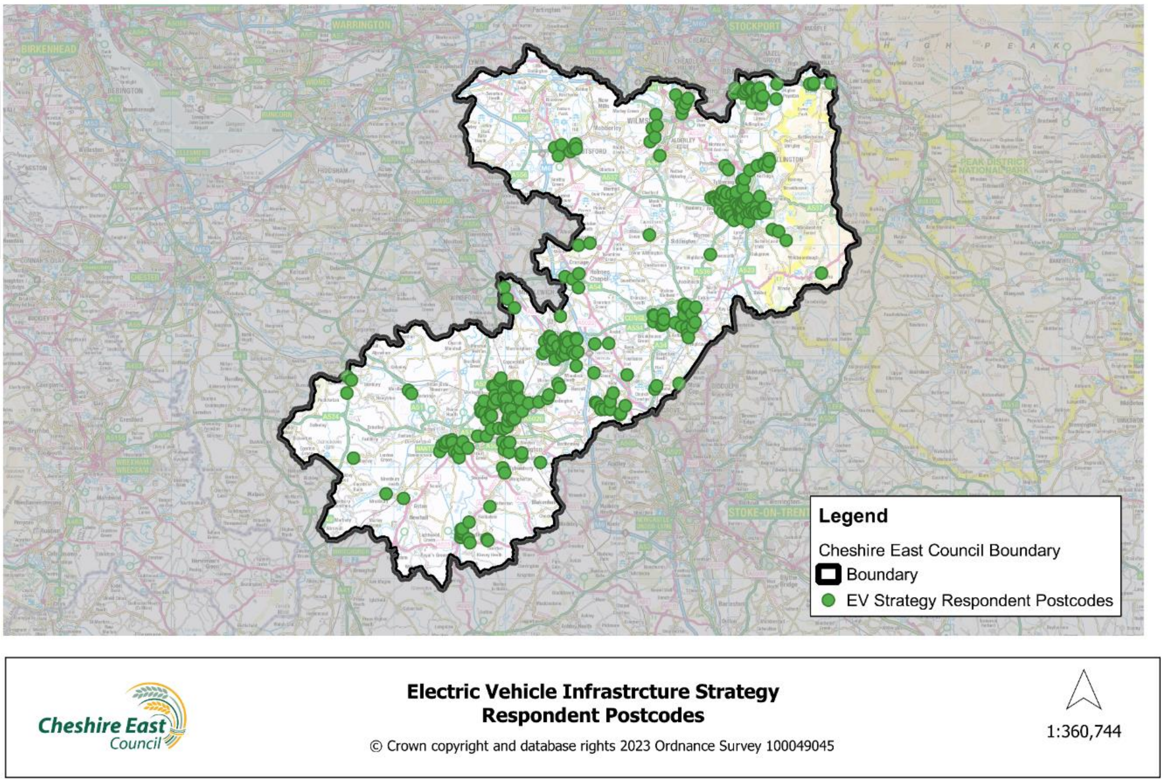
Background

During November-December 2022 Cheshire East Council undertook a consultation on the Draft Electric Vehicle Infrastructure Strategy. The consultation was held online with paper versions being available on request, hard copies of the consultation were also provided at libraries in Cheshire East. It was promoted to:

- The general public
- Town and Parish Councils
- Businesses in Cheshire East
- Local transport operators
- Special interest and community groups
- MPs

There was a good distribution of responses received from across the borough, a map of respondent postcodes (298 Cheshire East Postcodes that could be mapped) is shown below.

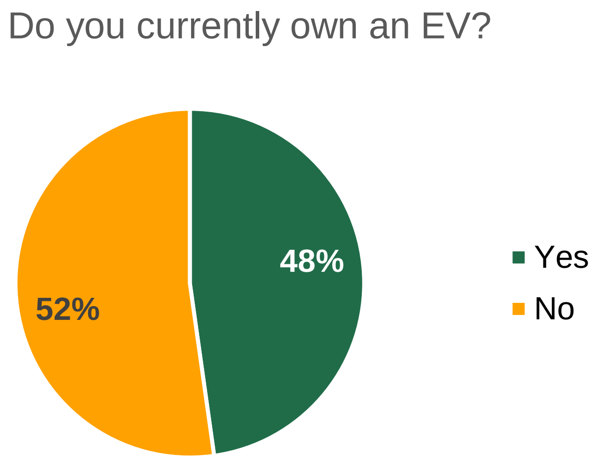
App Figure 9 Mapped Postcodes of Responses



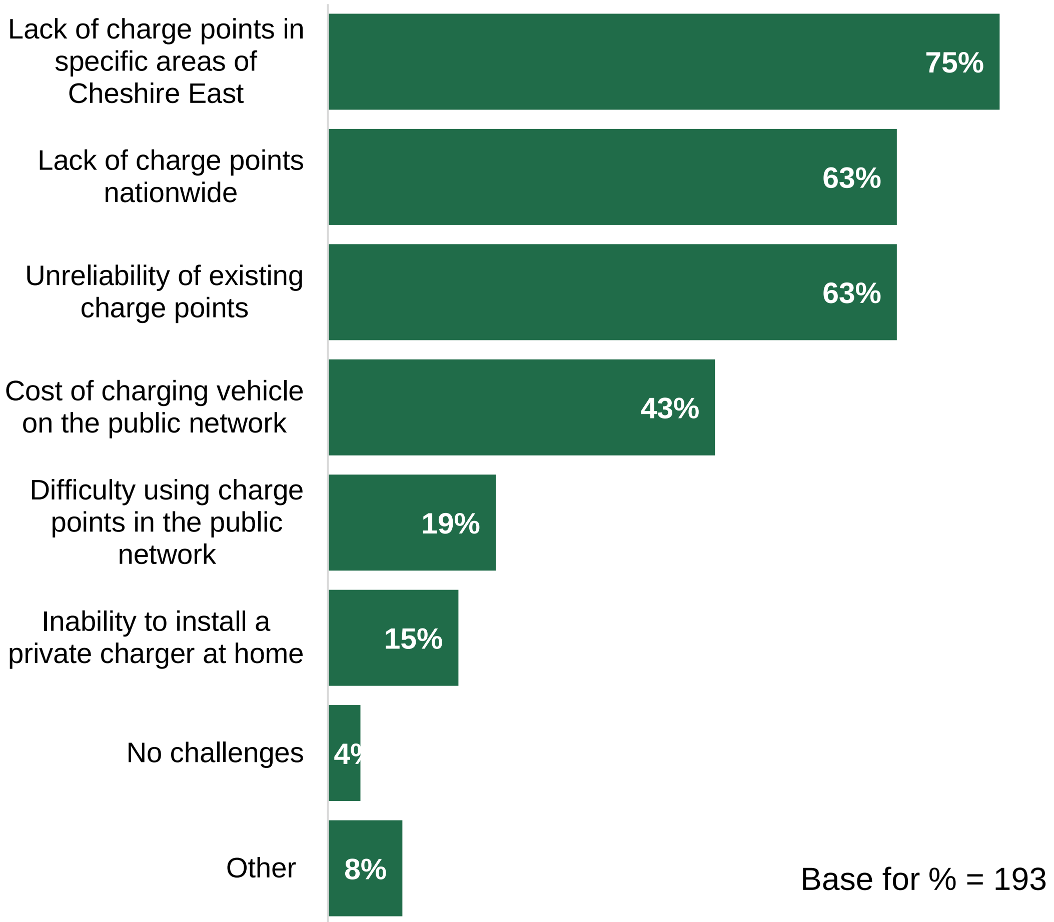
In total, 408 responses were received, 404 via the online survey and 4 email responses.

Almost one half of respondents (48%) stated that they currently own or drive an EV and just over one half (52%) stated that they do not currently own one.

Those who currently own an EV were asked what, if any, current challenges do they have in owning / driving an EV.



App Figure 10 Current challenges in owning / driving an electric vehicle



'Inability to install a private charger at home' is ranked 5th, however, it is important to note that while this effects a smaller percentage of the population, amongst residents that do not have access to off-street parking, their ability to install a chargepoint at home is a key issue.

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The ‘other’ challenges mentioned included: lack of rapid chargers, faulty chargers, and inconsistent parking charges & regulations.

Our response:

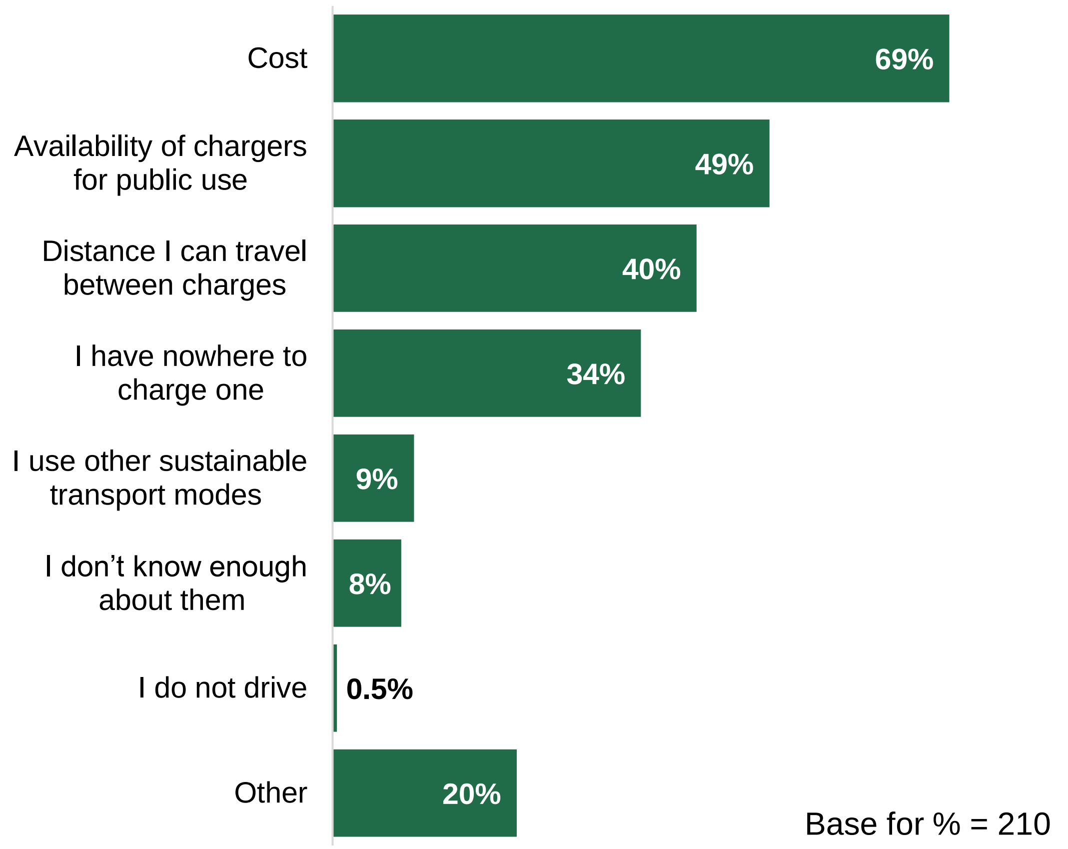
The Council is working to deliver a network of chargepoints across the borough, information on specific chargepoint locations, their maintenance, cost, and usability is provided in this strategy.

A strategic objective of the strategy is ‘to overcome inequalities in infrastructure provision, enabling our communities to transition to electric vehicles in a timely way.’ Therefore, work has been completed to assess equitable approaches to charging and plan for a network that provides for all residents. This strategy has been the subject of an Equalities Impact Assessment.

To answer queries about charging from residents without access to off-street parking, the Council has developed the ‘Cheshire East Councils on-street charging framework’.

Those who do not currently own an EV were asked what the main barriers to them not owning one were.

App Figure 11 Main barriers to not owning an electric vehicle



The 'other' barriers mentioned included: don't want one, believe they are worse for the environment overall and technology not yet good enough.

Our response:

The Council cannot influence challenges such as a lack of chargepoints nationwide or the cost of electric vehicles. However, information will be provided on the Council's website about chargepoint availability and wider support.

This strategy explains the plans for a chargepoint network across the borough, creating more publicly available chargers.

Further information will be provided on the Council's website to give people more information on EVs, the associated technology, and specific issues such as 'range anxiety'. Myth busting information will also be provided to tackle concerns about EVs impacts on the environment.

The objectives

The draft Electric Vehicle (EV) Infrastructure Strategy identified a set of five overall objectives as follows:

- Supporting the uptake of electric vehicles across Cheshire East
- Guiding the provision of a high-quality chargepoint network
- Overcoming inequalities in infrastructure provision, enabling our communities to transition to electric vehicles in a timely way
- Ensuring chargepoints fit in with the wider streetscape
- Supporting electric vehicles in the context of a wider sustainable and integrated transport system

Most respondents agreed that the objectives were the right areas to focus on.

Respondents were asked how strongly they agreed or disagreed that these objectives were the right areas to focus on. Most respondents agreed with the objectives. The highest agreement was for 'guiding the provision of a high-quality chargepoint network', 77% agreed (either strongly or tend to) with this objective.

Respondents who currently own an EV were much more likely to agree with the objectives within the strategy compared to those who do not own one.

The measures

There were several measures identified within the strategy. These were:

- Providing charging points at key destinations

- Providing on-street charging points to support residents with limited access to parking and home charging
- Providing on-route charging points to serve the major traffic routes
- Introduce chargepoints for the Council's own fleet and grey fleet
- Continuous engagement and joint working with the Electricity Network Operators to bring forward cost effective chargepoints and strategic strengthening of the power network
- Continuous engagement and joint working with the Electricity Network Operators to bring forward cost effective chargepoints and strategic strengthening of the power network
- Engage with bus operators and consider providing charging infrastructure for buses
- Encourage and where possible support the introduction of commercially provided charging forecourts

Respondents were asked to rate the measures in terms of importance from a scale of 1 to 5 with 1 being the least important and 5 being the most important. Providing charging points at key destinations was seen as the most important measure with an average rating of 4.08 provided. This was closely followed by 'continuous engagement and joint working with the Electricity Network Operators to bring forward cost effective chargepoints' with an average rating of 4.04 and 'strategic strengthening of the power network' with an average rating of 3.72.

The lowest priority for respondents was 'introduce chargepoints for the Council's own fleet and grey fleet' with an average rating of 3.11.

Generally, those who currently own an EV were more likely to rate the measures higher than those who do not currently own one. However, the measures were rated in the same order apart from 'Continuous engagement & joint working' which none-EV owners rated the highest with a rating of 3.8. Charging points at key destinations was rated the highest by current EV owners with a rating of 4.5.

Respondents were asked at what sort of locations would they like to see additional chargers. The top four locations selected were: at town centre car parks (74% selected this option), at supermarkets (69%), on a dedicated EV forecourt (59%) and at out-of-town retail areas (59%).

The 'other' sort of locations mentioned included: none / nowhere, hospitals & GPs, schools, motorway networks and pub car parks.

Those who do not currently own an EV were less likely to select as many of the locations apart from 'at out-of-town employment sites' - they were more likely to select this option (44% selected this compared to 32% of current EV owners). The number of respondents who were EV owners and none-EV owners selecting 'At rail stations', and 'in rural areas' were around the same.

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Written comments

Respondents were asked for written comments under specific consultation questions. This included being asked if they felt there was anything missing from the objectives, 86 respondents left a comment.

Respondents were also asked if they had any further comments to make on the draft strategy, 144 respondents left a comment on the online survey. Four responses were also provided by email, two received from the Coal Authority and Historic England had no specific comments. Comments received by Poynton Town Council and the Planning and Consultation Committee for Sandbach Town Council have been summarised and added to the themes below.

App Table 8 Summary of the comments received on the objectives and the overall strategy

Response theme	Number of mentions	Our response
Waste of time and money / not the Councils responsibility	45	The Council has been allocated funds to provide chargepoints by the UK Governments Office for Zero Emissions Vehicles. This funding is ringfenced for charging provision and cannot be spent on road maintenance. As demand for on-street charging infrastructure grows, it is expected that the private sector will invest more to build and operate a thriving, self-sustaining public network. CEC is therefore facilitating commercial models being put in place to ensure the local network can continue to expand and improve, to serve resident's needs. This includes working with the private sector to attract investment in EV charging infrastructure.
Availability of chargers inc. accessible chargers and maintenance	43	This strategy explains the plans for improving provision of chargers across the borough, especially in areas lacking chargepoints, including rural areas. Accessibility considerations have been made in the strategy and the accompanying Equalities Impact Assessment. They are also part of the Councils procurement approach for infrastructure that it funds. Although the Council can specify maintenance and operational standards for its own chargers it is not able to insist on these standards for commercially owned and operated equipment but encourages all operators to respond to issues raised in a timely manner. 'Cheshire East Councils on-street charging policy' (Chapter 6) has further detail.
Home / street charging points	33	Building regulations require all new homes to be provided with an EV chargepoint. See Chapter 2. Policy and Legislation Review. To answer queries about charging from residents without access to off-street parking, the Council has developed the 'Cheshire East Councils on-street charging policy' (Chapter 6). This includes consideration of impacts on existing road users, particularly using the pavement.
EV not green or is flawed - other fuels preferred	23	Further information on the sustainability of electric vehicles will be included on the Council's website alongside myth busting information. Chapter 3.7 The Hydrogen Project includes more information on the work being progressed to explore using hydrogen fuel in Cheshire East.
EV logistics and safety	23	For chargepoints that the Council is involved in delivering it has a set of objectives (see Chapter 5). This includes consideration of value for money of funding that the council has available, safety, and need. Policy related to chargepoint provision is outlined in Chapter 5. Strategic Priorities. The UK government is currently working with chargepoint operators to deliver a more convenient and joined up approach to payment at chargepoints. The council takes a multimodal approach to transport policy and strategy. This is outlined in its Local Transport Plan, which will begin to be updated this year.
Cost / payment considerations	22	The purchase cost of electric vehicles is continuing to reduce over time. Running and maintenance costs are lower than petrol and diesel vehicles meaning that the whole life running of cost of an EV is lower. Public chargepoints are commercially operated, which means the Council cannot mandate the cost of electric vehicle charging across the borough.
Need fast / rapid chargers	20	A mix of chargepoint types is required across the borough to cater for both existing and future needs of EV owners. This will include slower chargers for charging overnight, faster chargers at destinations where people may be for several hours, and rapid chargers that enable people to take on a full charge during a journey.
Improve other sustainable modes of transport	15	The Council is delivering a programme of active travel schemes to help and encourage residents to swap the car for walking and cycling for shorter journeys. The Council is currently refreshing the Cheshire East Bus Service Improvement Plan (BSIP). This will refocus delivery on what is achievable within current funding allocations. Should future funding be made available by the Department for Transport, the Council have schemes in development to improve public transport provision across the borough.

Response theme	Number of mentions	Our response
		The Council currently offers a demand responsive transport service, Go-Too. This is a pilot scheme funded by the Department for Transport until 2025, operating within rural areas south and west of Nantwich. The aim of the service is to connect rural communities to key services and amenities.
Intelligent network / generation of electricity	12	Smart charging is a common feature for many EVs and home chargers, which enable use of capacity in the electricity grid overnight. Vehicle to Grid (V2G) can also be part of the solution subject to infrastructure installed across the borough including at private properties.
Strategy is lacking detail / inaccurate / unclear	8	This EV Charging Infrastructure Strategy has been developed to directly support CEC's aim of reducing carbon emissions by accelerating the transition to electric vehicles. The strategy has been updated to reflect current data. Certain chapters have been changed to improve readability for the public.
Maintenance / repair of chargers	8	Although the Council can specify maintenance and operational standards for its own chargers it is not able to insist on these standards for commercially owned and operated equipment but encourages all operators to respond to issues raised in a timely manner.
Other comments provided include: • Should have been taken up sooner. • EV vehicles should be encouraged as a mix of other non-ICE vehicles.	8	The Councils ability to deliver chargepoints is limited by the availability of funding and government guidance. The strategy outlines the current programme for the earliest feasible delivery, which includes our engagement with and attracting investment from private sector partners alongside funding that CEC has. The Council is committed to delivering a high standard of chargepoints where it is involved in delivery. Alongside electric vehicles, the Council is looking into other alternative fuel sources such as hydrogen for larger vehicles. Section 3.7 The Hydrogen Project includes more information. The council also has strategies to encourage active modes and other forms of sustainable transport.
Objectives lacking detail / suggested addition	5	Based on the consultation, further work, and discussion amongst the Council's Electric Vehicle Infrastructure Programme Board the aim of the strategy has been refined and the objectives have been updated.

Appendix E. Residential Charging Evidence Base

Background Research

This section outlines the findings of desktop research carried out into the approach taken by other local authorities and organisations to address on-street charging issues and provide solutions for how residents with no off street parking will charge their electric vehicles. Liability, maintenance impacts, and planning consent will be considered as well as accessibility and equality considerations, and the feasibility of the findings for areas and street types in Cheshire East.

Findings

Oxford City Council (OCC) *Electric Vehicle Infrastructure Strategy 2022*

- Implements the hierarchy of EV charging infrastructure installations that seek to keep pavements accessible and minimise negative impacts on active transport options, prioritising off-street charging hubs and safe, licensed pavement crossing solutions over conventional on-street EV chargers (where feasible); and

- Go Ultra Low Oxford (GULO) provides on-street electric car charging solutions for residents who are considering buying an EV or own an EV and need access to electric charging points but do not have a driveway. GULO's initiative GUL-e project, provides a channel for charging cables to extend from homes to the roadside, without creating additional street clutter.

Warrington Borough Council (WBC) *Electric Vehicle Strategy 2021*

- Highlights areas to the north of Warrington as areas with limited off-street parking availability and higher levels of deprivation – considering trialling EV's through car clubs and providing on-street accessible charging points where appropriate;

- In areas of high-density housing, on-street charging points could be utilised where footpaths and power allow without causing streetscape concerns; and

- To avoid impacting pedestrian accessibility, trailing cables should be avoided as they are viewed as an obstruction to the footway under the Highways Act 1980.

West Sussex County Council (WSCC) *Electric Vehicle Strategy 2019 – 2030 (2019)*

Where no off-street parking exists, WSCC wish to enable residential charging through three potential routes including:

- Home chargepoints – focused on ensuring the pavements remain safe for pedestrians and other highway users and that WSCC do not expose themselves to excessive liability or risk;

    - It should be noted that this solution is only applicable to those with access to private off-street parking such as driveways and resident carparks.

  - Residential hub charging – WSCC can only commit to hubs on their own assets. Hubs will be located close to a residential area without access to off-street parking. Ideally, this will be less than 500m walk. Overnight charging will be free;

  - Residential on-street charging – WSCC are not pursuing lamp-post chargers due to their low power supply, concerns about trailing cables and ownership/ responsibility due to third part ownership (Tay Valley Lighting). Additionally, chargepoints must serve a community and not an individual and so no chargepoints will be installed directly outside one property, but in the best location to serve an entire street; and

- Accessibility – WSCC has stated that “on-street charging points will be located on the kerbside of the footway and be situated as close as possible to the kerb to limit the space they take up and reduce trip hazards”. Additionally, parking for chargepoints will not “remove parking designated for people with a disability, space for car club cars, bus bays, or bicycle parking” and they will ensure disability parking is provided with chargepoints.

Devon County Council (DCC) *Electric Vehicle Charging Strategy (Consultation Draft)*

DCC has recognised that “for those without off-street parking, some residents have already begun to charge vehicles by ‘trailing cables’ over the footway from their own domestic charger or wall socket to their vehicle”. DCC has stated that no trailing cables are allowed due to safety and legal issues as they are viewed as an obstruction to the footway under the Highways Act 1980. Liability concerns include establishing whose responsibility it would be if someone tripped on a trailing cable.

DCC are considering two options to minimise risk:

1. Gullies – a cable installed into the footway; and

2. Cable protectors – a way to reduce the trip hazard by covering the cable above the footway.

DCC has recommended that when providing on-street residential chargers, that lamp columns will be used where compatible depending on parking and physical space on the highway. They recognise that lamp column chargers are not always viable due to not always being located on the kerbside and limited power availability.

DCC has also recommended testing on-street residential pavement gullies to enable residents to charge without trailing cables. This is subject to DCC obtaining legal advice.

Solihull Metropolitan Borough Council (SMBC) *Solihull’s Electric Vehicle Strategy – Going Electric (updated July 2022)*

SMBC does not permit trailing cables across public footpaths and verges for safety reasons as under the Highways Act 1980 trailing cables across the public footway are viewed as an obstruction. Alternatives such as cable gullies and bollards fed from a home supply are being considered as lower risk options for those without off street parking.

For those that cannot charge at home or use a neighbour's charger, SMBC recommend workplace or public chargers as the next best option. This is due to an estimated 71% of homes in Solihull having space to park off-street. The council is however, considering the need for additional nearby charging facilities for residential areas without access to off-street parking. These nearby chargers will:

- Offer slower charging speeds suited to overnight charging at the lowest cost:
- Possibly be located on-street, in recessed parking bays, communal parking areas, or free local car parks: and
- Typically, be within a five-minute walk from residential areas with the highest need. For those with mobility issues, chargepoints are proposed to be less than five-minutes away.

City of York Council (COYC) *Public EV Charging Strategy (2020-2025)*

Rather than providing on-street residential chargepoints, COYC has committed to providing public charging infrastructure designed to support residents that don't have access to home charging. The council aim to do this with HyperHubs by providing five percent of parking spaces in all council-owned long stay car parks and Park and Ride sites.

Where there are significant residential areas without off-street parking more than 10-minutes' walk from these sites, the council will investigate alternative charging sites on a case-by-case basis.

Greater Manchester Combined Authority (GMCA) *Electric Vehicle Charging Infrastructure Strategy – part of the Greater Manchester Transport Strategy 2040*

- GMCA do not permit trailing cables across the footway between properties and EV's parked on-street due to the responsibility of safety and accessibility that lies on all ten local authorities in Greater Manchester. Pavement channels and cable protectors are also not permitted. Under the Highways Act 1980, obstructions to the footway are not permitted:.
- Any on-street EV charging infrastructure will avoid creating obstructions to other users of the highway and particularly those with reduced vision or mobility or those using pushchairs. Due to streetlamp columns being located predominantly at the back of the footway to reduce street clutter, GMCA do not support using lamp columns as a power source in these instances due to
    - Low power supply: and
    - The need to trail cables from the lamp column across the footway to the EV.
- EV charging infrastructure will not reduce active travel provisions by impeding space dedicated to walking or cycling. To do this, there is a presumption in favour of carriageway buildouts. GMCA recognise that in some cases, on-street

locations do not have the required carriageway space to accommodate the infrastructure;

- The relatively low level of usage (generally a single user) means that it is challenging to generate enough income from each chargepoint to cover ongoing operational and maintenance liabilities. If a dedicated chargepoint solution for each resident that requested one was delivered at scale it would require significant ongoing financial support which is contrary to the development of a viable EV charging infrastructure network;.
    - The chargepoints would require a higher user tariff and therefore would not be equivalent to home charging options. Implementing a higher tariff would make the on-street solution less attractive for users and mean that they are more likely to seek out cheaper charging alternatives which would lead to underuse of chargepoints and a requirement for greater subsidy; and
    - Potentially on-street chargepoints in residential areas could become stranded assets, with ongoing financial liabilities generating limited revenue, and creating unused car parking spaces increasing competition for on-street car parking which is already an ongoing issue for residents in many locations.
- GMCA has invited local authorities in Greater Manchester to submit applications to the On-Street Residential Chargepoint Scheme (ORCS) to increase the availability of on-street chargepoints in residential areas where off-street parking is not available;
- GMCA also consider off-street community charging hubs an option for some areas particularly residential areas with significant on-street car parking. GMCA will investigate opportunities to provide off-street community charging hubs on a case-by-case basis and will establish an online system for local residents and communities to register an interest in trialling community hub charging infrastructure;
    - Community charging hubs could potentially include charging bays for EV Car Club vehicles as well as other mobility services such as cycle hire or e-bike hire facilities, offering alternatives to private car ownership.

Accessibility Considerations

Accessible Chargepoints

Although chargepoint technology and design has improved over the last 10 years, challenges still remain for people with disabilities and the overall consumer experience does not always meet expectations, with many frustrations reported by EV owners. Current chargepoint challenges include:

- Chargepoint design, including challenges for some groups using this equipment due to its height, space around the chargepoint, bollards, confusing interfaces, heavy cables, lack of cable management systems, and connectors that require significant force to be applied for a successful connection;
- A lack of, or unclear, signage surrounding chargepoints, as well as high kerbs, limited space around the vehicle, and poor placement of the chargepoint relative to the kerb/bay; and

- Chargepoints being located in remote and dark areas with no CCTV or lighting.

To address these issues, BSI published new standards, PAS1899[16], for EV chargepoints in 2022 to ensure they are accessible and meet consumer's needs. The standards are important for improving the overall customer experience and to ensure people with disabilities can access chargepoints. The standards cover:

- The physical aspects of the environment surrounding fixed chargepoints (e.g., kerb height, ground type);

- The location, placement and spacing of chargepoints within the streetscape and relative to other infrastructure and/or street objects;

- The information, signals and indicators to be provided to users;

- Factors to be taken account of in the design of accessible chargepoints and their more immediate surrounding areas (e.g., height of chargepoint, cables and cable management systems, bollard spacing, interface tilt, colours used on screens, accessibility of language within communications, weight and ease of use of the equipment).

An Example of Fully Accessible EV Chargepoints

There are limited examples of chargepoints that adhere to the PAS 1889: 2022 standards published by the BSI; however product design consultancy Duku claim their solutions is likely to fully adhere, with App Figure 12 12 showing the Duku EV chargepoint designs.

App Figure 12 12The Duku EV Chargepoints – Unlocking Accessibility, Domestic and UE ONE MK3 Pop-Up

A feasibility project was undertaken to ensure that accessibility was considered during the design process in line with the latest BSI standards for the world's first accessible EV charger. The 'Unlocking Accessibility' chargers are fast chargers (7-22kW) and can be installed in approximately 10 minutes due to modular mounting methods and the plug and play system. Features of the chargepoint infrastructure that makes it more accessible include:

- An automatic, motorised cable management system that allows the charging cable to coil and uncoil without manual force needing to be applied;

[16] https://www.bsigroup.com/en-GB/standards/pas-1899/

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- No collision barriers surrounding the chargepoint due to the impact resistant base that protects the unit from damage; and

- High visibility with colour coded key features, ambient lighting, and a tap to pay interface that removes the requirement for touchscreens and apps.

The domestic 7kW charger is available as a socket or a tethered cable and is capable of being wall or pedestal mounted. The socket is protected by a sliding socket cover. The Domestic Charger has smart charging functionality and is compatible with home automation systems such as Alexa or Google Home, allowing for charging sessions to be scheduled and controlled with remote starting and stopping.

Finally, the ONE MK3 pop-up charger which has been installed throughout Plymouth as part of an Innovate UK funded project and builds on the MK1 and MK2 chargers previously installed in Oxford and Dundee respectively. The charger is flush with the pavement and extends to 900mm high when initiated via an app.

Key findings of the Equality Impact Assessment

An Equality Impact Assessment (EqIA) was carried out for the future provision of EV infrastructure in Cheshire East as part of this EV Infrastructure Strategy. This section summarises the findings, in App Table 9 9, that specifically relate to the potential impact of installing on-street EV charging infrastructure on people with protected characteristics and differing accessibility needs. The potential mitigation measures that could possibility combat the negative impacts are also considered.

App Table 9 9 EqIA Accessibility Considerations and their Potential Mitigation Measures

Potential Accessibility Consideration	Protected Characteristics Groups (PCG's) Affected	Potential Mitigation Measures
Trailing cables across the footway can pose a trip hazard and/or a barrier for all footway users.	*People with disabilities* • People with mobility issues • People with visual impairments *Being pregnant or on maternity leave* • People with buggies/ prams *Age* • Footway users in all age groups but particularly older people.	• Many local authorities are choosing to ban trailing cables across public footways and highways. • Use cable gullies/ channels to remove the need for trailing cables. • Install charging infrastructure as close to the kerbside of the footway as possible, with an allocated EV charging bay, to prevent the need for trailing cables.
Areas of restricted width/ uneven surfaces (through the use of cable protectors or raised	*People with disabilities* • People with mobility issues • People with visual impairments	• Many local authorities are choosing to ban the use of cable protectors on public footways. • Install charging infrastructure as close to the kerbside of

Potential Accessibility Consideration	Protected Characteristics Groups (PCG's) Affected	Potential Mitigation Measures
EV charger bases) on the footway can impact accessibility and force people into traffic flow areas to manoeuvre around uneven surfaces on the footway.	• Wheelchair users and their carers. *Being pregnant or on maternity leave* • People with buggies/ prams	the footway as possible, with an allocated EV charging bay, to prevent the need for cable protectors. • Only install charging infrastructure on-street if there is sufficient footway space for all footway users to pass comfortably and safely. • Ensure all EV charging infrastructure is installed flush with the footway surface.
Advances in technology used in charging infrastructure.	*People with disabilities* • People with learning disabilities. • People with visual impairments *Age* • Older people	• High visibility with colour coded key features, ambient lighting, and a tap to pay interface that removes the requirement for touchscreens and apps.
The weight of charging cables.	*People with disabilities* • People with physical impairments/ disabilities or mobility issues *Age* • Older people	• Ensure charging infrastructure is of high quality with cable weight considered – consider infrastructure that provides an automatic, motorised cable management system that allows the charging cable to coil and uncoil without manual force needing to be applied. • Install EV chargers as close to the kerb as possible so charging cables do not have to be carried a long distance to the EV.
Chargepoints located in dark areas that are not overlooked.	*Age* • Older people *People with disabilities* • People with visual impairments that require sufficient lighting to improve vision *Gender*	• Ensure all chargepoints are installed in well-lit and overlooked areas to ensure all chargepoint users feel safe using the facilities and leaving their car unattended for various periods of time.

Potential Accessibility Consideration	Protected Characteristics Groups (PCG's) Affected	Potential Mitigation Measures
	• Women or anyone that may feel unsafe alone after dark	

Accessibility concerns must be considered for other groups in addition to the Protected Characteristic Groups (PCG's), such as for people in low income households. This is due to the cost disparity associated with charging an EV using the public chargepoint network compared to a domestic charger powered from the home electricity supply.

It is more costly to charge using the public chargepoint network than a domestic charger as tariffs for home electricity supply are usually cheaper and domestic charging infrastructure also has the capability of charging overnight when electricity is cheapest. People from low income households are less likely to be able to afford an electric vehicle, which is a barrier in itself to EV uptake, however if they do own an EV for work and they are unable to afford to have an EV chargepoint installed at home they will need to use the more expensive public chargepoint network.

Managing Trailing Cables

Trailing cables present an increasing management issue for local authorities across the country. As discussed in the EqIA, trailing cables can pose a trip hazard and/or a barrier for all footway users.

Several councils are taking a proactive approach to this. Hampshire County Council (HCC) has published guidance[17] for residents without off-street parking which states that it is the responsibility of the person charging the vehicle to avoid putting themselves and others at risk when trailing a cable across a footway. Other guidance includes:

- Parking vehicles as close to the property as possible. The cable should not cross the carriageway;
- Using a suitable extension cable if necessary and never extending the cable from an upper storey or from a lamp column or nearby tree;
- The cable should be removed from the footway when not in use; and
- Use a cable protector that is non-slip and of contrasting colour with anti-trip sloped sides. The cable protector must cover the area likely to be walked across, i.e., the full width of the footway.

Norfolk County Council requires cables covers when cable covers are permitted across the footway[18] Cables across footways must be perpendicular. The permission does not include running a cable across the carriageway. Permission is granted following an assessment by a highways officer to determine the need and

17 https://www.hants.gov.uk/transport/electric-vehicles/ev-charging-guidance
18 https://www.norfolk.gov.uk/business/licences-and-permits/ev-cable-permission

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suitability at each location on a case-by-case basis. Permission is granted for a period of two years from the date of approval.

The table below details additional examples of local authority approaches to trailing cables this helps to benchmark the use of EV cables across footways with other local authorities.

App Table 10 Benchmarking use of EV cables across footways

Local Authority	Approach
Newcastle[19]	Only references home charging for those with a drive or garage. No obvious public position on cables across footways
Oxford[20]	To date, there are limited standards dictating the delivery of chargepoints, however a number of regulations are being developed which are likely to include: • Ensuring infrastructure does not obstruct pavements or highways and is not hazardous to pedestrians • Cables will not be permitted to trail across pavements or walkways, and instead will be accommodated safely in gullies etc. • Chargepoints will be retrofitted into existing urban furniture where possible No exceptions will be made for EV bays (i.e., EV bays will not be introduced where traditional parking is not authorised).
Oxfordshire[21]	Cables across the footway not permitted, primarily based on the Highways Act 1980. Solutions being set up or tested are available to enable charging for those with no off-street parking including: • Local charging hubs • Pavement gullies • Lamp column chargers • On street chargers
Warrington[22]	Using a cable running across the public footway not permitted because it would breach the Highways Act 1980, constituting a hazard to other users.
Buckinghamshire[23]	We do not currently allow residents to trail cables across the footway or public highway. We are expecting advice from Central Government on how to address this situation which affects 40% of the UKs population. While we are waiting for this advice, we are looking at potential options to enable residents to charge their vehicle safely at home without obstruction to other highway users such as pedestrians and motorists.

19 https://www.newcastle.gov.uk/services/parking-and-permits/car-parks-and-street-parking/electric-and-low-carbon-vehicles
20 https://www.oxford.gov.uk/downloads/file/8353/oxford_electric_vehicle_infrastructure_strategy
21 https://www.oxfordshire.gov.uk/residents/environment-and-planning/energy-and-climate-change/electric-vehicles
22 https://www.warrington.gov.uk/electric-vehicles
23 https://www.buckinghamshire.gov.uk/parking-roads-and-transport/parking/electric-vehicles/charging-an-electric-vehicle-at-home/

Camden[24]	Running a cable across the public footway should not be done due to health and safety.307 on-street chargepoints available
Norfolk County Council[25]	Permission must be granted, only under specific conditions, must use a cable protector. Permission lasts for two years.
Central Bedfordshire[26]	Residential a charging only available for those with off-street parking although a trial using a gulley system is underway. Implies cables cannot be laid freely but not explicit.
Bath and North East Somerset[27]	Strategy suggests that a cable trailing across the footway will not be acceptable although this is not explicit.

Options Scoping

This section provides a high-level summary of the potential options that may be adopted to provide on-street charging for those without off street parking. The table below sets out their relative benefits and disbenefits when applied to Cheshire East. The potential options have been derived from the background research previously undertaken based on best practice examples of other local authorities with recently published EV infrastructure strategies.

App Table 11 The benefits and disbenefits of the potential approaches to on-street charging for Cheshire East

Theme	Potential Option	Benefits	Disbenefits
Home chargepoints	Trailing cables	• Vehicle can be overlooked by EV owner at all times when parked outside their residence. • Can be removed from the footway when not in use. • EV owner is liable for any injuries caused by cable protectors/ trailing cables. • Low-cost, convenient option for the EV owner.	• Legal concerns as loose cables constitute as an obstruction to the highway as set out in the Highways Act 1980. • Trip hazards for visually impaired or people with mobility difficulties – reduces the accessibility of the footway for all users. • Safety concerns – difficult to manoeuvre around and may cause some footway users such as wheelchair users and people pushing prams and buggies to move into traffic flow to pass.

24 https://www.camden.gov.uk/electric-vehicles#maop
25 https://www.norfolk.gov.uk/business/licences-and-permits/ev-cable-permission
26 https://www.centralbedfordshire.gov.uk/info/167/electric_vehicles/1207/charging_electric_vehicles
27 https://beta.bathnes.gov.uk/document-and-policy-library/street-electric-vehicle-charging-strategy

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Theme	Potential Option	Benefits	Disbenefits
	Cable gullies	• Home charging is the most convenient way to charge an EV and chargers can be powered through the home's electricity supply. • Vehicle can be overlooked by EV owner at all times when parked outside their residence. • Eliminates the trip hazard associated with trailing cables across a footway – EV owner is liable for any injuries caused by trailing cables on public footways. • Relatively low cost to install. • Future-proof the footways by installing the gullies during highways work. • Not visually intrusive to the surrounding area and integrate well into many different streetscapes.	• Can become blocked with debris. • Difficult to establish who is responsible for upkeep and maintenance. • A parking space outside the residents home may not always be available and a dedicated parking space may be controversial among other residents. • May be difficult to obtain planning permission in conservation areas/ nearby heritage assets. • Long term maintenance impact on the footway – wide spread roll-out may be an issue. Implementation may need to wait for resurfacing works on the footway. • This may result in high demand for gullies in the short term which reduces in the long term as battery capacity increases and cars require less frequent charging. • Will need to assess footway for shallow services and utilities that may be impacted by gullies.
	Cable protectors	• Vehicle can be overlooked by EV owner at all times when parked outside their residence. • Can be removed from the footway when not in use – EV owner is liable for any injuries	• Legal concerns as cable protectors constitute as an obstruction to the highway as set out in the Highways Act 1980. • As they are a temporary measure, EV owners may neglect to use them every time

Theme	Potential Option	Benefits	Disbenefits
		caused by cable protectors/ trailing cables. • Low-cost option.	they charge which will result in trailing cables across the footway. • Trip hazards for visually impaired or people with mobility difficulties – reduces the accessibility of the footway for all users. • Safety concerns – difficult to manoeuvre around and may cause some footway users such as wheelchair users and people pushing prams and buggies to move into traffic flow to pass. • Visually intrusive to the streetscape.
	Removable Lance (Trojan Energy – AON)	• Reduces street clutter on the footway as the lance can be removed when not in use. • Less likely to be subject to vandalism as lance is only in place when charging an EV. • Uses household electricity supply – charges EV overnight when electricity is cheaper. • Have potential to be less visually intrusive on the surrounding environment as they are removable when not in use.	• Only allows the charging infrastructure to be used by one resident as they would be responsible for removing the lance when not in use. • Monthly billing cost to stay connected under the private subscription model where the household connection is used. • Costly infrastructure to install. • May require regular maintenance due to debris becoming lodged in the dock.
Residential charging hub	Standard fixed bollard chargers in CEC-	• Liability of the asset is with the chargepoint owner. • Can provide disability/ mother and child parking	• Liability for the cable is uncertain but most likely with the chargepoint user. • Hubs located in car parks would need to be

Theme	Potential Option	Benefits	Disbenefits
	owned car parks	spaces to ensure chargepoints are fully accessible. • Will not affect footway space in CEC as car parks are off-street (but can be considered as an on-street option e.g., gable ends). • Standard EV chargers are cheaper infrastructure to install when compared with more expensive infrastructure types such as the Trojan Energy Removable Lance. • Do not affect the visual aspects of the streetscape as they will fit within the car park landscape.	located relatively nearby residential areas that have minimal to no off-street parking in order for this to be attractive to EV owners. • Hubs located on streets would need to ensure they are conveniently located without squeezing existing parking demand. • May require a costly DNO connection. • Car park must be well-lit and overlooked to ensure safety for EV owners at all times and to reduce the risk of vandalism or theft.
	EV car club charging bays incorporated with e-bike hire facilities	• Alternative option to private car ownership for those who cannot afford an EV. • Encouraging more sustainable travel modes and active travel among local residents. • Means hubs can be located somewhat further from homes because of multi-modal opportunity	• May require a new costly DNO power connection. • E-bikes would require additional maintenance to replace them and ensure they are always available. They may also be prone to vandalism and anti-social behaviour.
Residential on-street chargepoints	Standard fixed bollards	• Can be located at the kerbside of the footway, reducing the need for trailing cables across the public footway and minimising the risk of trip hazards.	• If a dedicated EV-only parking space is required adjacent to the chargepoint through a TRO, this may be controversial among residents if

Theme	Potential Option	Benefits	Disbenefits
		• Standard fixed bollards are relatively low cost infrastructure to install when compared to other infrastructure types. • Convenient option for EV owners without off-street parking.	parking space is already limited. • Must ensure there is adequate footway space remaining after installation for footway users to pass the chargepoint safely. • Would require a new power connection to the DNO. • Need to consider accessibility of the chargepoint including drop kerbs, cable weight and user interface.
	Lamp column chargers	• Can reduce street clutter on the footway as additional charging infrastructure is not required. • Power supply is already in place. • Lamp columns at the kerbside reduce the need for trailing cables and minimise the risk of trip hazards. • Chargepoint is largely protected from vandalism and damage. • Not visually intrusive as the charging infrastructure is integrated into the existing lamp column.	• If the lamp columns are set at the back of the footway this would require trailing cables across footway to reach EV or 'satellite' bollards at the front of the footway. • Low power availability which may suggest they are not able to support even a slow charger. • If a dedicated EV only parking space is required adjacent to the lamp column charger, a TRO would be necessary which may be controversial among residents if parking space is already limited.
	Rising bollards	• Reduces street clutter as the charging infrastructure retracts into the ground when not in use, saving footway space.	• May require frequent maintenance to ensure the rising action of the bollard remains functional – this could be costly. • Expensive technology to install.

Theme	Potential Option	Benefits	Disbenefits
		• Less likely to be subject to vandalism as bollards are only visible when in use. • Less visually intrusive on the surrounding area as they retract into the ground when not in use.	
	Removable lance (Trojan Energy – Hub)	• Reduces street clutter on the footway as the lance can be removed when not in use. • Less likely to be subject to vandalism as lance is only in place when charging an EV. • Every lance can be used in any dock on the street within the Trojan Energy hub – this eliminates the issue of dedicated parking spaces outside homes.	• Requires a new power connection to the DNO and a separate feeder pillar. • Expensive infrastructure to install. • Monthly billing cost to stay connected.
	Buildouts into carriageway	• Reduces street clutter by using carriageway space instead – ensures the footway is accessible for all users. • Can install a dropped kerb on the buildout to ensure people with disabilities and mobility issues can access the chargepoint. • Particularly beneficial where footways are narrow and there would be no space for a bollard	• Carriageway space in many residential areas may be limited therefore making this option unviable in certain locations. • Carriageway space would need to be dedicated to an EV only parking space which may be controversial among the residents if parking space is already limited. • Safety considerations relating to EV owner being in the carriageway to operate the chargepoint – possibility of colliding with other road users or cyclists.

Theme	Potential Option	Benefits	Disbenefits
			• More visually intrusive than other options but have potential to integrate well into the streetscape.
Workplace chargepoints	Standard chargers in workplace car parks	• Car park owner is liable for the chargers and for maintaining them. • Provides charging facilities for EV owners without EV charging infrastructure at home or in their local area.	• EV charging is limited to the opening hours of the car park. • Parking spaces may already be limited at the workplace and therefore dedicating parking space to EV's only may be controversial among employees. • If there are many EV owners, competition for space may be higher which can raise frustrations.
Public chargepoints	Rapid (50+ kW) DC public chargepoint s	• Significantly faster than AC slow chargers - Allow for 80% charge in 20-40 minutes – more convenient charging and reduces range anxiety. • Can be located in various public locations such as at charging hubs, in retail parks, public car parks and also along major routes. • Future proof EV charging infrastructure – as EV batteries develop and become more efficient, they need a quicker charge. • If there are no car parks nearby a residential area with no off-street parking, providing a rapid public charger will allow EV owners to	• More costly to install and for EV owners to use due because of pricing structure. • Will be located further than walking distance from residential area with no off-street parking as this option may only be viable if there are no CEC-owned car parks nearby and suitable on-street options are not possible. Therefore, will need to be located where there are other amenities for drivers to use while waiting for vehicles to charge

Theme	Potential Option	Benefits	Disbenefits
		charge their vehicle quickly at a more remote location before returning home/ starting their day.	

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Appendix F. Procurement options

The procurement process is an opportunity to secure the most suitable chargers for each location, customer, and function. For instance, lamppost and bollard chargers may be adequate for many residents, while ultra-rapid chargers may be required on movement corridors and fast chargers will help customers in and around town centres. Below are some options for how to go about selecting a charging point provider or set of providers. The various locations that the Council wishers to see chargepoints installed at is likely to include both on-street and off-street settings.

Work with an existing framework contract

There is a wide range of potential frameworks that could be called off such as the Crown Commercial Services (CCS) and Eastern Shires Purchasing Organisation[28] (ESPO) both have framework contracts in place that allow any UK local authority to source charging points through them. These options are worth exploring, as the time and resource requirement of carrying out our own procurement may be avoidable if the offers available from providers through these frameworks are acceptable for Cheshire East and the relevant bidders are willing to extend their provision to an additional buyer / partner. This option provides the following benefits:

- Provides access to market leading suppliers with a verified track-record in the industry
- Offers optional elements and full turnkey solutions
- Ensures compliance with UK procurement legislation
- Has direct call-off options
- Is suitable for lease or purchase of single or high-volume quantities
- Is likely to save time and financial resource compared to carrying out in-house procurement

A hybrid approach would be to carry out a mini competition between those suppliers named on one of these contracts, which may lead to further benefits being offered by bidders particularly keen to be appointed.

Undertake in-house procurement

As part of conducting a procurement process use can be made of documentation used for other past procurements by neighbouring or other similar LAs, amending for the local circumstances where necessary. Purchase and install lamppost / bollard chargers and fast chargers for residential areas, business areas and town centres, perhaps match-funded by an OZEV grant, with operation by the charger operator and some form of revenue generation. Maintenance may remain the

28 https://www.espo.org/Frameworks/Fleet-Highways/636-Vehicle-Charging-Infrastructure

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responsibility of Cheshire East Council. There would be a low or no commitment for the chargers to remain in the location selected. Ultra-rapid chargers would potentially in future be installed along key corridors under similar agreements. Planning consent would be potentially easier to achieve, but the Council would have larger up-front costs and take greater commercial risk. An option for consideration would be the possibility of collaborating with adjacent local authorities to improve purchasing power through procurement activities.

Seek exclusive operators for each type of charger

Firms offering different types of charger can be invited to tender for exclusive operating contracts for their chosen type of charger. Cheshire East Council could request firms to offer prices for either installation, or combined installation, operation, and maintenance, of new charging points, or for contracts where the provider will fund, install, operate, and maintain new charging points. There would be lower commercial risk for the Council, with revenue generation potentially still available. The Council would likely be asked to commit to allowing the operator to use the site for a number of years, with the parking space likely to be devoted to EV charging.

Seek exclusive operator/s for a full charging package

One firm, or multiple firms under a lead operator, could be sought to offer all desired types of chargers for Cheshire East. The details of this approach would be similar to the previous approach, the main difference being that bidders would likely consist of consortia rather than individual providers. Again, there would be lower commercial risk for the Council, with revenue generation potentially still available. The Council would likely be asked to commit to allowing the operator to use the site for a number of years, with parking spaces in fast charger locations likely to be devoted to EV. Firms may be attracted to this idea as they would not be competing with other firms for charging revenue and grants, but there may not be any existing examples of this model within the UK. Under Concession Contract Regulations 2016 this approach may require separate contracts for each chargepoint operator.

Invite interest from all suppliers

Rather than excluding some suppliers through a procurement process, the Council could invite interest from any supplier who wishes to operate a charging point in Cheshire East (with proposed locations needing to go through a planning procedure and review by legal teams and the relevant DNO). A revenue generation agreement could be negotiated, with lower risk for the Council. The Council might be asked to commit to allowing the operator to use the site for several years, with the parking space likely to be devoted to EV charging. This approach is likely to require more internal resource to manage requests for new locations when compared to working with an exclusive partner or partners.

Revenue and rent

There are several options for CEC to capture revenue from the installation and operation of chargepoints, which as a minimum can help to cover its costs:

- CPO keeps all revenue.
- CPO pays a fixed indexed annual charge.
- CPO shares a proportion of gross revenue.
- CPO shares a proportion of gross or net profit.

For car parks where chargepoint parking spaces are allocated, CPOs could be charged a form of rent (or concession fee) for parking spaces used. An alternative is to operate on a peppercorn lease with a profit/revenue share agreement arranged with the Council. Under Concession Contract Regulations 2016 a contract may also be required to enable on-street chargepoints, which could enable ongoing costs to the council to be recovered through the same mechanisms.

Choosing locations or leaving this to the provider/s

It is possible for the LA to choose the locations where its charging points would be installed in some of the options listed here, whereas other procurement and management models require this choice to be left at least partially in the hands of the operator. If operators / suppliers choose where they would like to place chargers, subject to Council approval and other guidelines to be stated in the procurement documentation, this pushes the risk onto the operator but potentially reduces the revenue that can be generated for the Council. Alternatively, Councils can choose to select all specific locations and prescribe these to the providers. The risk of the latter approach is that some providers may not be willing to take the risk of Council-selected sites not leading to enough revenue or may insist on only installing and charging for the maintenance of charging points.

A hybrid approach would be to package up a number of busier (more attractive) sites alongside a number of less desirable sites so that the more popular locations help to cross-subsidise the less popular ones. The risk here is that the provider is less enthusiastic about providing additional chargers to expand the network quickly.

Ultra-rapid charging

If the Council owns land near trunk roads through Cheshire East such as the M6 or M56, ultra-rapid chargers could be provided as part of EV forecourts at locations along these routes where energy links and capacity are good. Encouraging private investment in ultra-rapid EV infrastructure, working with business and Highways England, could be a key objective of the strategy. A planning procedure and review by legal teams may be necessary, although the risk of objections may reduce given charger locations would be out of town or at existing service stations. However, it is more likely that the private sector will provide ultra-rapid chargers on privately-owned land unless the Council-owned land is particularly conveniently located for specific destinations where charging demand is expected to be high.

Appendix G – National, Regional and Local Policy

National Policy and Guidance

The following key UK strategies and policies help to set the foundation for EV growth and promotion in Cheshire East:

- *Town and Country Planning (General Permitted Development) Order (GPDO) (2015) Schedule 2, Part 2, Class D and E* – Provided that criteria in the GPDO is met before the installation of an EV home charger, no planning application or permission is required for an EV home charger. This is only applicable under permitted development rights[29] if the home has off-street parking.

- *BSI Group (2018) – BS 8300-1:2018 Design of an accessible and inclusive built environment – external environment. Code of practice* – Gives recommendations for the design of the external built environment to accommodate users with the widest range of characteristics and capabilities. It includes external features such as parking provision and street design.

- *Electric vehicles – Accessible charging – Specification PAS 1889: 2022 (2022)* - A new guidance standard developed by the British Standards Institute working with key stakeholders. The specification gives designers, procurers, and installers essential specifications on how to provide accessible public chargepoints for electric vehicles. This strategy encourages all chargepoint operators operating within the borough to adopt these specifications as far as practicable.

- *Building Regulations Part S (2022)* - The building regulation, Part S, came into force in June 2022 and requires chargepoints for electric vehicles. All new builds, major renovations and changes of use will require these facilities, and the regulations will apply to all types of buildings.

- *End of sales of new petrol and diesel cars by 2030 (2020)* – Step 1 will see the phase-out date for the sale of new petrol and diesel cars and vans brought forward to 2030. Step 2 will see all new cars and vans be fully zero emission at the tailpipe from 2035 (ending the sale of Plug-in Hybrid electric vehicles).

- *Policy Paper: Taking charge: the electric vehicle infrastructure strategy, published (2022)* - The strategy sets out a vision for 2030 to remove charging infrastructure as a real and perceived barrier to the adoption of EVs. The strategy forecasts that by 2030 around 300,000 public chargepoints will be needed as a minimum in the UK, but there could potentially be more than double that number. The strategy notes that sufficed chargepoints should be made available ahead of demand to ensure the UK is a place where:

    - Everyone can find and access reliable public chargepoints wherever they live;

[29] https://www.planningportal.co.uk/permission/responsibilities/planning-permission/permitted-development-rights

- Effortless on and off-street charging for private and commercial drivers;
- Fairly priced and inclusively designed public charging;
- Market-led rollout for most chargepoints;
- Infrastructure is seamlessly integrated into a smart energy system; and
- Continued innovation to meet drivers' needs.

The Taking Charge Strategy also notes that the business case for commercial deployment of EV charging infrastructure can be challenging, particularly in areas of low utilisation and where other barriers exist. To this end, government will intervene in two broad areas:

- Accelerating the rollout of high-powered chargers on the strategic road network through the £950m Rapid Charging Fund. This will unlock current barriers to deployment at some of these locations, enabling provision where the commercial case does not stack up.
- Of direct relevance to CEC, Government intends to transform local on-street charging by placing an obligation on local authorities (subject to consultation) to develop and implement local charging strategies to plan for the transition to zero emission vehicles. These strategies should identify how to provide affordable, convenient charging for residents, businesses including fleets, and visitors without causing pavement disruptions that could discourage walking and cycling. To assist this process government established £450m Local Electric Vehicle Infrastructure (LEVI) Fund that is being made available to local authorities. Key to local authorities accessing this funding is leveraging significant private sector investment.

- *Transitioning to zero emission cars and vans: 2035 delivery plan (2021)* – To increase the uptake of zero emission vehicles, the key commitments for the Zero Emission Vehicle Transition Council are to:
  - Introduce a new road vehicle CO2 emissions regulatory regime in 2024;
  - Zero emission cars will receive favourable company car tax rates until at least March 2025.
- *Department for Transport (DfT) Decarbonising Transport: A Better, Greener Britain (2021)* – Presents the path to net zero transport in the UK by 2050, the wider benefits it can deliver, and the principles that underpin the approach to delivering it. In addition, this strategy outlines the commitments and actions needed to decarbonise transport.
  - The sale of all non-zero emission HGVs (above 26t) will end from 2040, with lighter HGVs (from 3.5t up to and including 26t) from 2035;
  - The sale of new petrol and diesel cars and vans (under 3.5t) will be phased out by 2030, and all new cars and vans will be fully zero emission at the tailpipe from 2035; and

- Consultations are being undertaken to determine a phase out date for the sale of new non-zero emission buses, as well as plans to determine a phase out date for the sale of new non-zero emission coaches.

- *National Planning Policy Framework (2021)* – Local parking standards for developments should consider adequate provision for EV charging in safe, accessible, and convenient locations.

- *DfT Bus Back Better: National Bus Strategy for England (March 2021)* – Details how the government will spend the £3bn in long-term funding (announced in February 2020) to level up buses across England, outside of London, including key actions to transition buses to zero emissions.

  - The document notes the UK has one of the most ambitious approaches in the world to achieving net zero by 2050, and reliable, frequent, and affordable electric buses will form a key pillar of public transport moving forward if this goal is to be realised.

- *Policy paper: Government vision for the rapid chargepoint network in England, published (2020)* − The following are key applicable extracts:

  - By 2023, the aim is to have at least 6 high powered, open access chargepoints (150-350 kilowatt capable) at motorway service areas in England, with some larger sites having as many as 10-12. The government is confident this will be more than enough to meet demand from EVs by this date. These high-powered chargepoints are able to charge up to 3 times faster than most of the chargepoints currently in place and can deliver around 120-145 miles of range in just 15 minutes for a typical EV;

  - By 2030, it is expected that the network will be extensive and ready for more people to benefit from the switch to electric cars. There will be approximately 2,500 high powered chargepoints across England's motorways and major A roads; and

  - By 2035 it is expected there will be around 6,000 *high powered chargepoints across England's motorways and major A roads.*

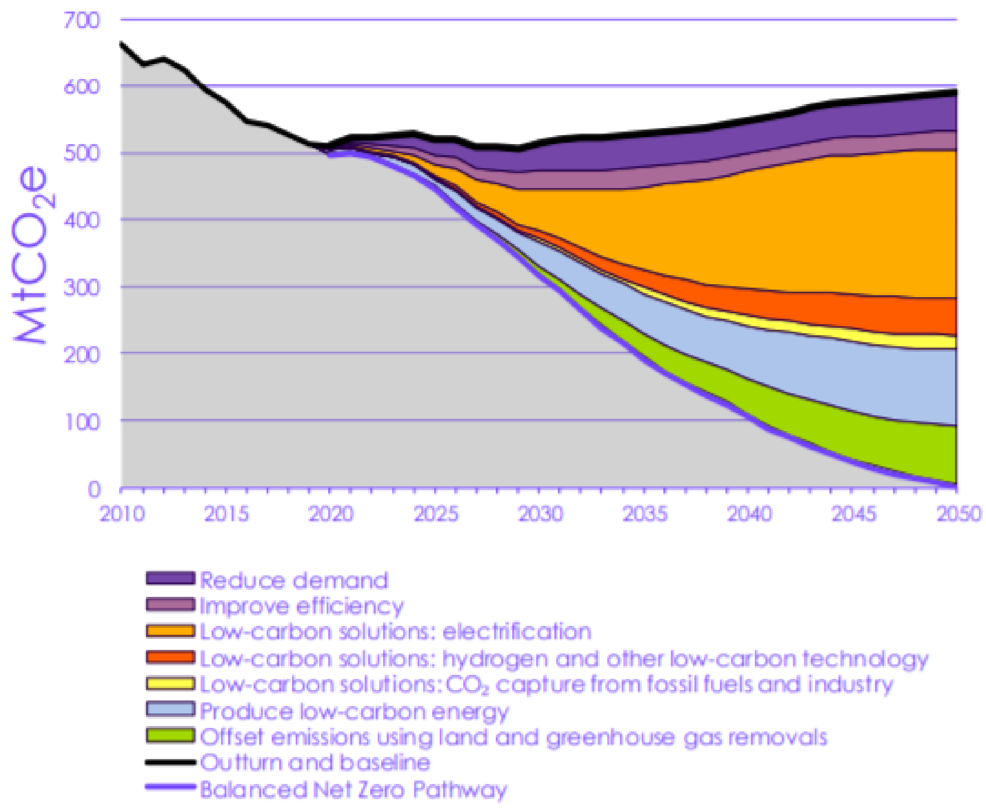
- *Highways England Road Investment Strategy 2&3 (2020)* – Documents present the long-term vision for what the Strategic Road Network should look like in 2050, and the steps to help realise this alongside an investment plan. The document notes that the rise of EVs is essential to achieving the target of net-zero carbon emissions by 2050, but also has the potential to encourage increased travel on our road network as the costs of driving fall.

- *Climate Change Commission's (CCC's) Sixth Carbon Budget (2021)* – CCC announced in 2021 that the UK territorial greenhouse gas emissions over the period 2033 to 2037 should be budgeted at 965 million tonnes of carbon dioxide equivalent. A chapter in associated Methodology Report focusses on surface transport and recommends a swift and sharp increase in EV infrastructure to facilitate EV take up.

  - Reduced demand − Around 10% of the emissions saving in the Balanced Pathway in 2035 comes from changes that reduce demand for carbon-intensive activity. Particularly important in these scenarios are slower growth in flights and reductions in travel demand. Reduced demand can result from reduced miles travelled and modal shift to lower-carbon modes. While changes are needed, these can happen over time and overall can be positive for health and well-being.

- Surface transport is currently the UK's highest emitting sector. In the CCC's Sixth Carbon Budget Balanced Pathway, options to reduce emissions, including take-up of zero-emission technologies and reduction in travel demand, combine to reduce surface transport emissions by around 70% to 32 Mt CO_2e by 2035 and to approximately 1 Mt CO_2e by 2050 (See illustration below)**Error! Reference source not found.Error! Reference source not found.**.

App Figure 13 Types of abatement in the Balanced Net Zero Pathway for the surface Transport sector (UK CCC)



Source: BEIS (2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis.
Notes: 'Other low-carbon technology' includes use of bioenergy and waste treatment measures.
'Producing low- carbon electricity' requires the use of CCS in electricity generation.

- *National Planning Policy Framework (2019)* – Local parking standards for developments should consider adequate provision for EV charging in safe, accessible, and convenient locations.

- *Planning Practice Guidelines Paragraph 008 (2019)* – Planning conditions and obligations can be used to secure air quality mitigation, including infrastructure to promote modes of transport with a low impact on air quality, such as EV charging points.

- *DfT's Future Mobility: Urban Strategy (2019)* – Sets out the Government's strategy for tackling the challenges of urban mobility, including through a £400m funding package for EV charging points.

- *Energy Saving Trust's 'Positioning chargepoints and adapting parking policies for electric vehicles' (2019)* – Provides guidance on the installation of chargepoints along footways and the use of parking bays. Recommends a clear footway width of 1.5m and placement of chargers at the front of pavements to avoid tripping hazards and away from areas with significant other street furniture. Alternatively, kerbs should be built out to maintain footway accessibility.

- *Committee on Climate Change (2019)* – In June 2019, the Government passed new laws to support a target of net zero emissions by 2050 in response to recommendations from the Committee on Climate Change (CCC).

- *DEFRA Clean Air Strategy (2019)* – Sets out the Government's plan to tackle all sources of air pollution, making our air healthier to breathe, protecting nature and boosting the economy. One way the government aim to do this is by moving towards electric vehicles as they support decarbonisation and air quality.

- *Automated and Electric Vehicles Act (2018)* – Promotes the development and deployment of autonomous and EVs, through large-scale investment in electric charging points and new rules ensuring vehicle compatibility, payment standardisation and guaranteeing reliability.

- *OLEV Road to Zero Strategy (2018)* – Outlines the ambition that every new car and van sold in the UK should be zero emission by 2040, and that the entire UK road fleet should be effectively decarbonised by 2050. However, on 3rd February 2020 the government brought the ban on new ICE car sales forward to 2035 which also prohibits the sale of new hybrid vehicles. This target was further strengthened in November 2020 to end new ICE car sales in 2030 (PHEVs in 2035).

- *DfT Future of Mobility: Urban Strategy (2018*) – This strategy sets out the approach that Government will take to seize the opportunities from the changes happening in urban transport including the uptake of electric vehicles. It sets out the benefits which the Government aims for mobility innovation to deliver and the principles that will help to achieve this.

- *Air Quality Plan for Nitrogen Dioxide (NO_2) in the UK (2017)* – Sets out how the UK aims to reduce roadside nitrogen dioxide (NO_2) through a requirement for development of local plans for interventions in targeted areas where the problem is most severe. The Plan references the Automated and Electric Vehicles Bill as well as the actions undertaken by other devolved nations including the Northern Ireland Executive which plans to promote the use of electric vehicles.

- *Clean Growth Strategy (2017)* – One of the key policies in the strategy is developing one of the best electric vehicle charging networks in the world by investing an additional £80m to support charging infrastructure development, and also taking new powers under the Automated and Electric Vehicles Bill.

- *Manual for Streets 2 (2010)* – Highlights the need to design footpaths to ensure accessibility and safety but does not address charging point placement specifically.

- *Climate Change Act (2008)* – Commits the UK to reducing emissions by at least 80% by 2050. This has since been amended to include a target of net zero emissions by 2050 (2050 Target Amendment – Order 2019).

Regional Policy

The following regional strategies and policies contribute towards the foundation for EV growth and promotion in Cheshire East:

- *Transport for the North (TfN) Decarbonisation Strategy (2021)* – sets out how TfN and partners across the North are committing to a regional near-zero carbon surface transport network by 2045. This supports TfN's key aims for improving localised air quality, which are:

    - A 55% reduction in emissions from 2018 to 2030, achieved mostly through mode-shift and demand reduction and

    - A 95% reduction in emissions from 2018 to 2040, reflecting longer-term decarbonisation measures, such as a high proportion of zero emission vehicles in the vehicle fleet.

- *TfN Strategic Transport Plan (2019)* – outlines the robust case for transformational transport investment across all the North, to rebalance the UK economy and drive major improvements in strategic connectivity through the North. This includes:

    - To support the move to EVs, a rapid increase in the number of public charging points across all areas of the North is required. This should be managed as part of planned improvements to the North's road network and through close engagement and collaboration with energy providers; and

    - Current and future EV drivers must be able to easily locate and access EV charging infrastructure that is affordable, efficient, and reliable.

- *Cheshire and Warrington Local Industrial Strategy (2019)* – outlines the strengths, weaknesses, threats and opportunities for the Cheshire and Warrington economy. It also outlines how the UK's Industrial Strategy can be implemented within the sub-region and notes the opportunity to deliver growth in a low carbon way.

- *Scottish Power Energy Network Charge Project (2019 to 2023)* – a Network Innovation Competition funded by Ofgem that will run between 2019 and 2023 throughout Merseyside, Cheshire, North Shropshire, North and Mid Wales. This project brings together transport and energy planning to accelerate the investment and deployment of public EV charging infrastructure. This will help to support the transition from fossil fuel to electric and address the needs of current and future EV drivers. The 'ConnectMore' tool has been developed to provide real time network capacity and projected EV demand between 2025 and 2050.

- *Cheshire & Warrington Energy and Clean Growth Strategy (2018)* – sets out the energy challenges facing the sub-region. It also outlines how, in collaboration with industry and key public-sector partners, the challenge of delivering 'affordable energy and clean growth' can be met. The strategy notes that the Cheshire and Warrington Local Enterprise Partnership (LEP) has a role in promoting low carbon technologies. This is a key factor in making new development sustainable, such as providing EV charging infrastructure.

Local Policy

- *Cheshire East Local Transport Development Plans (2022)* – Outline the issues and options for each of the 11 town areas in Cheshire East and were consulted on between December 2020 and March 2021. Measures to support the uptake of EVs are included in the reports for each town area.

- *Cheshire East Council Air Quality Action Plan (AQAP) (2021)* – Outlines the action CEC will take to improve air quality between 2020 and 2025. Road traffic contributes to poor air quality across the borough, which has led to the creation of several AQMAs in Cheshire East that are subject to specific targeted measures to reduce air pollution. The AQAP also recommends a holistic / integrated approach including a focus on low emission transportation.

- Enabling the transition to EV will contribute to the following priority outcomes identified in the Council's *Corporate Plan 2021 – 2025 (2020)*:

    - The Corporate Plan states that by 2025 the Council wants investment in EVs in its key service centres. This requires securing a supplier and installing chargepoints in Cheshire East car parks. The success of this will be measured as all CEC owned car parks in key service centres having at least one EV charging point.

    - GREEN – through proposals that would improve EV charging provision across the borough, the Council will further encourage the early adoption of EVs which will positively contribute both to our response to the climate emergency and also to reducing the incidence of air quality problems, especially in urban areas.

    - FAIR – the proposals are intended to create greater consistency and availability of access to EV charging, removing some of the long-standing barriers to purchase and use of EVs within the borough.

- *Cheshire East Council Environment Strategy 2020-2024 (2020)* – Outlines the Council's response to their climate emergency declaration and becoming carbon neutral by 2025. The strategy highlights the commitment to producing this EV Infrastructure Strategy to outline the ambition to increase electric charging infrastructure provision and seek funding opportunities and initiatives which encourage the uptake of EV usage. The Strategy will also determine the most appropriate locations across the borough depending on the need, land availability, power provision and types of charging points to be installed.

- *Cheshire East Carbon Neutrality Action Plan (2020)* - outlines the approach the Council will take to decarbonise its operations set out in the Environment Strategy, including a target to decrease fleet and grey fleet emissions by approximately 30% by 2025. A grey fleet vehicle is one owned and driven by an employee for business purposes. The employee is reimbursed on a pence per mile basis for using their private vehicle on business journeys. This will require electrification of the fleet and provision for business travel, which will both benefit from and impact on wider EV charging strategies, and has been informed by reviews conducted by the Energy Savings Trust;

- *Cheshire East Council Fleet and ULEV Review (2020)* – Outlines a benchmark of the greenhouse gas emissions and energy costs of the road transport fleets and provides a series of recommendations for creating a ULEV fleet.

- *Cheshire East Council EVCI Review (2020)* – Addresses the potential capacity to introduce charging infrastructure at CEC workplace sites and provides a series of recommendations for introducing charging on Council sites.

- *CEC Grey Fleet Review (2020)* − Covers the environmental impact and financial cost of grey fleet travel by CEC employees and provides recommendations to improve grey fleet management.

- *Cheshire East UK100 Pledge* – In January 2020 CEC committed to the UK100 pledge for the borough to be carbon neutral by 2045. Road transport makes up a third of the borough's carbon emissions and will be a key focus as the implementation strategy is developed.

- *Cheshire East Local Transport Plan 4 (LTP4) (2019)* − outlines a long-term strategy for travel and transport within Cheshire East. The LTP4 was adopted during October 2019 and covers the period of 2019 to 2024. The LTP4 includes a high-level parking strategy that highlights the potential to install on-street charging points, alongside the wider roll out of EV infrastructure.

- *Draft Economic Strategy for Cheshire East (2019)* – outlines that the UK Industrial Strategy predicts that the clean growth/low carbon economy is estimated to grow by 11 per cent per year through to 2030 (four times faster than the rest of the economy) and could deliver between £60 billion and £170 billion of export sales of goods and services by 2030. The sector in Cheshire East is sizable with over 5,000 employees and £0.5bn in sales as far back as 2011, the Council will support the further development of this sector, working with the Local Enterprise Partnership to deliver the Energy Strategy and clean growth aspects of the Local Industrial Strategy, supporting innovation by all businesses, promoting energy and climate resilience, and accelerating market development of energy and low carbon technologies such as heat and power networks and smart technologies. This will help to realise an ambition to create a competitive and sustainable economy while reducing rather than increasing overall carbon emissions.

- *Cheshire East Council Air Quality Strategy (AQS) (2018)* – The aim of the AQS is to provide a strategic framework to deliver local air quality improvements within Cheshire East. It can support the achievement of the air quality objectives and raise air quality as an issue for consideration within a wide range of local government and regional frameworks.

    - Promote the use of EVs and other low emission technology for both commercial and domestic use vehicles and the installation of a suitable charging infrastructure across the borough.

- *Cheshire East Council Low Emission Strategy (LES) (2018)* – The LES includes several recommended policy measures for improving air quality in the borough including planning measures to promote LEVs.
    - To encourage the uptake of EVs in the CEC area, one 'rapid charge' point will be provided per 10 residential dwellings and/or 1000m2 of commercial floorspace. Where on-site parking is provided for residential dwellings, EV charging points for each parking space should be provided. Development proposal should also consider discounted on- and off-street parking for LEVs and dedicated LEV.
- *Cheshire East Council Local Plan (2017)* – The Local Plan is the Statutory Development Plan for Cheshire East and is the basis for determining planning applications. This Local Plan Strategy document sets out the overall vision and planning strategy for development in the borough and contains planning policies to ensure that new development addresses the economic, environmental, and social needs of the area. It also identifies strategic sites and locations that will accommodate most of the new development needed.
    - The Policy CO_2 outlines that to enable business growth through transport infrastructure the Council will support new developments that are (or can be made) well connected and accessible by:

      vi. Providing recharging points for hybrid or EVs in major developments in order to reduce carbon emissions.
- *Publication Site Allocations and Development Policies Document (2022)* – outlines a specific set of requirements for developers in INF3 which states that for major developments one chargepoint should be installed for each new dwelling (new build or change of use) and one charging point for every five parking spaces for non-residential purposes. This reflects the governments proposed approach.
- *Policy SD1 - 'Sustainable Development in Cheshire East (2017)* - Outlines several policies that all new developments in Cheshire East should aim to incorporate where possible to achieve sustainable development. These include prioritising investment and growth within principal towns and key service centres, provide access to local jobs, services and facilities, ensure the development is accessible by public transport, walking and cycling and incorporate sustainable design and construction methods.
- *Policy CO1 - 'Sustainable Travel and Transport' (2017)* – Sets out to deliver the council objectives of delivering a safe, sustainable, high quality, integrated transport system that encourages a modal shift away from car travel to public transport, cycling and walking. The council will expect to improve pedestrian facilities so walking and cycling facilities so that they are more attractive for shorter journeys and improve public transport integration, facilities and capacity.

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Appendix H - Future EV Uptake

Uptake Model Overview

The key driving force in understanding the provision of future EV infrastructure, is to understand when and where the existing vehicle fleet will transition to EVs, as it is this transition which will drive the demand for charging. The fleet change has been modelled by creating a model for how new technology will diffuse into the existing vehicle fleet.

Table 10-1: Characteristics defining model diffusion of new vehicles

Characteristic	Description
The rate at which new vehicles are purchased.	This determines the 'churn' of vehicles within the fleet overall. If few new vehicles are being purchased (due to a recession, say) then there will be a substantial slowdown in the transition to EVs as the population of vehicles is not being replaced
The probability of new vehicle purchases being an EV	If the fleet is to transition to EVs, the probability of each new vehicle being an EV should increase to 100%. This aligns with the 2030 target that has been set by the UK Government.

However, too frequently, in discussions about EV uptake the focus is on the second question (probability of new vehicle purchases being EV), with little consideration given to the implications of the first question

Therefore, for each question a systematic technique needs to be determined to derive the two results required, the level of new vehicles and the change that that new vehicle is an EV.

To answer the first question, the data for income for each Middle Layer Super Output Area (MSOA, a government defined area used for aggregation of census statistics), and the ratio of new vehicle to existing vehicle registrations was used to generate a probability of new vehicle purchase. This variable alters with income due to the strong relationship between average income and new vehicle purchase rates.

To answer the second question, a choice model was used. A choice model is a technique for providing a systematic method of choosing between multiple options, each of which may have benefits associated with it. The form of the logit choice model used in this work is a Binary Logit Choice Model, with changing variables over the two alternatives. This form of the model allows us to calculate the probability of choosing between two distinct, and exhaustive (meaning that the options represent the only options available to the purchaser, and they must choose one) options. The general form of this model is shown below.

$$\boldsymbol{P(C_1) = \frac{\exp(\lambda U_1)}{\exp(\lambda U_1) + \exp(\lambda U_2)}}$$

Here, C1 represents Option 1, U1 represents the Utility of that choice (defined through a combination of income and EV price) and l is a parameter used to determine the sensitivity to change for the utility values within the logit choice model.

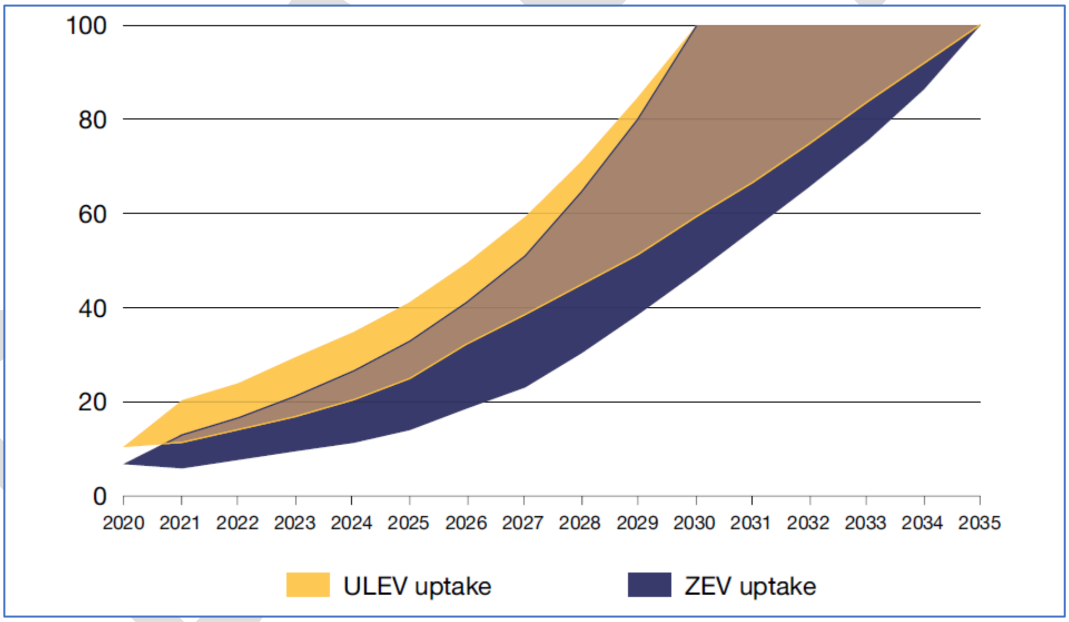
From this model, it is possible to create a stock flow equation which governs the movement of vehicles into and out of the vehicle fleet.

$$Fleet_{2023} = Fleet_{2022} + New\ Vehicles_{2023} - Scrapped\ Vehicles_{2022}$$

Essentially, the fleet in 2023 is governed by the fleet in 2022 plus all new vehicles from 2023, minus those vehicles scrapped in 2022. The new vehicles will be composed of a mix of ICE and EV.

A range of scenarios have been considered to account for the level of uncertainty around available data, modelling variables, and advances in technology to understand what different futures might look like. These cover 'Low', 'Medium' and 'High' private vehicle uptake projections that generally align with the range of potential pathways, set out in the 'Transitioning to zero emission cars and vans: 2035 delivery plan' (HM Government, 2021), to achieve their ambitions for 2030 and 2035. **Error! Reference source not found.Error! Reference source not found.** illustrates these potential pathways for both ULEV (PHEV) and zero emission vehicle (ZEV) private car uptake, showing a predicted range of distribution for each vehicle type (shaded in yellow and blue) and the level of uncertainty (shaded in brown).

Figure 10- Potential pathway – Percentage of new car sales accounted for by Ultra Low Emission Vehicles (ULEVs) and Zero Emission Vehicles (ZEVs)



The uptake of new company EVs has historically been at a faster proportional rate than the private market by approximately two years. The same curves have been accelerated by two years to calculate projections for company car and LGV uptake of ULEV (PHEV) and ZEV (BEV).

The scenarios for 'Low', 'Medium' and 'High' uptake apply the Government policy targets, banning different vehicle types in 2030 and 2035, and the varying levels of expected ULEV (PHEV) and ZEV (BEV) uptake on the following basis

- High – assumes an optimistic ZEV (BEV) uptake, at the upper end of the projected range, reaching 100% of all new car sales by 2030;

- Medium – assumes a more moderate ZEV (BEV) uptake, in the middle of the projected range, reaching 100% of all new car sales by approximately 2032; and

- Low – assumes that ZEV (BEV) uptake will be at the lower end of the projected, reaching 100% of all new car sales by approximately 2035. This is the latest by which all new vehicles will be ZEV (BEV).

Spatial Charging Demand Model

The relationship between EVs and their charging requirements is an inherently spatial one, and as such it is necessary to understand the characteristics of the areas EVs are likely to be purchased, the level of charge they are likely to require, but also to subsequently understand where those same EVs are likely to charge.

The energy demand has been calculated through assuming that each EV will split its energy demand across four different fundamental charging situations.

- Off Street Residential Charging: This is the charging that takes place on private land owned/rented by the household. The charging post itself is assumed to be private and only accessible by the owner;

- On Street Residential Charging: This is charging which takes place in the immediate local vicinity of residential areas and is expected to be primarily used by those with no private Off Street Charging. The capture area for On Street Residential charging is expected to be around 400m as this is a reasonable estimate for the distance people are willing to walk;

- Destination Charging: This is charging that is linked to specific destinations. As such it is likely to be used by all users, although it is likely to be used more by those without access to off street charging. The capture area of Destination Charging is between 15km and 25km as this is distance that a vehicle might be expected to travel to a destination for shopping/leisure/etc; and

- On Route Charging: The demand for on route charging comes from the overall split between local and Strategic Road Network movement, with the assumption that longer scale movements will charge at locations within 1-2 km of the major road network.

The split between the different charging types is shown in **Error! Reference source not found.Error! Reference source not found.**.

Table 10-2: Energy split between charging types

Residential Parking Type	Charging Location			
	Off Street Residential	On Street Residential	Destination	On Route
Owner with Parking Space	60%	0%	15%	25%
Owner with No Parking Space	0%	45%	30%	25%

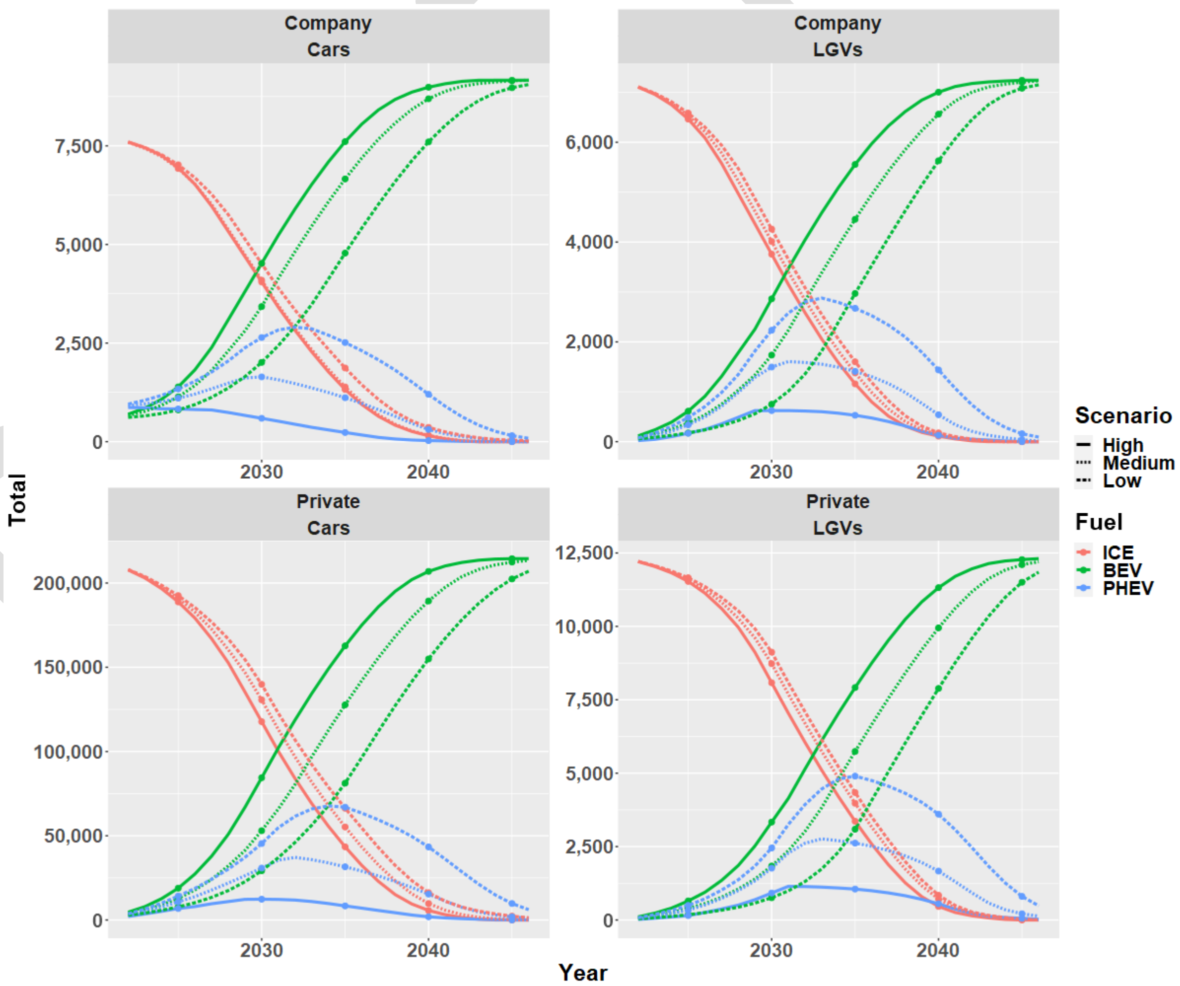
Generally speaking, it is not possible to determine the exact split of residential parking types within the model areas, therefore a heuristic based on the type of housing within each assessment area is used to determine the likely residential parking split.

Forecasted Uptake for Cheshire East

Error! Reference source not found. shows the expected uptake rates across multiple differing vehicle groupings. Under the model used here, the overall reduction in ICE vehicles is driven by the government-imposed mandates to ban new ICE vehicle purchases by ICE, and non-zero emission vehicles by 2035. However, the rate at which BEV purchases increase, compared to PHEV, is determined by the scenario selection.

In general, the BEV uptake curves follow the standard “S-Curve” which is observed in multiple technological diffusion models. The key aspects of this curve are the rapid acceleration of uptake up to 2030, followed by a stagnation in EV Uptake rates. This stagnation of uptake rates occurs when the existing vehicle fleet is being replaced at the maximum possible rate.

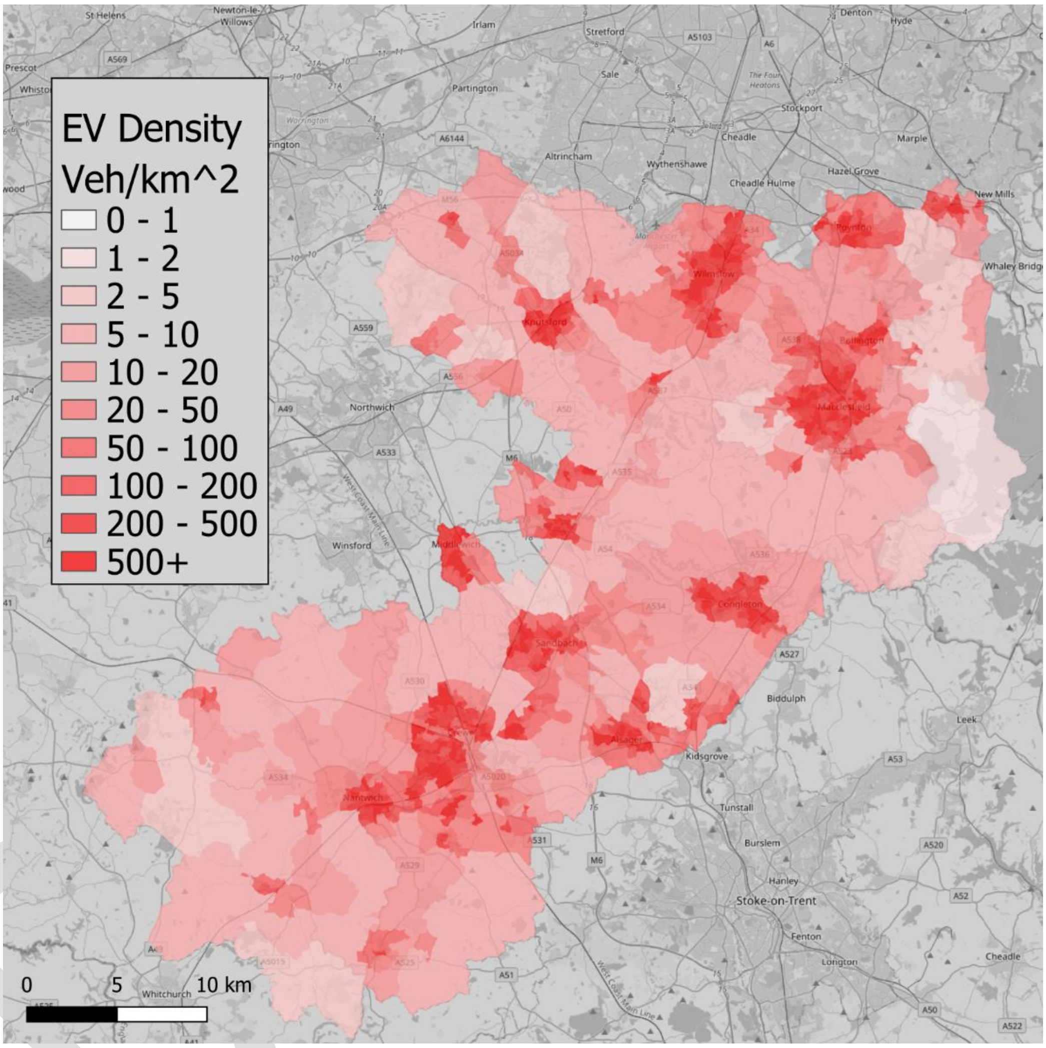
Figure 10-1 Uptake rates across Keepership, Body Type and Fuel



By comparison, the PHEV fleet distribution hits a likely peak from between 2030 to 2035 (depending on scenario) followed by a decline as the 2035 ban on non-zero-emission vehicles takes effect.

It is instructive to note that whilst the change in fleet numbers is at its maximum from 2028-2035, the relative increase in numbers will be much higher in the earlier years. Therefore, whilst the numbers will be higher post 2030, the relative increase in numbers, and hence change in required infrastructure, may be higher pre-2030. This highlights the need to anticipate the required infrastructure.

Figure 10-2 Electric Vehicle Density across Cheshire East (2030)



In **Error! Reference source not found.** we can see how EV density varies across Cheshire East. As might be expected, it is mainly concentrated in urban areas as the density of EV numbers is mainly driven by the density of population.

Whilst this is not a surprising result, it does serve to highlight the potential problems in attempting to provide EV infrastructure in rural areas. Fundamentally, a single chargepoint, particularly a low power chargepoint which is focussed on residential charging, will only be able to meet charging demand within a certain radius. A chargepoint in a rural area will not only have far fewer vehicles within usable distance, but there is also the likelihood that those vehicles will be attached to houses with off-street parking.

Hence, rural charging will be less financially viable.

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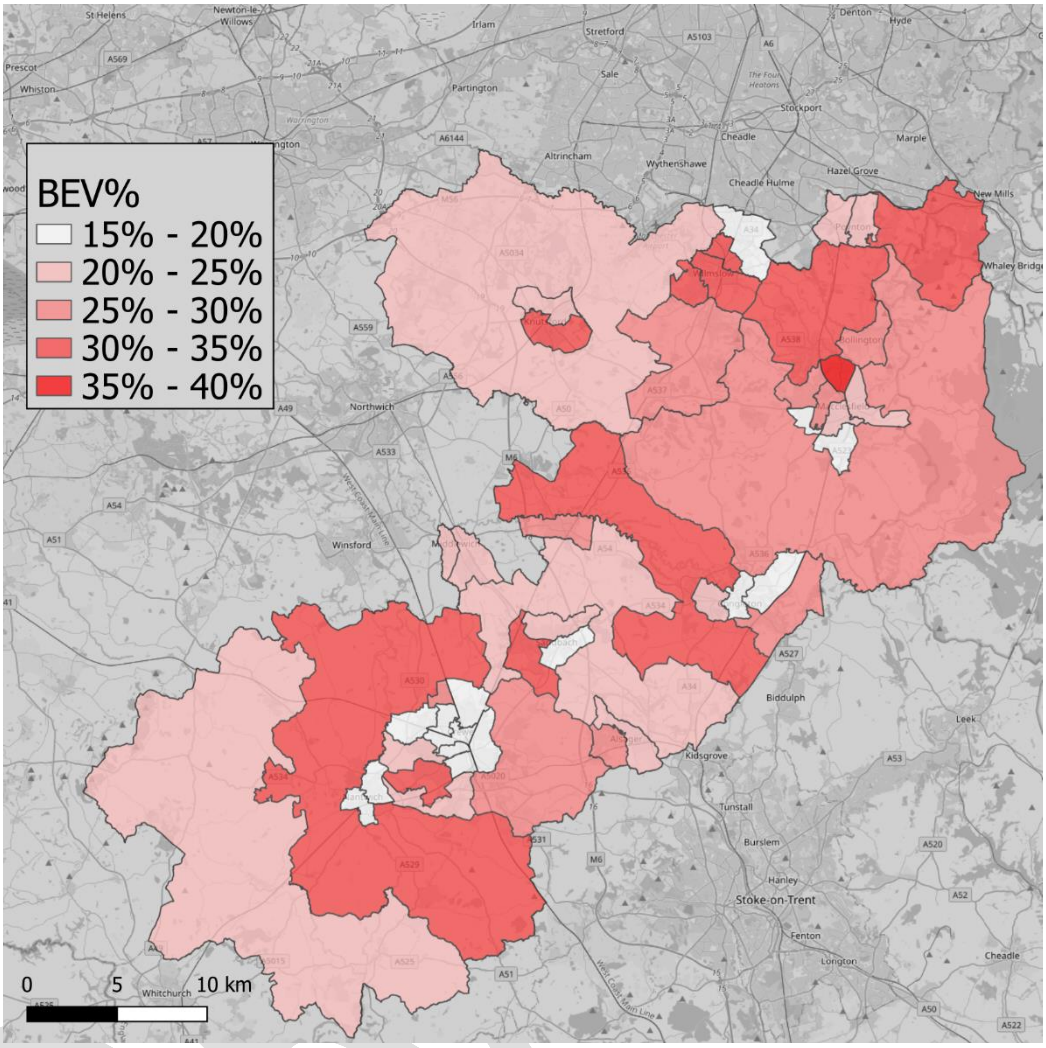
Figure 10-3: BEV Uptake as a % of Total Vehicles (2030)



Error! Reference source not found. shows the relative proportion of vehicles that will be BEV by 2030. As this metric is not concerned with either the total number of vehicles in each area, or the density of the areas, it serves to highlight those areas within Cheshire East where the uptake of BEVs is lower. From the map, we can see that this is most typically in the more urban areas.

The comparison between this result, and the result in **Error! Reference source not found.** is illuminating as it shows that whilst the areas of highest EV uptake, compared to the vehicle population, are rural, the actual concentration of EVs is more urban due to the spatial configuration.

Forecasted Charger Demand for Cheshire East

Converting the overall level of EV uptake within Cheshire East, to the number of chargepoints which will be necessary to meet this demand, requires the use of certain assumptions.

The initial energy demand is calculated using the average distance driven by a Car or LGV, multiplied by the efficiency of the vehicle in kWh/km. The average distance driven by a car is approximately 11,000 km per year which, when multiplied by the

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typical efficiency of 0.19 kWh/km, gives a typical energy usage of 2,090 kWh per year.
This energy will then be distributed across the differing charging location types, as set out in Forecasted charger demand for Cheshire East is outlined in Table 4-8 below and illustrated in Figure 4-8. By 2030 it is estimated that approximately 1,300 chargepoints will be necessary to meet the demand needs associated with the forecasted EV uptake for Cheshire East. This is across all publicly available charging location types including residential, destination and on-route.

Table **Error! Reference source not found.**. The Off-Street Residential demand is expected to be met entirely by private chargepoints and so is not included here.

To convert the energy demand by Charging Location into the required number of chargepoints, it is necessary to estimate the amount of energy that each chargepoint can provide, and then use this to estimate the overall chargepoint requirement.

Specifically, for publicly available residential usage, it would be assumed that the chargepoints are 7kW, and are utilised for 30% of the time, essentially, they are used to charge from 10pm to 6am. This would lead to a total energy provision of 18,400 kWh per year. Therefore, each chargepoint could be used to service, approximately nine vehicles which require publicly available residential charging. A similar calculation is used for destination and on-route charging, but with higher power ratings for the chargepoint.

Table 10-3: Forecasted publicly available charger demand for Cheshire East

Residential Parking Type	**Charging Location**		
	Residential	Destination	On-Route
2025	255	57	26
2030	1015	220	96
2035	2289	488	212
2040	3309	693	299
2045	3713	765	329