

# Electric Vehicle Charging market study

Final report

23 July 2021

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- A: En-route charging
  - B: On-street charging
  - C: Home and workplace charging
  - D: Problems people face using public charging
  - E: Data and analysis overview
- Glossary

# Summary: Building a comprehensive and competitive electric vehicle charging sector that works for all drivers

## Overview of our findings

1. The UK has committed to reducing greenhouse gas emissions by 28% by 2035 and moving to Net Zero by 2050. Transport, in particular cars, is the largest source of emissions (accounting for 27%). Transitioning from petrol and diesel cars to electric vehicles (EVs) is therefore key to reducing emissions and meeting Net Zero. Reflecting this, the UK Government has committed to end the sale of new petrol and diesel cars/vans from 2030.
2. For this to happen, however, it is essential that there is a comprehensive and competitive EV charging network in place, one that people can trust and they are confident using – much like filling up with petrol or diesel. If this is not the case, and the charging network is perceived as inadequate, or as not offering a fair deal to people, that will be a major barrier to EV take-up.
3. The scale of the shift to EVs – requiring the development of an entirely new network – should not be underestimated. While it is difficult to know precisely how much charging will be needed, forecasts suggest that at least 280-480,000 public chargepoints will be needed by 2030 – more than ten times the current number (around 25,000).
4. There will also need to be a suitable mix of different types of charging spread across the UK. While many people will regularly charge at home or work (if they can), a sufficient range of public charging is important to encouraging EV-take up. Rapid charging on longer journeys (such as on motorways and in remote areas) and on-street charging at the kerbside (for those without a driveway or garage) will be particularly important. But this is currently far from the case - access to suitable charging can be a 'postcode lottery'. For example, outside London there are only 1,000 on-street chargers (out of 5,700). Some areas are at risk of getting left behind – for example, the number of total chargepoints per head in Yorkshire and the Humber is a quarter of those in London.
5. We have examined how this critical new sector is developing and whether the sector left to its own devices can deliver what is needed. While some parts of the sector are developing relatively well (such as rapid charging at destinations like shopping centres and charging at home or work), other parts are lagging behind. We found greater challenges in rolling-out charging along motorways, remote locations and on-street. Therefore, targeted interventions are necessary to kickstart more investment and unlock competition:

- along the motorways where competition at service stations is very limited (one chargepoint operator – the Electric Highway - has a share of 80%). Constraints on electricity grid capacity and long-term exclusive contracts (covering around two-thirds of service stations) prevent entry by competitors at many sites. The Government’s commitment to fund grid upgrades provides an important opportunity to open up competition within these key sites, as well as putting in many more chargepoints;
  - in remote areas, where the commercial case for investment is very weak, which means there’s a risk these will be left unserved; and
  - in on-street charging where roll-out is very slow and local monopolies could arise if the market is left unchecked. Local authorities (LAs) play a crucial role here in rolling-out chargepoints and actively overseeing the market to maximise competition and protect local residents, but they are not all currently sufficiently equipped or incentivised to do this.
6. We have also found that there are other problems for EV drivers which can make EV charging challenging. It can be difficult and frustrating to find and access working chargepoints, and to compare costs and pay for charging. Emerging developments like subscriptions and bundling could create more problems in the future like ‘lock-ins’ (difficulties exiting contracts).
  7. In practice, using and paying for charging should be as simple as petrol or diesel. Everyone should be able to access convenient and affordable charging, no matter where they live. As we’ve seen in other markets, if it becomes complex or confusing, this damages people’s trust – which is not only a concern in itself but also a barrier to EV take-up. Deliberately steering the sector in the right direction now will help ensure that people do not lose confidence at this crucial early stage.
  8. While healthy competition will be critical to meet these challenges, market forces alone will not deliver what is required – in particular due to the wider environmental benefits of reducing carbon pollution. Even further government support, funding and oversight is also needed to push forward the pace of roll-out ahead of demand, working alongside key bodies like LAs and regulators.
  9. We have made eight recommendations to promote competition, unlock investment, and build people’s trust, both now and in the future. But there are still many uncertainties, so it is important for measures to be responsive and for the sector to be monitored closely going forward.

## **Very limited competition along motorways**

10. Being able to recharge as quickly as possible on longer journeys (en-route charging) is crucial to persuade drivers to switch to EVs as it will alleviate concerns about 'range anxiety' (the fear of running out of charge). But on motorways there has been very limited competition to date. At most motorway services there is just one chargepoint operator – the Electric Highway – leaving little choice for drivers. Customer satisfaction has been very low, driven by concerns about poor reliability and limited chargepoints.
11. Many of these critical motorway services require costly increases in grid capacity before more chargepoints can be installed, which is a major barrier. The Government's £950 million Rapid Charging Fund (RCF) has been set up to fund these grid upgrades in England - this provides a pivotal opportunity to open up and increase charging competition within motorway services, as well as increasing grid capacity. This will play a critical role in enabling there to be more than one chargepoint operator at service stations. Greater competition at services will help to deliver more choice, better reliability, low prices and continued innovation. But to achieve this, the RCF needs to be designed in the right way, otherwise there is a risk that if the funding primarily goes to the existing operators it could further entrench competition problems.
12. We also have concerns about the long-term exclusivity agreements between the Electric Highway and three motorway service operators (Roadchef, MOTO and Extra) which cover around two-thirds of service stations and last between 10-15 years since the contracts were entered into, with several years remaining on these. We are concerned that these arrangements increase barriers to entry for other chargepoint operators and, importantly, risk undermining the effectiveness of the RCF. While some period of exclusivity may have been necessary initially, the need for this increasingly looks far from clear, particularly given greater certainty over future EV demand and the introduction of the RCF. Several competitors told us they would look to enter and compete at motorway services but are prevented by these agreements.

## **Risk of 'charging deserts'**

13. Off the motorway in remote locations like rural areas or at tourist spots (where connection costs are high but demand may be lower), the business case for commercial investment in rapid en-route charging may be weak. This increases the risk of 'charging deserts' emerging which could deter EV take-up, both for EV drivers living in those areas and for those travelling to or through them.

## Challenges for local authorities supporting on-street roll-out

14. We also found problems for some people charging near their home – where more than a quarter of drivers do not have access to a driveway or garage and cannot install a home chargepoint (over 8 million households). For those drivers, having convenient and affordable local public charging will be crucial to EV take-up. On-street slow or fast charging near the home (where EVs can charge overnight), offers a more convenient, easier and cheaper way to charge than relying on rapid hubs (akin to petrol forecourts) or destination charging. Drivers could save over £100 a year by using an on-street chargepoint rather than rapid charging (which costs around 60% more than home charging). It also has greater benefits for the grid as when EVs are plugged in they can help manage the intermittency of renewable energy sources by providing flexibility as well as smoothing demand.
15. But roll-out in on-street has been slow and is very patchy. The commercial case for on-street charging is weak and it is currently reliant on government subsidies. This is delivered through grant funding which LAs can apply for, though many haven't – a third of the available funding has gone unspent.
16. LAs in Great Britain have a key gatekeeper role as they are responsible for parking and street furniture like lampposts where on-street charging is often installed. They also understand local needs. But while there are some examples of good practice, we found that generally LAs do not have any plans in place, dedicated personnel, financial resources or in some cases the appetite to drive forward roll-out. They do not have a clearly defined role – EV charging is not one of their statutory duties and so it can be a lower priority, particularly given competing demands on their resources and the other services they must provide.
17. The costs of installing on-street chargepoints and the fact that people generally want to charge near their home, means that on-street competition (where there's a choice between different operators) is often not feasible – at least at the moment. Therefore, there is a risk that, if left unchecked, local monopolies could develop. An alternative way to create competitive pressure is through tenders currently run by LAs 'for the market'. To be effective these need to be actively managed and monitored. But many LAs do not have sufficient resources - with some favouring working with a single chargepoint operator in an area, which, while easier, could put LAs in a weaker position in the long-run leading to worse quality or prices for residents.
18. To deliver sufficient, competitive on-street charging which encourages EV take-up, a step change is needed. LAs will need to play a much more active role in rolling-out charging and maximising competition by actively overseeing

the market to ensure high quality, affordable charging for local residents. To do this effectively LAs need to be sufficiently equipped, supported and overseen at national levels – ensuring that no areas lag behind.

## **Frustrations facing EV drivers**

19. Building trust in the sector is also vital for successful EV take-up, particularly at this early stage. Using and paying for public charging needs to be a simple, positive experience – much like it is with petrol and diesel.
20. While there have been some improvements, many EV drivers find charging to be complex, confusing and frustrating at times. On top of a lack of chargepoints which is a significant concern, reliability can be poor (on average 1 in 25 chargepoints are out of service – though this has been improving). Not all chargepoint operators make live data on availability and working status freely available which can make it hard to find chargepoints. It can also be difficult to find and pay for charging easily (with multiple apps or cards needed) as well as comparing prices. Currently only 9% of public chargepoints have contactless bank account payment which is a simple way to pay for charging.
21. Some people may have even greater problems engaging in this sector (such as those with disabilities who may face additional barriers due to the design or location of chargepoints or those who are less ‘tech-savvy’). Charging should be designed to meet different needs so that no-one is left behind. Open and interoperable charging networks that can be used easily by all drivers and brands of EVs is fundamental.
22. There are also some emerging developments which could cause problems down the line for people. For example, we have seen evidence of growing consideration by chargepoint operators of subscriptions and bundling. There is a risk that if these become more common, they could make it even more confusing for people, harder for them to understand and compare deals, and potentially lead to harmful subscription traps that exploit people’s inertia and make it difficult to exit.
23. We expect that some aspects of the charging experience, such as reliability, are likely to improve over time as the sector evolves, competition develops and more chargepoints are rolled-out. However, in the meantime, a difficult charging experience will undermine trust and put people off EVs.
24. While home charging is generally easier for people to use, we found that there are some issues which mean that people may not benefit from smart charging or other future benefits. Smart charging (ie enabling drivers to charge when

energy is cheapest) can save people money, benefits the grid as it helps manage demand and maximises the use of renewable electricity. Therefore, we welcome the Government's plans to require home chargepoints to be smart, otherwise people could miss out by buying 'dumb' chargepoints. Open standards for controls and data used by home chargepoints can help to fully maximise the benefits of smart charging by simplifying and automating it. It will also make it easier for third-parties to develop innovative solutions and applications for controlling home charging and other home energy services. As we found in banking, open data and standards can be critical to opening up competition in markets.

## **Markets alone cannot deliver – government support is critical**

25. In addition to the specific challenges facing some parts of the sector, there are various underlying factors which explain why market forces alone will struggle to deliver the EV charging infrastructure needed by 2030. In particular, left to their own devices, markets do not take into account the full benefits of carbon reduction. Changing to an electricity-based transport system will also result in significant upfront infrastructure costs eg the costs of installing chargepoints and connecting to the grid, many of which fall on the industry. There is also a 'chicken and egg' problem, where the commercial viability of EVs depends on a widespread charging network being in place, but the case for building that network is also dependent on the number of EVs on the road.
26. The transition to EVs will also impact the energy system. While there is expected to be enough power available to meet demand, in some places, grid upgrades will be required. However, EVs will also benefit the electricity system by providing flexibility to store energy and balance demand when plugged in for long periods of time, helping avoid the need for upgrades. Smart, slower charging at home or on-street will provide more of this flexibility than rapid charging.
27. The scale of these challenges and the need for a rapid roll-out mean that left to their own devices, markets will not be able to deliver. As a result, continued active government involvement at local and national levels will be needed to push forward the pace of roll-out and target funding and support at the areas where it is most needed, building on what is already being done. The energy regulators (Ofgem and Uregni) and energy distribution companies responsible for making connections to the grid, will also need to play their part to ensure that new EV charging infrastructure is installed efficiently and quickly. Many chargepoint operators told us that it can be a very lengthy process to connect to the grid and upgrades can be very costly – which has a significant impact on the pace and incentives for roll-out.

## Our recommendations

28. We have made eight key recommendations to unlock greater investment, promote competition and boost trust in the sector.
29. While transport is partly devolved and therefore approaches between the nations vary, we have found that the broad challenges are similar and therefore our recommendations are UK-wide. However, we recognise that circumstances and needs vary within each nation, therefore some have more or less relevance. It is important for lessons to be shared between nations, to help ensure that a comprehensive network is in place across the UK.

### *Meeting the scale of the overall challenge*

- UK Government sets out an **ambitious National Strategy for rolling out EV charging between now and 2030, alongside strategies from each of the Devolved Administrations** – building on the work already underway.
- Ofgem and Uregni make changes to **speed up grid connections, invest strategically and lower connection costs** - so that the electricity system supports roll-out.

### *Unlocking competition along motorways and targeting rural gaps*

- UK Government **rolls-out the Rapid Charging Fund as quickly as possible to increase capacity at motorway service stations and attaches conditions to this funding so that it opens up competition at these key sites** (eg no exclusivity in future, open tendering, chargepoints interoperable with all EVs and open networks available to all brands of EV). We also have concerns about the long-term exclusivity in the contracts between the Electric Highway and motorway service operators (Roadchef, MOTO and Extra), and therefore **we have launched a competition law investigation into these**.
- Off motorways, governments consider **targeting funding at gaps in remote areas** which may otherwise not be served.

### *Boosting investment and maximising competition in on-street charging*

- **LAs take a more active role in planning and managing the roll-out of on-street charging to maximise competition and protect local residents**, putting in place local plans and take into account key factors we have set out.
- **Governments take action to properly equip and incentivise LAs while also providing greater support and oversight - including providing funding for dedicated expertise and defining their role eg via a statutory**

**duty – in order to achieve a step change**, and work with LAs to explore and pilot other ways of rolling-out on-street charging.

### ***Creating a sector that people can trust and have confidence in***

- UK Government **sets open data and software standards for home chargepoints** so people can benefit from smart charging and flexible energy systems.
- UK Government **takes into account the following principles to ensure charging is as simple as filling up with petrol/diesel and tasks a public body with implementing, overseeing and monitoring these** as the sector develops to build people's trust:

- 1. It is easy to find working chargepoints** eg. people can access open data on live availability and working status and rely on minimum reliability standards;
- 2. It is simple and quick to pay** eg. no sign-ups needed, contactless bank account payment is widely available and charging networks keep up with payment technology;
- 3. The cost of charging is clear** eg. prices are presented in a simple standardised pence-per-kilowatt hour format; and
- 4. Charging is accessible and interoperable** eg all chargepoints can be used by all drivers, are not limited to a single brand of car, and follow inclusive design principles.

### **Next steps**

30. We will continue to work with the governments as well as the industry, to ensure a healthy charging sector develops. There are still many uncertainties about how the sector and technology will evolve. As a result, strategies, plans and measures for the development of EV charging must be flexible and responsive.
31. Given how important this sector is, we will oversee progress as it evolves over the next few years. We will take further action if the sector or parts of it are developing in a way that is damaging competition and investment and not working well for people.

# Key statistics

## Scale of the challenge

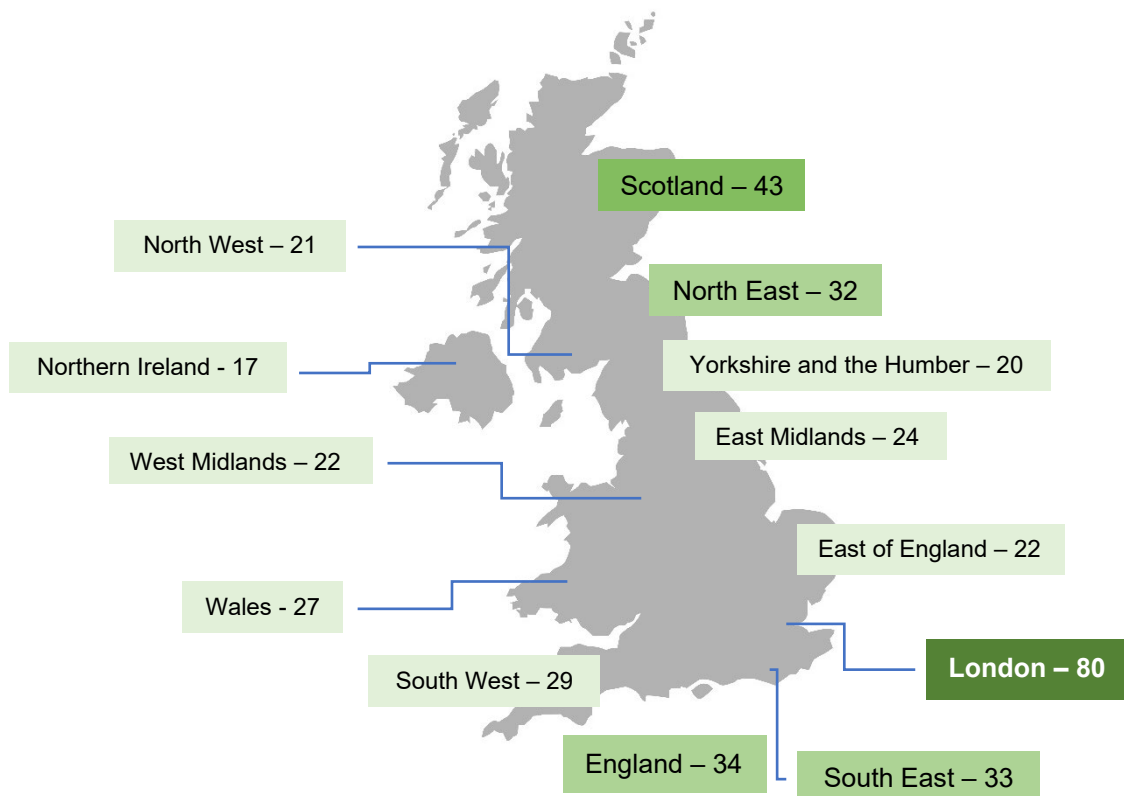
### At least ten times the current number of chargepoints needed by 2030

#### Current provision:

- UK network has grown to around 25,000 public chargepoints.
- Only 34 public chargepoints per 100,000 people on average in the UK.

#### Uneven and patchy provision:

### Chargepoints per 100,000



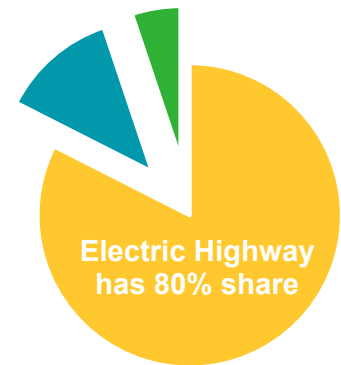
## En-route charging

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**500+ chargepoints installed at motorway stations, estimated 2,300 needed**

- Lengthy exclusivity agreements covering around two-thirds of motorway service stations.



## On-street charging

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**Only 1,000 on-street chargepoints outside of London - out of 5,700 in the UK**

- Over a quarter of drivers don't have a driveway or garage – 8 million+ households.
- Drivers could save over £100 a year using on-street as opposed to rapid charging.
- Almost one-third of government funding has not been taken up by LAs (ORCS).



## People's experience of public charging

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**Only 9%** of chargepoints offer contactless payment – 50% of rapid / ultra-rapid.

**1 in 25 chargepoints, 1 in 10 rapid** are out of service at any given time on average.

# Summary of the CMA's recommendations

## Meeting the scale of the overall challenge



1. Ambitious national UK Strategy for roll-out to 2030 - alongside strategies in Devolved Administrations.
2. Speed up grid connections, invest strategically and lower connection costs.

## Unlocking competition along motorways and targeting rural gaps



3. Roll out Rapid Charging Fund quickly and use it to open up competition at service stations.
4. Target funding at gaps in remote areas.

We've launched a competition law investigation into long-term exclusivity agreements at service stations.

## Boosting the roll-out in on-street charging



5. LAs take a more active roll in planning and managing roll-out to maximise competition.
6. Equip and incentivise LAs - eg funding for expertise, a statutory duty.

## Making it easier for people to charge EVs



7. Set open data and software standards for home chargepoints.
8. Ensure charging becomes as simple as filling up, with a public body with overseeing this.



# 1. Introduction

- 1.1 The transport sector is the largest source of carbon emissions in the UK. The majority of these emissions come from cars,<sup>1</sup> and therefore a smooth transition to electric vehicles (EVs) will be critical to achieving the UK Government's legally binding commitments for [Net Zero carbon emissions by 2050](#).<sup>2</sup> This shift is even more imminent following the UK Government's commitment to end the sale of new petrol and diesel cars and vans by [2030](#). Supporting the transition to a low carbon economy is a [CMA priority](#).
- 1.2 Putting in place sufficient EV charging infrastructure in the right locations, and building consumer trust and confidence in the sector, will be key to successfully transitioning at pace to EVs. 'Range anxiety' - the worry an EV will run out of charge - is currently a key barrier to EV take-up, among other factors. It is therefore a priority to put in place a comprehensive charging network and as the sector develops it will be important to encourage greater growth and investment which maximises competition, as well as ensuring that the charging network works well for all consumers.

## Purpose of the study

- 1.3 Our market study has considered the supply of chargepoints for electric passenger vehicles (cars and light vans)<sup>3</sup> across the UK, which is an emerging but fast-growing sector. We focused on two key themes:
- a) whether the sector can deliver the scale and pace of investment needed in a way that also enables a competitive sector which delivers good outcomes to consumers, and what measures can help to unlock competition and incentivise investment in the sector; and
  - b) how people interact with this new and potentially complex sector and any problems they may face, and what measures may be needed to ensure charging is easy and convenient, so that mistrust does not become a barrier to roll-out.
- 1.4 We looked at the EV charging sector as a whole and whether there are particular issues in different parts of the sector eg charging at home, work or

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<sup>1</sup> [BEIS, 2020 UK greenhouse gas emissions, provisional figures, March 2021, page 11](#).

<sup>2</sup> In 2018 the Government published its [Road to Zero](#) strategy, setting out its proposals to support the transition to zero emission road transport. In June 2019 the UK became the first major economy to pass laws to end its contribution to global warming by [2050](#), with a target to bring all greenhouse gas emissions to net zero.

<sup>3</sup> Covering all-electric and plug-in hybrid passenger vehicles - all-electric vehicles use a lithium ion battery as the sole power source and plug-in hybrids use an internal combustion engine (ICE) running on petrol or diesel, along with a small lithium ion battery. EV fleets - such as buses, coaches, delivery vehicles, trucks and taxis - are charged in depots or using available public EV charging. Fleet charging is outside the scope of this market study though where relevant we consider links to passenger EV charging.

publicly. We particularly focused on charging on-street and along motorways, which have additional challenges and are likely to be particularly important going forward to help drive EV take-up and address range anxiety.

- 1.5 While we have examined EV charging, we recognise that there are a number of other relevant factors impacting EV take-up, including the upfront cost of EVs and their supply.<sup>4</sup> We note that over time prices are expected to fall alongside the development of a second-hand market and a number of car manufacturers have recently announced intentions to increase supply.<sup>5</sup> We consider other factors which are relevant to the development of the EV charging sector, including potential technological developments and the sector's interrelation with the electricity system, in chapters 2 and 3.

## Work undertaken

- 1.6 We gathered and assessed a wide range of evidence and views, including submissions, internal documents and data from businesses in the sector and other key stakeholders such as consumer and trade bodies. We also held a series of roundtable sessions to discuss key challenges. We received around 50 submissions directly from individual consumers. All submissions are published on the [case page](#), alongside our two progress updates.
- 1.7 We carried out analysis using data commissioned from Zap-Map, a third-party aggregator of information on chargepoints and networks. The data included reports on the number of chargepoints in the UK, pricing and reliability. We also carried out analysis on prices based on this Zap-Map data, as well as information from chargepoint operators. More detail on both of these is set out in Appendix E. As part of our information gathering, we received a wide range of internal investment plans and business models from chargepoint operators which we examined in detail, particularly in relation to on-street charging and motorways. We also assessed a range of consumer research.
- 1.8 We engaged regularly with governments across the four nations and relevant regulators, who are also undertaking significant work in this area (as set out further in chapter 2 and subsequent chapters). We also engaged with other competition authorities and government bodies, in particular Norway, France, the Netherlands and Germany. A number of UK organisations have recently

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<sup>4</sup> For example, the list price of a VW Golf starts at £18,340.

<sup>5</sup> For example, while in 2019 there were 20 models of EV, Volkswagen alone is planning over 70 new models by 2030 – see [Climate Change Committee, The UK's transition to electric vehicles, December 2020, page 3](#). [Ford has also announced](#) that by mid-2026 100% of its passenger vehicle range in Europe will be zero emissions capable, all electric or plug-in hybrid; moving to all-electric by 2030.

or are currently carrying out work in this area, which we have considered in our study.<sup>6</sup>

## **This report**

1.9 This final report sets out our findings and proposes measures to address the issues we have identified during our market study.<sup>7</sup>

1.10 The remainder of this report is structured as follows:

- (a) Chapter 2 provides background on what EV charging is and the sector.
- (b) Chapter 3 sets out the progress of roll-out and scale of growth needed.
- (c) Chapters 4, 5 and 6 provide an analysis of investment and competition in en-route, on-street and in home, workplace and destination charging.
- (d) Chapter 7 looks at the problems people face using public charging.
- (e) Chapter 8 presents the CMA's conclusions and recommendations.
- (f) Further details on the evidence we have considered is set out in supporting appendices.

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<sup>6</sup> Including: [Electric Vehicle Energy Taskforce](#); [National Audit Office](#); [BEIS Select Committee](#); [Committee on Climate Change](#); [Policy Exchange](#); and [Citizens Advice](#).

<sup>7</sup> The CMA launched its market study on 2 December 2020 and has a statutory obligation to publish its final report, containing its findings and the action (if any) it proposes to take, within 12 months (ie by 1 December 2021). See [case page](#) for further details.

## 2. Background to electric vehicle charging and the sector

- 2.1 This chapter provides an overview of EV charging and the sector. It covers:
- (a) How and where EVs are charged;
  - (b) Charging and the electricity system;
  - (c) Developments in technology;
  - (d) Chargepoint operators and private investment in the sector;
  - (e) Policy approach and public funding (UK and in the four nations); and
  - (f) Regulatory framework.

### How electric vehicles are charged

- 2.2 There are two types of EV – all-electric (battery operated) and plug-in hybrids. The number of EVs is growing - as of end of May 2021, there were over 500,000 EVs registered in the UK, representing growth of 66% from 2019.<sup>8</sup> [The Climate Change Committee](#) (a public body which sets and advises UK Government on meeting carbon budgets) estimates that by 2030 there could be around 16 million EVs in the UK (though this is dependent on various factors - see also chapter 3).
- 2.3 In order to charge, EVs need to be parked and plugged into a chargepoint which is connected to the electricity network. The time it takes to charge an EV will vary according to the speed of the chargepoint - ultra-rapid, rapid, fast or slow<sup>9</sup> - which is based on its power output (in kilowatts - kW), and the type of battery in the EV. EVs can also charge via a three-pin plug, though this has a low power output and is therefore much slower. Table 1 sets out the estimated charge time based on the speed of charge. Currently only high-end EVs are capable of charging at ultra-rapid speeds.<sup>10</sup>

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<sup>8</sup> [Electric vehicle market statistics 2021 - How many electric cars in UK? \(nextgreencar.com\)](#).

<sup>9</sup> These speed categories are consistent with UK Government definitions, though the terms are not standardised eg rapid can also be referred to as ultra-fast. We also note that even a 'rapid' chargepoint can take at least an hour to charge a typical EV and a 'fast' chargepoint takes several hours.

<sup>10</sup> [Motoring Electric, Which electric cars can use Ionity ultra-fast 350kW chargepoints? May 2021](#).

**Table 1: charging speed by power (kW) and charge time**

|  | Slow      | Fast      | Rapid         | Ultra-Rapid   |
|--|-----------|-----------|---------------|---------------|
| Power                                  | 3-6 kW    | 7-22 kW   | 23-50 kW      | 51+ kW        |
| Charge time<br>(varies by EV<br>model) | 3-8 hours | 1-3 hours | 20-40 minutes | 15-30 minutes |

- 2.4 EVs can charge with either Alternating Current (AC) or Direct Current (DC) electricity.<sup>11</sup> AC electricity can be used by all speeds of chargepoints whereas DC electricity can only be used by rapid or ultra-rapid chargepoints.
- 2.5 EVs have different types of connector for different speeds of charge:
- (a) for slow/fast AC charging, EVs typically use a Type 1 or Type 2 connector (typically used by new EVs); and
  - (b) for ultra-rapid/rapid DC charging, EVs typically use either a Combined Charging Standard (CCS) or CHAdeMO connector type.
- 2.6 EVs can only plug into chargepoints with the same type of connector, unless an adapter is used.<sup>12</sup> Most chargepoints offer multiple connector types (eg both CCS and CHAdeMO) and are therefore largely interoperable with different EV models.<sup>13</sup> In practice this means that most EVs will generally be able to use most public chargepoints. The main current exception is the Tesla Supercharger network which is a closed network that currently can only be used by Tesla EVs – we discuss this further in chapter 7.

## Where charging takes place

- 2.7 Chargepoints can be installed in various places, each representing a different segment of the sector. Different speeds of charging can be more suitable in each of these segments:
- (a) **Home charging** - charging in a driveway or garage for those with off-street parking (approximately three-quarters of drivers).<sup>14</sup> A slow or fast chargepoint is installed and connected to the home electricity supply.

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<sup>11</sup> The EV converts AC electricity to DC electricity via an on-board chargepoint, whereas DC charging charges the battery directly based on the chargepoint's power output.

<sup>12</sup> Adapters are available for EVs that use a less common charging standard.

<sup>13</sup> For chargepoints with multiple connector types, generally only one connector can be used at a time (see Appendix D).

<sup>14</sup> [DfT, Electric Vehicle Charging in Residential and Non-Residential Buildings, page 6](#). A 2020 [Zap-Map survey](#) showed that 83% of respondents (EV drivers) had access to EV charging at home.

- (b) **Workplace charging** - charging in workplace car parks generally for use by employees. Chargepoints are typically slow or fast and can be used as an alternative to charging at home.<sup>15</sup>
- (c) **Destination charging** - charging in car parks at places which consumers have travelled to eg supermarkets, shopping centres, cinemas, restaurants and tourist attractions. Chargepoints are typically fast or rapid (slow or ultra-rapid are less prevalent).
- (d) **On-street charging** - charging which largely comprises chargepoints set up on the kerbside (eg installed in lampposts or bollards) or in car parks regularly used by local residents, and is generally used by those who do not have access to off-street parking. These chargepoints are slow or fast and can be used overnight – similar to home charging.
- (e) **En-route charging** - charging along motorways at motorway service areas (MSAs) or at service stations on A roads and trunk roads, for drivers to top up generally when travelling on longer journeys. Chargepoints are rapid and ultra-rapid. Rapid hubs (groups of chargers) are also being developed in local areas (more akin to petrol stations).

2.8 Throughout this report we refer to destination, on-street and en-route charging collectively as ‘public charging’ because chargepoints in these segments are generally accessible to the general public.<sup>16</sup>

2.9 Currently where consumers choose to charge is largely dependent on the provision of chargepoints in the different segments - which we explore in chapter 3. People’s preferences and needs will also influence their charging choices. These will vary depending on their living, working and travel behaviours (ie jobs, commuting, lifestyle, type of home, parking), as well as the physical characteristics of the area they live in (ie rural/urban).<sup>17</sup> Given the early stage of this sector, the extent to which the different segments will be used in future is uncertain. However, it is likely that drivers with off-street parking will charge at home most of the time. Around a quarter of drivers who are without off-street parking will likely charge at work if they can, or will be reliant on the public charging network (on-street charging is likely to be

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<sup>15</sup> While out of scope of our study, we note that workplace chargepoints can also be used to charge fleets.

<sup>16</sup> While the home and workplace charging segments can be largely considered ‘private’ ie for use by residents/employees, some people choose to rent out their home chargepoints (eg through platforms like [JustPark](#)) and chargepoints in some workplace car parks can be accessible to the public during certain hours.

<sup>17</sup> For example [Baringa](#) identified seven EV charging customer segments based on location, property type and commuting habits in on-street charging. [Deloitte](#) found that charging will likely fall into four broad categories though noted that future charging behaviours are uncertain.

particularly important for day to day charging).<sup>18</sup> All drivers will need to use public charging at some point, for example using destination chargers to top up locally or using en-route charging when travelling on longer journeys.

- 2.10 We set out the current number of chargepoints and forecasts for the sector's likely required growth in chapter 3, before exploring the development of the five segments in chapters 4, 5 and 6. The rest of this chapter provides an overview of other factors relevant to the sector and its development.

## Charging and the electricity system

- 2.11 Chargepoints need to be connected to an electricity supply to charge EVs and as EV take-up increases over time, so will demand on the electricity system.<sup>19</sup> The system will therefore need to have sufficient generation, storage and network capacity. When charged overnight or for longer periods of time EVs can also provide flexibility to the electricity system - by charging more slowly or even providing energy when it is scarce and providing other flexibility services like managing load on local distribution networks.<sup>20</sup> Chargepoints are connected to the electricity network which both transmits and distributes electricity. Transmission refers to the high voltage system that crosses the country, distribution refers to the lower voltage local networks that provide electricity to all but the biggest customers.
- 2.12 The electricity system is regulated by Ofgem in Great Britain and Uregni in Northern Ireland. Distribution network operators (DNOs) are licensed companies which manage the local electricity infrastructure for homes and businesses. DNOs are critical players in the EV charging sector as they help to facilitate the installation of chargepoints by making new connections and reinforcements to the electricity network when additional capacity is required. In some cases, the cost of these connections and reinforcement can be substantial (see chapters 3 and 4), but this varies significantly between areas depending on different factors.
- 2.13 Ofgem and Uregni play an important role in supporting the development of the EV charging sector through the incentives given to DNOs to deliver the

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<sup>18</sup> Estimates of the number of households without off-street parking vary. For example, [PwC](#) found that in the UK 28% of drivers do not have off-street parking. [Field Dynamics](#) estimated that approximately 32% of households in Great Britain outside London do not have access to off-street parking (7,800,000 households).

<sup>19</sup> The electricity system covers everything relating to the provision of electricity, including assets relating to generation, transmission and distribution.

<sup>20</sup> These flexibility benefits particularly arise in home, workplace or on-street charging but are more difficult in rapid/ultra-rapid en-route and some destination charging due to the shorter charging time. As set out in chapter 3, flexibility in the electricity system will be increasingly important as people use electricity for their cars and to heat their homes, helping to reduce the costs of supplying and distributing renewable electricity, avoiding the need for additional storage/generation capacity and network infrastructure.

necessary investment (including price controls – see chapter 3). We note that Ofgem will be publishing its high-level priorities to ensure that regulation can play a key role in enabling the transition to EVs at pace and ensure that consumers benefit from the shift. Ofgem will also identify priority actions it should take to support EV take-up and deliver its objectives in this area. Earlier this month Ofgem published its [consultation on its minded-to proposals](#) in relation to network connection costs. Currently customers seeking a large new or modified connection to the electricity network have to contribute towards the reinforcement costs needed to facilitate this. Ofgem is seeking views on whether to reduce or remove this cost.

- 2.14 [Ofgem announced in May 2021](#) that as part of its Green Recovery Scheme it would invest £300m in over 200 low carbon projects in electricity distribution and transmission (through funding for DNOs) ‘to get Britain ready for more electric transport and heat’. This includes new infrastructure such as cabling and sub-stations to support 1,800 new ultra-rapid chargepoints at MSAs as well as for chargepoints to be installed in towns and cities across Britain.<sup>21</sup>

## Developments in technology

- 2.15 Developing technologies are expected to improve the functionalities of EVs and chargepoints and significantly impact how consumers engage with the charging sector in future.
- 2.16 Notably smart charging has significant benefits: it can save consumers money and help manage demand on the electricity system, which will be increasingly important as the number of EVs increases. Smart charging allows EV charging to be intelligently controlled, so the charging occurs when the electricity network has surplus capacity or there is less demand (such as overnight) and electricity is cheaper. Smart chargepoints can currently be used for home and workplace charging, though in future it could potentially be deployed in other segments such as on-street. This would reduce the cost for consumers of using on-street charging and have wider environmental and electricity system benefits.<sup>22</sup>
- 2.17 There are also other, emerging technologies and innovations that are still in the early stages of development such as solar forecourts, ground-embedded chargepoints and wireless charging (embedding charging infrastructure in the

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<sup>21</sup> See also [DNO Green Recovery Scheme, Decision Document \(ofgem.gov.uk\)](#).

<sup>22</sup> This is currently being explored through the Government’s ‘[Beyond off-street smart meter electric vehicle charging infrastructure](#)’ programme. Smart charging can have environmental benefits as it can reduce the electricity system’s reliance on back-up generators and reduces the need for additional batteries as EV batteries are used instead to help smooth load on the network.

roadside). Vehicle-to-grid (V2G) is also an important emerging technology that can enable EV batteries to store energy and discharge it back to the network when this is most needed, helping to manage the load on electricity distribution networks and make savings or earnings for consumers.<sup>23</sup> 'Plug and charge' – technology which enables drivers to initiate automatic payment by connecting their EV to a chargepoint - can also help to simplify aspects of the charging experience (see also chapter 7). In the longer-term other technological developments such as the evolution of autonomous vehicles may also impact the nature of charging, for example robotic charging systems automating the connection between the vehicle and the chargepoint.

- 2.18 Such changes could significantly impact how the sector develops. While they may be beneficial to the sector and the consumer experience of charging, they also create some uncertainty about how and where charging will take place in the future.

## **Chargepoint operators and private investment in the sector**

- 2.19 Recent years have seen a significant expansion in companies entering the sector and an increase in the level of private investment. Chargepoints are provided by commercial entities known as chargepoint operators. There is a wide range of chargepoint operators, some of which are active across the sector (for example, by providing chargepoints at different speeds in different segments) and some of which focus on particular segments.
- 2.20 To install chargepoints, operators need to engage with site owners who procure and contract for chargepoints. Site owners can include homeowners and landlords, retailers, other types of businesses, MSA operators and local authorities (LAs) who are responsible for local roads, parking and street furniture like lampposts (particularly relevant to on-street charging).
- 2.21 Chargepoint operators can have different business models. Currently the main models in public charging are:<sup>24</sup>
- (a) full operator: the chargepoint operator funds the infrastructure and charges EV drivers directly. The site owner is paid a rent and/or a proportion of the revenue from charging;

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<sup>23</sup> For example, [Octopus Energy is trialling V2G technology](#).

<sup>24</sup> There are also variations of these, and some chargepoint operators may adapt their model based on the site owner for example taking a different approach for a LA than for a commercial site owner like a supermarket.

- (b) service provider: the chargepoint operator provides the chargepoint for a fee. It then manages the operation, payments, servicing and data collection. The host takes any revenue from charging; and
- (c) concession: this approach is similar to full operator, except the infrastructure is funded largely through Government grants (see next section). This is the model widely used by LAs in on-street charging.

- 2.22 In home charging, the main business model is a one-off purchase by the consumer of hardware and installation from a provider, with the contract for electricity supply to the chargepoint being separately provided to the consumer by the home energy supplier. Models for workplace charging can be a combination of hardware and software but may also include ongoing services like data processing and electricity supply.
- 2.23 As highlighted above, in public charging chargepoint operators generally only recoup the costs of their investment when their chargepoints are used. This can be risky at this early stage of the sector when EV take-up is fairly low (albeit increasing) and given ongoing uncertainties around people's charging preferences and behaviours and developments in technology. These factors, among others, can mean some charging segments have lower utilisation levels than others. Therefore, the payback period for the initial investment can be relatively long (historically this has been potentially between six to nine years, though it is expected to vary depending on the segment and business model).
- 2.24 Low demand and these uncertainties have also historically impacted the type of private sector investment attracted to the sector to date. These factors have made it difficult for infrastructure and pension funds seeking stable low-risk long-term investments. The sector has also been less attractive to private equity or venture capital funds seeking short to medium-term returns before exiting the sector.<sup>25</sup> Therefore investment to date has mainly been corporate venture capital from large vehicle manufacturers or energy suppliers (see paragraph 2.27).
- 2.25 Private investment to date has largely focused on where demand and returns have been strongest - home and workplace charging, and fast/rapid charging.<sup>26</sup> Private investment has been weaker in parts of en-route (ie along motorways and in remote areas) and in on-street charging, where it can be

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<sup>25</sup> See [Global Infrastructure Investor Association's ITC response](#) and [Mobility 2030: Investment in EV infrastructure \(assets.kpmg\)](#).

<sup>26</sup> Chargepoint operators' business plans indicate a particular appetite for rapid charging in destination and en-route charging. Investment appetite is also reflected in the progress of roll-out in the segments - see chapter 3.

more difficult and costly to roll-out charging. We explore these barriers in chapters 4 and 5.

- 2.26 The UK Government's recent commitment to end the sale of new petrol and diesel cars and vans by 2030 has provided reassurance on EV take-up and significantly reduced the investment risks. While the pace of take-up remains a risk, a number of chargepoint operators we spoke to emphasised that the shift to EVs had become a matter of when, rather than if, it happens. We note that there has also been some recent activity from private funds in the sector.<sup>27</sup>
- 2.27 In addition to chargepoint operators, established commercial players in infrastructure and transport are increasingly moving into the EV charging sector, often through partnering with chargepoint operators and/or through acquisitions. To date this includes: oil and gas providers seeking to take advantage of their existing forecourt presence (e.g. BP, Shell, Total);<sup>28</sup> energy companies seeking to take advantage of their networks and expertise in electricity generation and supply (e.g. EDF, Centrica, Ovo, E.ON, Engie)<sup>29</sup> and car manufacturers (eg Tesla<sup>30</sup> and Ionity<sup>31</sup>).

## Policy approach and public funding

### UK-wide

- 2.28 The UK Government has identified the decarbonisation of road transport - including the successful transition to EVs - as key to achieving its legally-binding commitment for Net Zero by 2050. It is providing significant support and funding to help the charging sector as set out below.
- 2.29 In November 2020, the UK Government published a [Ten-point Plan for a Green Industrial Revolution](#) which announced it was ending the sale of new petrol and diesel cars and vans by 2030 (brought forward from 2040). It also published a [National Infrastructure Strategy \(NIS\)](#), which outlined its approach to the roll-out of EV charging. This approach has been to maximise private investment into the sector, however, while the sector is developing and the availability of charging infrastructure is a barrier to EV take-up, the UK

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<sup>27</sup> For example - [\[🔗\]](#) Connected Kerb (an on-street chargepoint operator) and Hitachi Capital's investment in Gridserve (an en-route chargepoint operator) [\[🔗\]](#).

<sup>28</sup> For example, [Shell](#) acquired new Motion in October 2017 (then the largest network in Europe), [BP](#) purchased Chargemaster in June 2018, [Total](#) signed the acquisition of Source London (a large London focused EV network) in September 2020, [Shell](#) completed the acquisition of ubitricity in February 2021.

<sup>29</sup> For example, [EDF](#) acquired a majority stake in Pod Point in February 2020.

<sup>30</sup> Tesla has developed a Supercharger network of rapid and ultra-rapid chargepoints for its Tesla cars.

<sup>31</sup> Ionity, which provides rapid and ultra-rapid chargepoints, is a joint venture of BMW Group, Ford Motor Company, Hyundai Motor Group, Mercedes Benz AG and Volkswagen Group with Audi and Porsche.

Government has committed to invest £1.3bn to support EV charging infrastructure roll-out in the [2020 Spending Review](#).

- 2.30 Earlier this month the UK Government published its [Transport Decarbonisation Plan](#). The Plan emphasised the need for ‘an extensive network of charging and refuelling infrastructure’ and the Government’s support for the development of a market-led charging network. As the sector grows, the Government has committed to increasingly focus its efforts ‘on putting in place a policy and regulatory framework that supports increased investment and competition whilst meeting the needs of consumers’.
- 2.31 Alongside this, it published a [2035 Delivery Plan](#) to help reach the 2030 phase out date for petrol/diesel cars and vans. This set out a number of commitments to accelerate EV infrastructure roll-out, including plans to publish an EV Infrastructure strategy later this year, which will set out its expectations for the roles that industry and government will play in delivering EV charging.
- 2.32 The UK Government has also introduced a number of UK-wide grant schemes and funds.<sup>32</sup> Alongside a sector-wide fund, grants have focused largely on home and workplace charging, with some grant funding also being available for on-street charging roll-out. The main current schemes are set out in Table 2. In the NIS the UK Government committed to extend these existing grants (subsequently confirmed as to the value of £275m in the [2020 Spending Review](#)).

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<sup>32</sup> Previous schemes (since closed) include Plugged-in-Places which ran from 2010 - 2014 and looked at different approaches to setting up plug-in vehicle charging schemes, aided by match funding from the Office for Zero Emission Vehicles (OZEV - formerly, the Office for Low Emission Vehicles). Go Ultra Low Cities (GULC) was an £85 million fund which aimed to create a cohort of eight exemplar cities or regions that would lead the way in promoting EVs, tackling air quality, and reducing carbon emissions. The GULC areas were Oxford, Milton Keynes, Nottingham, York, Dundee, London, the West of England, and the North East.

**Table 2: Overview of UK-wide public funds and grants<sup>33</sup>**

| Grant  | Focus              | Overview   | Value to date<br>£'Millions |
|--|--------------------|--|-----------------------------|
| Charging Infrastructure Investment Fund (CIIF) | Sector-wide        | Announced in the Budget 2017, a 50:50 public-private investment fund focused on charging infrastructure. It has a 10-year life span to 2030. All of the funds must support investment in public charging. The Fund is managed by Zouk capital and to date it has invested in three UK companies: InstaVolt, Liberty Charge (a joint venture with Liberty Global), and EO Charging. | 400                         |
| Electric Vehicle Homecharge Scheme (EVHS)      | Home charging      | EVHS launched in 2015 (replacing a device grant scheme which was in place since 2013) and provides part funding for up to 75% of the installation cost of home chargepoints. As at April 2021 the grant covers up to £350 per chargepoint (conditions apply). The grant rate has reduced over time (from £950 in 2015). Over 135,000 home chargepoints installed via EVHS.         | 69+                         |
| Workplace Charging Scheme (WCS)                | Workplace charging | WCS launched in 2016 and is a grant designed to help organisations implement EVs into their fleets, staff cars or simply to encourage employees to purchase electric vehicles and charge them at work. Funding provided for over 4,000 businesses to date. As at April 2021 the grants covers up to £14,000 (£350 per chargepoint) (conditions apply).                             | 6+                          |
| On-street Residential Charging scheme (ORCS)   | On-street charging | ORCS launched in 2017 and provides up to 75% of hardware and installation costs to LAs for on-street and rapid charging. Delivered over 600 chargepoints to date with funding awarded for over 3,000 to be installed in future. It has a fund of £20 million for 2021/2022.  | 20 (2021/22)                |

2.33 In June 2021, the UK Government announced the launch of the [UK Infrastructure Bank](#). The bank's strategic objectives are to help tackle climate change, and to support regional and local economic growth. Its operating principles include 'prioritising investments where there is an undersupply of private capital'.

2.34 In addition to providing public funding for the sector, the UK Government is also stepping in to support the sector's development in other ways. It will be regulating later this year to improve [the consumer experience of using public chargepoints](#), following a consultation by the Office for Zero Emission Vehicles (OZEV).

<sup>33</sup> [Electric vehicle charging device grant scheme statistics: April 2021 - GOV.UK \(www.gov.uk\)](#). The EVHS and WCS are demand-led schemes. Funding allocated each year is informed by demand from consumers and businesses to install home and workplace chargepoints respectively.

- 2.35 The UK Government has also set out its aim to maximise the use of smart charging. It recently announced [plans to mandate smart charging capability](#) for all new home and workplace chargepoints in Great Britain later this year.<sup>34,35</sup> It is also [consulting on proposals](#) for all new-build homes and workplaces to be fitted with smart chargepoints.
- 2.36 Transport policy is also partly devolved and therefore there is some variation in approach to the roll-out of EV charging and to public funding in the nations.

### ***Approach in the nations***

- 2.37 In England, the approach has reflected the UK Government's focus on encouraging and leveraging private sector investment to build a comprehensive network of chargepoints.<sup>36</sup> There are currently over 50 chargepoint operators and charging networks within England, covering the overall sector and operating within particular segments.
- 2.38 To date, the UK Government has committed various funds to support chargepoint roll-out in England, including commitments in the NIS for additional funding for en-route and on-street charging. A £950m Rapid Charging Fund will fund upgrades to the electricity network to help meet future demand for chargepoints on MSAs and key A road locations where the costs of chargepoint installation are prohibitively expensive and uncommercial. Working with the private sector, it aims to ensure at least six rapid/ultra-rapid chargepoints at all MSAs in England by 2023, with a longer-term target of 6,000 along the entire Strategic Road Network in England by 2030. As well as committing additional funding in the 2020 Spending Review for home, workplace and on-street charging schemes (as noted above), a new £90m Local EV Infrastructure Fund will support the roll-out of large local on-street charging schemes and rapid charging hubs across England.
- 2.39 In Scotland, the Government has taken a different approach by setting up a national public charging network. Since 2011, the Scottish Government has spent over £45m to establish and roll-out [ChargePlace Scotland](#).<sup>37</sup> The majority of public chargepoints in Scotland are connected to this network. Most public chargepoints are currently free to use, with a single back-office

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<sup>34</sup> Following consultation. The scope of these plans reflects the fact that the GB energy system is separate from that operating in Northern Ireland (where energy policy is devolved). A decision on the smart meter roll-out in Northern Ireland has not yet been taken and therefore the Government's plans relating to smart charging will depend on when this decision happens and what the result is, or an alternative solution may be needed.

<sup>35</sup> Given the EV charging sector is evolving and as smart charging is an emerging technology, the UK Government has set out a phased approach to intervention - first acting to increase smart charging and ensure minimum protections for consumers. In phase two, Government intends to develop a system-wide approach to regulation across a broad range of smart devices and systems, including and beyond EV smart chargepoints.

<sup>36</sup> [House of Commons Library, Electric Vehicles and Infrastructure, December 2020, page 12.](#)

<sup>37</sup> See [Scottish Government: More electric vehicle charging points](#) and [ChargePlace Scotland](#).

provider (currently [SWARCO](#), until 2023) secured through a tender process run by Transport Scotland. Public charging has generally been free of charge in Scotland (we consider the implications for the different policy approaches for chargepoint roll-out in chapter 3).

- 2.40 In November 2020, the Scottish Government launched the Scottish National Investment Bank, which provides long-term investment for a number of purposes including supporting Scotland's transition to Net Zero. The Scottish Government has also implemented its own grant schemes in addition to the UK-wide schemes to support chargepoint roll-out. These include its Switched on Towns and Cities Challenge Fund and the Local Authority Installation Programme, in which the Scottish Government (through Transport Scotland) [invested £21m in 2019](#) to support EV charging. Funds are offered to all LAs in Scotland to install with a condition of the grant that chargepoints are on the Chargeplace Scotland network. An additional grant to the EVHS and WCS is available for home and workplace charging in Scotland.<sup>38</sup>
- 2.41 The Welsh Government published its [EV charging strategy](#) in March 2021.<sup>39</sup> Covering the period to 2030, the strategy estimates the need for up to 55,000 fast chargepoints and 4,000 rapid chargepoints and has allocated £30m to be spent by 2025. The strategy will be supported by an action plan to track and manage delivery, which will be monitored and reviewed annually. The Welsh strategy promotes a private sector led roll-out while addressing gaps in provision (particularly in rural areas) through a competitive tender for rapid chargepoint provision. The Welsh Government is rolling out the first round of grants and tasked Transport for Wales to deliver 12 rapid chargepoints at strategic locations, which it is doing through £2m of funds to procure a suitable chargepoint operator. The Welsh Government, as stated in its new Programme for Government, is to launch a new 10-year Wales Infrastructure Investment Plan for a zero-carbon economy and is setting a new target of 45% of journeys by sustainable modes by 2040.
- 2.42 Northern Ireland is at an earlier stage in developing its approach. Since 2014 there has been limited private investment in charging due to restrictions on the maximum resale price of electricity, and planning legislation also made it difficult to repair and replace broken chargepoints. Both barriers have recently been removed, as of [March 2020](#) and [December 2020](#) through legislative amendments, respectively.

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<sup>38</sup> In Scotland, [Energy Saving Trust](#) provides an extra £250 funding towards the cost of a home chargepoint or up to £350 for those in remote areas. The Energy Saving Trust also administers a [business chargepoint](#) scheme.

<sup>39</sup> The Welsh Government [commissioned Arup](#) to undertake work to inform the draft strategy which was published in December 2020 for consultation.

- 2.43 All public chargepoints in Northern Ireland are currently free to use and are operated and maintained by a single private provider, Electricity Supply Board (ESB) which is currently in the process of upgrading older chargepoints. The Department for Economy is consulting on an [Energy Strategy](#) to decarbonise the energy sector by 2050 at least cost to the consumer. The draft strategy proposes the development of an EV Charging Infrastructure Plan to ‘support the upgrade and extension of the [charging] network’. It also recognises that the private sector will have a role to play in EV charging roll-out and aims to remove further barriers to the commercial viability of EV charging.
- 2.44 Recognising the differences in approach across the nations has been a key consideration in our study. As highlighted, the policy approach in each nation has had implications for the levels of private investment and the scale of roll-out, which we consider in chapter 3. We consider specific differences in investment, competition and consumer engagement in the sector throughout our report.

## Regulatory framework

- 2.45 There are some regulatory requirements in place for the operation of EV chargepoints - the Office for Product Safety and Standards (OPSS) sets and enforces compliance with product and installation standards for chargepoints. The installation and other operational aspects of chargepoints are not currently regulated. As set out earlier, the electricity supply in the UK is regulated by Ofgem and Uregni.
- 2.46 There are two key pieces of UK-wide legislation relating to the sector. The [Alternative Fuels Infrastructure Regulations 2017](#) (AFIR) applies to public chargepoints – covering technical specification and consumer experience standards.<sup>40</sup> Through the [Automated and Electric Vehicles Act 2018](#) (AEVA), the Department for Transport (Secretary of State) has powers to improve the consumer experience, ensure provision at key strategic locations and require that all connections are smart. Secondary legislation is required for UK Government to introduce these changes.

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<sup>40</sup> This includes chargepoints for public use otherwise located on private land. It excludes home chargepoints (which includes residential care homes, resident car parks), off-street chargepoints for local residents, workplace car parks, proprietary networks aimed at exclusive use by one car manufacturer, car dealership forecourts, and chargepoints for fleet vehicles. Separate [guidance](#) is available for AFIR.

### 3. Scale of the challenge facing the EV charging sector

- While it is difficult to know precisely how much charging that will be needed, estimates suggest an additional 280,000 – 480,000 public EV chargepoints will need to be installed by 2030 to meet anticipated demand. This is more than ten times the size of the current network - currently about 25,000 public chargepoints.
- There are a number of factors which explain why market forces alone will struggle to deliver the pace and type of EV charging infrastructure needed to meet the UK Government’s greenhouse gas reduction targets.
- These factors include the cost of changing from a fossil-fuel based transport system to an electricity-based system (such as new network connections/upgrades), the cost of carbon pollution, the ‘chicken and egg problem’ of interrelated demand for EVs and charging infrastructure, and the spillover benefits EVs could have to the electricity system (eg when plugged in for an extended period of time, EVs can help balance changing demand and supply patterns).
- As a result, even greater active government involvement both at local and national level will be needed to provide a comprehensive EV charging network that is competitive and consumers can trust. DNOs must also play their part to ensure that new charging infrastructure can be connected efficiently and rapidly.
- We recommend that the UK Government puts in place an ambitious National Strategy for EV chargepoint deployment between now and 2030, alongside strategies from each of the Devolved Administrations – building on the work already underway across the nations.
- We also recommend Ofgem/Uregni use forthcoming price control reviews to strengthen DNO incentives to speed up EV charging grid connections, invest strategically in network reinforcement and lower new connection charges by removing the charge for any reinforcement costs.

#### Introduction

- 3.1 In order to meet the government’s carbon reduction targets and enable switching to EVs ahead of the planned 2030 prohibition on sales of new petrol and diesel cars/vans, there needs to be a comprehensive network of chargepoints at home, on residential streets, at destinations such as supermarkets, workplaces and on the road network for en-route charging.
- 3.2 The opportunity of a major increase in demand for EV charging, supported by government funding, have driven investment, entry and emerging competition. However, the pressing need to deploy charging networks rapidly and overcome several significant barriers to investment and competition means

that market forces alone will struggle to deliver. Therefore, active government involvement in the EV charging sector is essential to deliver a comprehensive network within this challenging timeframe.

3.3 This chapter is structured as follows:

- (a) Why EV charging is important;
- (b) Progress of roll-out to date;
- (c) Significant growth needed in the sector;
- (d) Broad factors impacting EV charging roll-out; and
- (e) Measures to meet the overall challenges facing the sector

## **Why EV charging is important**

3.4 The transport sector is responsible for more of the UK's greenhouse gas emissions than any other sector in the economy, accounting for 27% of total emissions in 2019 according to BEIS.<sup>41</sup> Two-thirds of emissions in this sector are from the use of petrol and diesel in road transport, particularly from cars and taxis.<sup>42</sup>

3.5 Decarbonisation of road transport is therefore vital to the achievement of the UK's longer-term Net Zero goals. The UK has also committed to achieving substantial emissions cuts in the medium-term, reducing greenhouse gas emissions in 2035 by 78% compared to 1990 levels.<sup>43</sup> Transport is considered to be one of the easier sectors to decarbonise, and so will be responsible for a substantial proportion of these medium-term reductions.

3.6 While other technologies, such as hydrogen fuel cells or biomethane, continue to be developed for specialised road transport applications, recent falls in the cost of battery technology mean that a low carbon road transport system is likely to be almost entirely powered by electricity. This system will also require a comprehensive network of EV chargepoints throughout the UK, allowing drivers to charge their vehicles easily and conveniently.

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<sup>41</sup> [2019 UK Greenhouse Emissions](#).

<sup>42</sup> In 2019, cars and taxis accounted for 55% of domestic road transport emissions.

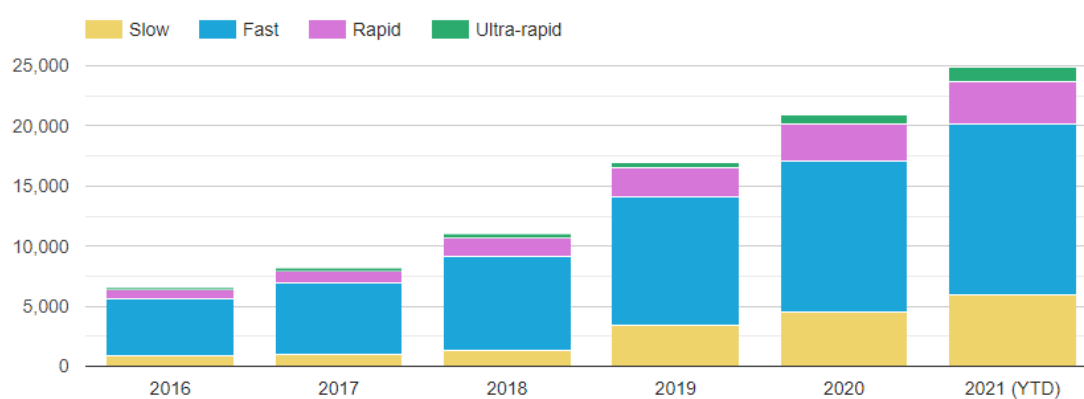
<sup>43</sup> [UK enshrines new target in law to slash emissions by 78% by 2035 - GOV.UK \(www.gov.uk\)](#).

## Progress of roll-out to date

### *The current EV public chargepoint network*

3.7 Figure 1 shows the yearly figures for the number of public chargepoints by charging speed from 2016 to June 2021. Over the period 2016 to 2020 the number of chargepoints has more than tripled, from over 6,000 to more than 20,000. To date, there are almost 25,000 public chargepoints. The growth rate over the period has increased year on year with the exception of 2020 when COVID-19 affected the ability of chargepoint operators to roll-out new chargepoints. In 2020 only 4,173 new chargepoints were installed, an increase of just 25% on the prior year. This compared with 5,737 new chargepoints in 2019, an increase of 52% on the prior year.

**Figure 1: Number of public charging points by speed 2016-to date (13 July 2021)**



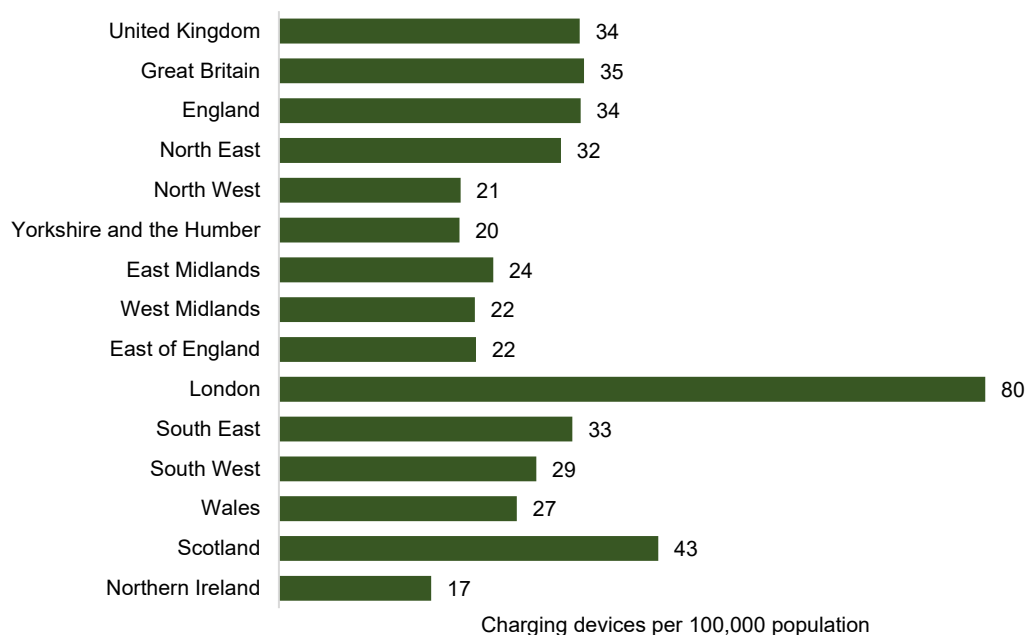
Total devices: 24853, Updated: 13 July 2021



Source: [Zap-Map](#), 13 July 2021.

3.8 The geographical distribution of public chargepoints across the UK is however very uneven, with significant differences between the nations, regions and local authorities.

**Figure 2: Public chargepoints per 100,000 of population by UK country and region**



Source: [Electric vehicle charging device statistics: April 2021 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/electric-vehicle-charging-device-statistics)

- 3.9 Figure 2 shows that for the UK overall there were on average 34 public chargepoints per 100,000 people. However, there are wide variations between nations - in Scotland there were 43 per 100,000 people while in Northern Ireland there were only 17 per 100,000 people. There is also a significant variation within different English regions, for example with the figure for London being four times that of Yorkshire and the Humber.
- 3.10 There is also variation in chargepoint distribution between LAs. For example, in Scotland, Dundee has a ratio of 80 chargepoints per 100,000 people but Edinburgh only has a ratio of 24. Similar variations can be found across LAs in England, Wales and Northern Ireland. We discuss local variations further in chapter 5.
- 3.11 These figures all show that while there has been significant growth in the number of public chargepoints, this growth has not been uniform across the UK.

### ***Home and workplace charging***

- 3.12 There are currently over [170,000 home chargepoints](#) across the UK installed through the UK Government home chargepoint grants schemes (EVHS and DRS - see chapter 2). Estimates suggest that home chargepoints will need to

increase to almost 6 million by 2030.<sup>44</sup> Last year around 40,000 home chargepoints were installed under the EVHS grants scheme. To meet the projected numbers this needs to increase significantly, and the rate of installations is to expected to grow as the number of EVs sold increases. OZEV measures the uptake of home chargepoint grants and is currently forecasting that 5% of UK homes with eligible off-street parking will have received a grant by 2025. In England alone, this equates to around 800,000 homes with chargepoints out of 16 million homes that have off-street parking.<sup>45</sup> This figure excludes home chargepoints that are not eligible for a grant (ie dumb chargepoints) and so is likely to be an underestimate.

- 3.13 There are over [13,000 sockets for workplace charging](#) installed through the Government grant scheme (WCS – see chapter 2) in the UK. There are no national statistics on the number of workplaces with parking spaces or a breakdown of those parking spaces. However, in the UK, more than two-thirds (68%) of people in employment travel to work by car (driver and passenger) which equates to 21.4 million people.<sup>46</sup> Of those who drive to work, 70% report that they park in workplace car parks.<sup>47</sup> This suggests that charging at work will increase markedly over time. Estimates suggest that the number of work chargepoints will be up to 1.4 million by 2030.<sup>48</sup> OZEV considers that the number of workplace chargepoints will continue to increase, driven by EV uptake and future changes in legislation, such as UK Government proposals to require businesses in England with carparks that have over 20 spaces to install chargepoints.

### ***How the UK compares to other countries***

- 3.14 As shown in Table 3, as at December 2019 the UK had the fourth largest EV charging network (after France, Germany and the Netherlands).<sup>49</sup>

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<sup>44</sup> Delta-EE, 2021 UK EV Chargepoint forecasts.

<sup>45</sup> [Ministry of Housing, Communities and Local Government, English Housing Survey Energy Report, 2017-2018.](#)

<sup>46</sup> [Transport Statistics Great Britain 2018 Modal comparisons \(TSGB01\) - GOV.UK \(www.gov.uk\).](#)

<sup>47</sup> [National Travel Survey: 2019 - GOV.UK \(www.gov.uk\).](#)

<sup>48</sup> Delta-EE, 2021 UK EV Chargepoint forecasts.

<sup>49</sup> [A 2020 report](#) which analysed EV readiness in Europe found that the Netherlands, Norway and the UK were best prepared for the transition to EVs (based on the maturity of their EV and EV charging sectors and Government incentives)

**Table 3: Number of chargepoints by country (as of December 2019)**

| Country     | Total number of public chargepoints [1] | Public chargepoints per 100,000 people | Rapid chargepoints (22-100kW) per 100,000 people | Ultra-rapid chargepoints (110kW+) per 100,000 people |
|-------------|---|--|--|--|
| Netherlands | 43,730 [2]                              | 248                                    | 2.5  | 2.5  |
| Germany     | 32,704                                  | 39                                     | 1.3  | 0.9  |
| France      | 29,538                                  | 44                                     | 2.6  | 0.9  |
| UK          | 24,445                                  | 36                                     | 6.1  | 0.7  |
| Norway      | 12,300                                  | 228                                    | 36.6   | 9.2  |

Source: Delta EE, CMA analysis

[1] Data is taken from the European Alternative Fuels Observatory and cannot be directly compared to chargepoint data in other sections of the report as it is compiled from different sources

[2] The Netherlands counts workplace chargers/hotels etc as ‘public’ even when they are not necessarily fully available to anyone who needs to charge, and this inflates its figures by approximately 18,000, according to Delta-EE.

3.15 Policy approaches vary between countries, with some countries taking a regulation-led approach. For example, the German Government has stated its intention to mandate EV chargepoints in all German petrol stations. The French Government, similarly to the UK Government, operates a grant system for EV chargepoints and in the Netherlands the Central Government provides different forms of support to help Local Governments with their local vision for EV charging.<sup>50</sup> With incentives in place for EV car ownership for many years, Norway has one of the most mature EV charging sectors. The Norwegian Government has drafted ambitious plans for EV charging infrastructure which falls to local authorities to carry out.<sup>51</sup>

3.16 EV charging sectors in most countries are in their infancy, therefore it is too early to tell whether particular policy approaches will be more or less successful in the long-term. While the UK’s charging network is growing, its roll-out is not as progressed in some respects as some other European countries – Norway and the Netherlands have over five times as many chargepoints per 100,000 than the UK, though the UK has on average the highest density of fast chargepoints on key strategic roads per 100km.<sup>52</sup> However, it is clear from our discussions with other competition authorities that all countries face similar challenges in providing the necessary charging infrastructure for the rapidly increasing numbers of EVs.

## Significant growth needed in the sector

3.17 As set out in paragraph 3.7, the UK’s public charging network has grown substantially since 2016. However, it is currently only a small fraction of the size it needs to be by 2030. Estimates set out below suggest the UK will need between approximately 280,000 to 480,000 chargepoints by 2030 – using the

<sup>50</sup> Policy Exchange, *Charging up*, February 2021.

<sup>51</sup> Deloitte, *Hurry up and wait...The opportunities around electric vehicle charge points in the UK*, 2019.

<sup>52</sup> Transport and Environment, *Recharge EU: How many charge points will EU countries need by 2030*, 2020

midpoint this would be at least 380,000 chargepoints. However, there are many uncertainties around the likely numbers that will be needed and therefore these are illustrative rather than precise forecasts.

3.18 The Committee on Climate Change (CCC) is an independent, statutory body whose purpose is to advise the UK and devolved governments on emissions targets, including the UK’s carbon budgets. We have used the CCC’s forecasts of public chargepoints as an authoritative source for our work, although we note that its forecasts are lower than others. To illustrate the scale of the increase required we have set out in Table 4 a breakdown of the forecast produced by CCC. Under even this forecast the UK needs nearly 12 times the current number of public chargepoints by 2030 - this varies between 6 and 41 times for different chargepoint speeds. This increase equates to nearly 27,000 new chargepoints per year - a similar number to the total installed to date. We note that other forecasts have different estimates of the number of different chargepoint speeds needed and these depend on the assumptions used of how EV drivers recharge.

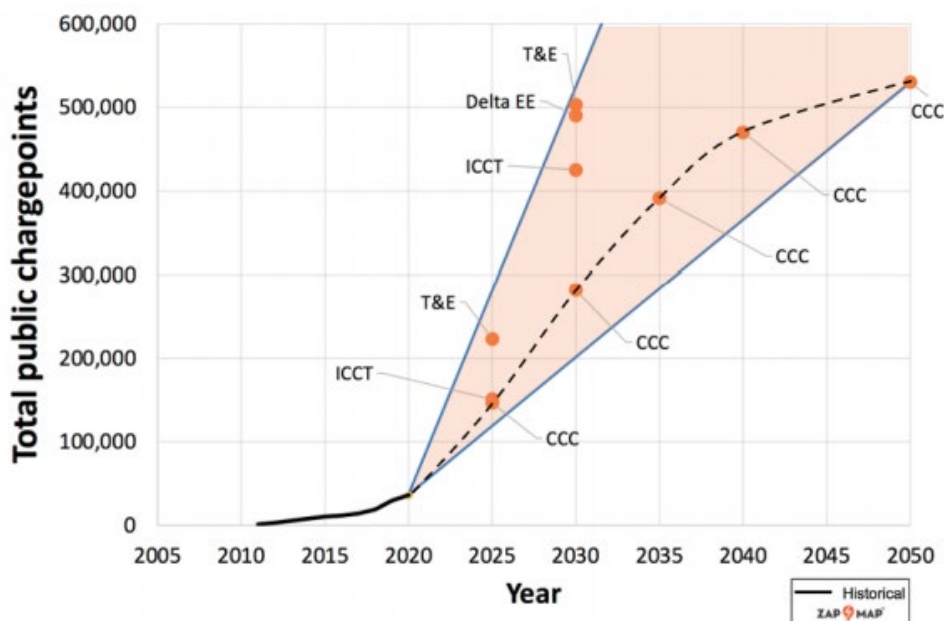
**Table 4: CCC forecast of the number of public chargepoints required**

| Chargepoint speed | 2020 (thousands) | 2030 (thousands) | Increase (thousands) | Size of increase 2020-2030 |
|-------------------|------------------|------------------|----------------------|----------------------------|
| 3-7kW             | 8.5              | 48.5             | 40                   | 6x                         |
| 22kW              | 9.7              | 106.3            | 96.6                 | 11x                        |
| 50kW              | 3.0              | 121.7            | 118.7                | 41x                        |
| 150kW+            | 0.3              | 5.0              | 4.7                  | 17x                        |
| Total             | 21.5             | 281.5            | 260                  | 12x                        |

Source: [Sixth Carbon Budget - Climate Change Committee \(theccc.org.uk\)](https://www.theccc.org.uk) Fig 3.1b Total electric cars on the road and supporting charging infrastructure in the balanced Net Zero Pathway.

3.19 The required number, location and speed of public chargepoints in the future is inherently uncertain. It depends on a variety of factors including the rate of EV uptake, EV usage, consumer preferences, future living and working patterns and the evolution of technology (see chapter 2). However, the estimates set out in Figure 3 indicate the overall scale of the likely necessary increase in chargepoints required to meet future EV demand. These projections, while approximate, indicate the substantial scale of the likely increase compared with the progress of chargepoint roll-out to date.

**Figure 3: Estimated forecasts for public chargepoints**



Source: [Policy Exchange](#). Forecasts from CCC, Transport & Environment, Delta-EE and ICCT – all 2020.

3.20 Figure 3 combines various forecasts from the CCC, Transport & Environment (T&E), Delta-EE and ICCT on the number of chargepoints that will be required to service the growth in EVs, which was set out by Policy Exchange.<sup>53</sup> It shows a range using these four forecasts of between 280,000 (CCC) and 480,000 (T&E) chargepoints needed by 2030. Though as noted above, it also illustrates that there remains a high degree of uncertainty surrounding the likely number of public chargepoints required by 2030.

3.21 Building a comprehensive public EV charging network will also involve significant financial investment. Slow and fast public chargepoints typically cost between £1,000 and £10,000, while rapid and ultra-rapid public chargepoints typically cost upwards of £25,000 just to install, excluding additional commissioning and electricity network connection costs. Taking the CCC’s forecast, the potential cost to meet 2030 forecast chargepoint numbers could be around £3-5bn and under other forecasts it could be as high as £6-10bn (both estimates are before commissioning and network costs). While these estimates are highly uncertain and sensitive to changes in assumptions, they illustrate the scale of the investment challenge.

3.22 While highly challenging, we consider that it is important for governments to assess the likely estimated numbers of future chargepoints required to support the uptake of EVs. This will help markets and governments track and

<sup>53</sup> ICCT, [Quantifying the electric vehicle charging infrastructure gap in the United Kingdom, 2020](#); CCC, [Sixth Carbon Budget - Climate Change Committee, 2020](#); Transport and Environment, [Recharge EU: How many charge points will EU countries need by 2030, 2020](#); Delta-EE, [Whitepaper: European EV Chargepoint Forecasts, 2020](#).

monitor progress and identify where there is underinvestment so that future support can be targeted at the parts of the sector that need it most. We understand that further detailed work to model future requirements is being undertaken by EVET. Precise figures or targets will be difficult to formulate but modelling to better understand the likely range, using a variety of assumptions and scenarios, is likely to be informative. As noted above, estimates will vary depending on user needs and preferences, as well as many other assumptions, therefore in considering deployment requirements it will also be important to understand and monitor consumer needs and preferences. Estimates may also change over time therefore it will be important for these to be updated and reviewed regularly.

- 3.23 We also considered how the growth of EVs compares to the growth of the public charging network. Estimates suggest there could be almost 16 million EVs on the UK's roads by 2030<sup>54</sup> (compared to current numbers of over 500,000 in 2021 (including plug-in hybrids)). In 2019 there were almost 100,000 EVs registered in the UK with just under 17,000 chargepoints, equating to one chargepoint for every six EVs. By 2020 the number of registered EVs had increased to just over 200,000<sup>55</sup> while the number of chargepoints had increased to just under 21,000, with the proportion falling to one chargepoint for every 10 EVs. In 2021, there is approximately one chargepoint for every 21 EVs.
- 3.24 This highlights the challenges facing the sector in keeping pace with the increasing take-up of EVs. Numbers of EVs per public chargepoint (both in relation to number and speed of chargepoints) is also informative of the progress being made towards sufficient chargepoint deployment and therefore will be useful to monitor and track.

## **Broad factors impacting EV charging roll-out**

- 3.25 The EV charging sector has seen significant private investment, competition between chargepoint operators and innovation. This has resulted in a growing network of chargepoints in all segments of the sector. However, as set out in the previous section, the rate of growth in the network needs to increase significantly over the next decade in order to anticipate future demand.
- 3.26 Typically, the prospect of a major increase in demand would be expected to generate a sufficiently large increase investment to meet that demand. There are, however, a number of factors which challenge the ability of the EV

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<sup>54</sup> [CCC, Sixth Carbon Budget - Climate Change Committee, 2020](#).

<sup>55</sup> EV registration figures taken from [Zap-Map](#), graph of cumulative number of plug-in vehicles registered in the UK (2012 to date).

charging sector to grow at the rate and develop in a way that is needed to achieve the government's greenhouse gas reduction targets, which we set out below.

### ***The costs of changing to a low carbon transport system***

- 3.27 Moving from a fossil fuel-based transport system to a low-carbon one, predominantly powered by electricity, involves significant interrelated costs. These costs include the direct investment required in EV charging networks, the EVs themselves, and the low carbon electricity needed to power them. System change costs also include the costs of changing consumer behaviour, and costs relating to the electricity system, such as reinforcement costs for reinforcing capacity and the costs of new connections.
- 3.28 These costs typically fall on those companies – such as chargepoint operators and EV manufacturers - involved in the new low carbon system and are then passed on to consumers. This puts their products at a competitive disadvantage compared to those companies operating in the legacy fossil fuel system, whose costs (for example fuel refineries or engine development) are largely sunk.
- 3.29 This cost disadvantage, unless addressed by government intervention, is likely to slow or even prevent the change to a low carbon transport system.

### ***The 'chicken and egg' problem - interrelated demand for EVs and charging***

- 3.30 In order for drivers to choose an EV, they must be confident that there is a sufficiently large EV charging network for them to be able to charge at home and when out and about. However, when deciding whether to deploy chargepoints, operators need to be confident that drivers will buy EVs and use chargepoints to enable them to make a return on their investment.
- 3.31 This 'chicken and egg' problem increases financial risks for both EV manufacturers and chargepoint operators, deterring investment and slowing the growth of charging networks. The problem is particularly acute at present when numbers of EVs and chargepoints are both relatively low. This means that rather than gradually scaling up the infrastructure in proportion with the growth in demand, significant investment will be needed ahead of demand to ensure a sufficient charging network is in place in order to encourage people to make the shift to EVs.

### ***Carbon pollution costs***

- 3.32 Carbon pollution costs are rarely taken into account by markets, because the climate change effects of carbon pollution are difficult to connect directly to actions in the market (such as buying a petrol car). This can lead to a bias towards higher carbon transport options, as the cost of pollution is not captured in market outcomes. While the government imposes fuel duty on petrol and diesel, this duty covers other environmental impacts beyond carbon pollution. Although measures such as carbon taxes can help to reflect these pollution costs, other factors such as the cost of switching to a less polluting car such as an EV can dampen the effectiveness of such measures.

### ***Wider benefits of EVs to the electricity system***

- 3.33 As the electricity system decarbonises, renewable generation technologies such as wind and solar make up a greater proportion of total generation. Renewable generation is intermittent, and one of the biggest challenges of a low carbon electricity system is managing the system to ensure that there is sufficient flexibility to keep demand and supply in balance.
- 3.34 In addition, as people turn to electricity to power their cars and heat their homes, load on the electricity distribution networks will increase, which could lead to costly network upgrades.
- 3.35 When plugged in for extended periods of time, EVs have the potential to reduce the costs of supplying and distributing renewable electricity. By controlling the speed and time of charging, or being able to supply energy from the EV's battery to the network, the system operator can more easily balance changing demand and supply patterns, and DNOs can manage local network load in a 'smart grid'.
- 3.36 If EVs were not available to provide these services, investment would be needed in alternative storage capacity and/or generation capacity, and network infrastructure, increasing the cost of electricity. However, currently only some of these benefits can be easily captured through market signals (such as time of use tariffs) in slower EV charging which provides them.

### ***The importance of electricity networks***

- 3.37 In addition, the electricity system will need to be able to support the mass uptake of EVs. Currently the costs of network reinforcement and upgrades for new connections in the UK can weaken the business case for new charging infrastructure. [Ofgem is currently consulting on](#) proposed connection charging changes to reduce and in some cases remove the cost of network

reinforcement for new connections (including those intended for chargepoints), which should improve investment conditions.<sup>56</sup>

The cost and complexity of grid reinforcement means that certain locations will be prohibitively expensive to fit charging posts which could act as a barrier to consumer adoption. – [E.ON](#).

- 3.38 There was widespread concern among chargepoint operators that the costs and difficulties of applying for network connections from DNOs can result in significant delays to installing chargepoints – and that a more transparent and timely process would significantly help to facilitate the faster roll-out of chargepoints at scale. For example, one chargepoint operator told us that connecting to the network was much slower in the UK than in other European countries.<sup>57</sup>

While power itself is not a barrier, the issues around it can create significant cost and cause significant delay to the expansion of infrastructure. With an end to end timeline of around 40 weeks for an average ultra-fast charging site, from feasibility study to commissioning, around 10 weeks of this can simply be waiting for a quote to be returned from a DNO. – [bp pulse](#).

- 3.39 We consider that the external benefits set out in paragraphs 3.33 to 3.37 of widespread EV adoption to both the transport and electricity systems may not be reflected in the electricity networks' regulatory and financial incentives, many of which were set several years ago.<sup>58</sup>

### ***The need for government and regulatory support***

- 3.40 The scale and range of the challenges described in this chapter mean that markets on their own are unlikely to deliver the low carbon transport system within the necessary timetables. Therefore, significant intervention is needed by governments (nationally and locally) and energy regulators, to enable the development of a comprehensive EV charging network that anticipates and meets consumer demand.
- 3.41 The UK Government and Devolved Administrations will need to oversee and monitor progress and ensure that funding, policies and support is targeted

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<sup>56</sup> Ofgem is proposing changes to reduce the contribution to reinforcement within the upfront connection charge for electricity generation and remove it completely for electricity demand.

<sup>57</sup> The chargepoint operator told us that it takes 12-15 months to build a site in the UK compared to 5-8 months in Europe.

<sup>58</sup> The current RIIO-ED1 price control for DNOs in Great Britain commenced in 2015. The RP6 price control for NIE Networks in Northern Ireland commenced in 2017.

where it is needed. These interventions include financial support in the form of grants and subsidies for EV charging and related infrastructure. However, it is important to ensure that this financial support unlocks further private sector investment (where possible) rather than replacing it. As set out in chapter 2, we recognise that the nations have taken different policy approaches and are at different stages in EV charging roll-out. However, the overall challenges are broadly similar across all four nations of the UK. As a result, it will be important and beneficial for the four nations to collaborate, share best practice and learn from each other.

- 3.42 We understand that the Government is planning to publish an EV Infrastructure Strategy later this year, which we welcome. This will be an opportunity to take into account our recommendations and set out further detail of its plans to support roll-out. Scotland has previously published broader EV strategies which included plans relating to charging (most recently covering the period [2017-2020](#)). It has made significant progress in rolling-out EV charging, using substantial public funding and free charging. However, the Scottish Government recognises that this model will be difficult to scale and is currently considering ways to attract greater private investment to further expand and upgrade its network.
- 3.43 The Welsh Government has recently published an EV charging strategy, which we understand will be supported by an action plan, monitored and reviewed annually (see chapter 2). Northern Ireland is at an earlier stage in its plans. We note that it is also planning to develop an EV Charging Infrastructure Plan and we would urge it to progress its plans and develop an EV charging strategy as quickly as possible.

## Measures to meet the overall challenges

**1.a) We recommend that the UK Government sets out an ambitious strategy for EV chargepoint deployment between now and 2030, to enable the UK to decarbonise transport and meet future emissions targets.**

This strategy should set out:

- the scale of chargepoint deployment required;
- the policies and funding to achieve the necessary deployment;
- how the benefits of competition and well-functioning markets in EV charging will be captured;
- how progress will be monitored and gaps in provision identified; and
- how sufficient capacity and skills can be developed across all levels of government, LAs and the industry.

**b) We recommend that the Devolved Administrations also develop and deliver national strategies.**

**2. We recommend Ofgem and Uregni use forthcoming price control reviews to strengthen DNO incentives to speed up EV charging grid connections, invest strategically in network reinforcement and lower new connection charges by removing the charge for any reinforcement costs.**

- 3.44 We welcome the UK Government's announcement that it is intending to publish an EV Infrastructure Strategy later this year. Furthermore, we note that Wales has recently published an EV charging strategy and that Scotland has previously published relevant strategies. It will be important for the forthcoming planned strategy by UK Government to take into account the Devolved Administration's strategies and vice versa.
- 3.45 As part of these strategies for delivering a comprehensive EV charging network, we consider that the UK Government and the Devolved Administrations should:
- (a) assess the overall scale of chargepoint deployment which is likely to be required (as discussed in paragraph 3.22),
  - (b) set out the policies and funding proposed to achieve this deployment;
  - (c) identify how to use private investment and competitive markets to provide benefits to EV drivers and electricity consumers in the roll-out of EV charging networks;
  - (d) monitor deployment of chargepoints to identify and target any emerging gaps in provision (like on-street, at MSAs and remote locations) and whether consumer needs are being met eg via regular consumer surveys;

- (e) ensure they have the capacity and skills to work effectively across different government departments, LAs, industry and businesses (eg commercial and investment, procurement and modelling expertise) and that LAs have the resources and capabilities to play their part (particularly regarding on-street charging).
- 3.46 Given uncertainties and potential future developments (as discussed in chapter 2), these strategies should be regularly reviewed and updated where necessary, with policies, funding and support adjusted where needed to ensure it is being targeted in the right areas and not crowding out investment. Progress of roll-out should also be reported on publicly, helping to build consumer confidence in the sector.
- 3.47 In relation to our second recommendation, it is critical for energy networks to be more responsive and work proactively with key players like chargepoint operators and LAs to deliver faster roll-out at scale.
- 3.48 We note that the next energy price control periods start in 2023 in Great Britain and 2024 in Northern Ireland. The timing of these new controls presents an opportunity for the regulators (Ofgem and Uregni respectively) to ensure that future regulatory settlements capture the wider benefits of EVs and provide incentives on the network companies to incorporate anticipated EV charging needs into their business plans, invest strategically where justified, and ensure that chargepoint operators can be connected to the electricity system swiftly.

## 4. En-route charging

- En-route charging is key to addressing range anxiety, but there have been very low levels of customer satisfaction, linked to concerns about poor reliability and limited provision.
- There is currently very limited competition at motorway service areas (MSAs), (where the Electric Highway has a share of 80%) and significantly more chargepoints will need to be installed at MSAs to meet likely future EV charging demand along motorways. But we are concerned that there are two major barriers to increasing investment and competition.
- First, the high costs of upgrading the electricity network, resulting from the amount of capacity needed and distant location of many MSAs from the distribution network. UK Government's plans to invest a £950m Rapid Charging Fund (RCF) in network capacity will significantly help to address this and in doing so, provide a key opportunity to open up competition at MSAs.
- Second, we are concerned that the Electric Highway's long-term exclusive arrangements increase barriers to entry at many MSAs and could undermine the effectiveness of the RCF. Several competitors told us that, in the absence of these agreements, they would be interested in providing chargepoints at MSAs.
- We therefore recommend that the UK Government rolls out the RCF as quickly as possible and attaches conditions to this funding to enable competition between chargepoint operators within each MSA site – including no exclusivity in future, open tenders and open networks.
- We have also opened an investigation under the Competition Act 1998 to assess the lawfulness of the existing long-term exclusivity arrangements between the Electric Highway and three MSA operators (Roadchef, MOTO and Extra).
- Off the motorway there is more investment and competition, but there is a risk of under provision in more remote areas, particularly in the short-term, given that the commercial case is likely to be challenging. We recommend that governments consider targeting funding at gaps in these remote areas to create a comprehensive UK-wide network which supports EV adoption.

### Introduction

- 4.1 En-route charging refers to the provision of EV chargepoints to be used by consumers during longer journeys (eg along motorways at MSAs or other major A roads). This segment is critical for the shift to EVs because EVs are currently viewed as having a limited range and the evidence shows that range anxiety is a key barrier to EV take-up. Extensive, rapid and reliable en-route charging can help address range anxiety and help build consumer trust in using EVs to make longer journeys.

- 4.2 En-route charging raises distinct issues compared to other segments:
- (a) Consumers may have a particularly limited set of options. If their EV runs out of charge during a longer journey, they have no choice but to use an en-route chargepoint during that trip, unlike when making shorter trips where they may be able to charge at any point during a week and therefore have a choice between charging their EV at home, work or at destinations.
  - (b) Consumer lack of choice is compounded by the fact that there can be fewer locations available to place chargepoints on longer journeys. To be effective options these locations need to have amenities such as cafes and toilets for consumers to use while they wait, as charging an EV can currently take 20 minutes to an hour.
  - (c) In the locations that are available, it can be prohibitively expensive to install chargepoints. Rapid/ultra-rapid chargepoints minimise waiting time for drivers, but these require large amounts of power and therefore electricity network upgrades. These network upgrades are particularly costly in more remote locations where en-route chargepoints tend to be located, due to their distance from the existing power network.
- 4.3 These challenges are greatest on the motorway. Most chargepoint operators told us that on A roads it is generally easier to find and invest in sites and that there is stronger competition, though we also consider some issues here in more remote locations.
- 4.4 Therefore, in this chapter we focus on investment and competition along the motorways, as well as in remote locations across the UK. It is structured as follows:
- (a) How EV charging is developing along motorways;
  - (b) Key issues in motorway charging;
  - (c) Investment challenges in en-route charging in remote locations; and
  - (d) Measures to unlock entry and competition.
- 4.5 Relevant evidence to support our findings and proposed measures in this chapter is in Appendix A. This includes a wider assessment of investment and competition in en-route charging.

## How EV charging is developing along motorways

4.6 Along motorways, MSAs are the key locations for charging. They offer a wide set of amenities such as cafes and shops, which, as noted above, are particularly important for EV charging given the time it takes for EVs to charge. More generally they are easily accessible, have large car parks and typically have space to expand, subject to planning permission.<sup>59</sup> The importance of MSAs is demonstrated by the fact that more than half of en-route charging by EV drivers in England is forecast to take place at MSAs (56%).<sup>60</sup>

### ***Very limited competition on motorways***

4.7 The Electric Highway (previously a subsidiary of Ecotricity<sup>61</sup>) is by far the largest chargepoint operator on or near motorways. It has a very strong position, with a share of 80% of all rapid and ultra-rapid open network EV chargepoints at MSAs in Britain.<sup>62</sup> The Electric Highway has a network of 247 chargepoints with a power rating of at least 50kW at MSAs. It is present at nearly all MSAs, and at most of these MSAs faces no competitors on the same site.<sup>63</sup>

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<sup>59</sup> Most of the UK's motorway network and MSAs are in England: there are 113 MSAs in England compared to 17 in the Devolved Nations.

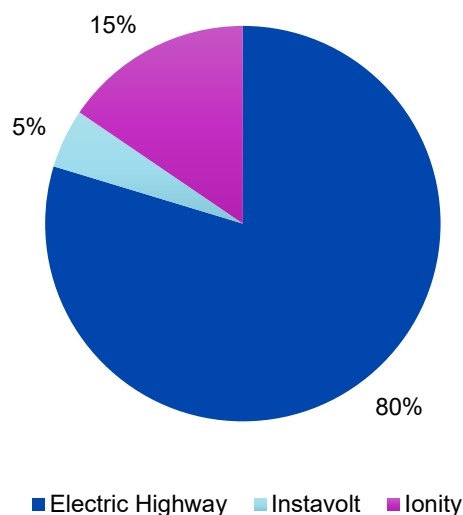
<sup>60</sup> The remaining 44% of en-route charging takes place at other locations such as rapid charging stations at petrol stations on A roads. The estimate is driven by a range of assumptions about battery size, vehicle efficiency, access to home charging, charging behaviour thresholds as well as movement patterns from the Regional Transport Models, which are uncertain.

<sup>61</sup> The Electric Highway Company Limited was a wholly owned subsidiary of Ecotricity Group Limited, until June 2021 when the Electric Highway Company Limited was sold to GRIDSERVE EH Limited, part of the Gridserve Holdings Limited group of companies: [Ecotricity completes Electric Highway sale to GRIDSERVE | Ecotricity](#)

<sup>62</sup> The Electric Highway's share of supply is 83%, if petrol forecourts at MSAs are excluded.

<sup>63</sup> While Tesla has a large number of rapid chargepoints at MSAs as part of its Supercharger network, these are only available to Tesla drivers and therefore do not compete with the Electric Highway.

**Figure 4: Shares of supply of open-network rapid chargepoints at MSAs in Britain June 2021**



Source: CMA, data for June 1 2021. Excludes Tesla chargepoints, which are not open-network

- 4.8 Even across all chargepoints within half a mile of the motorway, including sites that offer a much smaller range of amenities such as hotels, the Electric Highway's share of supply is 59%.<sup>64</sup>
- 4.9 This very strong position is reinforced by long-term exclusive agreements between the Electric Highway and three MSA operators in the UK (MOTO, Roadchef and Extra), which between them operate around two-thirds of MSAs in the UK. These exclusivity arrangements provide that, save for Tesla and in one case Ionity, only the Electric Highway can install, maintain and operate EV charging equipment at these MSA operators' sites.
- 4.10 Charging competition can either take place on a site or between sites. Competition between sites requires drivers switching to a different MSA, whereas within-site competition offers a choice of different chargepoint operators at each MSA. The latter is by far the most effective form of competition, as it allows customers a direct choice of chargepoint operator that they can easily switch between without having to drive to an alternative site. This is particularly important given the evidence shows that drivers' decisions to stop at a MSA are largely driven by convenience and when they need to take a break from their journeys.<sup>65</sup> It is also compounded by the smaller range of EVs compared to petrol/diesel vehicles that may make customers unable to drive to another site (which along motorways are typically some distance away or do not offer similar amenities).<sup>66</sup> For these

<sup>64</sup> Based on Zap-Map data, see Appendix A, Table 2. Excludes Tesla chargepoints, which are not open-network.

<sup>65</sup> One MSA operator told the CMA that the main reason a driver visits a MSA is to use the bathroom. For further evidence, see Appendix A.

<sup>66</sup> Most MSA sites are 12 to 28 miles apart.

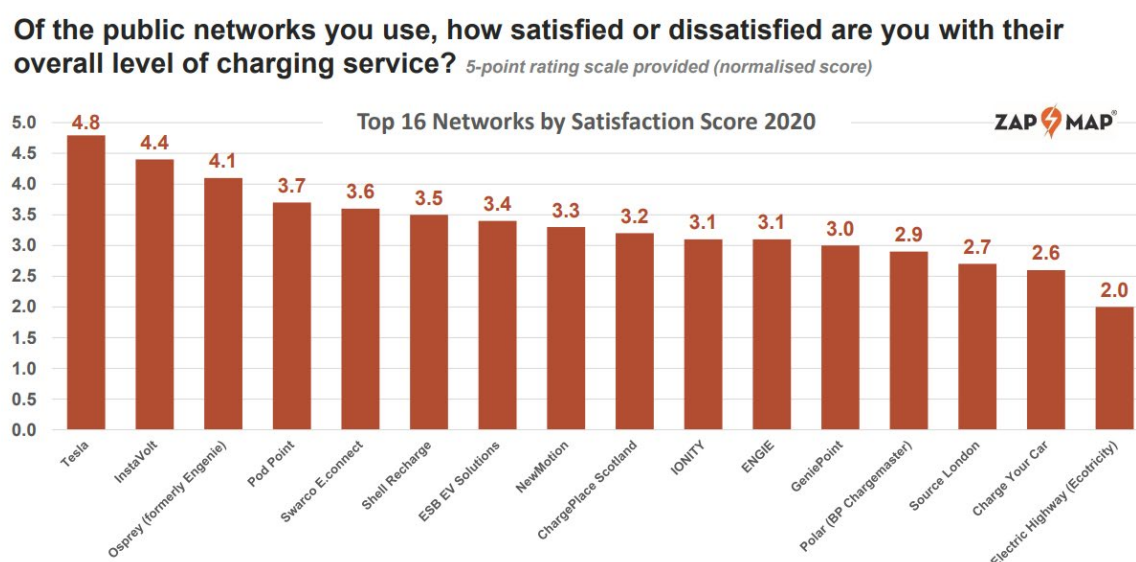
reasons competition between sites along motorways is likely to be much weaker. As set out above, we found that there is very limited competition within or even between sites.

4.11 The lack of competitors the Electric Highway faces at MSAs is recognised in a document [✂].

### **Concerns about poor reliability and limited provision**

4.12 Evidence shows there have been very low levels of customer satisfaction with EV charging at MSAs. In a recent Zap-Map survey, despite the Electric Highway being the largest en-route operator, it had by far the lowest customer satisfaction score out of the top 16 chargepoint operators (across the sector) - see Figure 5.

**Figure 5: EV drivers' satisfaction-levels with chargepoint networks**



Source: [Zap-Map EV Charging Survey Key Findings 2020](#)

4.13 Several stakeholders also raised concerns about the reliability of the Electric Highway's chargepoints and that there was a significant unserved demand for EV charging on the motorways.<sup>67</sup> Many consumers also raised concerns in their submissions.

<sup>67</sup> See Appendix A, paragraph 38.

[The Electric Highway has] had a devastating impact on most first time buyers and magazine journalists first impressions of public charging through unreliability difficulty of payment and poor customer service. – individual respondent.

[The Electric Highway's chargepoints are] outdated chargers that don't work, and not high power chargers, which puts off customers. – chargepoint operator.

- 4.14 Some stakeholders attributed these issues with the lack of competition. For example, one chargepoint operator submitted that the lack of competition has resulted in 'poor quality and availability of charging infrastructure on Motorway Service Areas.'

***Significantly more investment is needed***

- 4.15 A major cause of these poor outcomes is the lack of recent upgrades to EV charging infrastructure at MSAs. Until very recently, the Electric Highway had not upgraded its hardware for many years; most of its hardware has been in place since September 2013. Many respondents submitted that the Electric Highway's network is old and unreliable.

Ecotricity chargers are now some of the oldest charging hardware in the UK... This age contributes to the lack of reliability but the lower power also increases the charge time and therefore the journey time for EV's. – individual respondent.

- 4.16 Significant investment is therefore needed to improve quality and reliability of chargepoints and increase the number of rapid chargepoints to meet likely future EV charging demand at MSAs. To do so, investment is needed both in the chargepoints themselves but also more significantly, in the electricity network infrastructure to provide increased electricity supply. Estimates indicate that the equivalent of around 2,300 ultra-rapid chargepoints are needed at English MSAs by 2030.<sup>68</sup> There are over 500 rapid and ultra-rapid chargepoints at MSAs in the whole of the UK, today.
- 4.17 We note that the Electric Highway is in the process of [upgrading and replacing its existing chargepoints](#) and is planning to add additional chargepoints at many sites (up to 12 new ultra-rapid chargepoints at over 50

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<sup>68</sup> Includes Tesla. Note this estimate is based on a range of underlying assumptions, including EV uptake.

sites).<sup>69</sup> Although, this represents only a very small proportion of the total future investment that is required.<sup>70</sup>

## Key issues in motorway charging

4.18 As described above, there is currently very limited competition on the motorway. In this section we examine two barriers to entry which are hindering the emergence of greater investment and competition: (i) the limited capacity of the existing electricity network to support new entry (and the challenge of addressing this), and (ii) long-term exclusive arrangements between three MSA operators and the Electric Highway.

### *Limited electricity network capacity and the role of the Rapid Charging Fund*

4.19 Limits on electricity network capacity are significantly restraining the pace at which en-route chargepoints can be deployed. Almost all chargepoint operators told us that network connections are one of the main challenges they encounter in expanding their en-route charging networks. While these capacity limits are having an impact in several different segments, operators noted that this challenge is especially acute at MSAs. Charging in these locations involves particularly high-power demands during peak periods; this is driven by the need to minimise stop-off times and serve many drivers during rush hour traffic, which increases demand for rapid charging.

4.20 In addition, the costs of the network upgrades needed at MSAs are particularly high, as they tend to be in locations further away from the distribution network.<sup>71</sup> Estimates indicate that the average cost of upgrading network connections at each MSA to accommodate the electrification of all cars and vans will be around £7m, and at some sites could be as high as £27m.<sup>72</sup> The cost would be even higher if upgrades were carried out iteratively.

4.21 These network upgrade costs will therefore be a high proportion of the upfront capital cost of installing chargepoints at MSAs. For example, one stakeholder estimated that the cost to buy and install a 125kW rapid chargepoint is around £26,000; installing 24 of these at a MSA (which would meet estimates of the

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<sup>69</sup> This was initially through a partnership with Gridserve, which has since acquired 100% of Ecotricity's subsidiary, the Electric Highway Company, [REDACTED].

<sup>70</sup> For example [REDACTED].

<sup>71</sup> Although in some cases, MSAs could have connections direct to the transmission network.

<sup>72</sup> Estimates that full EV uptake will be achieved by circa 2050. The estimate of network upgrade costs is based on a range of simplifying assumptions for budget estimates and varies from one location to the next. The estimate of average peak power requirement is driven by a range of assumptions about battery size, vehicle efficiency, access to home charging, charging behaviour thresholds, movement patterns from the Regional Transport Models and dwell time at MSAs.

approximate average peak power requirement of 3MW in 2030 [✂]) would cost £636,000, which is less than 10% of the cost of the network connection. While there may be ways to reduce these upgrade costs or incrementally make smaller increases in capacity (eg by using battery storage), ultimately very significant expenditure will be necessary.

- 4.22 The high costs of these network upgrades mean that the business case for chargepoint operators to invest on a significant scale in the long-term is often challenging. For example, one chargepoint operator submitted that the ‘costs of local grid connection, particularly for the faster chargepoints necessary on the strategic road network, can be prohibitive for private investors.’ This is exacerbated by the fact that demand is relatively low at present, and that these upgrade costs will fall disproportionately on potential entrants as the Electric Highway is utilising much of the existing network capacity at MSAs.
- 4.23 In light of these challenges, the UK Government plans to invest a £950m Rapid Charging Fund (RCF) in future-proofing network capacity along motorways and key A roads in England to prepare for 100% uptake of EVs ahead of need.<sup>73</sup> The Devolved Administrations are also developing policies and funding to support en-route charging, although there is no direct equivalent of the RCF. Transport for Wales has been tasked by the Welsh Government to lead a project to install rapid chargepoints in key points in Wales’ transport network with £2m investment. The Scottish Government has invested over £45m in total since 2011 leading to a greater density of rapid chargepoints than the rest of the UK. In addition, Ofgem has announced investments for network upgrades needed for 1,800 new ultra-rapid chargepoints at MSAs and key trunk road locations as part of the Green Recovery Scheme.<sup>74</sup>
- 4.24 Given the scale of investment needed to upgrade the network, and the challenging business case for chargepoint operators, the RCF and similar initiatives will play a critical role in supporting the roll-out of EV chargepoints at MSAs. This will ensure there is sufficient network capacity to support the large expansion in the number of chargepoints that will be needed as EV uptake increases.
- 4.25 By substantially reducing one of the barriers to entry, it also provides a major opportunity to open up competition by enabling other chargepoint operators to install chargepoints at MSAs in direct competition with the Electric Highway. A

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<sup>73</sup> HM Treasury, *National Infrastructure Strategy*, November 2020.

<sup>74</sup> <https://www.ofgem.gov.uk/publications-and-updates/ofgem-delivers-300-million-down-payment-rewire-britain>. These will be financed as part of the existing RII0-ED1 price control (and are therefore ultimately funded through electricity customers’ bills) and will generally conclude by the end April 2023.

key question is therefore how this funding can be best used to maximum effect to unlock competition at MSAs, while avoiding any risk of this further entrenching the Electric Highway's existing strong position. We return to this in our discussion of measures below.

### ***Long-term exclusive supply arrangements***

- 4.26 As noted above, the Electric Highway has long-term exclusive agreements in place with three MSA operators in the UK.<sup>75</sup> Under these arrangements, with the exception of Tesla and in one case Ionity, only the Electric Highway can install, maintain and operate EV charging equipment at these MSA operators' sites. While there are some carve-outs to the exclusivity provisions, under these arrangements the MSAs have agreed not to appoint any chargepoint operators other than the Electric Highway at any of their main retail sites, limiting the ability to foster within and between site competition at their sites.<sup>76</sup>
- 4.27 We have concerns that these arrangements may be restricting competition at MSAs by increasing barriers to entry for other chargepoint operators. This may deprive consumers of the benefits of competition such as greater provision of chargepoints, lower prices and improved reliability. We note in particular that:
- (a) three MSAs in the UK, accounting for around two-thirds of MSA sites in the UK, have exclusive arrangements with the Electric Highway (subject to the carve-outs referenced in paragraph 4.9 and 4.26);
  - (b) the length of the exclusivity granted since the contracts were entered into was between 10-15 years (depending on the contract), with several years remaining on these. This significantly exceeds the five years generally considered unlikely to be problematic in certain circumstances<sup>77</sup> ([REDACTED]); and
  - (c) the Electric Highway's share of supply of chargepoints at MSAs is 80% (see paragraph 4.7) (substantially over the 30% threshold at which a legal

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<sup>75</sup> [REDACTED].

<sup>76</sup> For example, Tesla is carved out from the arrangements with some MSAs, but these are a 'closed network' and therefore do not compete with the Electric Highway. Petrol stations at MSAs are also outside the scope of the exclusivity, but are likely to only compete to a very limited extent because they have limited space, are in a less desirable location for accessing MSAs' amenities and face constraints in locating chargers next to petrol pumps.

<sup>77</sup> See subsequent footnote for details of the competition rules relating to exclusivity.

exemption to certain competition rules can be applied to some vertical agreements<sup>78</sup>).

- 4.28 Many other chargepoint operators have told us that these long-term exclusive agreements are a key barrier to greater competition and prevent them from entering at MSAs.

[The] cumulative effect of the majority of MSAs granting exclusive rights to a single operator has been to eliminate all effective competition. – chargepoint operator.

[Exclusive agreements] prevent open competition between alternative providers – chargepoint operator.

- 4.29 We have received evidence that, absent these arrangements, within-site competition at MSAs is likely to be commercially feasible, and this commercial feasibility is expected to grow further in the future as demand increases and network capacity subsidies are introduced (see Appendix A). It is also likely to be practically feasible to have multiple chargepoint operators at a MSA, given the smaller space requirements of chargepoints – a key difference with petrol stations which have a large physical footprint.
- 4.30 Most notably, several chargepoint operators indicated to us that in the absence of the exclusivity agreements they would be interested in establishing their own chargepoints on a large scale across the MSA network, and to do this in direct competition with other chargepoint operators located at the same sites ie without the need for exclusivity.<sup>79</sup> There are already some examples of this which demonstrates chargepoint operators' willingness to enter; for example, InstaVolt has deployed chargepoints at a MSA site (which was not subject to an exclusive agreement) at which the Electric Highway was present. This is consistent with financial modelling we reviewed on the commercial viability for chargepoint operators of having more than one operator at the same MSA site.

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<sup>78</sup> These second two factors combine to make it unlikely that the exclusivity between the Electric Highway and any MSA would be exempted from the application of Chapter I of the Competition Act 1998 by the [Retained Vertical Agreements Block Exemption Regulation](#) (VABER), the European regulation that continues to apply in the UK post-Brexit due to the European Union (Withdrawal) Act 2018 and the Competition (Amendment etc.) (EU Exit) Regulations 2019 (as amended by the Competition (Amendment etc.) (EU Exit) Regulations 2020). While Article 2 of VABER broadly exempts vertical agreements from the scope of Chapter I of the Competition Act 1998, agreements can only benefit from this exemption when neither party crosses a market share threshold of 30%; moreover, the kind of exclusivity that is contained in the Electric Highway's agreements with the MSAs is covered by the VABER only when it lasts for five years or less (see the European Commission's Guidelines on Vertical Restraints, paragraphs 131 and 195).

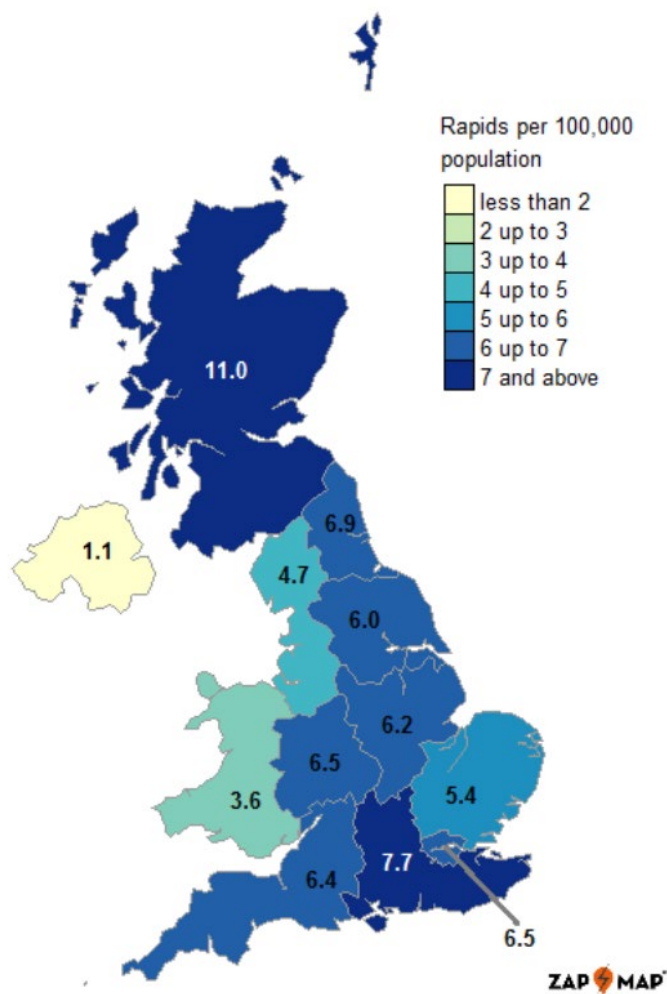
<sup>79</sup> They noted that the business case would become attractive at more sites with the planned Government funding for network connections as part of the RCF.

- 4.31 We recognise that some period of exclusivity may have been necessary to justify the initial investment by the Electric Highway. However, we are concerned that the duration of the current exclusivity provisions in the Electric Highway's contracts with three MSAs may exceed any period that may be justified by reference to the initial investment made, and that they may be in breach of the Competition Act 1998. Furthermore, there is now greater certainty over future demand in light of Government commitments to EVs and a stronger investment case given expected substantial Government subsidies (in particular the RCF), which together heighten our concerns. As noted above, there are several rival chargepoint operators keen to establish their own charging network at MSAs.
- 4.32 We are also concerned that the ongoing existence of long-term exclusivity arrangements could undermine the effectiveness of the RCF. If the Government were to roll out the RCF while the existing exclusivity arrangements are in place, there is a risk that this funding would only benefit the existing operators (primarily the Electric Highway). We consider this would significantly limit the overall benefits from the RCF in terms of opening up competition (as discussed in the previous section) and potentially further entrench the position of the Electric Highway. There is also a risk that – for this reason – the existing exclusivity arrangements could delay or prevent the RCF from being used to increase capacity and enable more chargepoints to be installed at MSAs.
- 4.33 In light of our concerns we have opened an investigation under the Competition Act 1998 to assess the lawfulness of the existing long-term exclusivity arrangements between the Electric Highway and three MSAs, including whether any period of exclusivity is longer than objectively necessary.

### **Investment challenges in en-route charging in remote locations**

- 4.34 Rapid chargepoints in remote locations can also be used for en-route charging. Figure 6 shows that there are currently fewer rapid chargepoints in more rural areas of the UK such as the East of England, North West England, Wales, and Northern Ireland. We note that Scotland has a much higher density of rapid chargepoints, because the Scottish Government has invested in their roll-out.

Figure 6: Rapid chargepoints per 100,000 population



Source: DfT/OZEV, [Electric vehicle charging device statistics: April 2021](#)

4.35 The lower number of chargepoints in remote locations can be explained by the fact that there is likely to be a weaker commercial case to invest in these areas, potentially even in the long-run once EVs have been rolled-out. Evidence from chargepoint operators illustrated that sites in remote areas are likely to have lower expected utilisation and more expensive network connections. For example, one chargepoint operator told us that it is ‘harder to justify building in rural areas. It’s expensive building sites which won’t see much utilisation’.<sup>80</sup> At least in the short-term, chargepoint operators are more likely to focus on other sites, which could risk leaving gaps in en-route charging provision in more remote locations.

4.36 These concerns were echoed by the National Infrastructure Commission’s (NIC) most recent [National Infrastructure Assessment](#). It considered that the pattern of commercial provision of rapid chargepoints is likely to be similar to

<sup>80</sup> Another chargepoint operator [redacted] told the CMA that ‘Motorways are obviously more lucrative than rural sites.’

broadband, where provision is strong in densely populated areas, but with rural areas initially underserved. It noted that commercial investors are less likely to build chargepoints in rural areas before EVs become the mainstream choice.

- 4.37 In our view this limited provision of rapid chargepoints in remote locations is likely to be a result of an emerging market failure. In chapter 3 we set out why environmental externalities will result in the private sector underproviding EV charging compared with what is required to meet Net Zero and EV take-up objectives. There is an especially high risk that the private sector will underprovide EV charging in remote areas where the low volume of local traffic is insufficient to make chargepoint deployment profitable.
- 4.38 Importantly, and unlike broadband (where rural coverage is also a challenge), this potential shortfall of rapid chargepoints in remote locations may inhibit the uptake of EVs by consumers nationally. Chargepoints in remote areas are used not only by local residents, but also by consumers who are visiting or passing through an area. In response to the CMA's invitation to comment, many stakeholders emphasised the importance of widespread rapid charging for EV uptake and raised concerns around the risk of under provision in rural, remote areas or tourist spots (where demand may only be high for periods of time).

Lower ownership rates means charging providers are less likely to install charging infrastructure in rural areas. - Individual respondent.

Many EV charging providers are able to operate in more densely populated urban areas however there is less incentive for EV charging providers to install the infrastructure needed in more remote regions of the UK - [The British Holiday & Home Parks Association](#).

- 4.39 This is consistent with the NIC's assessment, which notes that chargepoints benefit users and society by contributing to a complete network providing coverage across the country. The NIC concludes that there is a case for public funding of chargepoints in rural areas. Given the unprofitability of rural chargepoints in the near term, public funding would be unlikely to substantially crowd out private investment.
- 4.40 Overall, we therefore find that there is a risk of under provision of en-route charging in more remote areas, particularly in the short-term, given that the

commercial case is likely to be challenging. It is important that gaps in provision are addressed to increase the pace of EV uptake nationally.

## Measures to unlock entry and competition

### *Motorway charging*

**3. We recommend that the UK Government rolls out the Rapid Charging Fund as quickly as possible and attaches conditions to this funding to enable competition between chargepoint operators within each MSA site.**

These conditions include that there should be no exclusivity in future, open tenders for access to the network capacity provided by the RCF and that access should only be made available to chargepoint operators with open networks that are interoperable with all EVs.

**The CMA has opened a competition law investigation into the Electric Highway's long-term exclusive agreements with three MSA operators.**

- 4.41 Sufficient and reliable EV charging at MSAs is critical to increasing EV take-up. However, we have found that the Electric Highway has a very strong position, faces very few competitors at MSAs, and has had very poor consumer satisfaction (see Figure 5 above). It is crucial that there is entry by other chargepoint operators to intensify EV charging competition within MSAs, particularly in the medium to longer-term as demand rises. Competition within MSAs will lead to high quality, reliable and competitively priced charging.
- 4.42 While we consider that within-site competition is the most effective form of rivalry for motorway charging, having more than one chargepoint operator within each MSA site would have the added benefit of also increasing competition between MSA sites. Currently there is little point in consumers switching from one MSA to another as most only offer the Electric Highway's chargepoints.
- 4.43 We identified two major barriers to entry at MSAs – network upgrade costs and the Electric Highway's long-term exclusive agreements with three MSA operators. However, while network upgrade costs are a substantial barrier now, as the RCF and other similar initiatives are rolled-out this will help significantly to address this barrier in the next few years, leaving the long-term exclusive agreements as the principal remaining barrier to entry at MSAs.
- 4.44 In our view, it is critical that public funding is used to unlock competition by addressing barriers to entry at MSAs, while avoiding any risk of this further entrenching the Electric Highway's existing strong position. The RCF provides a major opportunity for establishing a basis for strong and beneficial

competition in the long-term along motorways, by enabling competition between different operators at each MSA. This forms the basis of our key recommendation on en-route charging set out above.

- 4.45 Where the RCF funds network connections, we consider that various conditions should therefore be attached to encourage greater competition between chargepoint operators within MSAs. In particular these conditions should include the prohibition of new exclusive agreements. In addition, these could also include other provisions to ensure a level playing field for competition, such as open tenders for access to the new network capacity to enable rival chargepoint operators to enter and compete effectively in practice. Conditions which maximise the benefits from this government funding could also be included, such as requiring all chargepoints to be made available to the wider public and interoperable with all EVs (ie chargepoints that can be used by all brands of EV with the necessary connector). We recognise that the Government is still considering the design and implementation of the RCF and that the sector is still evolving. Therefore, the conditions that are attached to this funding should be sufficiently flexible to react to future changes in demand and market conditions across the sector and at each individual site.
- 4.46 In order to achieve these benefits, the RCF will have to be designed carefully, as MSA operators have conflicting incentives. While MSA operators may benefit from having fast and reliable EV charging, as this may attract consumers to their sites, they also benefit from weaker competition within MSAs as they typically take a share of the resulting higher profits. These weakened incentives to promote competition are likely to be exacerbated by the limited willingness of EV drivers to choose between different sites given their range anxiety and rationale for stopping at MSAs. MSA operators may therefore seek to offer preferential access to network capacity or the prime locations for chargers in car parks to those operators that offer them the greatest profit share – which may not facilitate fully effective competition.
- 4.47 If evidence begins to emerge that MSAs are unwilling (or failing) to enable effective EV charging competition at their sites, the Government should consider taking a more active role on an ongoing basis. For example, this could include directly allocating the additional network capacity from the RCF itself or exercising some level of control over the revenues that MSA operators earn from EV charging.
- 4.48 We have also identified concerns with the Electric Highway's long-term exclusive agreements with three MSAs and therefore have opened an investigation under the Competition Act 1998 to assess the lawfulness of the existing long-term exclusivity arrangements.

- 4.49 It is critical that the RCF is used to unlock competition and enable much needed increased charging capacity for the future, and that the ongoing existence of long-term exclusivity arrangements does not undermine this.

### ***En-route charging in remote locations***

**4. We recommend that governments consider targeting funding at gaps in the commercial provision of en-route charging in more remote areas.**

- 4.50 A comprehensive UK-wide network of en-route chargepoints is necessary to support EV adoption nationally. However, in some more remote locations chargepoint operators may be reluctant to make the necessary investments due to the lack of a commercial business case.
- 4.51 Our recommendation seeks to ensure that governments consider areas where such market failure appears to be arising and considers the case for plugging these gaps across the UK. For example, in England this could involve the UK Government using the RCF to fill gaps in en-route charging on A roads.
- 4.52 Public funding should be awarded in such a way as to ensure competitive outcomes. For example, the funding could be awarded through tenders to chargepoint operators (ie competition for the market). As highlighted in the next chapter, where government subsidy is used and there is competition for the market, there will need to be active management and oversight of the contracts to ensure good outcomes for consumers.

## 5. On-street charging

- Between now and 2030 there needs to be a significant scaling up of on-street charging to help the transition to EVs for those who cannot charge at home due to lack of off-street parking (over a quarter of UK drivers). So far there are only 5,700 on-street chargepoints, and of these only 1,000 are outside of London.
- However, the commercial case for private sector financing of this infrastructure is currently highly challenging due to low usage. Private sector investment has been largely dependent on public subsidies, which few LAs have applied for leading to a limited and uneven roll-out across the UK.
- LAs play a key gatekeeper role as they understand local needs and control access to the kerbside and other sites for installing on-street charging. But they can face a number of challenges in rolling-out on-street charging – they do not have a clearly defined role, in many cases do not have the capabilities and resource to plan and oversee roll-out, and can face difficulties accessing funding.
- Demand for on-street charging is highly localised - meaning there is also a risk of local monopolies developing, which, if left unchecked, could cause problems. Currently the main way of creating competitive pressure is through tenders by LAs ‘for the market’ – to deliver this effectively LAs need to actively manage these but many lack the resources and capabilities.
- Therefore, there needs to be a step change in the role that LAs are currently taking in on-street charging and the support available to them.
- We recommend that LAs take a more active role in planning and managing the roll-out of on-street charging to maximise competition and protect local residents – putting in place clear local plans and taking into account key factors we have set out.
- To achieve this step change, we recommend that governments equip and incentivise LAs, as well as providing greater support and oversight eg provide funding for dedicated expertise and clearly define the role of LAs by, for example, introducing a statutory duty. Alongside this, governments should work with LAs to explore and pilot other ways of rolling-out on-street charging.

### Introduction

- 5.1 Many drivers will charge at home using chargepoints installed in their driveway or garage. But there are a significant proportion of drivers who will not be able to install a home chargepoint (eg those without off-street parking or who are living in flats) and who will rely on public or workplace charging.
- 5.2 For these drivers in particular, on-street chargepoints which are located on the kerbside, sometimes right outside a driver’s home, are likely to offer a good

alternative. On-street chargepoints provide slow/fast charging (similar to home charging) and are generally installed on existing lampposts, bollards or dedicated charging posts along a residential street. In some areas, residents need to park their cars in local car parks and in these cases equivalent slow/fast chargepoints can also be installed. We refer to charging at these locations as on-street unless otherwise stated.

- 5.3 Sufficient, low cost and convenient on-street charging is therefore essential for encouraging EV take-up, but despite its importance roll-out to date has been limited. In this chapter we explore the reasons for the lack of investment and concerns around competition in this segment. Further relevant evidence can be found in Appendix B.
- 5.4 This chapter covers:
- (a) Background – the importance of on-street charging, the role of LAs and chargepoint operator entry and expansion;
  - (b) How on-street charging is developing;
  - (c) Key issues - barriers to investment, difficulties facing LAs in supporting on-street roll-out, and risks to competition; and
  - (d) Measures to address the key issues in on-street charging.

## Background

### *Importance of on-street charging*

- 5.5 On-street chargepoints are an important form of charging for over a quarter of drivers estimated to have no off-street parking<sup>81</sup> - it is more convenient, cheaper and provides more flexibility to the electricity network than other options like rapid charging. For these reasons, while a broad mix of different public charging options is likely to be needed, on-street charging is an important part of building a comprehensive network that meets peoples' needs. Lack of off-street parking particularly impacts city and urban areas<sup>82</sup> and especially those in social housing (57% of households in social sector

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<sup>81</sup> Estimates of the number of households without off-street parking vary. For example [PwC](#) found that in the UK 28% of drivers do not have off-street parking. [Field Dynamics](#) estimated that approximately 32% of households in Great Britain outside London do not have access to off-street parking (7,800,000 households).

<sup>82</sup> For example, the proportion of vehicle drivers without off-street parking is just over half in London, and over a third in Manchester, Edinburgh and Cardiff ([PwC](#)). Such urban areas are generally more deprived than rural areas – see [Ministry of Housing, Communities and Local Government, Deprivation, 2019](#).

houses do not have off-street parking and 86% of households in social sector flats do not have off-street parking<sup>83</sup>).

- 5.6 Offering an attractive charging option for drivers without off-street parking is important as the evidence indicates that it will encourage EV uptake. For example, an AA survey from October 2020 found that one in seven drivers would not consider buying an EV on their next purchase because of a lack of off-street parking and home chargepoints. Several other studies also found that the most influential location in encouraging consumers to purchase EVs is charging at or near the home (see Appendix B). Evidence from business plans and internal evidence submitted by chargepoint operators was generally consistent with these studies, highlighting the importance of on-street charging.

#### *More convenient*

- 5.7 On-street charging is a particularly convenient way for EV drivers to charge as it can be used while parking outside or near their home, often overnight. Other charging options may not be as convenient for those without home and/or workplace charging. Destination charging relies on drivers making regular use of a particular set of destinations, which may only be suitable for some drivers. Using rapid charging hubs (ie groups of chargepoints) can be more time-consuming (getting to the hub and waiting for the EV to charge).

#### *Lower cost*

- 5.8 On-street charging can also be substantially cheaper than rapid charging, leading to greater savings for consumers (particularly when compared to petrol). The provision of on-street charging can therefore provide a strong financial incentive to consumers to switch to EVs.
- 5.9 As set out in Table 5, on-street charging can cost around £38 per month (for an EV with average usage), which is around 20% more expensive than home charging on a standard rate (£31 per month).<sup>84</sup> Rapid charging is typically the most expensive form of charging and can cost £48 per month, which is

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<sup>83</sup> CMA Analysis of the [English housing survey 2010](#), Chapter 2 data and annex tables, Table 2.23. In England, the top 20% of earners are also more likely to have access to off-street parking than the bottom 20%. Mid terrace dwellings and converted flats are more likely to have no designated parking provision and the private rented sector lives in comparatively high proportion of converted flats (11%) [English Housing Survey Energy Report, 2017-18](#).

<sup>84</sup> Figures based on our analysis of the Zap-Map data. For further detail, see Appendix E.

around 30% more expensive than on-street charging (and around 60% more expensive than home charging on a standard rate) (see also Appendix E).<sup>85</sup>.

**Table 5: Weighted average monthly cost by segment/charger power for a typical driver (2021)**

| Segment or charger power | Average monthly cost |
|--------------------------|----------------------|
| Home charging            | £31                  |
| On-street                | £38                  |
| Rapid charging           | £48                  |
| Petrol                   | £57                  |
| Diesel                   | £52                  |

Source: CMA analysis of Zap-Map data, 26 February 2021. Monthly cost was weighted based on the number of chargepoints. See Appendix E for further detail on this analysis.

- 5.10 Without on-street charging, the energy cost savings consumers make from EVs could be smaller, which could hinder take-up. EVs can be much less expensive to recharge than the cost of refuelling a petrol or diesel car. However, this benefit is reduced if consumers need to rely on rapid charging.<sup>86</sup> There is also greater potential to use smart technologies in on-street charging so that drivers can charge even more cheaply overnight when electricity costs are lower.
- 5.11 Charging costs for those relying on public charging are currently substantially higher than for home charging. Nonetheless, as on-street chargepoints are less expensive than rapid chargepoints, this can help reduce the price disparity between public and home charging. A typical consumer could pay around 60% more to use rapid charging compared to home charging, and on-street charging could reduce this price difference to around 20%. While this price disparity is lower in on-street charging, our analysis has shown that rapid and on-street charging are likely to remain more expensive than home charging due to the underlying cost differences involved (see Appendix E). This raises equity issues that governments may wish to consider.

### *Beneficial for the electricity system*

- 5.12 On-street charging will also offer benefits in terms of flexibility to the energy system. When plugged in, EVs have the potential to reduce the costs of supplying and distributing renewable electricity (see chapters 2 and 3). When charging overnight on-street using smart technology, EVs could further ease demand on generation capacity and the local network and provide flexibility to the electricity system. In contrast, rapid charging is generally inflexible as the EV is not plugged in for long periods of time.

<sup>85</sup> Note that ultra-rapid charging can also be more expensive than on-street and rapid charging. We have not included ultra-rapid pricing in our analysis.

<sup>86</sup> Rapid charging can save consumers around 10% of the money they spend on refuelling a car, whereas the savings from on-street charging are far more substantial, at around 30%.

## ***Key role played by LAs***

- 5.13 The roll-out of on-street chargepoints is currently largely dependent on public funding delivered through procurement by individual LAs who contract with chargepoint operators. Through these contracts, charging prices are generally being set by individual LAs.
- 5.14 LAs can currently apply for funding to procure on-street chargepoints, with the main source of funding being the On-Street Residential Charging Scheme (ORCS), which is administered nationally by the Energy Savings Trust.<sup>87</sup> This scheme is open to all LAs in the UK. In Scotland, LAs have access to additional funding for chargepoints (as set out in chapter 2).
- 5.15 LAs have an important gatekeeper role in allowing access for chargepoint operators to install on-street charging. They are responsible for overall planning policies in their areas including alterations to streets, street furniture and parking (including creating dedicated EV charging bays). Within Great Britain they own the street furniture (such as lampposts and bollards) and often own local car parks, which can be suitable for on-street charging. LAs in Northern Ireland do not have the same type of control over infrastructure on the pavements;<sup>88</sup> however, they can potentially play a similar role.
- 5.16 In addition, more broadly LAs are likely to have a good understanding of residents' needs and the suitability of sites in the local area for charging. This is particularly important in on-street charging as it will ensure that provision suits the varying needs and living/working patterns of local residents. LAs will also need to take into account safety considerations for pedestrians.

## ***Chargepoint operator entry and expansion***

- 5.17 Chargepoint operators currently bid for contracts with LAs to install and operate on-street chargepoints, with LAs generally retaining ownership of the chargepoints.
- 5.18 The largest chargepoint operator currently is ubitricity, with a share of supply of over 50% in on-street charging, which has recently been acquired by

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<sup>87</sup> This scheme is administered by the Energy Saving Trust on behalf of OZEV – it evaluates applications and also offers guidance to LAs in applying for funding and different procurement models, as well as helping LAs in England develop local policies to support EV uptake through the [Local Government Support Programme](#). ORCS offers up to 75% of the capital costs of procuring and installing on-street chargepoints – the remaining 25% has to be raised privately or funded by the LA. Resource to apply for funding and monitor the contract once in force is not funded. Specifically excluded in this funding is the installation of passive-only infrastructure such as the underground cabling and ongoing upgrades and maintenance of existing chargepoints.

<sup>88</sup> In Northern Ireland the responsibility for street furniture and pavement access lies with the Department of Infrastructure. This can cause difficulties for LAs in rolling-out on-street as they are not directly responsible for approving access to the necessary sites/furniture.

Shell.<sup>89</sup> This is followed by Source London (owned by Total), Char.gy, Electric Blue, bp pulse, ChargePlace Scotland and CityEV (with shares of supply in on-street charging ranging from 23 - 2%). There are also other existing operators and new or potential entrants with a significant interest in this segment such as SWARCO, Connected Kerb, Mer, and Liberty Charge. In Northern Ireland the main provider of fast and slow chargepoints is EcarNI. In Scotland, LAs contract out the installation and maintenance of on-street chargepoints but use a single back-office provided under the Chargeplace Scotland brand.

- 5.19 Although the on-street charging segment is currently relatively concentrated, this may reflect the nascent stage of its development. There has been some recent entry and expansion in on-street charging. Importantly, there do not appear to be material barriers specific to new entrants (although there are wider barriers to investment in on-street charging described below).
- 5.20 On-street chargepoint operators use different models of provision. This can involve chargepoint bollards (eg Source London, bp pulse) and adding chargepoints to lamp posts (eg ubitricity and Char.gy). Another model is 'split infrastructure deployment' based on splitting out the provision of core below the ground charging infrastructure (eg cabling) which above the ground components (eg discrete charging posts) can connect to. This model can involve one firm focusing on the below the ground infrastructure (eg Liberty Charge) which other chargepoint operators can connect to, or one integrated provider initially providing both the below and above ground infrastructure (eg Connected Kerb),<sup>90</sup> with the option to split this provision in the future.

## How on-street charging is developing

### *Low numbers of chargepoints and patchy provision*

- 5.21 The supply of on-street charging is substantially below what is likely to be needed in the longer-term to for EV-take up and to meet future demand. There are currently only around 5,700 on-street chargepoints in the UK, with the vast majority of these in London (see Figure 7).<sup>91</sup> Outside London there are only around 1,000 on-street chargepoints,<sup>92</sup> meaning that currently 90% of households without off-street parking are further than a five-minute walk from

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<sup>89</sup> Based on CMA analysis of Zap-Map data, 26 February 2021 – see Appendix E.

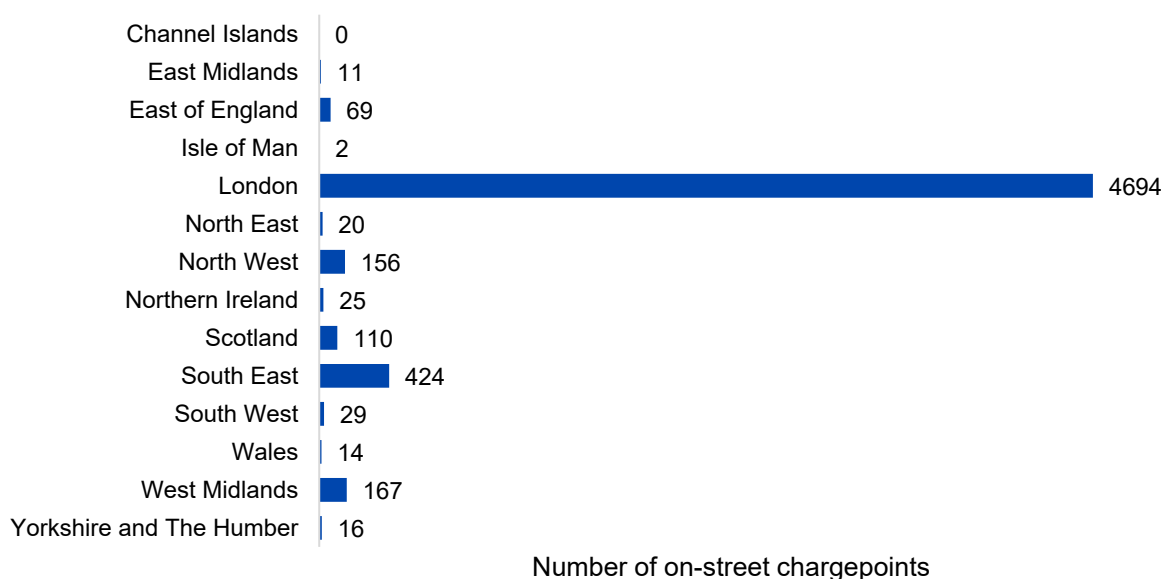
<sup>90</sup> While still in development, there are some examples where this type of model is being introduced in the UK. For example, Swindon Borough Council is working in partnership with Connected Kerb and Barratt Developments to install underground infrastructure in a new home development (laying infrastructure to enable over 130 EV chargepoints – with the initial installation of 20 active chargepoint sockets).

<sup>91</sup> CMA analysis of Zap-Map data, 26 February 2021.

<sup>92</sup> CMA analysis of Zap-Map data, 26 February 2021.

a public chargepoint.<sup>93</sup> This shows that the majority of households without off-street parking currently do not have access to conveniently located chargepoints nearby.

**Figure 7: On-street chargepoints by region**



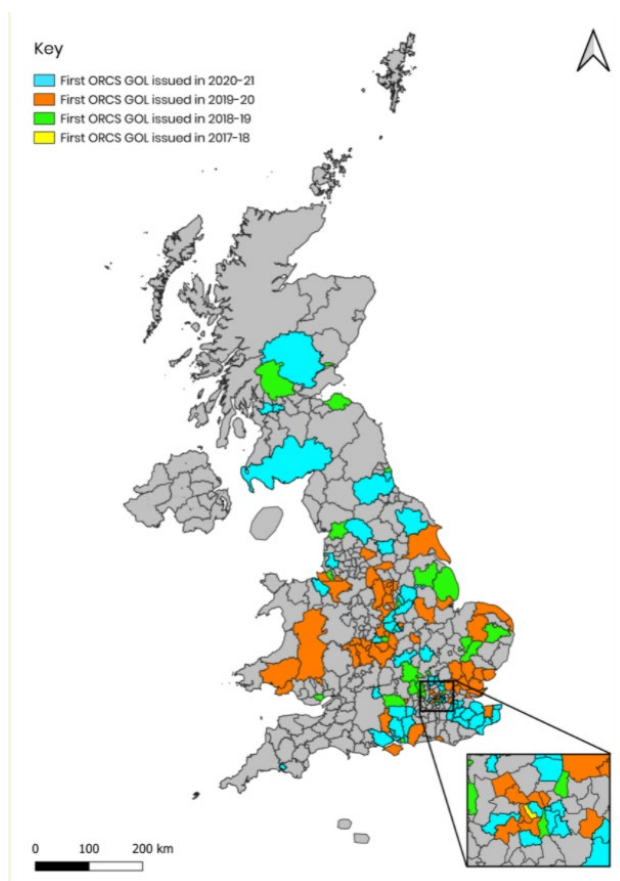
Source: CMA analysis of Zap-Map data, 26 February 2021.

5.22 Figure 7 also highlights how the roll-out of on-street chargepoints to date has been patchy. One factor behind this is the difference in LAs that have accessed centralised grant funding (see Figure 8). This funding is only available if LAs apply for it and there are large areas of both urban and rural UK that have not accessed this funding. For example, it has not been used by any of the LAs in Northern Ireland or in large areas of Wales. There are also large parts of the North of England and central Scotland that have not used any of the on-street funding available.<sup>94</sup>

<sup>93</sup> Field Dynamics, *On-street households: the next EV challenge and opportunity*, September 2020.

<sup>94</sup> We note in Northern Ireland, [X].

**Figure 8: Projects supported by ORCS since 2017**



Source: [Energy Savings Trust](#).

- 5.23 Only around £8.5m funding was available through ORCS between 2017-18 and 2019-20. Out of this funding, almost one-third was not taken up by LAs.<sup>95</sup> In 2020-21 ORCS funding increased to £20m per year with a key challenge being increasing the take-up of this funding. In 2021 the UK Government also announced a further £90m would be made available to support the roll-out of on-street charging.
- 5.24 While some regional variation can be explained by differences in levels of off-street parking, this is unlikely to explain the substantial variation in on-street chargepoints by region, and the evidence we have seen indicates that the proactivity of LAs in planning and coordinating roll-out is a key factor behind regional differences in roll-out and the limited scale of this roll-out on nationwide basis. Although some LAs, such as those in London, have been more proactive at driving roll-out, there has more generally been a lack of planning at local levels to understand needs and requirements.

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<sup>95</sup> Uptake of this funding has been slow with underspends against budget in each of the last three financial years and 32% of the total budget was not used. By the end of March 2020, ORCS funding had only contributed to 690 on-street chargepoints ([NAO, Reducing Carbon Emissions from cars, 2021](#)).

## ***Substantial growth needed***

- 5.25 There is inevitably some uncertainty over precise future requirements for on-street charging. However, it is clear that there will need to be significant scaling up in this segment. This is illustrated by considering the number of ‘on-street’ households without off-street parking in Great Britain. Outside of London alone there are around 8 million such households<sup>96</sup> and therefore the current provision of 1,000 on-street chargepoints outside of London is substantially short of what will be needed. Forecasts for the number of on-street chargers required by 2030 vary. The CCC estimated that approximately 50,000 3-7kW chargepoints will be needed,<sup>97</sup> whereas Delta-EE estimated that 275,000 chargepoints (22kW and below) will be installed at on-street locations.<sup>98</sup> Although different, these estimates illustrate that there will need to be a significant increase in the numbers of on-street chargepoints.
- 5.26 As noted above, urban areas like cities with higher density populations have significantly higher numbers of households and drivers without off-street parking.<sup>99</sup> Therefore more on-street charging will be needed in these areas, in particular.

## **Key issues in on-street charging**

- 5.27 In this section we examine three emerging key issues in on-street charging:
- (a) barriers to investment in on-street charging leading to slower roll-out, in particular the weak commercial investment case;
  - (b) difficulties faced by LAs in supporting the roll-out; and
  - (c) the risks to competition – if left unchecked, local monopolies could develop, but there are limitations with the current LA-led competition ‘for the market’.

## ***Significant barriers to investment***

- 5.28 The commercial case for private sector financing of charging infrastructure in the on-street segment is currently very challenging. The single largest issue for private investment is the low utilisation at present of on-street chargepoints

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<sup>96</sup> [Field Dynamics, On-street households -the next EV challenge and opportunity, 2020](#). Precise estimates for numbers of households without off-street parking vary. For example the English Housing Survey Energy Report 2017-18 ([Annex Table 3.2](#)) estimates that there are approximately 6 million dwellings in England with no designated parking provision.

<sup>97</sup> [CCC, The Sixth Carbon Budget: The UK's path to Net Zero, December 2020, Figure 3.1b](#).

<sup>98</sup> [Delta-EE, 2021 UK EV Chargepoint forecasts](#).

<sup>99</sup> [PwC, Charging ahead! The need to upscale UK electric vehicle charging infrastructure, April 2018](#).

and high costs, leading to the ‘chicken and egg’ issue where demand/utilisation and investment in charging infrastructure are dependent on each other (see chapter 3). We were told by one chargepoint operator that utilisation rates were currently around [X] of what they need to be to reach breakeven (see Appendix B). This has meant that the private sector to date has been largely unable to deliver on-street infrastructure without government subsidies.

- 5.29 Based on our review of chargepoint operator business plans and financial models, we found that currently the revenues from on-street chargepoints generally do not cover running costs or the upfront costs to install the infrastructure (see Appendix B). The time it takes to breakeven is currently estimated to be at least seven to nine years but this is uncertain as it depends on the rate of EV uptake during this period.
- 5.30 Most current contracts are around five to 10 years in duration but typically involve public funding to cover a substantial proportion of the upfront capital expenditure (see Appendix B). Awarding sites or contracts for on-street charging on a longer-term basis is one way to help make this type of charging more commercially viable, but this can also raise some risks in terms of potential weaker dynamic competition.<sup>100</sup>
- 5.31 We have also been told by several chargepoint operators that rolling-out chargepoints at a greater density and scale may also help make the commercial business case more viable. Higher density provision can help reduce the costs of digging up the streets to install on-street charging infrastructure, which can account for 50% or more of the costs. Higher density can also lower maintenance costs due to reduced travel time between chargepoints. In addition, larger scale provision can be important for accessing lower cost capital funding from infrastructure financiers, as well as making it easier to cover the costs of participating in tender and planning processes.<sup>101</sup> <sup>102</sup> While some LAs have pooled resources to jointly procure which has increased scale,<sup>103</sup> this is not generally the case.

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<sup>100</sup> For example, longer awards can lead to an incumbency advantage, which could make it more challenging to add new technologies such as smart charging or vehicle-to-grid on a competitive basis; whereas shorter awards make it easier for the incumbent to be replaced by an innovative new entrant, which may increase the strength of the competitive constraints on chargepoint operators. The greater risk of long-term contracts is reflected in the Government Commercial Functions [Market Management Guidance Note \(2021\)](#) which notes that more detailed market assessments are required when there are long-term contracts and when Government is a market-maker.

<sup>101</sup> Some chargepoint operators told us they are put off from offering on-street charging due to the small, piecemeal procurements currently led by LAs.

<sup>102</sup> An [OFT review in 2004](#) highlighted some potential benefits of contract aggregation but also some potential risks for competition.

<sup>103</sup> For example, Nottingham City Council led the Go Ultra Low-funded programme to develop the N2D2 network in various locations in Nottingham, Nottinghamshire, Derby and Derbyshire, partnering with relevant LAs for

## ***Difficulties faced by LAs in supporting on-street roll-out***

- 5.32 We found that there are a number of challenges for LAs in driving forward the roll-out and investment in on-street charging; in particular lack of clarity over their role and mixed appetite, limited analysis of where investment is needed, and some difficulties accessing funding.
- 5.33 We note that as set out in its recent [2035 Delivery Plan](#) the Government plans to provide further support for LAs including EV infrastructure guidance, an information pack on the available support and funding, and best practice forums and webinars. These are positive developments which we welcome. However as set out in this chapter, overall, we found that there is substantial scope in this area to strengthen LAs' specific capabilities, capacity, role and incentives.

### *Lack of clarity over LA role and mixed appetite*

- 5.34 While LAs may be well placed to deliver on-street charging, many stakeholders told us that LAs' role in this was unclear. LAs have wide-ranging roles in delivering various core statutory services but EV charging is not one of their statutory responsibilities. Therefore, particularly given funding constraints and other pressures on LAs, stakeholders told us that in many cases EV charging is lower priority. There is currently no formal requirement by LAs to oversee or support the delivery of EV charging (although many LAs are choosing to support this delivery to help them meet their objectives relating to climate change or reducing emissions/pollution in their local areas).
- 5.35 Most chargepoint operators told us that it can be difficult to engage with LAs as there is no clear remit to promote, plan and oversee EV charging. On a practical level, most LAs do not have any dedicated EV personnel (ie no designated point of contact),<sup>104</sup> or process in place to manage their requests. Responsibility for EV charging within LAs can also therefore fall through the cracks between different teams (ie planning, roads, transport etc). In the cases where LAs have one or two personnel in place, the LAs have been more able to play a greater role in overseeing and managing roll-out.<sup>105</sup> This includes LAs in Scotland, where one chargepoint operator noted that the Scottish Government is actively engaging LAs and most LAs have a

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Derby, Derbyshire and Nottinghamshire to do so. Nottinghamshire City Council told us that Wolverhampton is also part of the scheme and is able to draw down from the same contract to install chargepoints in its area.

<sup>104</sup> [Local Partnerships](#) finds that only 15% of LAs have a dedicated team for delivering EV charging infrastructure.

<sup>105</sup> [Policy Exchange](#) estimates it would cost £16m per year to have two full-time staff on average at each of the 200 LAs with responsibilities for highways. London Councils also noted to us that 'In order to effectively manage and deliver electric vehicle infrastructure, dedicated staffing [for LAs] is essential. This was demonstrated in London, where boroughs participating in the Go-Ultra-Low City Scheme tasked one or more borough officers to deliver residential chargepoints.'

dedicated person responsible for EV charging, as well as LAs in Nottingham, Oxford and London.<sup>106</sup>

Whilst there are strong messages from central government to extend charging opportunities there is no obligation or duty on authorities to do so in the same way as there is in respect to general asset maintenance of the highway... There is no obligation even to provide an outline strategy for how charging facilities will be developed in future. [London Councils, GLA, TfL and LGTAG](#).

- 5.36 We were also told that appetite amongst LAs for installing on-street charging can vary greatly. Some LAs have concerns about additional 'street clutter' and there can be objections from local residents. The limited number of EV drivers at present may mean it is not always a high priority at present to find a way of offering on-street charging while resolving concerns over street clutter. These factors can also influence the extent to which, and variation in, LAs rolling-out and effectively overseeing on-street charging.

LAs fear that deploying EV chargepoints will imply street clutter. - chargepoint operator.

#### *Limited analysis of where investment is needed*

- 5.37 As noted in the previous section, there has been a lack of strategic planning at local levels, regarding the current and future likely requirements. Many LAs have not undertaken any planning and do not have an EV charging plan in place to set out what charging will be needed in the local area.<sup>107</sup> Little strategic work has been undertaken on the number and location of on-street chargepoints that need to be made available to meet long-term demand. This planning is important as it will ensure that infrastructure is deployed in the right places where it is likely to be most utilised, both in the short-term to meet existing demand and importantly to stimulate and meet future EV demand.<sup>108</sup> Coordination with DNOs is also needed, to understand the areas where additional network capacity may be required including developing below the

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<sup>106</sup> We note that these cities and a number of others were awarded additional Go Ultra Low City funding (see Appendix B) – helping them to roll-out EV charging.

<sup>107</sup> TfL along with GLA, [City of York](#) and Dundee City Council are examples of organisations that have developed plans setting out what charging will be needed. See the London and Dundee case studies in this chapter for further details.

<sup>108</sup> Many LAs are seeking to reduce car usage overall. This may reduce to some extent the requirements for on-street charging and can be factored into local plans.

ground cabling and power connections.<sup>109</sup> As the [NAO highlighted](#), there is no single data set to show which residential areas will pose the most serious challenges to installing chargepoints or where additional network infrastructure will be needed.<sup>110</sup>

- 5.38 The evidence also suggests that some LAs are focusing on installing chargepoints in the easiest places (ie quick wins) rather than where it is most needed. For example, several LAs told us that it was easier to install chargepoints in LA-owned car parks rather than on-street. However, where these car parks are in attractive destination locations (eg city centres), there may be greater potential for private sector investment in EV charging (see chapter 6). The result is that the roll-out of on-street charging is generally not demand-led and there are substantial gaps. There are some exceptions such as in some London boroughs where there has been greater planning and coordination, and residents can register their interest in having a public chargepoint near their home (see London case study in the box below).

#### **London case study**

London's EV infrastructure delivery plan used modelling to find that 2,300 to 4,100 rapid chargepoints and 33,700-47,500 slow/fast chargepoints could be needed by 2025 across London.<sup>111</sup> LAs in London can identify sites where demand is greatest based on [residents' suggestions](#). There is also an [online dashboard](#) providing analysis of chargepoint usage across London.

To support chargepoint delivery, London Councils and Transport for London (TfL) have set up and funded a pan-London co-ordination function. UK Power Networks (a DNO) has developed a heat mapping tool to identify network constraints, and TfL has produced [guidance on chargepoint installation](#).<sup>112</sup> TfL has also set up two framework agreements which have been well used by LAs in London and TfL to deliver chargepoints with public funding. TfL and London Councils are now looking at options for chargepoints to be procured through the Crown Commercial Services Dynamic Purchasing System, which allows new suppliers to be added at any point.<sup>113</sup>

#### *Difficulties accessing government funding*

- 5.39 There are some barriers in accessing existing available government funding. A number of stakeholders told us that LAs have limited time and resource

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<sup>109</sup> Generally, there is likely to be spare capacity when using lampposts to install on-street charging, but beyond that as the scale of on-street roll-out increases there may be limits in capacity in some areas.

<sup>110</sup> [NAO, Reducing carbon emissions from cars, 2021, paragraph 2.22](#)

<sup>111</sup> [TfL, London electric vehicle infrastructure delivery plan, June 2019](#). The International Council on Clean Transportation has also undertaken more recent [modelling](#) on individual borough chargepoint requirements, which will be used to inform future EV infrastructure planning in London ([TfL, LGTAG response to ITC](#)).

<sup>112</sup> [TfL, London electric vehicle infrastructure delivery plan, June 2019](#).

<sup>113</sup> [TfL, LGTAG response to ITC](#).

available to apply successfully for grant funding schemes and limited financial capacity to fund the remaining 25% capital funding needed for the main on-street charging funding scheme (ORCS), particularly given pressures on LA funding and competing priorities. To access ORCS funding, a LA needs to demonstrate that their plans meet the criteria of the scheme and provide a business case.<sup>114</sup> Investment plans have generally been focused on short-term bidding for annual funding rounds via ORCS – which has meant that in many cases the focus has only been on short-term chargepoint roll-out rather than strategic investments. There are also some limitations in the way the funding has been designed which makes it more difficult to plan and roll-out charging strategically (see Appendix B).

One LA told us that there is a vast difference in the amount of expertise in EVs within LAs and LAs can struggle to apply successfully for grant funding schemes.

### ***Risks to competition***

5.40 This section sets out the factors which shape the nature of competition in on-street charging, the issues arising from the current approach and delivery models for achieving greater investment and competition.

#### *Risk of local monopolies*

5.41 Demand for on-street charging is likely to be highly localised, because EV drivers are likely to want to use the most convenient chargepoint near their home. This is supported by evidence from on-street chargepoint operators which indicated that consumers want to charge as close as possible to their homes for this type of charging ie wherever they park normally and typically no further than 30 to 50 metres away from their homes (see Appendix B).

5.42 It is unlikely, at least at this stage, that there will be many different chargepoint operators installing on-street chargepoints on the same part of a residential street due in part to the costs of installing charging coupled with the lack of demand and practical challenges.<sup>115</sup> In the longer-term, when utilisation is higher, it may be possible in some areas for more on-street chargepoint

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<sup>114</sup> [On-Street Residential Chargepoint Scheme guidance for local authorities](#).

<sup>115</sup> The number of different on-street chargepoint operators nearby on any given street is typically only one, but two operators can be located close to each other when one is focusing on lamppost charging and the other on bollards.

operators to compete to serve the same households (ie greater ‘within-market’ competition).<sup>116</sup>

- 5.43 However, introducing strong within-market competition appears unlikely to be possible at the earlier stage of roll-out. This means that there is the risk of local monopolies developing or little competition to serve the same households.
- 5.44 Given this, it is critical that other models of competition are used to help achieve competitive outcomes in on-street charging, such as using competition ‘for the market’ through tenders (which is the current model delivered via LAs). This model of competition can help protect EV drivers who use on-street charging– as long as there is very active contract management.

#### *Challenges faced by LAs in maximising competition*

- 5.45 In principle, LAs are well placed to ensure good outcomes in on-street charging through competitive tendering of contracts and active contract management. However, we have found that this can be challenging for LAs, though there are some examples of good practice.
- 5.46 A number of stakeholders raised concerns that LAs are not sufficiently incentivised and equipped to drive effective competition for the market and actively oversee provision – and that competition does not appear to be a consideration for many LAs. This can involve a LA working with a single on-street chargepoint operator across an entire local area for ease and consistency.<sup>117</sup> LAs often use open tenders, but some may repeatedly award contracts to the same chargepoint operator or directly award contracts. While this can reduce initial administrative costs and be easier to manage, it could also put LAs in a much weaker negotiating position in the longer-term. This means that over time it may be more challenging to create sufficient competitive tension that achieves good outcomes for consumers, or it may be more difficult to replace operators that are failing to deliver.<sup>118</sup>
- 5.47 We recognise the pressures and competing priorities LAs face. Nonetheless, there is a risk that long-term competitive outcomes in this segment could be

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<sup>116</sup> In future it may be possible to locate chargepoints from rival chargepoint operators in the same neighbourhood or street. This may be more feasible in residential car parks, streets where there is plenty of on-street parking, and in high density areas where there will be greater demand, for example we note that in some parts of London there are multiple chargepoint operators offering on-street charging (eg Southwark). The use of staggered and/or overlapping contracts may also in time be feasible.

<sup>117</sup> London is one of the few examples where more than one operator is present locally, though in the examples we have seen this tended to be on adjacent streets rather than on the same street.

<sup>118</sup> This also increases the risk that LAs will have to pay incumbent operators more than necessary to install and maintain chargepoints, reducing the scale of roll-out for a given amount of public funding available.

weakened if LAs are not sufficiently equipped to manage competition and effectively oversee the market.

### **Dundee case study**

Dundee is a city with a population of around 150,000 people, of whom just over 50% do not have access to off-street parking. It took two years of consultation and detailed planning to find the best locations for the chargers, looking at network capacity and user convenience as well as chargepoint type and the optimum number of chargers in any location. Dundee City Council's strategy involved targeting the most polluting vehicle sectors (in particular taxis and commuters into the city centre).

Dundee installed slow chargepoints in multi-story car parks, with city residents and those travelling into the city a particular target for these. Dundee also installed three hubs of six rapid chargepoints and four fast chargepoints within hubs placed strategically around the city to help cut travel into the city and reduce emissions. In addition, it has started a pilot of pop-up on-street charging located within the pavement in eight locations across the city. If the pilot is successful, it hopes to be able to roll out pop-up chargepoints to whole residential streets in the future.

To deliver this roll-out, Dundee City Council ran a multi-million pound open tender in 2016 for which it appointed SWARCO on a four year contract to install and maintain chargepoints. The tender was awarded based on a 65% weighting on quality and 35% weighting on the cost to Dundee City Council. It also made some further direct awards to SWARCO during this period.

- 5.48 In line with the above, we also found that LAs are generally setting on-street charging prices largely by reference to the prices that other LAs set, rather than using the competitive tender process to determine prices. At present, prices are often set below running costs (with capital costs largely covered by grants) in order to encourage switching to EVs. However, there is a risk that higher prices could be charged potentially in the future. As the sector develops, it will be important for prices to be set at competitive levels.
- 5.49 In order to maximise competition for the market, LAs need to design, assess and award tenders in a way which attracts and enables chargepoint operators who have the most competitive proposition (eg in terms of price and quality of service). Beyond the initial tender, it is also important to ensure that competitive tension can be sustained at re-tendering. This needs long-term planning by LAs to avoid them being tied to an incumbent provider and, where possible, anticipating and planning for the competitive introduction of new technologies in the future. Active contract management will also help to ensure good outcomes are being delivered throughout (ie reliable working chargepoints which are maintained).

5.50 However, we recognise that this is challenging for LAs, particularly if they do not have sufficient resource in place (which is the case for many LAs). To maximise effective competition and protect consumers, LAs will need sufficient resource, capacity, specialist skills and guidance to run tenders and actively manage contracts in on-street charging.

One LA reported practical challenges for LA resourcing because engagement with other chargepoint operators implies a resource cost for LAs in terms of running the procurement process. Even if operators bring their own resource there are costs for the LAs in terms of having the relevant conversations and opening doors to operators.

5.51 The CMA has previously looked at [the role of LAs in delivering competition](#) and considered the opportunities as well as risks involved, with reference to our work in previous markets. We have set out further guidance to LAs specifically regarding EV charging in the measures section below.

#### *Delivery models for on-street charging*

5.52 The main delivery models for increasing investment and competition in on-street charging are:

- (a) LA-led tendering, building on the current approach set out above;
- (b) more centralised tendering, which would involve nationally or regionally led procurement for on-street charging provision, allowing a range of successful bidders providing on-street charging infrastructure and/or services in different areas or regions; and
- (c) a utility regulation model, which would involve regulating the provision and prices of on-street charging provision in a similar way to electricity networks.

5.53 There appear to be many benefits of a LA-led approach so long as it is implemented effectively. Unlike other delivery models, this approach is already in place and being followed by some LAs. The 'need for speed' in installing new chargepoints (see chapter 3) is an important factor in favour of building on an existing approach. As noted above, LAs have a central role in on-street charging and are in a particularly strong position to assess local requirements, which will vary by area. The roll-out will also need to integrate with wider local transport policy objectives overseen by LAs (such as overarching ambitions to reduce emissions and car usage).

- 5.54 However, based on the limited and patchy roll-out we have seen to date, there will need to be a step change in this approach so that LAs carry out and are accountable for a much more active and defined role. To do this they will need to have sufficient direction and support. Setting out a clear LA role, for example through a statutory duty, will be important in establishing this, alongside additional resourcing and capabilities. Greater oversight and support for LAs from national governments will also be needed to identify and help address problems they may be having.
- 5.55 While there are some potential benefits of the other delivery models (eg it may be easier to develop specialist expertise and capacity and greater direct accountability under more centralised tendering), they would require a significant change in direction from the current approach, which could slow down immediate roll-out and risk losing the benefits of locally-led solutions. Any consideration of a more centralised approach should take into account the risks and costs of slowing the pace of development. The utility regulation model would also require very active regulation and oversight and lose some of the competition benefits.
- 5.56 As noted in paragraph 5.20, another alternative approach is for the on-street infrastructure deployment to be split between longer-life core infrastructure that is below the ground and the remaining 'above ground' components (split infrastructure deployment).<sup>119</sup> This above ground infrastructure is where there is likely to be greater innovation and therefore greater benefits from more frequent tendering and shorter-term awards. This could also allow new operators to enter more easily, potentially with new innovations and a lower cost service.
- 5.57 In theory, the split infrastructure deployment approach appears to be a relatively attractive model as it could potentially allow for longer-term financing of below ground assets,<sup>120</sup> as well as enabling increased competition for the market in the above ground chargepoint infrastructure, unlocking the benefits outlined above. LAs would play a significant role in this deployment model, particularly in the short-run tendering for the above-ground infrastructure, to ensure the needs of their residents are met.

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<sup>119</sup> Below the ground includes for example cabling and underground boxes to enclose chargepoint hardware and above ground components includes for example bollards, chargepoint sockets, software and potentially some of the hardware enclosed in the underground boxes.

<sup>120</sup> This could possibly be regulated and financed using a traditional Regulated Asset Base model (as is the case for electricity networks). Alternatively, it could be delivered through LA-led or more centrally led procurements, financed by governments or their agencies (for example the UK Infrastructure Bank or the Scottish National Investment Bank) with an access price to provide a return on the financing.

5.58 Given the potential benefits in terms of enabling greater private investment and competition, we consider that this model should be actively considered by governments – for example through trials - in conjunction with LAs.

## Measures for on-street charging

**5. We recommend that LAs take a more active role in planning and managing the roll-out of on-street charging to maximise competition and protect local residents.**

To support this roll-out and deliver effective on-street competition, LAs should have a clear local plan in place and take into account the key factors we have set out (see Figure 9 below).

**6. We recommend that governments take action to properly equip and incentivise LAs to drive forward roll-out, while also providing greater support and oversight. A step change can be achieved by:**

- providing funding for dedicated expertise;
- clearly defining the role eg introducing a statutory duty;
- facilitating greater knowledge and best practice sharing; and
- proactively encouraging and supporting any LAs that are lagging behind.

Governments should also work with LAs to explore and pilot other ways to roll-out on-street charging which may attract more investment and competition in the longer term, in particular split infrastructure deployment and financing models.

**Figure 9: Key factors for LAs in maximising on-street competition**

- Managing price and quality - use tenders to constrain prices and set/monitor stringent key performance indicators (KPIs) to ensure value for money for EV drivers and a quality service – free charging can encourage EV-take up but in the long-run may also deter private investment and may be unsustainable financially so consider using it carefully or be clear upfront that there is a ‘sunset clause’.
- Contract length – test how long contracts need to be to attract sufficient bidders taking account of the costs of chargepoint hardware, below the ground infrastructure and expected utilisation.
- Collaborating – where feasible work with other LAs ie regional partnerships, to deliver greater scale and efficiencies. As part of this work closely with DNOs.
- Flexibility in contract awards - use Dynamic Purchasing methods to build frameworks or agreements that provide access to the widest possible range of chargepoint operators during the life of that framework or agreement.
- Risk of incumbency – where possible identify and implement strategies to reduce risk of relying on one supplier in an area/region, for example tendering regularly and staggering contracts.
- Exclusivity - manage and limit exclusivity to what is appropriate for supporting business incentives to invest at each stage of roll-out (particularly important as utilisation increases).
- Technical agnosticism – ensure that it is easy and inexpensive to change operators at the end of the contract.
- Interoperability – ensure that chargepoints are interoperable ie can be used by any brand of EV and different connectors.
- Demand-led – where possible look at how to maximise ways of installing chargepoints where there is current as well as future demand, for example introducing a way for residents to request a chargepoint on their street.

5.59 Between now and 2030 there needs to be a significant scaling up of investment in on-street charging. Our recommendations are designed to address this key challenge, alongside generating more effective competition and protecting consumers.

- 5.60 There needs to be a step change in the role that LAs are currently taking in on-street charging and the support and resource available to them. Rather than focusing on short-term infrastructure and investment, this means much more active oversight of the market and planning roll-out (as set out in Figure 9). Our recommendations will help to ensure that the immediate roll-out of on-street charging is delivered in a more effective and active way by LAs, building on their current role, with greater support from governments.
- 5.61 In addition to this, further work should also be undertaken now to understand and explore whether there are additional ways to achieve roll-out at greater pace and scale.
- 5.62 In all cases we would expect that LAs will continue to play an important role in on-street charging.

## **6. Home, workplace and destination charging**

- Charging at home, work and at destinations is developing relatively well - with significant appetite for investment from a range of suppliers.
- We found that there are some immediate challenges for people when buying home chargepoints, as there can be limited support and information. Over time we anticipate that knowledge and awareness of home charging options will increase, but this should be monitored as the sector evolves.
- Open standards for controls and data used by home chargepoints can help to simplify and automate smart charging - enabling third-parties to develop innovative solutions and applications for controlling home charging and other home energy services.
- Without these in the longer-term people may not be able fully to benefit from smart home charging and flexibility in the electricity system, which offers savings and smooths demand on the network. More generally open standards can help to enable greater competition, as we've seen in other markets.
- We recommend that UK Government set open data and software standards so that people can maximise the benefits of smart charging and flexible home energy systems. We also strongly support Government plans to require new private chargepoints to be smart and meet minimum quality standards.

### **Introduction**

- 6.1 For the majority of EV drivers, home charging offers a convenient and cost-effective option for regular charging. Workplace charging can offer an alternative form of charging for those who drive to work, and destination

charging can be convenient for people that regularly travel to other destinations.

- 6.2 In this chapter we assess how investment and competition in EV charging is developing in each of these segments. We also consider problems that people are facing in home charging and how to address these. The next chapter looks at people's experience of public charging (covering en-route, on-street and destination charging).
- 6.3 Appendix C sets out the range of relevant evidence we have gathered and assessed - including internal documents from chargepoint operators, and submissions from consumers and other stakeholders.

## **How home EV charging is developing**

- 6.4 Unlike other segments, we have not found evidence which suggests that the private sector will not support the necessary roll-out of home chargepoints. Drivers that wish to switch to an EV and have off-street parking (ie garage/parking space) can easily arrange to have a home chargepoint installed. There is no 'chicken and egg' problem as seen in other segments, because in home charging EV drivers are able to purchase and install chargepoints as and when they choose to. Whereas, as discussed in chapter 3, in other segments the commercial case to install chargepoints and EV demand are dependent on each other.
- 6.5 There are a large number of firms active in the supply of home charging. Pod Point has a particularly high share of supply [50-60%], followed by bp pulse [10-20%] and Rolec [5-10%]. There are also other firms that currently have smaller shares of supply but that are growing rapidly - including myenergi, EO Charging, Ohme Technologies, Anderson, Wallbox, Ates and New Motion.
- 6.6 Although the supply of home charging is currently concentrated, the evidence we received indicates that there appear to be low barriers to entry and expansion - with a number of new entrants bringing innovative products to market and ambitious strategic plans, which is generating increased competitive pressure. A number of industry stakeholders (including both the larger and smaller chargepoint operators active in this segment) also submitted that they consider the home charging segment to be competitive. This was supported by internal documents we reviewed from new entrants.

There is a significant amount of competition and this segment is the most established – [Energy UK](#).

The market place for off-street home charging is becoming well established with various models available offering a number of different features across a wide price range – [Northern Ireland Energy Networks](#).

6.7 We expect that there is likely to be continued investment in home charging and there do not appear to be any reasons why competition between providers in home charging will not generally develop well given apparent low barriers to entry and significant investment appetite from new entrants. Therefore overall, we have not found significant challenges in the supply-side of home charging. However, we found there are some problems people may experience in home charging, which we consider in the next section.

### **Problems people can experience in home charging**

6.8 Overall, it is relatively straightforward for people to buy and install a home chargepoint.<sup>121</sup> The Government’s EVHS grant currently helps toward the cost of purchasing and installing a smart chargepoint (funding up to £350 - see chapter 2), although from 1 April 2022 it will only be eligible for those in rented or leased accommodation.<sup>122</sup>

6.9 Currently, most home chargepoints can be used with any EV and energy tariff which means that people generally have a wide range of options and aren’t limited to choosing a particular chargepoint based on the type of EV or their energy supplier (see Appendix C). This type of interoperability is important as it enables people to choose and switch freely between different products and services, without being tied in.<sup>123</sup>

6.10 However, we have identified some immediate challenges and longer-term risks for people buying and using home chargepoints, which we explore in the following sections.

#### ***Limited support and information when buying a home chargepoint***

6.11 Evidence from a number of different sources highlighted that people may currently rely on EV manufacturers and car dealerships when making

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<sup>121</sup> There are three ways to charge at home - through a three-pin plug connection (which is very slow); using a ‘dumb’ chargepoint (works similarly to eg a mobile phone or tablet charger) or a ‘smart’ chargepoint (see chapter 2 for further details). In this chapter we focus on the use of chargepoints for home charging.

<sup>122</sup> [Support for small businesses, landlords and leaseholders: government charges up the electric vehicle revolution with £50 million boost - GOV.UK \(www.gov.uk\)](#).

<sup>123</sup> We also note and welcome [Government’s recently announced plan](#) to require smart home chargepoints to be designed so they are compatible with any energy supplier ie do not lose smart functionality when people switch supplier.

decisions about home chargepoints (see Appendix C). A number of stakeholders, including several chargepoint operators, told us that people currently have a low awareness and understanding of the chargepoint options and may be more reliant on information and advice provided by EV manufacturers and dealerships at the point of sale. Research provided by a chargepoint operator found that 45% of home chargepoint sales in major European countries including the UK are made through EV manufacturers and dealerships.

- 6.12 It also seems likely that when people are buying an EV, they will generally put most of their time and effort into researching different EV models – which is a much larger purchase – rather than the chargepoint. There was some evidence to support this. For example, a research document prepared for one stakeholder found that ‘home charger choice and install [is] steered by car deal/dealer’ and that consumers’ own research into chargepoints tends to be ‘cursory and quick’. It found that people were ‘not weighing up the options in much detail’ and had little mental capacity to take on real research into chargers after making the decision to switch to an EV.
- 6.13 However, a number of stakeholders highlighted that dealerships themselves have limited knowledge of the different chargepoints and therefore may not be best positioned to support and advise consumers. We have also seen internal documents showing that EV manufacturers and dealerships are entering into preferred partnership agreements with chargepoint operators. This means that the preferred operators’ chargepoints are recommended over other options, and sales staff can be financially incentivised to sell chargepoints from certain operators. Therefore, there is a risk that people are not adequately informed of the full range of options.
- 6.14 Several stakeholders also raised concerns that there is a lack of standardisation in the quoted costs for installing home chargepoints<sup>124</sup> and some highlighted that there can be additional costs which may not be clear at the time of purchase (eg fees for fuse upgrades or rewiring).<sup>125</sup>
- 6.15 Choosing and purchasing the right home chargepoint (and tariff) that meets people’s needs is important. Over time as the number of EVs grows, we anticipate that knowledge and awareness of home charging options will increase both for consumers (with tools like comparison websites to assist) and among dealerships.<sup>126</sup> However, this is an area that we consider it will be

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<sup>124</sup> For example see [submission from Rightcharge](#).

<sup>125</sup> For example see [submissions from Citizens Advice and UKPN](#).

<sup>126</sup> For example [Rightcharge](#) (an online service to help drivers compare home chargepoints) submitted that ‘An assessment of promotions by automotive companies shows that the vast majority of automotive retailers (car

important for the Government to monitor as the sector develops and consider whether specific measures may be necessary to protect consumers in future,<sup>127</sup> in the next chapter we discuss monitoring and oversight of the consumer experience in public charging.

### ***People could miss out on the benefits of smart charging and future home energy management***

- 6.16 Smart charging and in future other technological developments offer a number of benefits, not just to EV drivers but to all users of the electricity system. People can potentially make significant savings using smart charging and it benefits the electricity system by smoothing demand (see chapter 2).
- 6.17 Given these benefits, over time as the number of EVs increases, it will be critical that people can easily use smart charging, so it becomes widespread. We note that the UK Government is currently undertaking work on smart charging, and has set out [proposals to require new private chargepoints to be smart](#), which we strongly support.
- 6.18 The more automated and the simpler smart charging is, the easier it will be for people to use, and the more likely that its benefits will be optimised. To use smart charging, the home chargepoint needs to be able to communicate with the EV and energy supplier to adjust the time and speed of charging.<sup>128</sup> This process can be done manually (eg the driver sets a timer for their chargepoint) which can be complicated. Manual settings also don't fully utilise smart charging functionality as they lack the same level of flexibility - for example, it's harder and inconvenient to react to real-time changes in electricity prices.
- 6.19 To fully maximise the benefits of smart charging, a chargepoint may need to be able to communicate with another third-party – an aggregator or flexibility provider. Open standards for controls and data used by home chargepoints can help to do this by simplifying and automating smart charging. Open standards involve ensuring data collected by home chargepoints on electricity usage and charging is in a standardised, accessible format, and that the chargepoint can be easily controlled through a standard interface. This makes it easier for trusted third-parties to develop innovative solutions and

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dealerships and leasing companies) currently only refer drivers to a single home charge point option. This, we believe, is not due to a lack of will but instead is due in part to the fact that independent, multi-brand partners have only recently emerged in the market, and we hope to see this gradually change as automotive retailers realise that they can offer a wider range of choice without adding complexity to their sales process.'

<sup>127</sup> For example, dealerships and EV manufacturers could be required to offer 'cooling off' periods.

<sup>128</sup> This enables the chargepoint to start charging when electricity is at its cheapest, stop when demand is particularly high and then re-start again, over a pre-set time period to ensure the EV is still sufficiently charged.

applications, for example to control the chargepoint (with permission from the users).

- 6.20 Some stakeholders noted that open standards and data can help to improve people's experience by ensuring they are not 'locked in' to the chargepoint operator's interface, but have a choice of alternatives to manage the chargepoint from third-parties.<sup>129</sup> Without open standards and data, people are restricted to using the interface that comes with their chargepoint to manage charging, unless they replace the chargepoint, which can be costly and difficult. Therefore, open standards and data will help ensure that people can easily charge their EV in a way that works for them, while reducing charging costs and providing flexibility to the electricity system. Open standards can also help to generate more competition and innovation in the sector, as new players can enter and compete to develop these solutions and improve the charging experience.<sup>130</sup>
- 6.21 While this may not be an immediate concern for people, we consider that open data and standards for home chargepoints are likely to generate significant long-term benefits.<sup>131</sup> Over time as more home appliances become 'smart', and more households have heat pumps, domestic batteries and solar panels, open standards in home chargepoints would also enable the development of third-party solutions to help manage the entire home energy ecosystem via a single integrated service. This will help to maximise efficiency and savings from home energy use<sup>132</sup> and provide flexibility to the electricity system. We note that many stakeholders also supported such innovation and energy flexibility in workplace charging (see Appendix C).
- 6.22 Our previous work in retail banking has highlighted the benefits of open standards and data for competition and innovation and better outcomes for consumers.<sup>133</sup>
- 6.23 People will also need to be informed clearly of the implications and benefits of open data and have control over how their chargepoint data is used. There will need to be sufficient, strong data protections in place. A [joint statement](#)

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<sup>129</sup> For example, see [Centrica submission](#). As we consider in the following section, we note that people can still be at risk of being locked in to a chargepoint through bundled offerings.

<sup>130</sup> We also considered evidence on whether it should be possible to change the software system in home chargepoints. Some chargepoint operators supported this but a number also raised concerns that making home chargepoints function in this way is difficult, adds substantively to the overall cost of home chargepoints and is not a necessary or useful function for consumers. See also Appendix C.

<sup>131</sup> This would need to be implemented with due regard to competition law.

<sup>132</sup> For example, to turn off supply for devices that aren't being used overnight and divert to the EV charging.

<sup>133</sup> Open Banking was introduced following the [CMA's market investigation into retail banking](#). Open Banking allows customers to share their current account data through secure, standardised and open Application Programming Interfaces (APIs) with trusted third-parties without having to disclose their online credentials to them - see also Appendix C.

between the [CMA and ICO](#) published earlier this year sets out a number of relevant considerations for protecting the data of users of digital services and promoting competition.<sup>134</sup> We also note [UK Government plans to legislate](#) for smart home chargepoints to meet cyber security standards.

### ***Bundling could make it hard to compare deals and risk being ‘locked in’***

- 6.24 Bundling (selling different items ie products and services, together as a package) is not currently very prevalent. However, some bundles which include home charging are starting to be offered eg energy tariffs bundled with discounted public charging and energy tariffs bundled with the home chargepoint. Some stakeholders noted that bundling may become more common as new business models develop.<sup>135</sup> Bundling may in future be used to help spread the cost of home chargepoints (similarly to mobile phones and pay-monthly tariffs).
- 6.25 While bundling can help to simplify product and service options, it can make it harder to compare these and to choose the right deal. For example, it may be cheaper to buy a chargepoint and tariff separately, or a separate tariff may be more suitable to a driver’s needs than the one offered in a bundle. We discuss this further in chapter 7.

### ***Some people may face additional challenges***

- 6.26 Some groups may face additional challenges in home charging. For example, people living in rented, leased or multi-unit accommodation can find it difficult to get permission to install or decide who pays for home chargepoints. Those who are less ‘tech savvy’ may also particularly struggle to engage with potentially complex and technical aspects of smart charging. Therefore, it will be important to ensure that home chargepoints are accessible and interoperable to all drivers and EVs (as set out in the next chapter).
- 6.27 We understand that OZEV is considering how to address the challenges facing renters and those in leased accommodation through reforms to the EVHS.

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<sup>134</sup> This includes views that users should have clear information about what personal data is collected and how it is used, and can make an informed decision over whether to accept the terms offered by platforms for use of their personal data; and users having more control over their personal data to make meaningful decisions over whether to withhold access to it or share it with others.

<sup>135</sup> For example, [submissions from E.ON, Citizens Advice and DCC](#) - see also Appendix C. New business models include energy companies owning or partnering with chargepoint operators - for example, [PodPoint \(part owned by EDF Energy\) offers an EDF tariff as part of its ‘Solo Smart Charger’](#).

## Measures in home charging

### **7. We recommend that the UK Government sets open data and software standards for all home chargepoints.**

We also strongly support Government plans to require new chargepoints to be smart and meet minimum quality standards.

- 6.28 As EV take-up increases, it will be critical to ensure that people charging at home can fully utilise and benefit from smart charging and energy flexibility, to save costs, and help manage demand on the electricity system. Open data and software standards for home chargepoints will enable innovative solutions to make it easier for people to use smart charging and other potential future services. It will be more effective to develop these standards early on in the sector, rather than seeking to introduce them at a later date. It will also be important to have the appropriate governance and systems in place as part of this.
- 6.29 Smart charging will have many benefits for people and the wider electricity system. As the EVHS grant ends, people may be put off from buying smart chargepoints. Ensuring compliance with minimum quality standards will help to reassure people about the benefits of smart chargepoints.

## How workplace EV charging is developing

- 6.30 There are significant investment opportunities in workplace charging supported by Government grants. If workplaces are encouraged to anticipate the long-term need of their workforce to charge at work, the ‘chicken and egg’ problem may also be less problematic to the roll-out of workplace charging. In this respect, the Government is consulting on requiring new and existing non-residential buildings (including workplaces) to provide chargepoints (see Appendix C). This is likely to lead to substantial investment in workplace charging.
- 6.31 There are a large number of firms active in the supply of workplace charging, although there is some concentration of supply in this segment. Rolec currently has the highest share of supply [20-30%], followed by Pod Point [10-20%], EO charging [5-10%], Alfen [5-10%] and myenergi [5-10%].
- 6.32 Despite this, the evidence indicates that competition between firms is generally developing well in this segment (see Appendix C). No significant concerns were raised by stakeholders about competition in workplace charging with some industry stakeholders noting that it was highly competitive. In particular, there appear to be low barriers to entry and

expansion, with many firms that have entered in recent years. There are also significant investment opportunities in this segment as from the shift to EVs. Chargepoint operators' strategy documents also indicate that competition is increasing in this segment. Much like home charging, we consider there may also be benefits from open data and standards.

- 6.33 We found that there is likely to be ongoing investment in workplace charging, supported by Government policies and there are no apparent reasons why competition generally will not develop well. Therefore, there is no clear need for measures at this stage.

## **How destination EV charging is developing**

- 6.34 We found that there is significant private sector investment appetite in destination charging (see chapters 2 and 3). There is a wide range of destination locations where chargepoint operators are installing chargepoints including supermarkets, retail outlets, leisure facilities, hotels, restaurants, tourist attractions, and town/city centre car parks. Chargepoint operators told us that there are many landowners of such sites that they can reach agreements with to install chargepoints and that this is an easy process (particularly, easier than engagement with LAs). Landlords at these sites are often supportive of these investments as they can help drive footfall at these destinations. This alleviates the 'chicken and egg' problem and helps drive investment in destination charging.
- 6.35 Many chargepoint operators are active in this segment, although there is some concentration of supply among the top suppliers. Pod Point and bp pulse have a significant presence with shares of supply of 29% and 18% respectively.<sup>136</sup> Tesla is also a significant presence in destination charging but is only available to Tesla drivers.<sup>137</sup> Other chargepoint operators active in this segment include ChargePlace Scotland, ZeroNet, GeniePoint, InstaVolt, Charge Your Car (run by bp pulse), Osprey, VendElectric and EV ChargeOnline.
- 6.36 Although there is some concentration in the supply of destination charging, much like the other segments discussed in this chapter, there is evidence of low barriers to entry and expansion. Many stakeholders (including a number of chargepoint operators) told us that competition is developing well in this segment. A few stakeholders raised land banking of sites as a possible concern but we have not found substantial concerns about this.<sup>138</sup> There are

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<sup>136</sup> CMA analysis of Zap-Map data, 26 February 2021.

<sup>137</sup> We have therefore not included Tesla's chargepoints in the share of supply estimates for destination charging.

<sup>138</sup> Land banking involves buying up undeveloped land as an investment, rather than developing/using the land.

a wide range of destination locations and agreements can be reached relatively easily with landlords at these sites (who, we were told, often run open tenders). Consumers are therefore likely to have an increasing number of competing destination sites where they can choose to charge their EVs, helping to deliver competitive outcomes in this segment.

- 6.37 Based on our assessment above, we found that investment and competition is developing relatively well in this part of the sector. Therefore, there is no clear need for measures at this stage.

## 7. Problems people face using public charging

- Building people's confidence and trust in the sector is key for EV take-up. Using and paying for public charging needs to be a simple, positive experience - it should be as easy and convenient as filling up with petrol or diesel.
- However, that isn't always the case. As well as there being a lack of chargepoints, it can be difficult, confusing and frustrating for EV drivers to find and access working chargepoints, compare costs and pay for charging.
- Some people can also face greater challenges - such as disabled drivers, those who are less tech-savvy and drivers in remote/rural areas.
- Emerging developments like subscriptions and bundling could make charging even more confusing and 'lock in' people to deals so they end up paying more than they need to – as we've seen in other markets.
- As the sector evolves, competition develops and there are more chargepoints, some aspects of charging are likely to improve; however, this will not address all the problems, particularly where it is not in the interests of chargepoint operators to do so.
- A poor charging experience at this early stage risks putting people off EVs. Therefore, intervention is needed now to build trust and for EV take-up.
- We recommend that as part of its work in the sector, the UK Government takes into account the following principles and tasks a public body with implementing, overseeing and monitoring these as the sector develops, to ensure drivers have a positive charging experience:
  1. It is easy to find working chargepoints eg. people can access data on live availability and working status and rely on minimum reliability standards;
  2. It is simple and quick to pay eg. no sign-ups needed, contactless bank account payment is widely available, and charging networks keep up with new payment technology;
  3. The cost of charging is clear: eg. prices are presented in a simple, standardised pence per kilowatt hour (p/kWh) format; and
  4. Charging is accessible and interoperable eg all chargepoints can be used by all drivers, are not limited to a single brand of car, and follow inclusive design principles.

### Introduction

7.1 It is critical that EV charging is a simple and positive experience for people, to build trust and confidence in the sector and for the successful take-up of EVs. This chapter sets out:

(a) The importance of a positive public charging experience;

- (b) Problems people are facing (including additional challenges for some groups);
- (c) Emerging developments in the sector; and
- (d) Measures to make public charging easier.

7.2 Appendix D sets out the relevant evidence we have gathered and assessed - including from chargepoint operators, consumers and consumer bodies and a range of other key stakeholders. We also analysed data from Zap-Map on UK public charging networks (see also Appendix E).<sup>139</sup>

## **Importance of a positive public charging experience**

7.3 All EV drivers will use public charging at some point - whether to top-up when out and about (eg when parked up at a supermarket, restaurant, cinema or tourist spot), for on-street charging (a particularly important option for those without off-street parking) or recharging when travelling on longer journeys.

7.4 A good experience of using public charging will be important to EV take-up, to build people's trust and confidence in the sector. The experience of charging is different to filling up a petrol or diesel car; however, the process for using and paying for charging should be as simple and convenient. People are familiar with using and paying for petrol/diesel at any station and this being a reliable, straightforward experience. Drivers should also simply be able to turn up, charge and pay when out and about and have options to charge easily and cheaply overnight. If charging is confusing or difficult, this will undermine trust and put people off the shift to EVs.

7.5 The most important factor for EV take-up at this early stage of the sector is having enough chargepoints and people's perceptions of this. In one survey the most common reason given by respondents (non-EV drivers) for not considering purchasing an EV as their next car, was that there are not enough chargepoints. In the same survey, two-thirds were worried about range anxiety.<sup>140</sup> People therefore need to be confident that there are enough charging options to suit their needs ie in the right places and at the right speeds.

7.6 The evidence shows that other important aspects of the public charging experience are:

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<sup>139</sup> Zap-Map data is as of 26 February 2021 covering 61 charging networks, with some small networks excluded.

<sup>140</sup> February 2020 AA Yonder Driver poll. 68% of 9,250 respondents.

- (a) reliability of public chargepoints - for example, reliability was ranked as the most important factor for a public network in a 2019 Zap-Map panel survey of over 1,600 EV drivers and again in a 2020 Zap-Map panel survey of over 1,500 EV drivers.<sup>141</sup> High reliability is particularly important at this early stage of the sector while chargepoint provision is low - as drivers have few alternative options. Perceptions of poor reliability can also deter people from EV take-up, through range anxiety;
- (b) accessible information to help find working chargepoints and to plan for longer journeys - for example, 94% of more than 17,000 (EV and non-EV) drivers surveyed in January 2021<sup>142</sup> said that access to real-time data on chargepoints (ie knowing in advance if they are out of service or unavailable) would make chargepoints easier to use;
- (c) simple and consistent payment methods - for example, in the same survey 96% of drivers said that contactless payments at all public chargepoints would make it easier to charge, and 87% said that having access to all public chargepoints via a single smartphone app or membership card would make it easier;
- (d) clear comparable pricing to easily find the best deals - in the same survey over 90% of drivers said that standardised pricing would make it easier to use public chargepoints. We note that the price of charging may currently be less significant than other aspects, particularly as it is cheaper than petrol/diesel, but it is likely to become more important over time; and<sup>143</sup>
- (e) interoperability (ie public chargepoints that can be used with all brands of EV and different connectors) - for example in a 2019 AA survey,<sup>144</sup> 87% of 17,633 (non-EV drivers) thought that being able to easily use any available public chargepoint is an important factor in deciding whether or not to buy an EV. In addition, 86% of respondents agreed that all chargepoints on public land should be accessible to all EV drivers.

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<sup>141</sup> In the 2019 [Zap-Map panel survey](#) of over 1,600 EV drivers, reliability was ranked as the most important factor for a public network (out of reliability, cost, speed of charging, facilities). In the 2020 [Zap-Map panel survey](#) of over 1,500 EV drivers, reliability was the key factor (out of reliability, ease of use, cost and facilities).

<sup>142</sup> AA January 2021 Yonder Driver poll, fieldwork completed 12-20 January 2021. 'A great deal or quite a bit easier' and 'somewhat easier' response options. Of the 17,302 respondents, 890 were EV drivers and responses among this group were similar to the whole sample or higher: 99% said contactless payment would make it easier; 93% said a single app or card would make it easier; 99% said access to information would make it easier and 95% said standardised pricing would make it easier to use public chargepoints.

<sup>143</sup> For example, a [2020 Zap-Map panel survey](#) of over 1,500 users showed that reliability and ease of use were more important factors than pricing, which has remained consistent over time. Appendix D sets out further evidence on what people find most important in EV charging.

<sup>144</sup> The AA Populus Driver Poll is run across a panel of members, who are not necessarily fully representative of the general driving population. This survey was run from 10 -17 December 2019 and was completed by 17,643 respondents, of which 17,633 were drivers. This question was asked of the latter base.

- 7.7 Overall, these priorities are largely similar across the UK. However, we found that people are facing problems in these key areas of public charging, and some groups - such as disabled drivers - can face additional difficulties,<sup>145</sup> which we explore in this chapter. Some aspects of the charging experience can be more or less important in the different nations, due to their particular circumstances and variation in policy approach. For example, there are differences in chargepoint installation, with slower roll-out in Wales and Northern Ireland than in Scotland and England (see chapter 3). In Scotland, through regular monitoring of faults and engagement with the unit hosts, we were told that generally reliability is good, although concerns were raised about reliability in Northern Ireland.<sup>146</sup> In Wales, some stakeholders noted that bilingual support and services will be important in public charging.<sup>147</sup>
- 7.8 There is evidence that at this early stage of the sector's development, many people are unfamiliar with EV charging - for example half the respondents to a survey who would consider owning an EV (but don't currently or plan to own one as their next car) said they found the whole subject of EV charging confusing.<sup>148</sup> While it is not possible to predict how the sector will evolve, over time as the number of EVs increases, we anticipate that people will become more familiar with EVs and charging. We have also seen evidence of emerging payment methods linked to new technologies, and subscriptions and bundling becoming more common. It is important that such developments do not lead to further problems for charging in future - such as making charging more confusing or locking people in to deals, as we've seen in other markets.
- 7.9 In some areas, we expect the charging experience is likely to improve over time as the sector evolves, competition develops and more chargepoints are rolled-out. However, this is unlikely to be the case across all aspects of charging, particularly where there are limited commercial incentives for chargepoint operators. Additionally, as the evidence above highlights, in the meantime a difficult charging experience will undermine trust and put people off EVs. Early intervention now to improve the charging experience, steer the sector in a healthy direction and prevent problems arising down the line, will help to boost people's confidence, build trust and mean a smoother transition to EVs.

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<sup>145</sup> The [Research Institute for Disabled Consumers](#) found that 61% of disabled people would consider buying an EV only if charging was made more accessible (25% would agree to consider getting an EV now).

<sup>146</sup> [The Electric Vehicle Association NI](#) found that almost 60% of EV drivers were considering switching back to petrol or diesel cars due to issues with reliability. As set out in chapter 2 we note that some barriers to reliability in Northern Ireland have been recently removed.

<sup>147</sup> One LA has made bilingual provision a requirement in their invitation to tender.

<sup>148</sup> AA Populus Driver survey from 12-18 March 2019. Base: 15,922 respondents.

- 7.10 We recognise that the UK Government, Devolved Administrations and other bodies including Ofgem and EVET are undertaking significant work in this area to look at the people's experiences of charging (see Appendix D). In particular, OZEV recently consulted on [the consumer experience at public chargepoints](#), including measures to improve reliability, open up chargepoint data, make it easier to pay for charging and having a standard pricing metric – areas we explore below. OZEV plans to regulate to improve the consumer experience in public charging later this year.
- 7.11 We have therefore recommended that, as part of its work in the sector, UK Government takes into account four key principles to ensure charging is as simple as filling up with petrol/diesel. It should task a public body with implementing, overseeing and monitoring these as the sector develops to build people's trust. This will help ensure that EV charging works for people, now and in future.

**Charging should be as simple as filling up with petrol or diesel. This means:**

1. **It is easy to find working chargepoints** eg. people can access data on live availability and working status and rely on minimum reliability standards;
2. **It is simple and quick to pay** eg. no sign-ups needed, contactless bank account payment is widely available and charging networks keep up with new payment technology;
3. **The cost of charging is clear** eg. prices are presented in a simple, standardised p/kWh; and
4. **Charging is accessible and interoperable** eg chargepoints can be used by all drivers, are not limited to a single brand of car, and follow inclusive design principles.

## **Problems people are facing**

- 7.12 In this section we examine in more detail the problems that people are facing in public charging.

### ***Not enough chargepoints in the right places***

- 7.13 Consumer surveys consistently highlight that putting in enough public chargepoints ahead of demand is critical to help alleviate range anxiety and for EV take-up. For example, a [2021 EV driver survey](#) by Shell found that the

'biggest desire' for an improved charging experience for UK drivers was increased availability of public chargepoints (43%) and a [2020 survey](#) by Deloitte found that UK consumers' greatest concern about EVs was a lack of charging (identified by 33% of respondents - up from 22% in 2018).

7.14 As set out in earlier chapters, the rate of public chargepoint installation needs to accelerate sharply in order to meet anticipated demand by 2030, and provision across the UK is very uneven with significant differences between nations, regions and LAs. We have already set out a number of measures to unlock private investment and promote competition which will help address the barriers to roll-out. Therefore, we do not consider chargepoint provision in detail in this chapter. The fact that the public network is still small (albeit growing) exacerbates some of the other issues discussed in later sections. Accelerating chargepoint roll-out is therefore essential to improve people's experience of charging.

### **Concerns about reliability**

7.15 Overall, we found that reliability is improving over time, though there are some ongoing concerns, particularly with rapid chargepoints along motorways.

7.16 There can be reliability issues with the chargepoint hardware and/or software. Evidence from chargepoint operators suggests that issues often arise due to faulty communication between the chargepoint and back office system (eg payment or software provider) and older technology in the chargepoint or EV.

7.17 We carried out analysis on Zap-Map data to look at reliability levels across public charging. Table 6 shows the percentage of chargepoints by speed in en-route, on-street (kerbside only) and other types of charging (including destination) which were out of service at some point on 26 February 2021.<sup>149</sup> On average around 1 in 25 chargepoints were out of service.

**Table 6: Proportion of chargepoints out of service (single point in time in 2021)**

| Segment                                  | % chargepoints inactive by speed |      |       |             |                             |
|--|----------------------------------|------|-------|-------------|-----------------------------|
|  | Slow                             | Fast | Rapid | Ultra-rapid | Total (% in segment)        |
| En-route                                 |                                  |      | 11.1  | 0.4         | 7.2                         |
| On-street (kerbside)                     | 0.4                              | 4.9  |       |             | 1.9                         |
| Other (includes Destination)             | 4.4                              | 3.7  | 6.7   | 5.3         | 4.3                         |
| Total (% inactive chargepoints by speed) | 1.2                              | 4.0  | 8.1   | 1.8         | 3.8 (% inactive across all) |

Source: CMA analysis of Zap-Map data, 26 February 2021. Figures have been rounded to 1 decimal place. See Appendix E for further detail.

<sup>149</sup> Zap-Map data, as at 26 February 2021. The en-route segment includes rapid and ultra-rapid chargers within 0.5 miles of a motorway or A road (including trunk). On-street (kerbside) includes slow and fast chargers. 'Other' includes all chargepoints not present in en-route or on-street. See Appendix D for further detail.

- 7.18 Analysis by [Zap-Map](#) showed that 5.8% of chargepoints were out of service (1.9% partially) at some point in 2019 (down from 8.5% in July 2018). While not directly comparable to our analysis, this gives some indication that reliability has been improving overall.
- 7.19 A number of stakeholders noted that reliability is especially important in en-route charging,<sup>150</sup> as the range of EVs is lower than for petrol/diesel cars and so the perceived risk of being stranded (ie range anxiety) can be greater on longer journeys. As Table 6 shows, reliability for rapid chargepoints - particularly in en-route charging - is relatively poor, with on average around one in 10 rapid chargepoints out of service at any given time. Similarly, evidence suggests that consumers perceive reliability to be most problematic along motorways and particularly poor for the Electric Highway chargepoints (see Appendices A and D). Some consumers and stakeholders also raised poor customer service or long call waiting times as a further, compounding issue.<sup>151</sup>

... EV charging at the Motorway Service Areas is a shambles. It has been so for some time ... EV drivers I have spoken to has all agreed that, ... they all drive off the Motorway into the countryside to find a reliable charger. - individual respondent

### ***Difficulties finding chargepoints***

- 7.20 We found that information about chargepoints - particularly 'live' or real-time information - can be limited, inconsistent or difficult to access, and this can make it difficult for people to find available and working chargepoints.
- 7.21 Consumer research shows that people need access to information to find the right chargepoints to suit their needs, and live status information is particularly valuable to know which chargepoints are available and working. For example, in a [2021 EVA England survey](#), all respondents used information to locate chargepoints (83% primarily used a website or app, 17% primarily used their EV sat nav) and 98% believed that access to real-time data would save them time.<sup>152</sup> Stakeholder and consumer submissions also highlighted the importance of data, particularly consistent aggregated cross-network data (there are around 60 public charging networks in the UK) to make it easier and more convenient for EV drivers to find chargepoints.

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<sup>150</sup> For example [EDF Energy and Pod Point](#), [Zouk Capital](#), [Fastned](#).

<sup>151</sup> For example, see [E.ON's submission](#).

<sup>152</sup> 1,025 respondents.

- 7.22 Evidence from chargepoint operators shows that most offer information about their chargepoints. However, the type, volume and format of information varies which can make it difficult for people to access and navigate. For example, some chargepoint operators provide a map on both their website and app, whereas others provide this on only one platform or have different information on each platform. It is also less common for chargepoint operators to provide live information on their chargepoints.
- 7.23 There are a small number of third-parties which aggregate cross-network data - notably, Zap-Map and Open Charge Map, among others - to provide fairly comprehensive 'static' and some real-time data on chargepoints.<sup>153</sup> These use open data standards, most commonly the Open Charging Protocol Interface (OCPI) standard - an API which allows chargepoint operators to communicate dynamically with third parties.<sup>154</sup> However, this relies on chargepoint operators voluntarily providing their data to aggregators and some operators are reluctant to do so, particularly real-time data. Difficulties finding working chargepoints may also be exacerbated by low provision and poor reliability (particularly in rapid and ultra-rapid charging – see above).

### ***Difficulties paying for charging***

- 7.24 We found that paying for EV charging can be difficult. Unlike paying for petrol/diesel, payment methods can vary significantly between charging networks. People may need to use a number of different methods depending on which network they use, which can be frustrating and inconvenient - particularly on longer journeys.
- 7.25 Data on the largest 47 chargepoint operators (see Table 7), shows that all offer at least one 'ad-hoc' pay-as-you-go (PAYG) option.<sup>155</sup> However, different operators offer a mix of different PAYG options - most commonly an app, a RFID card,<sup>156</sup> contactless bank account card payment, and/or a QR code on a smartphone, among others. Around a quarter also offer subscriptions and a small number offer free memberships which can have benefits (eg discounted rates), though they require registration.

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<sup>153</sup> Zap-Map covers most (over 95%) of the public charging sector (though its real-time coverage is slightly lower at around 70% of public networks) [8].

<sup>154</sup> We were told that most chargepoint operators also already or are planning to use OCPI standards for their own chargepoint data.

<sup>155</sup> The [Alternative Fuels Infrastructure Regulations 2017](#) requires all public chargepoints to have 'ad hoc' payment options (ie you can pay without entering a contract with the chargepoint operator).

<sup>156</sup> A radio-frequency identification (RFID) card is a physical card capable of receiving, storing and transmitting data with a RFID reader via radio waves. A RFID card can be used to access a chargepoint and pay for a charge.

**Table 7: Overview of the variation in payment methods offered by top 47 chargepoint operators**

| Access/payment method | No. of chargepoint operators | % total chargepoint operators [1] |
|-----------------------|------------------------------|-----------------------------------|
| PAYG (any)            | 47                           | 100%                              |
| PAYG (app)            | 32                           | 68%                               |
| PAYG (RFID)           | 21                           | 45%                               |
| PAYG (Contactless)    | 20                           | 43%                               |
| PAYG (QR code)        | 4                            | 9%                                |
| PAYG (other) [2]      | 14                           | 30%                               |
| Subscription (any)    | 12                           | 26%                               |
| Free membership       | 4                            | 9%                                |

Source: CMA calculations based on data provided by Zap-Map, 26 February 2021. Excludes Tesla.

[1] The numbers indicated by our analysis do not sum to 100% as some chargepoint operators offer multiple access methods.

[2] This may include access via eg web link, fob, phone service, smart cable.

7.26 While people benefit from a choice of payment methods, it can be difficult to know which options can be used for different chargepoints. In a January 2021 survey almost half (49%) of EV drivers thought that paying at public chargepoints is too complicated and 61% thought that too many apps are required to use the public charging network.<sup>157</sup> This may be particularly frustrating for people on longer journeys or when using a chargepoint for the first time - the lack of information on chargepoints (see above) can also mean it is difficult for people to know the payment method for a chargepoint in advance. We note that overall, there have been limited issues with payment or pricing (covered later) in Scotland and Northern Ireland where public charging is largely free, though this may become more of an issue in future.<sup>158</sup>

I don't want to need to do homework before undertaking a long journey to ensure I have all the right accounts or contactless cards for any charging company I come across. I just want to be able to pull in and charge without a second thought. - individual respondent.

7.27 Some PAYG options can also be less convenient than others as they require an additional step to access (eg signing up to a RFID card or downloading an app).<sup>159</sup> These options could also generally be more attractive for chargepoint operators to use as they can also give operators access to customer data on charging (such as location and charging behaviour).<sup>160</sup>

<sup>157</sup> AA January 2021 Yonder Driver poll, fieldwork completed 12-20 January 2021. Base: 890 EV drivers (excludes the respondents who were 'non-applicable' for this question (458 respondents).

<sup>158</sup> In Scotland, some chargepoints are now starting to be paid for and some concerns have been raised about variation in pricing structures where it costs to charge in some areas eg see [EVA Scotland's](#) submission. Pricing is determined by the chargepoint site hosts - ie LAs - rather than Transport Scotland. Some stakeholders noted that free charging in Northern Ireland may need to change in time and people might find it difficult to start paying for charging.

<sup>159</sup> In addition, some chargepoint operators require a minimum amount of funds to be topped up on an app prior to charging in order to pay via the app (see Appendix D).

<sup>160</sup> Some chargepoint operators we spoke to noted the use of customer data to develop more tailored services for drivers (eg subscriptions or bundles) and to inform where to install new chargepoints.

- 7.28 Consumer research shows that people have a strong preference for contactless payment, which allows drivers to use the same payment method across different chargepoint networks (ie is 'cross-network'). For example, a 2021 [EVA England survey](#) found that just under half (46%) of respondents considered contactless the easiest payment method, and 85% preferred to use contactless at a rapid chargepoint.<sup>161</sup> However, as Table 7 shows, contactless is offered by less than half of the top chargepoint operators. Our analysis of Zap-Map data also found that only 9% of public chargepoints have contactless payment, and half of rapid and ultra-rapid chargepoints (see Appendix D).
- 7.29 There is some evidence from chargepoint operators that contactless is not always suitable for slow/fast chargepoints in on-street and destination charging, where smaller more 'discrete' chargepoints may not be physically large enough to host a contactless unit. Chargepoint operators also told us that providing contactless payment adds up to £1,000 in capital costs per chargepoint (for the unit and services), or more if retrofitting.

### ***Unclear and complex pricing***

- 7.30 We found that chargepoint operators use different pricing structures, which can make it harder for people to compare prices. Pricing information can also be difficult to find.
- 7.31 There are currently around 160 pricing models in the UK.<sup>162</sup> Table 8 sets out our analysis of Zap-Map data on the pricing structures offered by the top 47 public charging networks. It shows high levels of variation - while most chargepoint operators offer variable pence per kWh pricing based on the chargepoint's energy usage, some structure their prices as per hour or per minute usage of the chargepoint, or other variations.<sup>163</sup> Just over half (55%) have the same pricing for all of their chargepoints/speed of chargepoints.<sup>164</sup>
- 7.32 The data also shows that around a third of chargepoint operators charge connection fees on top of the charging cost, and some charge additional fees such as minimum payments or overstay charges. Only a few stakeholders told us that connection fees are necessary (eg to recoup higher costs, particularly

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<sup>161</sup> Survey completed by 1,025 respondents.

<sup>162</sup> Based on Zap-Map data, 26 February 2021. Includes every discrete pricing model for each chargepoint operator under each access method and charger power segmentation if applicable. Does not account for chargepoint operators which have different pricing per location.

<sup>163</sup> For example, one chargepoint operator includes parking fees in its per hour charge rate.

<sup>164</sup> We also found that chargepoint operators take different approaches to setting prices eg varying these by the payment method (eg PAYG or subscription or chargepoint speed). See Appendix D.

in rapid/ultra-rapid charging). These additional fees can make it harder to compare pricing and to understand the total cost of charging.

**Table 8: Summary analysis of pricing structures offered by the top 47 chargepoint operators (Zap-Map data)**

| Pricing structure        |                  | Number of chargepoint operators | % of total chargepoint operators [1] |
|--------------------------|------------------|---------------------------------|--------------------------------------|
| Standardised pricing [2] |                  | 26                              | 55%                                  |
| Variable unit pricing    | p/kWh            | 41                              | 87%                                  |
|                          | p/hour           | 7                               | 15%                                  |
|                          | p/min            | 2                               | 4%                                   |
|                          | per session      | 2                               | 4%                                   |
|                          | Other [3]        | 5                               | 11%                                  |
| Flat pricing             | Connection fees  | 15                              | 32%                                  |
|                          | Minimum payments | 6                               | 13%                                  |
|                          | Overstay charges | 6                               | 13%                                  |

Source: CMA calculations based on data provided by Zap-Map, 26 February 2021. Excludes Tesla.

[1] The numbers indicated by our analysis do not sum to 100% as some chargepoint operators offer multiple pricing structures.

[2] Standardised pricing refers to when the chargepoint operator has the same pricing for either all their chargepoints, or groups of their chargepoints based on charger power (ie slow/fast versus rapid/ultra-rapid pricing).

[3] Other variable pricing includes per: 10kWh, 2 hours, 2 or 4 hours, 4 hours, per hour + p/kWh

7.33 Most stakeholder submissions which commented on pricing noted that people are not currently able to easily understand and compare charging tariffs. This is supported by consumer submissions and surveys which highlighted that price information is not always clear (see Appendix D).

Charging tariffs are mind numbingly complex and difficult to compute. - individual respondent

***Most chargepoints are interoperable but some remaining issues***

7.34 We found that the public charging network is currently largely interoperable ie most public chargepoints can be used by any EV (see chapter 2).

7.35 Interoperable public chargepoints are important so that EV drivers can have a full choice of options, and this will become increasingly important as the number of EVs increases so that people can easily switch and use different chargepoints. It will also help to drive competition and innovation in the sector.

7.36 As set out in chapter 2, there are different connectors for charging which means that chargepoints with only one connection type cannot be used for all EVs. The different connections can also add confusion to the charging experience. However, we note that the sector is starting to resolve this - most new chargepoints are now fitted with both connection types for AC and DC charging, which we welcome (see also Appendix D).

7.37 There is also one closed charging network in the UK - Tesla Supercharger network - which can only be used by Tesla cars. Tesla's business model has been to invest in its network from the start, to drive sales of its EVs, which has

led to it having an extensive, high-performing network.<sup>165</sup> This has helped to drive EV take-up and build people's confidence more broadly in the charging sector. However, some consumers and stakeholders have raised concerns about the closed nature of the network - the impact of this is particularly acute at this early stage of the sector given the current lack of provision, as there are fewer alternatives – particularly en-route charging (see chapter 4) and given reliability concerns (as highlighted above).

- 7.38 Closed networks can restrict the charging options available to drivers and make it more complex and difficult for people to charge and switch to different chargepoints. Moving forward it will be crucial for networks to be open and available for use by all EV drivers – particularly at this early critical stage to build people's trust and confidence.
- 7.39 We note that [Tesla has indicated that it intends to open](#) its Supercharger network in the future - and for example [recently announced](#) it's planning to do this in Norway next year - which we strongly welcome.

### ***Additional challenges for some groups***

- 7.40 Our [previous work on consumer vulnerability](#) found that some groups can face additional challenges with engaging with particular markets. Similarly, some groups may be at risk of being unfairly penalised or left behind in the shift to EVs:<sup>166</sup>
- (a) Disabled drivers can face a number of additional barriers to accessing and using public chargepoints, due to their design and location. Recent research by [Zap-Map and Motability](#) and by the [Research Institute for Disabled Consumers](#) has highlighted concerns about the weight of charging cables making these very difficult to lift, and unsuitable parking arrangements / space for disability access, including trip hazards and barriers making it difficult to navigate around chargepoints, among other areas. This can put disabled drivers off from shifting to EVs.<sup>167</sup> We note that the [Government with Motability](#) has recently commissioned the British Standards Institute to develop accessibility standards for chargepoints, which we welcome.

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<sup>165</sup> The Tesla Supercharger network has sites across England, Scotland and Wales with a planned site in Northern Ireland, and is expanding with further sites planned for 2021 and 2022 [as shown on its website](#). Tesla [consistently ranks as the best network](#) in consumer surveys.

<sup>166</sup> These groups are not mutually exclusive and therefore in reality the challenges that individual drivers (who may sit across groups) may experience are likely to be multi-layered and complex. We note that those without off-street parking can pay more for charging than those with home chargepoints (see chapter 5 and Appendix E).

<sup>167</sup> The [Research Institute for Disabled Consumers](#) found that 61% of disabled people would consider buying an EV only if charging was made more accessible (25% would agree to consider getting an EV now).

- (b) Given the importance of technology to the sector, people who may be less tech-savvy - which can include some older drivers - may be particularly at risk of being left behind. People [aged 65+ are less likely to own a mobile phone and more likely not to use the internet](#) compared to the UK average, which may limit their ability to use some PAYG options.
- (c) People living in or travelling through remote/rural areas can experience connectivity issues when paying for charging.<sup>168</sup> Connectivity should improve over time through the ongoing roll-out of full fibre broadband and 5G in rural areas. 'Free vends' (where it's still possible to use the chargepoint when there is a communication fault, but not to pay) may help to address some of the issues in the immediate term.<sup>169</sup>
- (d) People without bank accounts<sup>170</sup> and/or smartphones<sup>171</sup> may also struggle to pay for charging, as chargepoints largely only offer cashless payment options which can require a smartphone (eg QR code, app) or bank account card.

7.41 We have seen evidence of emerging concerns about safety due to the location of chargepoints, for example in poorly lit areas. While relevant to all drivers, this may be a particular consideration when charging in remote/rural areas, or for some potentially vulnerable groups eg elderly drivers.

7.42 Conversely, as EVs and charging is rolled-out, access to petrol/diesel may become harder. Therefore there is a risk that people who are less able to afford the upfront cost of an EV could end up paying higher lifetime costs to fuel and maintain their petrol/diesel car, and may find it increasingly difficult to fill up their cars. As set out earlier, the cost of EVs is expected to decrease over time (including through the development of a second-hand market). Access to slow/fast on-street charging can also help to ensure charging is more affordable for those without off-street parking (with the potential for further cost savings as smart charging becomes available). But for those who cannot afford the cost of buying or leasing an EV, it will be important that they are not excluded from driving and that sufficient petrol and diesel continues to be available for at least a transitional period following 2030.

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<sup>168</sup> Some PAYG options rely on mobile signal or internet connection, such as apps/QR codes.

<sup>169</sup> For example, see [EVA Scotland's submission](#).

<sup>170</sup> An [estimated 1.3 million people in the UK are 'unbanked'](#) ie they do not have a bank account, and therefore primarily rely on cash to pay for goods and services.

<sup>171</sup> [Around 10% of UK adults do not own a smartphone](#).

## Emerging developments

7.43 As noted earlier, there are many uncertainties around how the sector will evolve over time as more people shift to EVs and the sector grows. For example while the primary way for people to pay has been PAYG (and evidence suggests this will continue to be important in future), we have also seen evidence of new emerging payment methods (roaming and plug and charge) and growing consideration of subscriptions and bundling. While these developments can have some benefits for people, there is a risk they could also make charging more confusing (as we've seen in other markets) and damage trust in the sector if not implemented in an open and clear way. We briefly consider these developments below and further detail is in Appendix D.

### ***New payment methods - roaming and plug and charge***

7.44 Roaming is a cross-network payment method that allows people to pay for charging via a single app or card.<sup>172</sup> Roaming is in the early stages in the UK (it is more common in parts of Europe) though some sector-led roaming options are starting to emerge, such as [Zap-Pay](#) and the [Electric Juice Network](#), as well as being offered by chargepoint operators. However, there is some evidence from continental Europe that roaming can make it harder for people to compare charging options due to variation in pricing and mark-ups, and that roaming tariffs tend to be more expensive.

7.45 In addition to roaming, in future 'plug and charge' technology may offer a quick and convenient option by automating payment. If the EV is registered with the chargepoint operator, the chargepoint will recognise it when plugged in to charge and the driver will be billed without needing to use an app, card or other payment method. This could make it easier for people to pay.

### ***Subscriptions and bundling***

7.46 We have seen from internal documents that some chargepoint operators are planning to introduce or expand their subscription offers in future, though the evidence currently indicates that PAYG is likely to be the main way of paying for charging (see Appendix D).

7.47 Subscriptions can make it harder for people to find the best charging deal, as they can be difficult to compare with PAYG options (particularly if, as highlighted above, pricing structures vary).<sup>173</sup> Our previous [work on the loyalty](#)

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<sup>172</sup> Stakeholders we spoke to (including chargepoint operators) had mixed views on roaming - some considered it unnecessary given contactless and others considered it a valuable and innovative alternative (see Appendix D).

<sup>173</sup> Some chargepoint operators told us this was why they had not introduced subscriptions. See Appendix D.

[penalty](#) highlighted the risk of harmful practices by businesses (known as ‘sludge’<sup>174</sup>) including subscription traps, which introduce unnecessary friction, exploit customer inertia and make it difficult for people to exit subscriptions. In particular, we found that auto-renewals or rolling-over of contracts combined with price rises could make it more likely that people would stay with their provider for longer and end up paying more than they needed to. As part of this work, we set out principles on subscription traps and auto-renewals which would also apply to EV charging - including ensuring that subscriptions are as easy to exit as to enter, and people are properly notified before any renewal.<sup>175</sup> We also note [recent proposals from Government](#) to tackle subscription traps by requiring businesses to make it clear what people are signing up for and letting them cancel subscriptions easily.

- 7.48 It is critical that this does not happen in EV charging and people are not misled or left feeling ripped-off or unfairly treated, as this will undermine trust in the sector. People should not be ‘locked-in’ to paying for a charging service they may not need.<sup>176</sup>
- 7.49 We have also seen some bundling starting to occur and some stakeholders submitted that it may become more common in future. There is a risk that bundling also makes it confusing for people to identify the best deal and/or that people get locked into deals that may not be suited to them (eg if a subscription service is included in a bundle), as noted by some stakeholders.<sup>177</sup>

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<sup>174</sup> A term coined by [Professor Richard Thaler](#) referring to practices which ‘appear intentionally designed to discourage behaviour which is in the consumers’ best interests’.

<sup>175</sup> For example, even where subscriptions are month-to-month rolling contracts, people should be sent regular reminders about how to cancel to make it clear and easy to exit a contract. See also: ‘[Loyalty penalty](#)’ [super-complaint - GOV.UK \(www.gov.uk\)](#). We understand that most chargepoint operators offering a subscription currently do so on a monthly rolling basis and these subscriptions can be cancelled at any time. We are aware of one yearly subscription in EV charging which auto-renews though we note this can be cancelled at any time.

<sup>176</sup> While drivers who have a subscription with a charging network will still be able to use other charging networks, they may be paying more than they need to if they are paying for a subscription in addition.

<sup>177</sup> Some stakeholders submitted that bundling may reduce price transparency if it becomes more common - eg [Ombudsman Services](#), [E.ON UK](#). E.ON UK also noted that bundling may lead to lock-ins.

## Measures to make public charging easier

**8. We recommend that, as part of its work in the sector, the UK Government takes into account the following principles to ensure EV charging is as simple as filling up with petrol or diesel. It should task a public body with implementing, overseeing and monitoring these as the sector develops to build people's trust:**

- **It is easy to find working chargepoints** eg. people can access data on live availability and working status and rely on minimum reliability standards;
- **It is simple and quick to pay** eg. no sign-ups needed, contactless bank account payment is widely available, and charging networks keep up with new payment technology;
- **The cost of charging is clear** eg. prices are presented in a simple, standardised p/kWh format; and
- **Charging is accessible and interoperable** eg chargepoints can be used by all drivers, are not limited to a single brand of car, and follow inclusive design principles.

7.50 Using public chargepoints should be as simple, convenient and straightforward as filling up a petrol or diesel car. However, we found evidence that people are facing a number of different problems which can undermine trust and confidence in the sector and deter EV take-up. It is therefore imperative to tackle these challenges now, at this early stage of the sector, to encourage people to shift to EVs.

7.51 We expect that some aspects of the charging experience will improve as the sector evolves, competition develops and more chargepoints are rolled-out (for example in relation to chargepoint provision and people's understanding of charging). However, in the meantime, a difficult charging experience will put people off EVs. The need for intervention is strongest where chargepoint operators are not fully incentivised to improve all aspects of the charging experience, as the sector is unlikely to resolve such issues itself.

7.52 We have set out four overarching principles to steer the development of the sector for UK Government to take into account as part of its ongoing work in this area. These principles reflect the key aspects of a positive charging experience, drawing on the evidence and analysis set out in this chapter. Some of these principles may require legislative change to implement - as referenced earlier, OZEV is planning to regulate this year to improve people's experience of public charging. The UK Government should task an appropriate public body to work with the industry to oversee these principles and to monitor the development of the sector. It will be important for this body

to have suitable enforcement powers in order to fulfil this role. This will also provide reassurance to consumers.

### ***Principle 1 - Easy to find working chargepoints***

- 7.53 It should be easy to find working available chargepoints so that people can identify charging options and plan journeys, and people should not have to worry about chargepoints being out of service. A number of stakeholders told us that standardised open data would enable more third-party aggregators to enter and compete to offer innovative data solutions - eg more cross-network data platforms, greater integration with EV sat nav systems and/or navigational apps.
- 7.54 However, there are mixed incentives for chargepoint operators to provide chargepoint information to drivers - while operators can be incentivised to make information on the location of their chargepoints accessible to drivers, so people can find their chargepoints, they are less incentivised to provide live status information for drivers when chargepoints are not working or unavailable. We have also seen evidence of operators partnering with EV manufacturers so that sat nav systems can be limited to a single operator's charging network, rather than cross-network, and this can reduce people's awareness of the different chargepoints available. To help open up competition and ensure people are given a wider choice of chargepoints, EV sat nav systems should reflect the full range of charging options and not be limited to a single charging network.
- 7.55 Reliability has been improving – however, while there are fewer chargepoints, even a small proportion of out of service chargepoints can be problematic and reinforce range anxiety, putting people off EVs. Intervention to improve reliability now can help to build confidence in the sector as well as creating reputational incentives for chargepoint operators and encouraging competition.
- 7.56 In practice, increasing the prevalence of easy to find working chargepoints would include:
- (a) open data on public chargepoints, including live data on chargepoint availability, working status and payment method. This could be via the OCPI standard which is already the most commonly used standard, which would also enable consistent chargepoint information to be provided in EV sat nav systems; and

- (b) minimum reliability standards - particularly for rapid and ultra-rapid<sup>178</sup> chargepoints where there are few alternatives nearby. Further detailed consideration will need to be given by the Government as to how this can be effectively and proportionately implemented. As reliability improves, standards may no longer be needed and therefore this should be kept under review.

### ***Principle 2 - Simple and quick to pay***

- 7.57 To build people's confidence in the sector and encourage EV take-up, paying for charging should be as simple and convenient as paying for petrol/diesel, regardless of which network is being used. While chargepoint operators offer a choice of payment options for their network, they are not incentivised to provide cross-network options (ie the same payment method across different chargepoint networks). In addition, operators may be reluctant to offer cross-network payments that do not allow them to collect customer data.
- 7.58 In practice, this would include offering simple PAYG payment options which don't require people to sign up or share their data - such as contactless (where feasible),<sup>179</sup> particularly at rapid/ultra-rapid chargepoints, or QR codes. However, as technology in the sector evolves, other alternative methods may develop and therefore this should be kept under review. We note that there is value in offering other payment methods alongside contactless/QR codes - see also principle 4.

### ***Principle 3 - Cost of charging is clear***

- 7.59 Our work in various markets has highlighted the importance of presenting pricing information in a simple, clear and easily comparable way so people can make informed decisions about their options.<sup>180</sup> However the evidence shows wide variation in pricing structures in the sector and chargepoint operators are not incentivised to make it easier for people to compare deals offered by different networks.
- 7.60 In practice, making sure that the cost of charging is clear would include:

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<sup>178</sup> Where feasible, minimum standards could also apply to slower chargepoints or alternatively, be monitored/overseen via KPIs when procured by LAs (see chapter 5).

<sup>179</sup> We note that the cost of offering contactless may be prohibitive in some cases, eg in on-street charging, as current low utilisation means it takes longer for chargepoint operators to recoup their investment (see chapter 5).

<sup>180</sup> For example, our [loyalty penalty super-complaint response](#) highlighted the role of information-based remedies which increase transparency in markets, and help consumers to compare products and services and make well informed decisions. More recently as part of our [Funerals Market Investigation](#), we set out a number of remedies to improve price transparency in the funerals market, to support customers when making choices about funerals.

- (a) standardised p/kWh pricing formats across all payment methods so people can easily compare options - many chargepoint operators offer p/kWh pricing and EV drivers are already familiar with this pricing structure; and
- (b) transparent pricing information - the full cost of charging is provided clearly and consistently upfront (eg on the chargepoint as well as on their website and app) so people can easily see what they are paying for without having to spend lots of time and effort searching.<sup>181</sup> There should be no hidden fees - the full cost of charging should be reflected in the price.

#### ***Principle 4 – Charging is accessible and interoperable***

7.61 All drivers should have a positive charging experience. As EVs become a mass market, it's important that some groups aren't unfairly excluded from charging and that all drivers no matter what brand of EV they drive can access the full range of charging options. Intervention at this early stage of the sector is therefore needed to help ensure all drivers can access charging in future.

7.62 In practice, this would include:

- (a) interoperable open-access charging networks - chargepoints should be interoperable and not limited to a single brand of cars. As set out in chapter 4, we also recommend that interoperable networks are one of the conditions for access to the Rapid Charging Fund for charging on motorways;<sup>182</sup> and
- (b) inclusive design of chargepoints - this ensures that when products/services are developed these are accessible to, and usable by, as many people as possible.<sup>183</sup> This applies to chargepoint hardware and software, including payment options (eg providing alternative options such as text payment).

7.63 There is a risk that emerging developments - such as subscriptions and bundling - make charging more confusing (as we've seen in other markets).

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<sup>181</sup> We note that under existing consumer law, price information needs to be accurate and transparent. This includes that it should be clear, complete (ie no hidden fees) and upfront. Consumers should be able to compare products easily and make informed decisions. See also CMA guidance: [Consumer protection from unfair trading - guidance - oft1008 \(publishing.service.gov.uk\)](https://www.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/681108/consumer-protection-from-unfair-trading-guidance-oft1008.pdf) and [Unfair contract terms: CMA37 - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/unfair-contract-terms-cma37).

<sup>182</sup> ATMs are an example of interoperable networks in other markets - through an interbank network, it is possible to use a bank account card to access and deposit cash via any ATM on that network ie the individual consumer is not required to belong to a certain bank to access an ATM.

<sup>183</sup> Eg designing chargepoints to be accessible for disabled drivers is also likely to benefit some elderly drivers who may struggle with mobility.

Our third principle to ensure the cost of charging is clear can help address this risk and our principles from our work in other markets, such as no lock-ins, would also apply here (see paragraph 7.47). Because of the importance of the consumer experience in this sector, we recommend that UK Government tasks a public body with implementing, overseeing and monitoring these principles as the sector develops.

- 7.64 The measures we have set out throughout this chapter are relevant to all four nations. We note that some of the principles, particularly in the immediate term, may be more or less relevant, depending on the circumstances of each nation. Overall, it will be important to ensure that people have a consistently positive experience of public charging regardless of where they are in the UK.

## **8. Conclusions and recommendations**

- 8.1 In order to deliver the UK's Net Zero obligations and smoothly transition to EVs, the UK will need to develop a comprehensive EV charging network, which people can trust and easily use.
- 8.2 We have found that while progress is being made, the UK has a long way to go in delivering the necessary infrastructure. While healthy competitive markets will be critical to meet this challenge, even greater UK Government support and oversight by Devolved Administrations is needed to push forward the pace of roll-out ahead of demand – working alongside key bodies that also have a critical role such as LAs, DNOs and energy regulators. We recognise that much work is already underway and this provides a good platform to continue and build on the support given to the sector.
- 8.3 Some parts of the sector - charging at home, work and destinations - are developing relatively well. But there are greater challenges in charging en-route along motorways (critical in addressing range anxiety) and on-street (convenient and cost effective for drivers without off-street parking and has benefits for the network). Therefore, targeted interventions will be necessary both to kickstart investment but also to unlock competition:
- (a) along the motorways where competition and investment at MSAs has been very limited, as constraints on network capacity and long-term exclusive contracts in place prevent entry at many sites. The introduction of the RCF provides an important opportunity to open up competition within MSAs, as well as rolling-out many more chargepoints. Off motorway in remote areas the commercial case for investment is very weak; and

- (b) on-street roll-out is significantly lagging behind and there are risks to competition as local monopolies could arise, if the market is left unchecked. LAs play a crucial role in this segment to drive forward immediate roll-out and maximise competition. To do this effectively LAs need to be clear about their role, put plans in place and provide active oversight – but they must be sufficiently equipped and incentivised by governments. Other delivery models may attract greater investment and competition in the long-run, though LAs will continue to play an important role to ensure local needs are met.
- 8.4 At this crucial early stage, it is also important to build people’s trust in the sector so that they are confident in making the shift to EVs, and to ensure no-one is left behind in the transition. As well as expanding the chargepoint network, it is also important that chargepoints work reliably (particularly while the network is still small but growing), are easy to find, use, pay for and can be accessed by everyone.
- 8.5 But we have found that the process of charging can still be complex and difficult for people. While some aspects may improve with time as the network grows and competitive markets develop (like reliability), this is not likely to be the case in all areas ie where it is not in the commercial interests of operators. Our experience from other markets has shown that active interventions in these key areas to make it easier for people can make a significant difference. In this way, the sector can be steered in a healthy direction before problems become embedded.
- 8.6 While we have found that there are emerging challenges, we also recognise that the sector is still in its early stages of development and there remain many uncertainties around how it will evolve and what will be required in future. For example:
- (a) Many drivers have not yet used EV charging and therefore people’s preferences and behaviours are still being formed. These may also evolve over time to reflect different living, driving and working patterns.
  - (b) Different business models are still being tested and these will impact the way that people and businesses interact.
  - (c) Changes in technology (such as wireless charging, better batteries and driverless cars) may have a significant impact on the sector which will affect how competition and investment develops, and how people engage with charging in the future.
- 8.7 No-one can predict precisely how this sector will evolve. However, ensuring competition can flourish is important as it will encourage continued innovation,

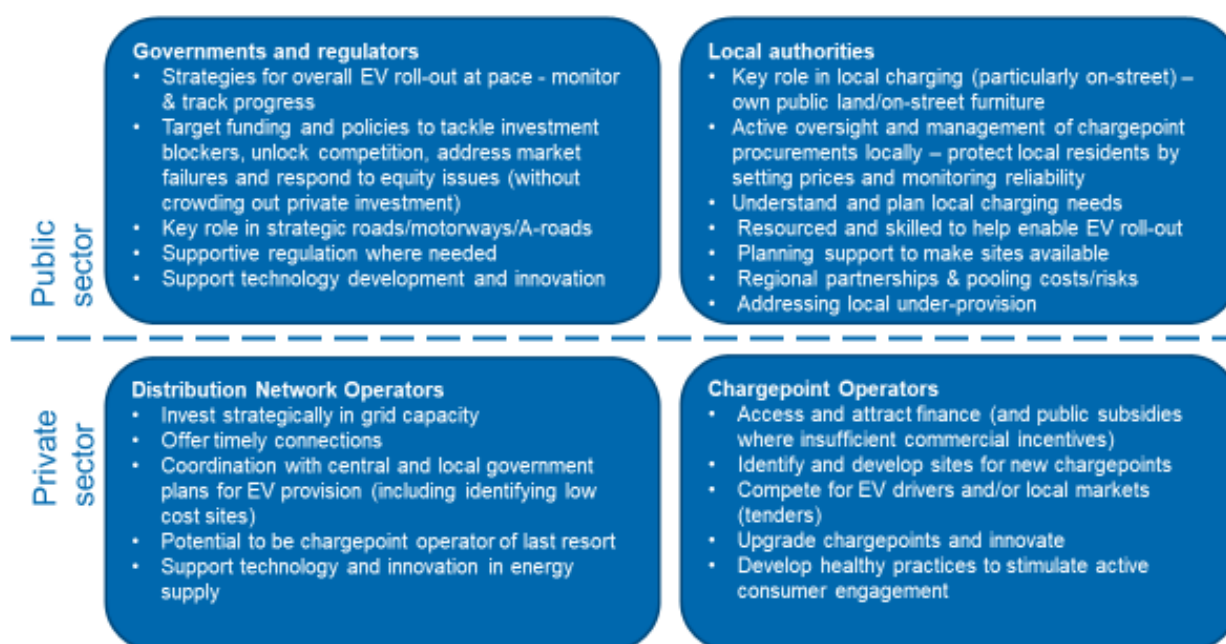
more choice, lower prices, greater investment and improvements in quality. Competitive healthy EV charging markets also means that the UK's charging network will be responsive to new developments. Therefore, strategies, plans and measures to enable an effective charging sector will need to be flexible and responsive to these future developments and be kept under close review to ensure they are targeted at the areas that are in need of support.

## Our recommendations and next steps

8.8 In this section we set out the eight measures discussed throughout this report in the preceding chapters and set out the next steps beyond this study.

8.9 These are directed towards governments (ie the UK Government and the Devolved Administrations), energy regulators, LAs and the industry – each of whom has an important role to play in creating a thriving EV charging sector across the UK (see Figure 10). Effective EV roll-out will be driven by both the public and private sector working in partnership.

**Figure 10: Public and private sector roles in EV charging**



8.10 While transport is partly devolved and therefore policy approaches between the nations vary, we have found that the broad challenges are similar and therefore our recommendations are UK-wide. However, there are certain issues and measures that have more or less relevance to each of the nations, as highlighted in earlier chapters. We would also encourage continued cooperation and engagement between governments and departments responsible for EV charging, to share lessons and knowledge as the sector develops.

- 8.11 We consider that this package of measures will effectively and proportionately address the emerging concerns we have identified in the sector. On this basis, we decided not to make a market investigation reference<sup>184</sup> (a more detailed examination into the sector), which we do not think is necessary or appropriate at this stage.
- 8.12 However, alongside this study, we have also opened a Competition Act 1998 (CA98) investigation to assess the lawfulness of the existing long-term exclusive arrangements between the Electric Highway and three MSA operators (Roadchef, MOTO and Extra). We will separately report on the progress of this case.
- 8.13 As explained above, this sector is continuing to evolve. Therefore, given its importance and the problems we have identified, we will continue to oversee its progress. We will take further action if the sector or parts of it are developing in a way that is damaging competition, investment and not working well for consumers.
- 8.14 In the meantime, we will continue to work with UK Government, the Devolved Administrations, LAs, energy regulators and the industry, to ensure a healthy comprehensive charging sector develops which works well for people.

### **CMA Recommendations**

**1.a) We recommend that the UK Government sets out an ambitious strategy for EV chargepoint deployment between now and 2030, to enable the UK to decarbonise transport and meet future emissions targets.**

This strategy should set out:

- the scale of chargepoint deployment required;
- the policies and funding to achieve the necessary deployment;
- how the benefits of competition and well-functioning markets in EV charging will be captured;
- how progress will be monitored and gaps in provision identified; and
- how sufficient capacity and skills can be developed across all levels of government, LAs and the industry.

**b) We also recommend that the Devolved Administrations develop and deliver national strategies.**

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<sup>184</sup> For further detail see our [second progress update](#) and the [notice of our decision](#) published in May 2021 – in accordance with our statutory duty to make a decision on a market investigation within six months of launching a market study.

**2. We recommend Ofgem and Uregni use forthcoming price control reviews to strengthen DNO incentives to speed up EV charging grid connections, invest strategically in network reinforcement and lower new connection charges by removing the charge for any reinforcement costs.**

**3. We recommend that the UK Government rolls-out the RCF as quickly as possible and attaches conditions to this funding to enable competition between chargepoint operators within each MSA site.**

These conditions include that there should be no exclusivity in future, open tenders for access to the network capacity provided by the RCF and that access should only be made available to chargepoint operators with open networks that are interoperable with all EVs.

**We have also launched a CA98 case into lengthy exclusive agreements.**

**4. We recommend that governments consider targeting funding at gaps in the commercial provision of en-route charging in more remote areas.**

**5. We recommend that LAs take a more active role in planning and managing the roll-out of on-street charging to maximise competition and protect local residents.**

To support this roll-out and deliver effective competition, LAs should have a clear local plan in place and take into account the key factors we set out in our report.

**6. We recommend that governments take action to properly equip and incentivise LAs to drive forward roll-out, while also providing greater support and oversight. A step change can be achieved by:**

- providing funding for dedicated expertise;
- clearly defining the role eg introducing a statutory duty;
- facilitating greater knowledge and best practice sharing; and
- proactively encouraging and supporting any LAs that are lagging behind

Governments should also work with LAs to explore and pilot other ways to roll-out on-street charging which may attract more investment and competition in the longer term, in particular split infrastructure deployment and financing models.

**7. We recommend that the UK Government sets open data and software standards for all home chargepoints.**

We also strongly support Government plans to require new chargepoints to be smart and meet minimum quality standards.

**8. We recommend that, as part of its work in the sector, the UK Government takes into account the following principles to ensure charging is as simple as filling up with petrol or diesel. It should task a public body with implementing, overseeing, monitoring these as the sector develops to build people's trust:**

- **It is easy to find working chargepoints** eg people can access data on live availability and working status and rely on minimum reliability standards;
- **It is simple and quick to pay** eg no sign-ups needed, contactless bank account payment is widely available, and charging networks keep up with new payment technology;
- **The cost of charging is clear** eg. prices are presented in a simple, standardised p/kWh format; and
- **Charging is accessible and interoperable** eg chargepoints can be used by all drivers, are not limited to a single brand of car, and follow inclusive design principles.