

Building an Electric Vehicle Charging Infrastructure that is Fit for the Future

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1. Foreword

At Which?, we have made a commitment to bringing sustainability into everything we do, from our work representing consumers through advocacy, to our in-depth investigations and rigorous product testing and advice. We've been testing electric vehicles (EVs) for over a decade, and it's clear to us that as well as being vital to tackling the climate crisis and helping us to reach net zero, the transition to EVs is also an opportunity to transform the consumer experience for those who need to own a car.

Our vision of the EV future would see drivers being able to easily find an available, working charger somewhere nearby, park up, and pay using their bank card or via one app/RFID card (radio-frequency identification card, a type of identification card used to pay at charge points). Pricing should be simple and fair. Disabled drivers should be both catered for with suitable charge points and the means to easily locate them. Charge points should be reliable, but if something should go wrong, adequate support should be on hand and a suitable system of redress for any experience that requires it.

Right now, that's not the case. It's a confusing maze of 60 networks with limited interoperability, little consideration for disabled drivers' needs – and we don't even know where all charge points are located.

There's a lot of great work happening in EV infrastructure being spearheaded by some fantastic companies, and guided by UK and devolved governments. But more needs to be done, and as EV numbers continue to rise and the public charging infrastructure becomes integral to everyday life, the more significant these issues will become.

It is vital that we act now to build the right foundations so that consumers can transition to an EV with confidence and look forward to a seamless, positive and convenient driving experience. To this end, Which? is publishing this report to highlight the weaknesses of the public charging infrastructure as it stands, propose tangible solutions and, ultimately, help get the public charging infrastructure to a place where consumers can truly reap the benefits of a net zero future.

Rocio Concha

Director of Policy and Advocacy, Which?

2. Executive Summary

The ban on the sale of new petrol and diesel cars after 2030, and hybrids after 2035, is a crucial step towards achieving the UK's legally binding commitment to reach net zero emissions by 2050. Consumers have an essential role to play in this transition, and alongside efforts to reduce car journeys, switching to a zero-emission electric vehicle (EV) at the right time will be an important change to reduce emissions.

To empower consumers to take this vital step, drivers must have confidence that EVs and the charging infrastructure will be able to meet their needs. However, currently only two in five (41%) drivers signal some intent to buy an EV.¹ Which? has found that consumers identify a number of perceived barriers that put them off switching. These include the upfront cost of buying an EV, which 34% of consumers identified as an obstacle, and range anxiety (or how far an EV can travel on a single charge) which 44% highlighted.² Most significantly, we found that three of the top five perceived barriers to EV ownership for consumers are related to charging,³ which is the focus of this paper.

Currently, the roll-out of public charging infrastructure is not happening quickly enough, and provision varies significantly across the UK. Some respondents to our car survey questioned 'will there be a charging facility where and when I need one?', and 'will I find a charger that works?'.⁴ The roll-out will need to accelerate dramatically to ensure that the charging network keeps pace with future demand, and there is an urgent need to improve the consumer experience of using public charge points, which is too often frustrating and inconvenient. Issues include a lack of accessibility for disabled drivers, complicated payment methods, poor reliability, and patchy data on charge points. These issues combine to create a network that is difficult to navigate, and those dependent on the public charging network also face having to pay more to recharge than those who are able to charge at home.

'The network is in a confusing mess.'

Male, South East England⁵

Key recommendations:

In order to create a public charging infrastructure that meets UK motorists' needs, provides a user-friendly experience, and facilitates and supports uptake of EVs, there is a clear need for the UK and

1 Which? report, [Supporting Consumers in the Transition to Net Zero](#), October 2021. Which? surveyed 3,619 UK adults between the 30 April and 2 May 2021. This 3,619 sample was made up of 2,000 UK respondents with boosts to achieve c.500 respondents for each devolved nation. Fieldwork was carried out online by Yonder and data have been weighted to be representative of each nation's population by age, gender, social grade (aged 18+); and then weighted by region.

2 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021

3 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021. Three of the top five barriers were: Access to electric vehicle charging points when away from home/making a long journey, 33%; Access to electric vehicle charging points at or near to home, 29%; Charge time/ How long it takes to recharge an electric vehicle (time), 28%.

4 Which? Car Survey of 53,245 car owners, April–June 2021. EV and PHEV owners who responded that they were not at all confident or not very confident about charging their car using the UK public charging network were asked to explain why they felt this way. Quotes from: Male, West Midlands, and Male, East of England.

5 Which?, Car Survey, April–June 2021. All subsequent pull-out quotes in this report come from this source.

devolved governments to develop strategies for the roll-out of EV infrastructure, coordinating their plans where necessary. As part of this, priorities and key targets should be outlined and committed to, and an overview should be provided of how many charge points will be needed and of which type, by when, and how they should be distributed. We welcome existing plans that are in place in Scotland and Wales, which we look forward to being further developed and implemented, and await with interest forthcoming strategies by the Northern Ireland Executive and the UK government.

We make the following recommendations, recognising that the different situations and approaches taken in the UK nations means that some proposals may be more or less pertinent to each government.

Firstly, strategies from the devolved administrations and UK government should:

- **Set out a plan to expand on-street charging options.** Owning and charging an EV should be a realistic option for people who don't have access to off-street parking. Plans should be set out to work with local authorities (LAs) and charge point companies to ensure that on-street public charging is readily available for those who need it.
- **Set out a plan to expand the en-route charging network, coordinating with the other governments where appropriate.** In England, the Rapid Charging Fund (RCF) should be rolled out quickly and used to address cold spots in rural and remote areas as well as to support expansion on motorways and major roads. The UK government should also move forward with proposals to ensure effective competition between charge point operators (CPOs) at motorway service areas (MSAs), in line with the recent Competition and Markets Authority (CMA) market study recommendations, including no exclusivity in future, open tenders and open access networks.⁶
- **Clarify the responsibilities of local authorities and ensure comprehensive guidance and support are provided.** The role of LAs in the roll-out of charging infrastructure should be clearly defined to ensure a cohesive approach. LAs also need to be better supported in the role they are already undertaking, and the UK and devolved governments should ensure that sufficient guidance and comprehensive national and local data are provided. If a statutory obligation is to be placed on LAs in England and Wales to plan for and provide charging infrastructure, their resourcing must be reviewed and ring-fenced funding must be provided if necessary.
- **Ensure funding is targeted at areas where the market is not delivering.** Strategies should set out the UK and devolved governments' plans to work with providers to identify suitable financing, for areas where the market is not delivering charge points at a sufficient pace to meet current and future demand. This potentially includes en-route charging in remote areas, on-street charging in certain areas and on motorways.

Secondly, EV drivers must have confidence that they will be able to access the charging infrastructure they need, no matter where they live and travel in the UK. Networks should be open to all car users, and all car models should be able to access compatible public chargers. We recommend that:

- **The UK government should move forward with plans to mandate accessibility standards for public charge points.** The UK and devolved governments should also set a minimum target for accessible charge point provision as a proportion of all public charge points across the UK, and provide guidance on how these should be distributed. LAs should have a clearly defined responsibility to ensure this target is met in their areas, and work with CPOs to achieve this.

6 Competition and Markets Authority (CMA), [Electric vehicle charging market study: final report](#), July 2021

- **The UK government should move forward with plans to require CPOs at certain sites to offer open access charging** (as opposed to chargers restricted to users of a certain car brand, for example), and these requirements should be extended to all public charge points. The UK government should also consider whether there is a need to provide guidance on differential prices charged to drivers of different brands of EVs, to ensure they are not punitive.
- **The UK and devolved governments should monitor the availability of both main types of DC charging plugs (Combined Charging System, or CCS, and CHAdeMO)** in the public network and ensure that, if the car industry coalesces around CCS as a single plug standard, this doesn't unreasonably constrain CHAdeMO owners' ability to charge.

Furthermore, payment should be simple, with bank card payment offered wherever possible, and roaming should allow access to the entire network via one app or RFID card, using a single account. Pricing should be fair, so that those who can't charge from home aren't unfairly disadvantaged, as well as easy to understand and comparable across all networks. We recommend that:

- **The UK government should move forward with plans to regulate for payment interoperability and mandate that all charge points must offer payment by bank or credit card as a minimum, wherever possible.⁷**
The UK government should also work with the devolved governments and CPOs to support the development of a cross-network roaming solution that will allow consumers to access all public charge points with a single RFID card or app, and introduce regulations if needed.
- **The UK government, devolved governments and CPOs should work together to find a solution to allow public charge point users to pay by cash**, including exploring the potential merits of a payment card that consumers can upload with cash at facilities like Post Offices and Paypoint outlets.
- **The UK government, devolved governments and LAs should work with industry to develop and support possible solutions to enable people without off-street parking to charge at a comparable rate to home charging**, either by having access to readily available, low-cost public charging or by being able to use their home energy supply. In the shorter-term, governments should provide clarity on any regulations relating to charging from home so that drivers can understand what is permissible.
- **The UK government should move forward with proposals to mandate a standard metric for charging costs**, which should be given in pence per kilowatt hour (kWh).

Finally, the consumer experience of public charging should be seamless. High standards must be set for charge point reliability, and consumers should be able to easily locate charge points that are available, functioning and suit their needs. The charging process should be as simple as possible, and there must be a clear, comprehensive redress system if something goes wrong. We recommend that:

- **The UK government should move forward with plans to set open public charge point data standards.**
It must mandate that information including: location; type of power (AC/DC); rate of power; connector type (CCS/CHAdeMO); and level of accessibility, is shared about all public charge points, as well as live data on availability and working status.
- **Car manufacturers should print labels for maximum AC and DC charging rates adjacent to EVs' charging sockets** to help consumers choose the right charge point for their vehicle.

⁷ Recognising that this will not always be feasible, for example for on-street chargers in lampposts and bollards, or where the cost would be prohibitive.

- **The UK government should act on its proposal to mandate CPOs to meet a 99% availability standard** as an average across its fleet of charge points,⁸ and provide a 24/7 helpline for consumers.
- **The UK and devolved governments should map out the full regulatory and consumer protection landscapes for EV charging.** The responsibilities of the relevant regulators should be clarified to ensure the whole of the EV charging sector is covered. Any gaps in consumer protection must be addressed so that consumers can easily access redress.

8 The UK government has proposed that ‘where a chargepoint has an assumed starting availability of 24 hours a day, 365 days a year, the operator would be allowed up to 4 days’ of downtime per chargepoint for repairs and maintenance a year.’ UK government, [Consultation: The consumer experience at public charge points](#), closed April 2021.

3. Introduction

The UK has made a bold legal commitment to become net zero by 2050. Transport is currently the highest emitting sector of the UK economy,⁹ and in order to meet the net zero target, the government has announced a ban on the sale of new petrol and diesel cars after 2030, and hybrids after 2035.

Not everyone has, or needs, a car, and reducing car journeys and increasing the use of public transport and active modes of travel will play an essential role in decarbonising the transport sector. However, for those who do own a car, switching to an electric vehicle (EV) at the right time is an important step to help reduce emissions. This will require vast new infrastructure as well as a step-change in how drivers refuel their vehicles, and has the potential to bring a myriad of benefits including lower refuelling costs, cleaner air and less noise pollution.

The UK government made a commitment in the 2021 Net Zero Strategy to ‘ensure the UK’s charging infrastructure network is reliable, accessible, and meets the demands of all motorists’.¹⁰ It has invested significant funding to support the transition to EVs, including providing purchase grants and UK-wide schemes to expand charge point provision. In 2020, a £1.9 billion investment was committed to ‘charging infrastructure and consumer incentives’,¹¹ and an additional £620 million for public charging in residential areas and targeted plug-in vehicle grants was committed in 2021.¹² As transport policy is partly devolved, the devolved administrations (DAs) are pursuing individual approaches to the roll-out, and additional funding schemes are in place (see Chapter 4).

The EV market in the UK has shown strong growth in recent years, rising from a 1.6% share of new car sales in 2019¹³ to 11.6% in 2021.¹⁴ However, this remains a relatively small market share, and we know that half of drivers are currently reluctant to change to an EV for a number of reasons.¹⁵ These include the higher purchase cost of EVs compared with petrol or diesel cars, which recent Which? research has shown can take as long as ten years to recoup.¹⁶ A third (34%) of consumers we surveyed in 2021 identified this as the most significant obstacle to switching, while perceptions of how far EVs can travel without needing to recharge was a concern for 44% of drivers. Consumers also highlighted access to charging points when at home or on journeys (29% and 33% respectively), journeys becoming more difficult to plan (19%), and how long EVs take to recharge (28%), as factors which put them off switching to an EV.¹⁷

9 UK government, [Transport and Environment statistics](#), May 2021

10 UK government, [Net Zero Strategy](#), October 2021

11 HM Treasury, [November 2020 Spending Review](#), November 2020

12 HM Treasury, [Autumn Budget and Spending Review 2021](#), October 2021

13 SMMT, [Electric and Alternatively Fuelled Vehicles Registration Statistics](#), January 2020

14 SMMT, [Covid stalls 2021 UK new car market but record EV sales show future direction](#), 6 January 2022

15 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021. Survey respondents were asked ‘How comfortable, if at all, are you with changing to a solely electric vehicle?’; 26% responded ‘not very comfortable’, while 24% responded ‘not at all comfortable’.

16 Which?, [High upfront costs for electric cars could push more people to petrol](#), August 2021

17 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021

As this is an emerging market, there are challenges in predicting how it will develop and what the impact on consumers will be. Nevertheless, it is clear from the current evidence that significant work is needed to address consumers' concerns about switching to EVs and ensure that user-friendly infrastructure is in place to support them when they do.

Currently, provision of public charge points is inadequate in some areas, and varies significantly across the UK. Those who are unable to charge from home due to a lack of off-street parking face having to pay higher prices on the public network, and some aspects of the public charge point network simply aren't working well for consumers. Issues we have identified include a failure to meet disabled drivers' needs, complicated payment systems, poor reliability, and patchy data, while if something goes wrong there isn't a clear redress system in place.

Encouragingly, Which? research has found that most consumers (85%) identify something which would encourage them to go electric, notably good access to charging points when on a journey and at/near to home, which 27% and 22% of consumers respectively identified.¹⁸

This paper focuses on the actions that are needed now to create a UK-wide public charging network that is fit for purpose. We recognise that there are other developing issues, such as the security and privacy of data shared with the charging network, which are also highly important, and which will require further attention.

4. An EV charging network that meets consumers' current and future needs

According to a Which? survey of car owners, 78% of EV charging currently happens at home,¹⁹ which will often be the most convenient and cheapest way to recharge. However, this won't be an option for everyone, as home charging requires access to off-street parking (a garage or driveway), which means we can estimate that over a quarter of drivers will be entirely dependent on the public charging network.²⁰ Furthermore, all drivers are likely to need to charge their vehicles en route at some point and will depend on the public network to do so, so it is essential that the infrastructure is in place to meet this demand.

This will require a comprehensive, UK-wide public charging network that is fully accessible to all drivers, with adequate provision no matter where they live and travel. This will need to include: on-street chargers in residential areas; destination chargers at places people have travelled to (such as shopping centres); and en-route chargers on motorways and major roads.

Different types, and powers, of charge points will also be needed to suit different scenarios. 'Slow' (3–6kW AC) chargers are often used for on-street charging, and can take between 15–19 hours to recharge, based on a 54kWh EV battery²¹ (charging times will vary based on the car). 7kW AC 'fast' chargers can charge in 6–8 hours, while the 22kW 'fast' chargers can do so in 2–3 hours – both are also used for on-street charging, as well as destination charging. Rapid chargers (50–99kW DC) can charge up to 80% in around forty minutes to an hour, and are often used for destination and en-route charging, while ultra-rapid charge points (currently 100kW to 350kW) are faster still and also used for en-route charging.²² However, it's important to note that not all EVs can make full use of all types of chargers – for example, the most common DC maximum charge rate in Which? tests in 2020 and 2021 was 100kW, and many existing EVs have a DC rate below that, which means that the latter can't make effective use of 100kW+ ultra-rapid DC charge points. Similarly, very few EVs have a 22kW AC charger, meaning that most cannot make full use of 22kW AC fast chargers.

Key actors' roles and responsibilities

The UK government has so far regarded its role as 'stimulating rapid private investment and unblocking market failures',²³ and has introduced a number of UK-wide funding schemes, as well as some which are England-only. Although it has not set overall targets for the number and type of charge points needed across the UK, expecting this to be driven by private investment,²⁴

19 Which?, Car Survey, April–June 2021

20 CMA, [Electric vehicle charging market study: final report](#), July 2021

21 54kWh is the average battery capacity from the 54 electric cars tested by Which? since 2017. Charging times based on supplying 57.5kWh to include the 7% average loss of charge (across a sample of 23 cars) that Which? has recorded in our independent tests.

22 Which?, [How to use electric car charging points](#), November 2021

23 According to the House of Commons Committee of Public Accounts, [Low emission cars report](#), May 2021

24 [House of Commons Committee of Public Accounts, Low emission cars report](#), May 2021

it has set targets for rapid charging in England.²⁵ The Conservative Party also made a manifesto commitment in 2019 to ensure that everyone is within 30 miles of a rapid EV charging station.²⁶

As transport policy is partly devolved, each of the DAs are pursuing their own approaches to EV infrastructure, which differ significantly. In Scotland, the government has invested in the roll-out of a national network of public EV charge points, ChargePlace Scotland, which it owns and claims is ‘one of the most comprehensive networks in Europe’.²⁷ Transport Scotland set out a roadmap to widespread adoption of plug-in vehicles back in 2013,²⁸ and in 2022 published a draft strategic vision for the next phase of the roll-out, which sets out plans to accelerate commercial investment.²⁹

In Northern Ireland, a network of public charge points was installed by a public-private consortium between 2012 and 2014,³⁰ which is currently operated by the Electricity Supply Board (ESB). A lack of further investment since then, until very recently,³¹ means that its provision now lags well behind the UK average.³² An EV Charging Infrastructure Plan is due in 2022, which will look at encouraging ‘private participation in EV infrastructure development’.³³

The Welsh government has published an EV Charging Strategy and an Action Plan. These set out an ‘enabling role’ for government in delivering charging infrastructure, with a commitment for Transport for Wales to take the lead in delivering rapid charging on the strategic trunk road network, and targets are set for rapid and on-street charging.³⁴ In England, the UK government has announced some specific funding schemes, such as the Rapid Charging Fund³⁵ and the Local EV Infrastructure Fund.³⁶

LAs are key players in the roll-out of public charge points locally, and have a unique understanding of the needs of their local areas. However, because their responsibilities vary, and their role has not been clearly defined by government, authorities are pursuing different approaches. In Great Britain, LAs are responsible for street and parking alterations, and they own bollards and lampposts which can be transformed into on-street chargers.³⁷ As the CMA sets out, LAs’ responsibilities are different in Northern Ireland, where ‘the responsibility for street furniture and pavement access lies with the Department of Infrastructure,’ which ‘can cause difficulties for LAs in rolling-out on-street as they are not directly responsible for approving access to the necessary sites/furniture.’³⁸

25 UK government policy paper, [Government vision for the rapid charge point network in England](#), May 2020

26 Conservative Party, [2019 Conservative Party Manifesto](#)

27 Transport Scotland, [Switched On Scotland Phase Two: An Action Plan For Growth](#), 2017

28 Transport Scotland, [Switched On Scotland: A Roadmap to Widespread Adoption of Plug-in Vehicles](#), 2013

29 Transport Scotland, [A Network Fit For The Future: Draft Vision for Scotland’s Public Electric Vehicle Charging Network](#), January 2022

30 Northern Ireland Electricity Networks, [Infrastructure for a Green Recovery - Briefing to the Infrastructure Committee](#), December 2020

31 BBC News, [Electric cars: ESB to use £3.27m funding ‘to double chargers’](#), November 2021

32 In Northern Ireland there are 18 public charging devices per 100,000 of population, compared with the UK average of 42. Department for Transport, [Electric Vehicle Charging Device Statistics](#), January 2022

33 Northern Ireland Executive, [The Path to Net Zero Energy](#), December 2021

34 Welsh government, [Electric Vehicle Charging Strategy Action Plan](#), October 2021; and Welsh government, [Electric Vehicle Charging Strategy](#), March 2021

35 UK government, [Rapid Charging Fund](#)

36 UK government, [Transitioning to zero emission cars and vans: 2035 delivery plan](#), July 2021

37 CMA, [Electric vehicle charging market study: final report](#), July 2021

38 CMA, [Electric vehicle charging market study: final report](#), July 2021

All UK LAs are also able to bid for funding from the UK government to procure and install charge points through the On-Street Residential Chargepoint Scheme (ORCS),³⁹ although uptake has been uneven.

The private sector's role is also significant in delivering charge point infrastructure, and the UK government has said that it 'expects the private sector to deliver charge points where they are commercially viable' and that it 'will only intervene when there is a clear market failure.'⁴⁰ Investment in charging infrastructure can be entirely privately funded, or can be shared between public and private investment. For example, Shell is aiming to install 50,000 on-street charging points across the UK by 2025 through its Ubitricity network, by offering to meet LAs' installation costs that are not covered by government grants.⁴¹

There are a variety of different business models for public charge points, as set out by the CMA:

- **'Full operator'**: the charge point 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
- **'Service provider'**: the charge point operator provides the charge point for a fee. It then manages the operation, payments, servicing and data collection. The host takes any revenue from charging
- **'Concession'**: this approach is similar to full operator, except the infrastructure is funded largely through government grants [...]. This is the model widely used by LAs in on-street charging.' In this model, 'charge point operators currently bid for contracts with LAs to install and operate on-street charge points, with LAs generally retaining ownership of the charge points.'⁴²

Chargepoint provision and distribution across UK nations and regions

There is a general consensus that the pace of the roll-out of charging infrastructure is too slow. For example, the Climate Change Committee has estimated that over 280,000 public charge points will need to be available by 2030,⁴³ compared with the current network of 29,215.⁴⁴ The Society of Motor Manufacturers and Traders (SMMT) estimates that more than 700 new charge points will need to be installed every day until the end of the decade⁴⁵ – whereas our analysis of ZapMap data shows only 21 chargers per day were installed during 2021.⁴⁶

'Local to where I live there are very few public charging points.'

Male, South East England

The infrastructure roll-out has been uneven across UK nations and regions, and slower in areas where installing charge points can be more complicated and costly, or where demand is lower and the commercial case is weaker. This includes motorways, rural and remote areas, and some residential areas.

'Limited infrastructure.'

Male, Northern Ireland

39 UK government, [On-Street Residential Charge point Scheme](#)

40 UK government, [Rapid Charging Fund](#), 'The National Infrastructure Strategy also clarified that the government expects the private sector to deliver charge points where they are commercially viable and that government will only intervene when there is a clear market failure.' The November 2020 National Infrastructure Strategy can be found [online](#).

41 Shell, [Shell aims to install 50,000 Ubitricity on-street EV charge posts across the UK by 2025](#) September 2021

42 [CMA, Electric vehicle charging market study: final report](#), July 2021

43 Climate Change Committee, [Sixth Carbon Budget](#), Figure 3.1.b, December 2020

44 ZapMap, [EV Charging Stats 2022](#), accessed on 4 February 2022

45 SMMT, [Business buyers in pole position on Race to Zero as consumers stuck on the grid for electric vehicle adoption](#), 25 March 2021

46 Which? analysis of ZapMap, [EV Charging Stats 2022](#), accessed on 24 January 2022

The number of charge points needed will vary between different areas, depending on factors including the availability of off-street parking (and therefore the possibility for home charging) and population density. Nevertheless, the way the roll-out is developing means that drivers living and travelling in some parts of the UK are likely to struggle to access the infrastructure they need, and we are seeing significant differences across the UK nations. While in Scotland there are 52 public charge points per 100,000 people, this compares with 43 in England, 33 in Wales, and just 18 in Northern Ireland. There are also differences between regions – for example, in London, there are 102 public charge points per 100,000 people, compared with 26 in Yorkshire and the Humber and 24 in the North West of England.⁴⁷

‘Very limited charging points in my area.’

Male, North East England

There is some evidence that the availability of charging infrastructure in a local area may affect consumers’ willingness to switch to an EV. A recent Which? survey found that Londoners expressed the highest comfort with switching to an EV of all UK consumers, with 66% of London-based respondents reporting that they were comfortable switching to an EV, which could be linked to the relatively high charge point numbers in the capital.⁴⁸

Funding

The roll-out is developing unevenly partly because of the way charge points are funded. Although charging has been free on some networks,⁴⁹ CPOs generally make money from customers using their charge points, but it can take a long time for the costs of installation to be recouped – according to the CMA, the payback period for the initial investment can be between 6 to 9 years.⁵⁰ The revenue from charge point use also depends on the rate of EV uptake, which although growing remains relatively low. These factors have been described as a ‘chicken and egg’ problem by the CMA, whereby CPOs are reluctant to invest ahead of demand because of the initial low rates of return (due to low usage), and consumers are reluctant to switch to EVs due to the perceived inadequacy of the current charging network.

These challenges have meant that public funding has played a critical role in supporting the development of the network so far, and is likely to continue to do so for the foreseeable future. There are a number of schemes provided by the UK government and the DAs to improve public charging provision, as well as to support home and workplace charging. The main schemes are as follows:

- **UK: Charging Infrastructure Investment Fund (CIIF).**⁵¹ A £400 million investment fund which aims to leverage private sector investment in public charging by providing match funding from the UK government.
- **UK: On-street Residential Chargepoint Scheme (ORCS).**⁵² Open to all LAs across the UK, the scheme provides grant funding of up to 75% towards the cost of procuring and installing on-street charge points in residential areas that lack off-street parking. In Scotland, LAs have been

47 Department for Transport, [Electric vehicle charging device statistics: January 2022](#)

48 [Which?. Supporting Consumers in the Transition to Net Zero, October 2021](#)

49 Charging is currently free in Northern Ireland on the ESB network, and has been largely free on the ChargePlace Scotland network.

50 CMA, [Electric vehicle charging market study: final report](#), July 2021

51 UK government, [Charging Infrastructure Investment Fund](#)

52 UK government, [On-Street Residential Chargepoint Scheme](#)

supported to install ChargePlace Scotland charge points through 100% capital grants via the Local Authority Investment Programme.⁵³

- **UK: Workplace Charging Scheme (WCS).**⁵⁴ Grant funding of up to 75% towards the purchase and installation of charge points at workplaces for staff use. Additional funding is provided through the Energy Saving Trust (EST) in Scotland for businesses.⁵⁵
- **UK: Electric Vehicle Homecharge Scheme (EVHS).**⁵⁶ A grant towards 75% of the cost of a home charge point and its installation. From April 2022 the eligibility criteria will change, so that it will no longer be open to homeowners living in single-unit properties, but will remain open to homeowners who live in flats, and people in rental accommodation. For people living in Scotland there is further funding available via the EST, as well as additional funding for those living in the most remote areas of Scotland.⁵⁷
- **UK: Go Ultra Low Cities scheme.** The UK government's Go Ultra Low Cities scheme awarded funding to a number of cities to pursue a range of projects to encourage uptake of ultra low emissions vehicles, for example installing rapid charging.⁵⁸
- **England: Rapid Charging Fund (RCF).** A £950 million fund that will be available towards the costs of electric grid upgrades at 'sites across the strategic road network where upgrading connections to meet future demand for high powered charge points is prohibitively expensive and uncommercial'. It is intended to support a number of targets the UK government has set out in its vision for the rapid charge point network in England.⁵⁹

The other UK nations do not have schemes that directly replicate the RCF but are pursuing other policies to increase rapid charging. In Northern Ireland, the Executive has matched EU funding to install a number of rapid charge points,⁶⁰ and funding has also been awarded from the UK government's Levelling Up fund which will increase the number of rapid chargers, and see high-power charging hubs installed at strategic locations.⁶¹ In Wales, the Welsh government is part-funding the installation of rapid EV charge points at strategic locations.⁶² Scotland has already installed many more rapid charge points than the UK average.⁶³

- **England: Local EV Infrastructure Fund.** A £90 million fund to be launched by Summer 2022 that will support the roll-out of larger on-street charging schemes and rapid charging hubs.
- **Scotland: Switched on Towns and Cities Challenge Fund (STCCF)**⁶⁴ provided funding for LA projects to promote EV uptake.

53 Transport Scotland, Report on Public Electric Vehicle (EV) infrastructure in Scotland – Opportunities for Growth, July 2021

54 UK government, [Workplace Charging Scheme](#)

55 Energy Saving Trust, [Business charge point funding](#)

56 UK government, [Electric Vehicle Homecharge Scheme](#)

57 Energy Saving Trust, [Domestic charge point funding](#)

58 UK government, [£40 million to drive green car revolution across UK cities](#), January 2016, online

59 UK government policy paper, [Government vision for the rapid charge point network in England](#), May 2020

60 Irish News, [EU funded project to install electric vehicle charge points launched](#), September 2021

61 BBC News, [Electric cars: ESB to use £3.27m funding 'to double chargers'](#), November 2021

62 Transport for Wales, [TfW appoints SWARCO UK Ltd to deliver 21 electric vehicle rapid charge points](#), June 2021

63 Scotland has 12.9 public rapid chargers per 100,000 of population, compared with the UK average of 7.7. Department for Transport, [Electric vehicle charging device statistics: January 2022](#)

64 Transport Scotland, Switched on Towns and Cities Challenge Fund

- **Scotland: Public EV Infrastructure Fund.** A recently announced £60 million fund, with half expected to come from the private sector, which the government anticipates will ‘double the size of Scotland’s existing network of charge points over the next few years’.⁶⁵
- **Scotland: Project PACE and Electric A9.** Project PACE is a project involving Transport Scotland, SP Energy Networks and LAs to improve public charge point provision across Lanarkshire ‘where the commercial market has not yet delivered and is unlikely to in the short to medium term’.⁶⁶ Electric A9 will develop multiple charging hubs along the route.⁶⁷
- **Wales: Ultra Low Emission Vehicle Transformation Fund.** Provides grants to LAs to support transport decarbonisation schemes, including EV charging.⁶⁸

On-street charging

The roll-out of on-street charging has been patchy and hindered by both the weak commercial case (the ‘chicken and egg’ issue discussed in the section [Funding](#)), and the reliance on LAs whose role is not clearly defined and who are affected by resourcing and capability issues. To meet demand, the roll-out will need to accelerate significantly, as according to CMA analysis there are only around 1,000 on-street charge points outside London, and only 5,700 in the UK in total.⁶⁹

Role of Local Authorities in On-Street Charging

Providing EV charging infrastructure is not currently a statutory duty for LAs, who need to balance multiple other competing demands within their finite resources. This means that the approach varies significantly between LAs, and while some have been especially active, charging infrastructure is not a high priority for all LAs, with only 15% of LAs in England currently having a dedicated team for delivering EV charging infrastructure, according to a recent survey.⁷⁰

This lack of clarity has been identified as a key barrier to delivery by research conducted on behalf of the Local Government Association (LGA), which reports a ‘lack of coherent strategic direction at a national level, including no articulation of the vision for the future and lack of clarity over the role authorities were expected to play in delivering EV charging infrastructure’.⁷¹ This may change in future as the Office for Zero Emission Vehicles (or OZEV, the team working across UK government on the transition to zero emission vehicles⁷²) has recently consulted on introducing a statutory duty on LAs in England and Wales to plan for and provide EV infrastructure.⁷³

In order to increase charge point provision, all LAs can apply for funding from the UK government’s On-Street Residential Chargepoint Scheme (ORCS) to cover 75% of the costs of procuring and installing charge points. However, the National Audit Office (NAO) reports that the

65 Michael Matheson, Cabinet Secretary for Net Zero, Energy and Transport, [Meeting of the Parliament \(Hybrid\) 26 January 2022](#)

66 SP Energy Networks, [PACE](#)

67 ChargePlace Scotland, [Electric A9](#)

68 Welsh government, [Written Statement: Local Transport Grants and Ultra Low Emission Vehicle Transformation Fund allocations to Local Authorities 2020-21](#), May 2020

69 CMA analysis of Zap-Map data, 26 February 2021, from [Electric vehicle charging market study: final report](#), July 2021

70 Local Partnerships, report commissioned by the Local government Association, [Scoping the role of local authorities in the provision of electric vehicle charging infrastructure](#), July 2021

71 Local Partnerships, report commissioned by the Local government Association, [Scoping the role of local authorities in the provision of electric vehicle charging infrastructure](#), July 2021

72 [OZEV](#) is part of the Department for Transport and the Department for Business, Energy & Industrial Strategy.

73 UK government, Consultation: [Future of transport regulatory review: zero emission vehicles](#), closed November 2021

ORCS' budget has been consistently underspent,⁷⁴ and CMA analysis shows it has not been used by any of the LAs in Northern Ireland, large areas of Wales, and large parts of the North of England and central Scotland as of July 2021⁷⁵. To address this, think tank Policy Exchange has suggested that allowing private CPOs to access government funding directly, rather than having to go through the LA, could allow more charge points to be installed at a lower cost.⁷⁶

Research on behalf of the LGA has also shown that comprehensive guidance, as well as national data and modelling, is needed to better support LAs. LAs raised concerns that they lacked the necessary expertise and guidance to make decisions on charge point technology, and 'felt that there was a need for national data and forecasting to enable joined up local delivery.'⁷⁷ OZEV is currently working with the Institution of Engineering and Technology to supplement existing resources with more technical advice, but it is clear that better signposting and reliable guidance needs to be provided as soon as possible.

LAs also report concerns about funding the remaining 25% of the cost which is not covered by the ORCS.⁷⁸ To address this issue in Northern Ireland and encourage councils to apply, the Northern Ireland Minister for Infrastructure recently announced that the remaining 25% of the capital costs will be covered by match funding.⁷⁹

Finally, competition is currently limited in on-street charging, which could result in negative outcomes for consumers in terms of price or quality. Although LAs could be well placed to encourage competition through the procurement process, many do not currently have the capacity to consciously maximise competition. As the CMA explains, '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.'⁸⁰

En-route charging

Which? research shows that good access to EV charging points when on a journey would encourage 27% of consumers to consider switching to an EV. This will also be key to improving motorists' confidence in making longer journeys and addressing range anxiety, which we found is currently a barrier to switching to an EV for 44% of consumers.⁸¹

Motorway Service Areas

Ensuring there is sufficient charging and adequate competition at motorway service areas (MSAs) is particularly important. In this situation, drivers are likely to be travelling longer distances and may be further from other opportunities to recharge, and are therefore likely to be more restricted in their choice of where to recharge. More rapid and ultra-rapid charge points will need to be installed at MSAs and on key roads to meet current and future demand, as well as to meet

74 National Audit Office, [Reducing carbon emissions from cars](#), February 2021

75 [CMA, Electric vehicle charging market study: final report](#), July 2021

76 Policy Exchange, [Charging Up!](#), February 2021

77 Local Partnerships, report commissioned by the Local Government Association, [Scoping the role of local authorities in the provision of electric vehicle charging infrastructure](#), July 2021

78 [CMA, Electric vehicle charging market study: final report](#), July 2021. 'A number of stakeholders told us that LAs have limited time and resource 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.'

79 [Hansard](#), Northern Ireland Assembly, 15 November 2021

80 [CMA, Electric vehicle charging market study: final report](#), July 2021

81 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021

government targets for there to be ‘around 6,000 high powered charge points across England’s motorways and major A roads’ by 2035.⁸² However, there are significant barriers to expansion, including exclusivity agreements that are in place at some MSAs.

‘There are still not enough rapid chargers to feel confident there will be one available where it is needed.’

Female, West Midlands

The rapid charge point network Electric Highway (now owned by Gridserve) dominates MSAs in Britain with a share of 80% of rapid and ultra-rapid open access charge points.⁸³ This dominance is further strengthened by long-term exclusivity agreements which are in place between Electric Highway and MSA operators MOTO, Roadchef and Extra, who operate around two-thirds of MSAs in the UK.⁸⁴ These agreements have made it almost impossible for other companies to operate at these sites and provide within-site competition.

The CMA investigated these long-term exclusive agreements under competition law to assess their lawfulness, and Gridserve has now committed not to enforce the exclusive rights after 2026, or where RCF funding has been granted⁸⁵ (see section: [Funding](#)). The CMA also recommended that conditions should be attached to RCF funding to promote within-site competition at MSAs, including no exclusivity in future, open tendering, and open-access networks.⁸⁶ The UK government has also recently consulted on ‘taking new powers to make the exclusive elements of existing charge point service arrangements void and unenforceable’, and to ‘ensure long-term competition is maintained at [MSA and major A road service area] sites’,⁸⁷ by mandating open tenders for charge point contracts, and setting requirements for a minimum number of operators at each site.

A further, significant barrier to expanding charge point provision on motorways is that electricity grid upgrades are often required due to the need for rapid and ultra rapid chargers, and these can be prohibitively expensive. According to the CMA, almost all charge point operators they spoke to mentioned network connections as a main challenge.⁸⁸

Rural and remote areas

Rapid charging in more remote and rural areas is also important to ensuring EV drivers are confident making longer journeys, and is particularly important in tourist spots. However, projected low rates of usage and costly connections to the electricity grid can deter CPOs from investing, and this has so far resulted in fewer rapid charge points in rural areas (although Scotland is an outlier due to investment by the Scottish government).⁸⁹ As such, the CMA concludes that the ‘limited provision of rapid charge points in remote locations is likely to be a result of an emerging market failure’.⁹⁰

‘Around where I live (rural village) there are no public chargers. I believe the closest one is five miles away.’

Male, South East England

82 [UK Government, Government vision for the rapid chargepoint network in England](#), May 2021

83 [CMA, Electric vehicle charging market study: final report](#), July 2021

84 [CMA, Electric vehicle charging market study: final report](#), July 2021

85 CMA, [CMA to open up electric vehicle charging competition on motorways](#), November 2021

86 [CMA, Electric vehicle charging market study: final report](#), July 2021

87 [UK government, Consultation: Future of transport regulatory review: zero emission vehicles](#), closed November 2021

88 [CMA, Electric vehicle charging market study: final report](#), July 2021

89 CMA, Figure 6, Source DfT/OZEV, cited in CMA, [Electric vehicle charging market study: final report](#), July 2021

90 [CMA, Electric vehicle charging market study: final report](#), July 2021

Support with grid connection costs

To address some of these issues and improve rapid charging provision, the UK government has announced a £950 million RCF to provide support towards grid connection costs in England (see section: [Funding](#)). However, the fund has not yet been rolled out, and it is not clear that it will be used to address the cold spots, or areas where provision is inadequate or non-existent, in remote and rural areas.

Although there is no exact equivalent of the RCF in the devolved nations, there is alternative funding in place to support rapid charging (see section: [Funding](#)).

The UK government has also said that it is working with network companies to ensure that those seeking a connection are supported to find the most cost-effective solution, and has created an online central source of guidance on how to secure grid connections in a timely, easy and affordable manner.⁹¹

Ofgem has also recently proposed to remove connection charges for grid network reinforcements from charge point installers' costs, which the regulator believes will make it cheaper to install new EV charging stations in the locations they are needed.⁹²

91 UK government, [Zero emission vehicles: Government Response to the Committee's First Report](#), October 2021

92 Ofgem, [Ofgem to ensure electric car revolution unlocks full benefits for consumers](#), September 2021

5. Accessibility

For the public charging network to be fit for purpose, adequate charge points must not only be available but accessible too – so that drivers are able to use the charge points when they get to them. At the moment, this is not always the case, as existing public chargers in the UK are not suited to the needs of many disabled drivers, and the existence of a single-brand network means that many drivers are excluded from accessing some of the best chargers currently on the network. There is also a risk that, as the industry continues to coalesce around one standard plug and socket type, cars with the other socket type could face difficulties in accessing the charger type they need.

Access for disabled drivers

It is estimated that up to 1.35 million drivers with a disability (or 50% of all disabled drivers) could be wholly or partially reliant on public charging infrastructure from 2035.⁹³ However, disabled drivers currently face fundamental challenges in using public charge points, and according to a survey by the Research Institute for Disabled Consumers (RIDC), 73% of respondents who had seen public charge points perceived them as neither accessible nor easy to use.⁹⁴

The RIDC's investigation into the accessibility of public chargers identified issues including a lack of adequate space around the charge point, using charging cables, and plugging in the connector, as potentially difficult for disabled people. As a result, the investigation concluded that 'the existing charging points infrastructure is not accessible for a large proportion of disabled people with mobility or dexterity impairments.'⁹⁵ Unsurprisingly, a recent survey found that this is having a clear impact on EV uptake among disabled drivers, as 61% of disabled people who responded said that they would consider buying an EV only if charging was made more accessible.⁹⁶

Although some requirements are set out under the Equality Act 2010,⁹⁷ the UK government admits that 'currently, there's little in the way of regulation that specifically directs CPOs and local authorities to make charge points accessible to those who experience disabilities'.⁹⁸ The RIDC's findings demonstrate that more needs to be done to make charging more accessible for the whole population. To tackle this, the UK government has partnered with Motability to commission the British Standards Institution (BSI) to develop accessibility standards for EV charge points, which are intended to provide guidance for industry and define 'fully accessible', 'partially accessible' and 'not accessible' public EV charge points.⁹⁹ The UK government has also consulted on what

93 Ricardo report for Motability, [Electric Vehicle charging infrastructure for people living with disabilities](#), September 2020

94 Research Institute for Disabled Consumers, [Going Electric?](#), June 2021

95 [Research Institute for Disabled Consumers, Going Electric?](#), June 2021

96 Research Institute for Disabled Consumers, [Inaccessible Charging is Barrier to Electric for Disabled and Older Drivers](#), April 2021

97 As the UK government explains, 'Under the Equality Act 2010, goods and services, including petrol filling stations, have a duty to make reasonable adjustments so that everyone can access their facilities. Provisions for adjustments are not prescriptive – leading to a different experience for disabled users depending on the station used.' [Consultation: The consumer experience at public charge points](#), closed April 2021

98 [UK government, consultation: The consumer experience at public charge points](#), closed April 2021

99 UK government, [UK government partners with disability charity to set standards for electric vehicle charge points](#), June 2021

accessibility regulations might be needed,¹⁰⁰ as well as on a proposal to mandate accessibility standards for UK public charge points.¹⁰¹

There are also a number of pilot projects underway - for example, the Scottish government has funded trials to test solutions to ensure disabled people have easier access to charge their EVs.¹⁰² Motability is also working with Designability, a charity that works to enable disabled people to live with greater independence, to 'engage with disabled drivers and identify their requirements for accessible charging'.¹⁰³

Single-brand networks

The Tesla 'supercharger' charging network is an ultra-rapid charge point network that Which? research found to be one of the fastest, most prolific and affordable ranges of ultra-rapid chargers. However, these benefits are unable to be accessed by drivers of any other car brand, as the chargers are only available for Tesla cars – even though each supercharger unit also has a CCS charger, which means they could be used by other EVs.¹⁰⁴

Tesla also has a 'destination' charging network whose chargers can be unique to Tesla, or open to all users with a Type 2 plug – Tesla says it advises hosts that 'wherever two chargers are installed, we encourage one to be universal and one to be Tesla only'. Which? research has revealed that the technology is in place that would make all of these chargers open to all EVs, as there is a switch inside that could be used to set the destination chargers from Tesla-only to universal.¹⁰⁵

In 2021, Tesla confirmed that the supercharger network will be opened to other EV drivers. So far, the company has said that superchargers in 'all countries' would be opened to all EV drivers 'over time',¹⁰⁶ and a pilot programme has begun in France, the Netherlands and Norway,¹⁰⁷ but no specific timings for the UK have yet been announced.

Although this announcement is an important development in improving access to public charge points for all drivers, there is nothing to prevent other companies developing charge points which aren't open to all drivers. However, the UK government has recently proposed requiring existing providers of charge point services at MSAs 'to make their charge points open access rather than only open to an exclusive network or group of networks or manufacturers', subject to consultation.¹⁰⁸

It is also possible that companies could introduce differential pricing for customers who don't belong to their network, which could effectively price customers out from using their charge points. For example, in reference to the pilot scheme currently underway, Tesla has said that 'the prices for non-Tesla drivers reflect the additional costs of supporting charging for a wide range of vehicles and adapting our locations to accommodate these vehicles'.¹⁰⁹

100 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

101 [UK government, Consultation: Future of transport regulatory review: zero emission vehicles](#), closed November 2021

102 Transport Scotland, [New funding to improve charge point accessibility](#), February 2021

103 [UK government, UK government partners with disability charity to set standards for electric vehicle charge points](#), June 2021

104 Which? magazine, Shock to the system, April 2021

105 Which? magazine, Shock to the system, April 2021

106 Carbuyer, [Tesla Supercharger network will open to rival electric cars](#), July 2021

107 Tesla, [Non-Tesla Supercharger Pilot](#), November 2021

108 [UK government, Consultation: Future of transport regulatory review: zero emission vehicles](#), closed November 2021

109 Tesla, [Non-Tesla Supercharger Pilot](#), November 2021

Access to compatible public chargers

EVs have two sockets, one for AC charging (slow/fast) and one for DC charging (rapid/ultra-rapid). Legislation sets out that charge points must provide one plug type for AC charging (Type 2), and one plug type for DC charging (CCS), as a minimum.¹¹⁰

However, while most cars have CCS sockets for DC charging, there is also a different type of socket, CHAdeMO, which some cars use instead. This is an issue for drivers because CHAdeMO and CCS plugs and sockets are not interoperable, meaning that drivers are limited to using the chargers whose plugs are compatible with their EV's socket type. While there are currently only slightly more CCS than CHAdeMO public chargers,¹¹¹ because CCS is the only type required by law, as well as being by far the most common socket on UK EVs, it is likely that charge point operators will stop installing CHAdeMO chargers in the future.

'There are too many different types of charger and not all are compatible.'

Male, South West England

The UK government has said that 'as manufacturers are increasingly standardising their connectors, government has no plans to intervene in the vehicle market,' arguing that 'the vast majority of EVs can charge on the entire UK public charging network'.¹¹² While this may be true at present, access to CHAdeMO chargers could become a problem if the EV market continues to favour CCS sockets as it evolves. If this occurs, it will be essential that CHAdeMO users are not disadvantaged and can continue to access public CHAdeMO chargers for as long as they need them.

110 [Alternative Fuels Infrastructure Regulations 2017](#)

111 ZapMap, [EV Charging Statistics 2022](#), accessed January 2022

112 OZEV leaflet, [Common Misconceptions About Electric Vehicles](#), September 2021

6. Payment and pricing

Paying to use public charge points should be simple and quick, and shouldn't require consumers to plan ahead, download charge point company-specific apps or carry multiple RFID cards. It should also offer consumers the choice to pay via their preferred method.

Furthermore, charging prices must be transparent and easy to understand and compare, so that consumers can make an informed choice. In addition, people should not be penalised with significantly higher prices simply because of the type of home they live in.

Payment interoperability

There are around 60 public charging networks across the UK,¹¹³ and many of them require customers to pay via individual apps or provider-specific RFID cards, meaning that consumers need to download multiple apps and carry multiple cards. Furthermore, while it's not always possible for charge points to offer contactless bank account payments, for example due to prohibitive cost or space limitations,¹¹⁴ it's a simple option for consumers that should be available wherever possible – but only 9% of public charge points currently offer it.¹¹⁵ There are also no charge points which incorporate a cash-based option.

Although some roaming solutions are developing, such as the Zap Pay app, which allows users to pay through its app at multiple different networks,¹¹⁶ and the Octopus Electric Juice network, which allows access to a number of networks via one card and app,¹¹⁷ they do not cover 100% of the public network.

'Current arrangements are too complicated and unreliable – multiple companies each with very different arrangements, each requiring apps or subscription – nothing is very clear or simple. Compared with payment for fuelling a petrol/diesel car it's far more complex.'

Male, South West England

There is legislation in the UK¹¹⁸ which requires CPOs to provide 'ad-hoc access' at all public charge points without the need to enter a contract, which most CPOs provide through apps, requiring access to a smartphone. Beyond this, the UK government has so far relied on issuing guidance on payment methods rather than intervening. For example, it set out that it wanted to see 'all newly installed rapid and higher powered charge points provide debit or credit card payment by spring 2020'.¹¹⁹ However, as this is not legislation, Which? research has found that some firms ignored

113 [CMA, Electric vehicle charging market study: final report](#), July 2021

114 [Appendix D](#), CMA, Electric vehicle charging market study: final report, July 2021

115 [CMA, Electric vehicle charging market study: final report](#), July 2021

116 [Zap-Pay](#)

117 [Octopus Electric Juice Network](#)

118 [Alternative Fuels Infrastructure Regulations 2017](#)

119 UK government, [All new rapid charge points should offer card payment by 2020](#), July 2019

this,¹²⁰ and the UK government itself admits that ‘we’d expect to have seen more progress on new rapid devices, but this has not been the case.’¹²¹

‘Bewildering variety of different charging companies requiring downloading of their individual apps in order to pay.’

Male, Wales

The UK government invited feedback on proposed requirements for minimum payment methods that wouldn’t require a mobile or fixed internet connection, such as contactless payments, in a recent consultation. The UK government also proposed to intervene to implement roaming, consulting on different roaming solutions which would provide a common method of access to all public charge points via one membership card or app.¹²² It has since confirmed that it will introduce rules this year to ‘mandate a minimum payment method – such as contactless payment – for new 7.1 kW and above charge points, including rapids’.¹²³

In contrast, no progress has been made to allow users to pay by cash. As current charge points do not have the facility to accept direct cash payments, Which? has suggested that a single RFID card used to access all charge points could also function as a pre-payment card, which users could top up with cash at places like Post Offices and Paypoint outlets. This could introduce cash into the system and allow drivers the option to pay in the way that best suits them.

‘Too many different apps and payment methods. I find it almost impossible to use public chargers.’

Male, East of England

Affordability

The lower running costs of an EV relative to petrol and diesel vehicles are often promoted as a key benefit of switching, including in a recent UK government leaflet,¹²⁴ and Which? research has found that lower running costs of an EV compared with a petrol or diesel car would encourage 21% of consumers to make their next vehicle electric.¹²⁵ These lower running costs can also be important in helping drivers recoup the initial upfront purchase costs, which are currently higher for EVs than for petrol and diesel cars. However, although some public chargers can be free to use, the cost benefits of EVs are generally much stronger for those who are able to charge at home, which the NAO has found can be between 59% and 78% cheaper than using public chargers.¹²⁶

‘The electricity is VERY expensive.’

Male, South West England

120 Which? magazine, Shock to the system, April 2021

121 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

122 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

123 UK government, [Government funding targeted at more affordable zero-emission vehicles as market charges ahead in shift towards an electric future](#), December 2021

124 Go Ultra Low, cited in an OZEV leaflet, [Common Misconceptions About Electric Vehicles](#), September 2021: ‘It costs from only 1p per mile to charge up a new EV, compared to around 10p per mile to fuel a new diesel or petrol vehicle.’

125 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021

126 [National Audit Office, Reducing carbon emissions from cars](#), February 2021

For example, Which? compared the home and public charging costs for a number of EVs, and found that for the Hyundai Ioniq (2016–), the estimated annual cost using public charge points would be £708.27, compared with £495.79 for home charging. For the Seat Mii (2020–), estimated annual cost using public chargers is £751.72, compared to £526.21 for home charging, while estimated annual costs for the Mini Electric (2020–) are £764.76 for public charging and £535.33 for home charging.¹²⁷ In addition, home charging is subject to a lower rate of VAT at 5%, compared with 20% on public chargepoints.

‘Too expensive relative to home charging.’

Male, South East England

However, charging at home won’t be an option for everyone. Currently the main mainstream way to charge at home is by having a wall charger installed (although some people also charge using a three pin plug), which requires people to have access to off-street parking (i.e. garages and driveways). Over eight million households (or more than a quarter of drivers) do not have this, for example because they live in terraced housing or flats.¹²⁸

Although some charging solutions are emerging to allow those who do not have access to off-street parking to charge using their home electricity supply, these are in a nascent stage, and might still require parking to be available near the driver’s home, which won’t be possible for everyone. For example, Innovate UK and OZEV have awarded funding for a trial in Oxford of a specially designed gully system that allows users to charge using their home electricity supply,¹²⁹ while Greenmole’s EV Charge Channel is similarly submerged below the surface of the pavement to allow households to charge their EV outside their home.¹³⁰

There is also a lack of clarity over what is permissible in terms of home charging, as some councils advise that running cables on public pavements is illegal, while others provide advice on how to use cables to charge from home.¹³¹ This means that unless and until other legally permissible solutions are developed and become widespread, a significant proportion of drivers will be dependent on the public charging network, and face paying more to recharge.

Transparent and comparable pricing

A recent Which? investigation highlighted the inconsistent way that pricing information is displayed for consumers, which makes it difficult to compare prices across networks. We revealed that as pricing is not standardised, while most operators charge in pence per kilowatt hour (kWh), firms can also charge by time (per minute), making it difficult for motorists to easily work out how much they will ultimately be charged.¹³²

‘There is no consistency about how to pay or how the charges are calculated.’

Male, East of England

127 Which?, [How much does it cost to charge an electric car?](#) updated November 2021. Mileage and energy costs: 9000 miles is the average (pre-Covid) mileage survey respondents said they did in the Which? most recent car survey. (UK wide survey, 47,013 owners told us about 55,833 cars they own). Home charging uses a rate of 21p per kWh, which was based on standard tariffs from multiple energy suppliers, including regional variations. Public charge point rate based on 30p per kWh.

128 [CMA, Electric vehicle charging market study: final report](#), July 2021

129 Current News, [Oxfordshire County Council gets green light for on-street EV charging trial](#), August 2021

130 Greenmole, [EV Charging for Terraced Households](#)

131 For example, [Haringey Council](#) advises that ‘it is illegal for any person to place or run a cable or wire along or across a public highway’. In contrast, [Hampshire council](#) provides advice to residents without access to off-street parking on how to use cables to charge from home.

132 Which? magazine, Shock to the system, April 2021

The UK government has attempted to tackle this via its vision for the rapid charge point network in England, which set out an expectation that any new charge points should make clear pricing information available in pence per kWh.¹³³ More recently an OZEV consultation proposed to mandate CPOs to adopt a pence per kWh metric,¹³⁴ and the UK government has since confirmed that it will introduce rules so that motorists will ‘be able to compare costs across networks which will be in a recognisable format similar to pence per litre for fuel.’¹³⁵

133 [UK government policy paper, Government vision for the rapid charge point network in England](#), May 2020

134 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

135 [UK government, Government funding targeted at more affordable zero-emission vehicles as market charges ahead in shift towards an electric future](#), December 2021

7. A straightforward and positive consumer experience

Charging an EV using public charge points should be easy and convenient, but evidence shows this is not currently the case – some respondents to our recent car survey have called it ‘too much hassle’, ‘far too complicated’, and ‘such a user-unfriendly system.’¹³⁶

Transitioning to an EV will mean a number of significant changes for drivers, who will need to navigate new terminology and technology when refuelling, as well as a potential need to plan journeys in advance so that they can be sure of finding somewhere to recharge. To make this transition as easy as possible, drivers will need easy access to real-time information on charge point location and availability, and information on their cars to help them choose the right charger for their vehicle. They will also need charge points to be in good working order, and where things do go wrong, a clear and comprehensive redress system should be in place.

Comprehensive real-time information

EV drivers need to be able to easily locate charge points which they can be confident are available and functioning. Which? research has shown this is important for consumers, as 19% cite ‘journeys becoming more difficult to plan and/or stressful due to uncertainty over access to a charger’ as a barrier which puts them off switching to an EV.¹³⁷

At present, standardised data about all public charge points is not openly available. A National Chargepoint Registry was established in 2011 by the UK government, which was intended to create a database of publicly funded charge points across the UK, but as the government acknowledges, ‘the data is incomplete and contains inaccuracies due to an absence of agreed data sharing standards or incentives on parties to update and maintain their data submissions.’¹³⁸ Private sector-led solutions such as ZapMap have emerged to provide location data to consumers, but despite being the market leader, ZapMap’s coverage is still less than 100% of charge points.¹³⁹

‘Finding a charging point is difficult.’

Male, North West England

Live availability data is even more patchy, possibly because, as the government reports, some CPOs ‘have concerns about the sharing of live availability data. This is due largely to the commercial sensitivity around the utilisation of charge points.’¹⁴⁰ This means that currently, dynamic availability data is only available for around 70% of the chargepoints on ZapMap.¹⁴¹

Furthermore, the data that is available is not always reliable, as Citizens Advice revealed when they analysed one years’ tweets about public charge points and found that ‘in nearly one in

136 Which?, Car Survey, April–June 2021. Quotes from: Male, South East England; Male, South East England; and Female, London.

137 [Which?, Supporting Consumers in the Transition to Net Zero](#), October 2021

138 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

139 [ZapMap](#) claims to have ‘95%+ of public charge points mapped’, accessed on 21 January 2022

140 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

141 [ZapMap](#), accessed on 21 January 2022

five (19%) of the tweets [...] people complained about the quality of data on charge point apps. This included charge points missing from apps, broken charge points displayed as working, or charge points displaying incorrect information on speed or cost.¹⁴² Which? analysis has similarly highlighted a problem where poor quality of the apps makes finding a charge point difficult, with the apps available from the five biggest networks scoring an average of 2.7 out of five stars,¹⁴³ putting them in the bottom 8% of rated apps in the Google Play store that Android devices use.¹⁴⁴

‘The one time where I was planning a trip requiring a charge along the route, I arrived at the charging station and it wasn’t working despite the app saying it was “busy”. I had to turn around and go home.’

Female, East of England

There is also currently no way for disabled motorists to easily access information about the accessibility of charge points, making it more difficult for these drivers to plan their journeys and amplifying concerns about range. In a report for Motability, none of the information services that were investigated provided information on the accessibility of individual charge points, including ZapMap, although the company did ‘[indicate] a willingness to add accessibility-related details.’ Some apps also allow crowdsourced data to be shared which can include accessibility information.¹⁴⁵

The UK government has proposed to set a data standard that CPOs need to meet when making public charge point data openly available, and to mandate that ‘must-have’ data types including location, power-rating and pricing data must be made available.¹⁴⁶ It is expected to lay legislation soon.¹⁴⁷

Accessible information about maximum charging rates

EV drivers need to be able to easily identify chargers that are right for their car. However, this can be challenging because EVs have maximum rates of charge that they can receive. If drivers use a charger with a higher rate of charging than their EV can use, it will still charge the car, but users may end up paying more for a higher power of charge than they have actually received. This could also lead to rapid charging spaces being taken up by drivers who aren’t able to make full use of them.

There is currently no requirement for information about maximum charging rates to be provided on cars to help consumers choose the right charger. However, many petrol and diesel cars list the fuel type on the cap to prevent misfuelling, and nozzles are different sizes to make it clearer for drivers. Given charge point power rates are much more varied, Which? has previously recommended that similar steps should be taken to make the EV charging process as easy to navigate as possible, and proposed that a car’s maximum AC and DC charging rates should be required to be printed next to its charging sockets. This would let consumers know, without having to remember, what charging rate their car can use.

‘The instructions are not clear or easy to understand on chargers.’

Male, West Midlands

142 Citizens Advice, [How can public electric vehicle charging be improved?](#), Which? Conversation, April 2021

143 According to statistics from Statista, cited in Which? magazine, Shock to the system, April 2021

144 Which? magazine, Shock to the system, April 2021

145 Ricardo report for Motability, [Electric Vehicle charging infrastructure for people living with disabilities](#), September 2020. Other information services considered were: National Chargepoint Registry, A Better Route Planner, Open Charge Map, Plugsurfing, Charge your Car, Pod Point, and Electric Highway.

146 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

147 UK Parliament, [Written Question](#), July 2021

A reliable network

At this critical early stage in the consumer transition to EVs, it is particularly important that drivers are able to access charge points which are in good working order in order to establish trust. If EV drivers experience poor reliability this could damage confidence, discourage more people from switching to an EV, and could even lead to EV owners switching back to petrol or diesel cars.

‘So often you turn up expecting to be able to charge and it’s not working.’

Female, East of England

Currently, data shows that reliability can be poor – the CMA reports that on average 1 in 25 charge points, and 1 in 10 rapid, are out of service at any given time.¹⁴⁸ Relatedly, an EV Association England (EVA England) survey found that ‘62% of drivers disagreed or strongly disagreed that public charge points are typically in good working order.’¹⁴⁹ A number of respondents to a Which? car survey in 2021 also mentioned perceived unreliability as a reason why they did not feel confident charging their car using the UK public charging network.¹⁵⁰

Reliability has been a particular issue at MSAs, where until recently there has been a lack of upgrades,¹⁵¹ and in Northern Ireland, where snapshot research by the EV Association Northern Ireland found that more than a quarter of AC chargers and around half of DC chargers were out of order.¹⁵² There are a number of contributing factors to this situation in Northern Ireland, including the age and condition of the chargers, and planning legislation which historically ‘made it difficult to repair and replace broken charge points’.¹⁵³ The legislation was amended in 2020 to remove this barrier,¹⁵⁴ and upgrades are now underway.¹⁵⁵

‘Poor reliability of public charging points makes planning a journey very difficult.’

Male, South West England

To improve reliability, the UK government has proposed to mandate that CPOs must meet a 99% availability standard as an average across their entire fleet of charge points. As such, ‘where a chargepoint has an assumed starting availability of 24 hours a day, 365 days a year, the operator would be allowed up to 4 days of downtime per chargepoint for repairs and maintenance a year.’ It has also proposed that CPOs must provide a 24/7 call helpline for consumers, so that assistance can be provided to consumers who are struggling to access a charge point.¹⁵⁶ The UK government has since confirmed that it will introduce standards to ‘ensure reliable charging for electric vehicle drivers.’¹⁵⁷

148 [CMA, Electric vehicle charging market study: final report](#), July 2021

149 EVA England, [Improving Drivers’ Confidence in Public EV Charging](#), April 2021

150 Which?, [Car Survey](#), April–June 2021

151 According to the CMA, ‘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.’ [CMA, Electric vehicle charging market study: final report](#), July 2021. Gridserve is now undertaking work to upgrade its motorway charging network. [Gridserve, Biggest motorway EV charging upgrade in UK history underway, with 11 new ultra high-power Electric Hubs in construction, plus world-first Electric Forecourt at Gatwick Airport](#), December 2021

152 Hansard, [Decarbonisation of Road Transport in Northern Ireland: Electric Vehicle Association Northern Ireland](#), May 2021

153 [CMA, Electric vehicle charging market study: final report](#), July 2021

154 [The Planning \(General Permitted Development\) \(Amendment\) Order \(Northern Ireland\) 2020](#)

155 BBC News, [Electric cars: ESB to use £3.27m funding ‘to double chargers’](#), November 2021

156 [UK government, Consultation: The consumer experience at public charge points](#), closed April 2021

157 [UK government, Government funding targeted at more affordable zero-emission vehicles as market charges ahead in shift towards an electric future](#), December 2021

A comprehensive redress system

When things go wrong for consumers when charging their EV, there should be a clear and easy process for them to make a complaint and, if needed, access redress. This is particularly important when consumers are being asked to invest in a relatively new technology where levels of confidence may be low.

However, this is not currently the case, and Ombudsman Services (OS) has raised concerns that ‘there is not, at present, a clear or well-defined journey for complaints about the various aspects of EVs,’ which they believe ‘will make it very difficult for customers to know where to go if something goes wrong, for instance, if they have charging problems.’¹⁵⁸ Bundled products and services (such as charging, parking, home energy and accident services) could present a particular problem, as it may not be clear who is responsible when an issue arises.

The UK government recently consulted on ensuring adequate consumer protections when using public chargepoints, and is proposing to take powers to ‘require financial redress for consumers and penalties if bodies breach requirements’, including ‘a mechanism for an enforcement body to impose penalties and sanctions on industry participants for poor consumer service.’¹⁵⁹

158 Ombudsman Services, [Response to Invitation to Comment on the CMA Market Study on Electric Vehicle Charging](#), January 2021

159 [UK government, Consultation: Future of transport regulatory review: zero emission vehicles](#), closed November 2021

8. Conclusions and Recommendations

The UK has taken the first steps in what will be a major transition from petrol and diesel vehicles to EVs, and while the charging network is developing well in some areas, this report highlights a number of existing and emerging issues.

Currently, charge point provision across the UK is patchy, and the network is much more developed in some areas than others. This is particularly concerning given that approximately eight million households will be unable to charge at home and will therefore be totally dependent on the public charging infrastructure. Where charge point infrastructure does exist, incomprehensive data and poor reliability means that drivers can't always be confident that the charge point will be available and working when they get there.

Furthermore, more and more charge points continue to be installed which are inaccessible to disabled drivers, and single-brand networks can restrict the numbers of charge points which are available for most drivers. Unnecessary inconvenience is a feature of the current network, as the lack of interoperability between networks' payment systems means drivers have to plan journeys in advance and navigate multiple apps and accounts. Meanwhile, owners of cars with CHAdeMO sockets could potentially face difficulties accessing compatible chargers in future. Issues including differing pricing structures and a lack of consumer information on cars also combine to create a confusing and complex experience for drivers, and if something did go wrong while charging their EV, the lack of a clear redress process could compound the driver's negative experience.

It is essential that these issues are addressed swiftly and at an early stage of the transition, so that growing numbers of drivers continue to make the switch to EVs, and to ensure that the expanding network meets the highest standards, fit for the future. This requires concerted action from EV manufacturers, CPOs and LAs, as well as the devolved and UK governments.

Working together, they must ensure that the right chargers are in the right places, so that everyone in the UK is able to rely on being able to access the charging infrastructure they need, no matter where they live and travel in the UK, and whether or not they have access to off-street parking. Prices should be transparent and easily comparable, and people living in certain types of accommodation mustn't face significantly higher prices simply because of the type of home they live in. Public charge points should be there to serve all users, including those with accessibility needs. Finally, we should strive to create a consumer experience that is as simple and positive as possible.

Coordinated Government Strategies

1. To achieve these goals, there is a clear need for the UK and devolved governments to develop strategies for the roll-out of EV infrastructure, coordinating their plans where necessary. As part of this, priorities and key targets should be outlined and committed to, and an overview should be provided of how many charge points will be needed and of which type, by when, and how they should be distributed. We welcome existing plans that are in place in Scotland and Wales, which we look forward to being further developed and implemented, and await with interest the forthcoming strategies by the Northern Ireland Executive and the UK government.

We make the following recommendations, recognising that the different situations and approaches taken in the UK nations means that some proposals may be more or less pertinent to each government. Strategies should:

- **Set out a plan to expand on-street charging options.** Owning and charging an EV should be a realistic option for people who don't have access to off-street parking. Plans should be set out to work with LAs and CPOs to ensure that on-street public charging is readily available for those who need it.
- **Set out a plan to expand the en-route charging network, coordinating with the other governments where appropriate.** In England, the RCF should be rolled out quickly and used to address cold spots in rural and remote areas as well as to support expansion on motorways and major roads. The UK government should also move forward with proposals to ensure effective competition between CPOs at MSAs, in line with the recent CMA market study recommendations including no exclusivity in future, open tenders and open access networks.¹⁶⁰
- **Clarify the responsibilities of LAs and ensure comprehensive guidance and support are provided.** The role of LAs in the roll-out of charging infrastructure should be clearly defined to ensure a cohesive approach. LAs also need to be better supported in the role they are already undertaking, and the UK and devolved governments should ensure that sufficient guidance and comprehensive national and local data are provided. If a statutory obligation is to be placed on LAs in England and Wales to plan for and provide charging infrastructure, their resourcing must be reviewed and ring-fenced funding must be provided if necessary.
- **Ensure funding is targeted at areas where the market is not delivering.** Strategies should set out the UK and devolved governments' plans to work with providers to identify suitable financing, for areas where the market is not delivering charge points at a sufficient pace to meet current and future demand. This potentially includes en-route charging in remote areas, on-street charging in certain areas and on motorways.

There are also a number of actions that the UK government, the devolved administrations and industry leaders must take in order to build an accessible and user-friendly charging infrastructure that works for all drivers.

Access for all:

- 2. Accessibility for all drivers' needs.** Accessible charge points should be readily available for disabled users, and we strongly support the UK government's proposals to mandate accessibility standards for public charge points. The UK and devolved governments should also set a minimum target for accessible charge point provision as a proportion of all public charge points across the UK, and provide guidance on how these should be distributed. LAs should have a clearly defined responsibility to ensure this target is met in their areas, and work with CPOs to achieve this.
- 3. No more single-brand networks.** The UK government should move forward with plans to require providers of charge point services at certain sites to offer open access charging. This must mean that networks are open to car users of any brand, and these requirements should be extended to all all public charge points. The UK government should also consider whether there is a need to provide guidance on differential prices charged to drivers of different brands of EVs, to ensure they are not punitive.

4. Access to compatible public chargers: The UK and devolved governments should monitor the availability of CCS and CHAdeMO DC charging plugs in the public network and ensure that, if the car industry coalesces around CCS as a single standard, this doesn't unreasonably constrain CHAdeMO owners' ability to charge.

Easy payment and fair and transparent pricing for EV charging:

5. Payment interoperability. The UK government should move forward with plans to regulate for payment interoperability and mandate that all charge points must offer payment by bank or credit card as a minimum, wherever possible.¹⁶¹ The UK government should also work with the devolved governments and CPOs to support the development of a cross-network roaming solution that will allow consumers to access all public charge points with a single RFID card or app, and introduce regulations if needed.

6. Introduce cash. The UK government, devolved governments and CPOs should work together to find a solution to allow public charge point users to pay by cash, including exploring the potential merits of a payment card that consumers can upload with cash at facilities like Post Offices and Paypoint outlets.

7. Affordability. The UK government, devolved governments and LAs should work with industry to develop and support possible solutions to enable people without off-street parking to charge at a comparable rate to home charging, either by having access to readily available, low-cost public charging or by being able to use their home energy supply. In the shorter-term, government should provide clarity on any regulations relating to charging from home so that drivers can understand what is permissible.

8. Transparent and comparable pricing. The UK government should move forward with proposals to mandate a standard metric for charging costs, which should be given in pence per kilowatt hour (kWh).

A straightforward and positive consumer experience:

9. Comprehensive real-time information. The UK government should move forward with plans to set open public charge point data standards. It must mandate that information including location, type of power (AC/DC) and rate, connector type (CCS/CHAdeMO) and accessibility for disabled drivers is shared about all public charge points, as well as live data on availability and working status.

10. Charging rate labels to make it easier to choose the right charger. Car manufacturers should print labels for maximum AC and DC charging rates adjacent to EVs' charging sockets to help consumers choose the right charge point for their vehicle.

11. Charge point reliability. The UK government should act on its proposal to mandate charge point operators to meet a 99% availability standard as an average across its fleet of charge points, and provide a 24/7 helpline for consumers.

12. A comprehensive redress system. The UK and devolved governments should map out the full regulatory and consumer protection landscapes for EV charging. The responsibilities of the relevant regulators should be clarified to ensure the whole of the EV charging sector is covered, and any gaps in consumer protection must be addressed so that consumers can easily access redress.

¹⁶¹ Recognising that this will not always be feasible, for example for on-street chargers in lampposts and bollards, or where the cost would be prohibitive.

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