Electric Vehicle Charging on Long Journeys:

Current Challenges and Future Opportunities

BACKGROUND AND CONTEXT

Electric vehicles (EVs) are a key cornerstone of the UK government's strategy for mitigating climate change and achieving net zero. With no tailpipe emissions and given the national shift towards renewable electricity generation, they are promising a significant reduction in greenhouse gas emissions from transportation.

To support the uptake of EVs, the UK is planning to phase out the sale of new petrol and diesel cars by 2030. Moreover, the government is investing heavily in improving the EV charging infrastructure, as evidenced by a budget of £1.3 billion for this in the National Infrastructure Strategy.

These policies are offering confidence to the public, and EV uptake is accelerating rapidly, with battery EVs registered in the UK rising by over 93% from 205k in 2020 to 397k in 2021[1]. However, charging EVs away from home to enable longer journeys remains a challenge. Over the same period, the number of public rapid charge points in the UK rose by just over 31%, from 3,930 in 2020 to 5,164 in 2021. Indeed, the number of registered battery EVs per rapid charge point increased from 31 EVs in 2018 to 77 EVs in 2021, showing that competition for the current infrastructure is rising rapidly.

This growing competition is potentially a significant barrier for the continuing widespread adoption of EVs and for the transition towards electrified transport. Thus, it is crucial to understand the current challenges that EV drivers face on long journeys and what the opportunities are for mitigation and targeted investments.

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[1]Data from Zap-Map (https://www.zap-map.com).

OUR STUDY

We conducted a large-scale survey of 1,278 EV drivers with experience of charging on long journeys. This was done through an online survey (1,072 drivers) and in-person interviews (206 drivers) at rapid charging stations in Cobham, Fleet and Winchester, and at the Fully Charged LIVE event in Farnborough. All interviews were conducted between 19 April and 5 May 2022. During the survey, we asked participants about their charging experience, key challenges they regularly encounter and how their experience could be improved. We also asked about how they choose charging stations when planning a long journey. Here, we summarise the key findings from our survey, followed by a set of recommendations for policymakers and industry stakeholders.
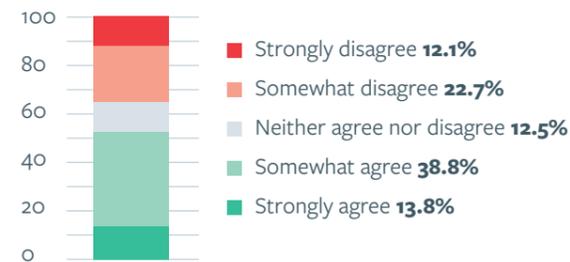
# FINDINGS AND IMPLICATIONS

1. Lack of Infrastructure

More than a third of EV drivers are dissatisfied with their charging experience on long journeys, experiencing queues at charging stations, charge points that are out of service and other issues.

While the majority of EV drivers (52.6%) are generally satisfied with their experience of charging on long journeys, more than a third (34.8%) are dissatisfied. When asked about a number of specific challenges, 68.6% state that they regularly encounter problems with charge points that are out of service (21.6% frequently and 47% occasionally). Even when stations are working, there are problems with availability – 32.3% report that stations are frequently fully occupied by charging cars, while 46.1% encounter this problem occasionally. Furthermore, 51.2% regularly come across charge points occupied by non-EVs (12.4% frequently, 38.8% occasionally). Ease of use and access is another issue: 38.4% report regularly having trouble locating a charge point (8.2% frequently and 30.2% occasionally), and 51.5% of participants regularly have problems with the payment method (12.1% frequently and 39.4% occasionally).

■	Strongly disagree **12.1%**
■	Somewhat disagree **22.7%**
■	Neither agree nor disagree **12.5%**
■	Somewhat agree **38.8%**
■	Strongly agree **13.8%**

Satisfaction
"In general, I am satisfied with my experience of using public charging stations on long journeys."
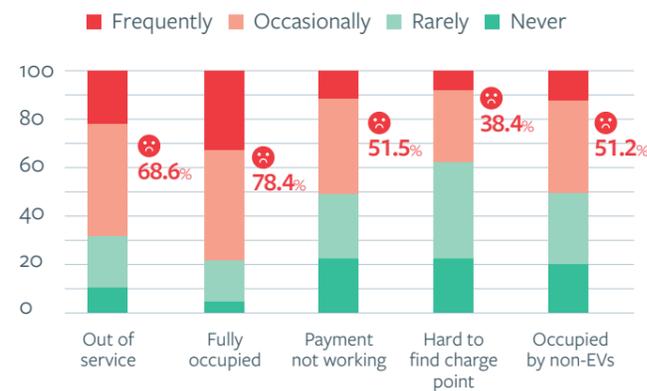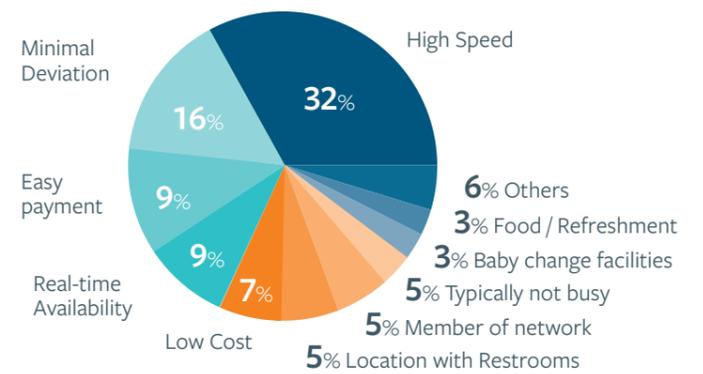

Key Charging Challenges

2. Diversity of Preferences

Drivers vary significantly in how they choose charging stations, showing a diversity in needs and individual preferences.

We asked EV drivers to select and rank the most important features they consider when choosing charging stations on long journeys. Here, the answers displayed considerable diversity in preferences. The feature most frequently ranked top was a high speed of charging (32% of drivers chose this), followed by a minimal deviation to their route (16%). The remaining half of drivers ranked a wide range of other features highly, including real-time availability information (9%), easy payment methods (9%) and low cost (7%).

First Preference for Charging Station Choice

3. Lack of Information

An important challenge encountered by many drivers is the lack of real-time information on charge point availability and service status.

Many drivers commented on the lack of real-time or up-to-date information about charge points. When questioned about key challenges when charging on long journeys, 356 (27.9%) of drivers raised this in their open comments. While many specifically referred to a lack of information about whether charge points were currently in use, others were interested in whether stations were out of service. A few drivers commented that even with real-time information, there is no guarantee that a station will be available at the time of the driver's arrival.

A large proportion of participants use dedicated EV information and routing apps - 915 (71.6%) use Zap-Map and 118 (9.2%) use A Better Route Planner. Many users are happy with these apps and 216 state in open comments that they meet all their needs, or that there is nothing to dislike about current apps. However, 887 participants (69.4%) list aspects that they feel are currently lacking from those apps, including incomplete or unreliable information about charge points (for example, regarding availability, service status and pricing), lack of a universal payment system and lack of integration with the car's on-board computer.

RECOMMENDATIONS

1. Investment in Infrastructure

Make targeted investments to improve the UK's infrastructure.

All stakeholders, including industry and government, must collaborate to improve the charging infrastructure all over the UK. Clearly, capacity needs to be increased to keep pace with the rapid uptake of EVs. Building large charging stations with many concurrently usable charge points will help reduce uncertainty around queues and charge points being out of service. Beyond the provision of more high-speed charging stations, features like sheltered charge points, safety (including good lighting), and nearby facilities need to be considered. In doing this, there is a value in encouraging diversity in charging station features to cater for different drivers' individual preferences. Where possible, charge points should be placed at visible locations and should be easily accessible, including by drivers with different needs. As questions around queueing etiquette were frequently raised, this should be considered in the design and potentially enforced in the planning process, for example by requiring dedicated queueing lanes for large stations.

2. Real-Time Information

Ensure charge point operators supply useful and reliable real-time information.

Make it mandatory for companies to share real-time data, both on whether a charge point is currently in use and on whether it is out of service. Additionally, as many respondents in the survey wanted to know whether a charge point would be available when they arrived, the provision of historical data would enable drivers to avoid peak times and would enable the use of artificial intelligence tools to predict likely queueing times based on both historical and current data. Given current complaints about inaccurate and unreliable data, there should be penalties for providing inaccurate data to consumers.

3. Smart Routing Applications

Enable third-party application developers to provide integrated, smart routing applications.

It will be beneficial to develop more integrated and smart applications to make it easier for drivers to plan long journeys. The applications should have a central repository of up-to-date charge point data that includes more than just the location and socket type, covering aspects such as local facilities, shelter or availability of restrooms. To provide a personalised experience, application developers should take into account the diverse personal preferences of drivers. These could be learnt, using artificial intelligence technologies, by observing historical behaviour or by interacting with the user. With this information, routing apps can help users plan charging stops on long journeys, combining information like the weather and vehicle type with the driver's personal preferences to suggest the most suitable charging stops. Using predictions from Recommendation 2, queues could be anticipated and drivers diverted to other stations as necessary, making more effective use of the limited infrastructure and improving the experience for drivers.

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