POLICY BRIEFING
February 2022 (2)

PREFERENCES FOR PUBLIC ELECTRIC VEHICLE (EV) CHARGING

Published by the Transport Studies Unit, University of Oxford
with funding from **Innovate UK**

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SUMMARY:

- Households who may not be able to charge an EV at home currently park their vehicle(s) both on and off the street.
- These households may not want to charge an EV at the kerbside if this is perceived as insecure and they have to compete more for parking space.
- A safe, pleasant walk home from wherever EV drivers park and charge is a priority, especially for women.

1 INTRODUCTION

National surveys[1] suggest that approximately 30% of households in the UK do not have a private garage or driveway adjacent to their home where they can install a charger or charge a vehicle using domestic electricity – something that up to 90% of current plug-in electric vehicle (EV) owners in the UK are able to do[2]. Whilst being able to charge at home makes drivers more likely to buy or lease an EV, there are other options for charging at home. Charging can take place on- or off-street, and may use public space in residential areas.

Our research aims to understand perceptions of and preferences for EV charging infrastructure to make the case for providing attractive alternatives to residents who cannot install or access private charging. We appointed Accent, a Market Research Company with transport experience, to conduct a survey that would seek views on parking, electric vehicles, and charging them. Using an online panel, our survey participants are representative of the national population of car drivers by gender, age and UK region.

Our survey also used scoping questions to target car drivers who cannot park all of their household's vehicles on driveways and in private, domestic garages. The reason for collecting a sample defined by their parking situation at home is that these are the types of households who are most likely to need public charging infrastructure if they want to drive an EV.

2 THE DIVERSITY OF RESIDENTIAL PARKING

Out of 2,001 valid responses, half our survey participants live in one-car households and the other half in households with two or more cars or vans. More than one in five drivers in both groups of households usually park their vehicle in off-street car parking areas when at home, even though the majority of those who are unlikely to be able to charge an EV at home park on-street (**Figure 1,** next page).

1 National Travel Survey, British Household Survey

2 Deloitte. 2019. Hurry up and... wait | The opportunities around electric vehicle charge points in the UK.

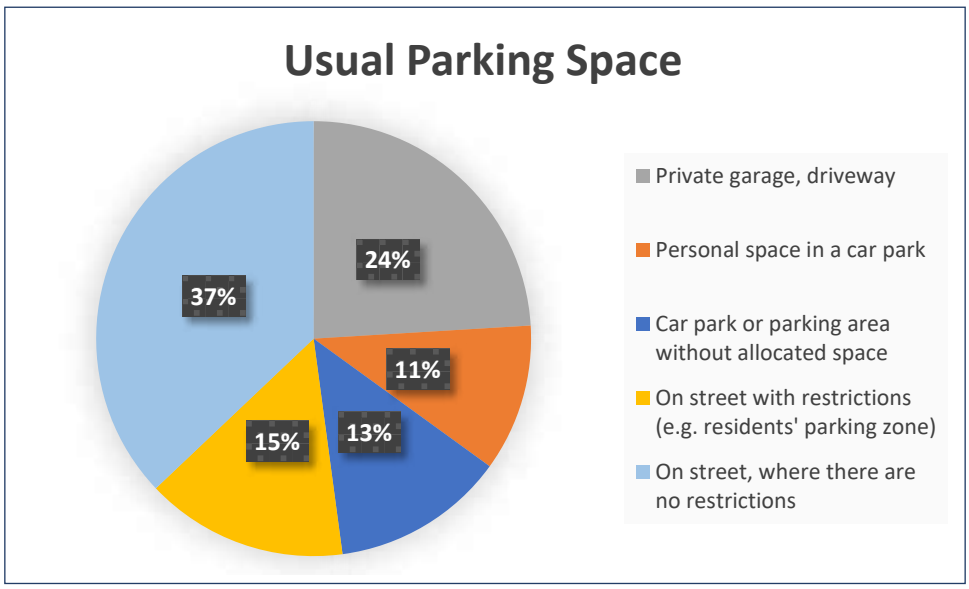

Figure 1: Usual parking place among study participants

Our research also found that the socio-economic and geo-demographic characteristics of the households who use these different types of parking are distinct and significantly so. This is nowhere more noteworthy than between those who usually park on-street where there are restrictions on parking, compared to where there are none, as shown in Table 1.

Table 1: Differences between drivers using different parking places

	Private garage / driveway	Personal space in a car park	Car park / parking area (unallocated)	On street with restrictions	On street, no restrictions
Number of vehicles per household (mean for each parking situation)	2.22	1.67	1.60	1.45	1.53
Home is owner-occupied (% with each parking situation)	81%	50%	36%	48%	59%
Annual household income over £40k (% with each parking situation)	51%	31%	32%	47%	32%
Pay for residential parking (% with each parking situation)	8%	19%	17%	55%	2%

Residential parking is free for 85% of our sample of 2,001 survey participants. Those who do pay for their parking tend to live in areas with on-street parking restrictions, such as residents' parking zones, where they pay for permits, streets are wider on average to allow marked bays, and there are more higher income households. If policy for the provision of public charging infrastructure for residents is to be equitable and inclusive, then interventions should focus on extending the benefits of the lower operational costs of driving electric to lower income families living in terraces and flats, who are likely to either park on-street where there are no restrictions or off-street, in shared parking areas. These lower income residents may be home owners, but not own space to park a vehicle.

3 WHERE TO CHARGE?

About a third of survey participants intend to buy or lease an EV as their next vehicle on average, but this is very much skewed by income and gender **(Figure 2)**.

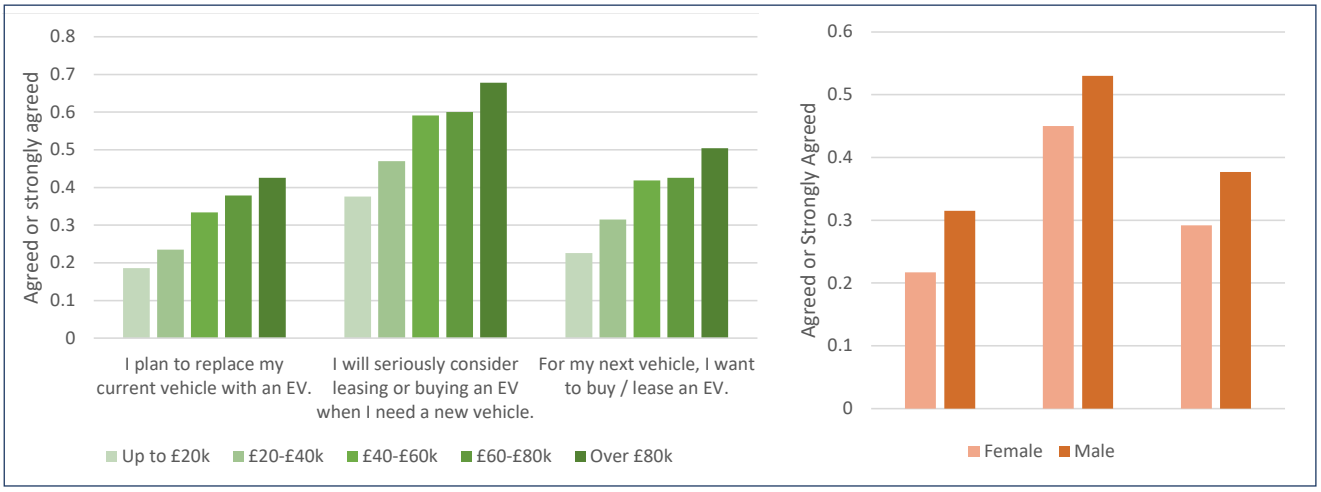

Figure 2: Interest in EV adoption among survey participants

Like other studies, the intention to switch is motivated by environmental values and positive attitudes towards EV technology. Experience of parking pressure around people's homes was not directly associated with the intention to purchase or lease an EV, but competing with neighbours for parking space, on- or off-street, made survey participants less confident that they'd be able to charge an EV locally. On the other hand, those who can easily find a space at home or on-street outside their home might be more confident about charging an EV if they had to, but that doesn't make them more likely to consider purchasing one themselves.

Overall, the majority of participants expect it to be difficult to find and know how to use local charging infrastructure (**Figure 3**).

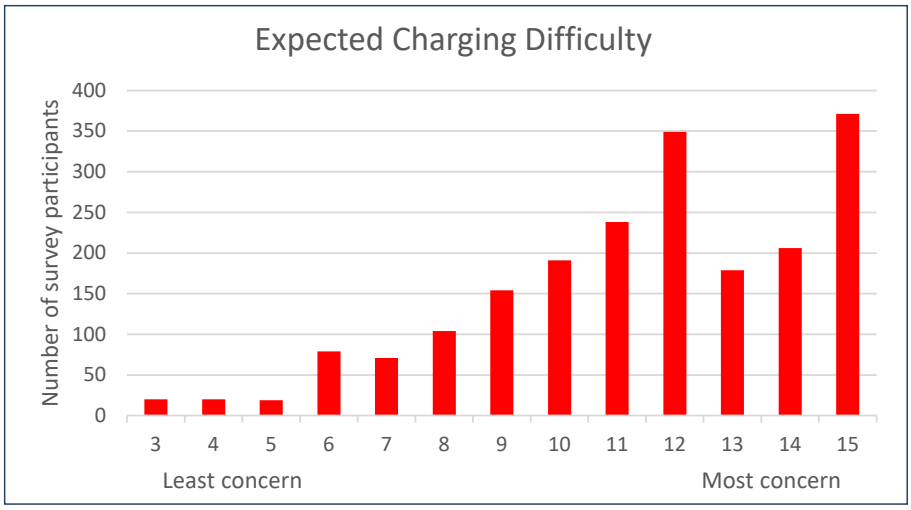

Figure 3: Frequency with which survey participants rated local charging to be difficult

More on- and off-street charging infrastructure of different types and in different locations will be required to reduce expected difficulties with charging and accommodate a full transition to battery-powered, plug-in vehicles for those who cannot charge at home. On-street charging may be appropriate where there are:

- wide streets with space for charging without obstructing the pavement; and
- pre-existing marked bays, and possibly residents' permits to control parking.

However, even in such areas, adding on-street charging will limit who has access to on-street space, potentially causing conflict between neighbours. Charging hubs in a car park could offer a better solution for many local residents who cannot charge at home.

4 CHOOSING CHARGING PREFERENCES

We asked the survey participants to imagine they had an EV and have no opportunity to charge in a private garage or driveway. They were given a choice between two alternatives for a residential overnight charging service: one on-street and one car-park-based. The characteristics of the alternatives could vary. Table 2 summarises these characteristics and describes the levels of each characteristic that could be included for that alternative. Some had only one level, others two or three. Each participant was shown six carefully selected combinations of levels to choose between alternatives, so that our analysis could identify how the participant valued the different characteristics and levels.

Table 2: Characteristics of On-Street and Car Park EV charging services

Attribute	Levels On-Street	Levels Car Park
Charging space guarantee	• No guarantee	• No guarantee • Space reserved on booking • Unique space only allocated to you
Charging fee (per night, to full battery)	• £4 • £8 • £12	• £4 • £8
Payment	• Per charging session (pay as you go)	• Per charging session (pay as you go) • Monthly (subscription)
Parking duration	• Unlimited • 8pm-8am only	• 5pm-9am only • 8pm-8am only
Dedicated security measures at parking location	• None • CCTV	• None • CCTV • Security guards on patrol
Walk time to home	• 2 minutes • 5 minutes • 10 minutes	• 2 minutes • 5 minutes • 10 minutes
Walk experience	• Good experience: the route is pleasant and you feel safe • Neutral: route is OK and makes you neither safe nor unsafe • Bad experience: the route is unpleasant and makes you feel anxious	• Good experience: the route is pleasant and you feel safe • Neutral: route is OK and makes you neither safe nor unsafe • Bad experience: the route is unpleasant and makes you feel anxious

Of the 12,012 choices by the participants, over half chose to charge their supposed future EV in a car park, and they valued the car park alternative slightly more than the on-street alternative, as shown in **Figure 4.** Figure 4 also shows the relative importance of the different characteristics to the sample as a whole.

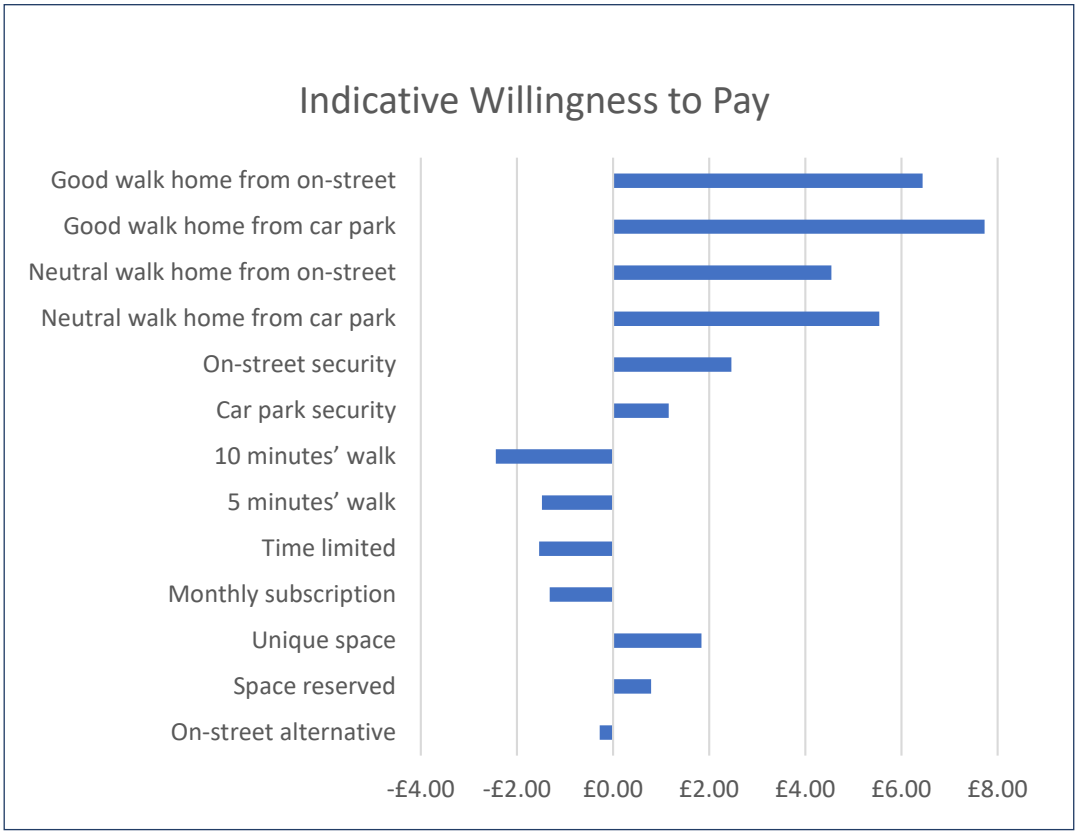

Figure 4: Willingness to pay for different characteristics in car park or on-street alternative

The quality of the walk experience is valued much more highly than the walk time, and is more important if coming from a car park than from an on-street charging space. On the other hand, security measures at the parking location are more important on-street than in a car park.

Cost is obviously important, but our analysis found that how important varied significantly between participants. Therefore, we undertook further modelling to understand which sorts of people would make which trade-offs. Those who chose the car park option fell into two groups:

- Value seekers; survey participants who experience parking pressure in their neighbourhood, and therefore value a choice that offers them a reservation or allocated space in a secure car park; and

- Cautious users; majority women who also preferred the security measures and space guarantees available in car parks, but for whom a safe, pleasant walk home was non-negotiable.

As shown in **Figure 5,** (next page) individuals in both groups are more likely to be aged over 50 and more willing to change where they park in order to charge.

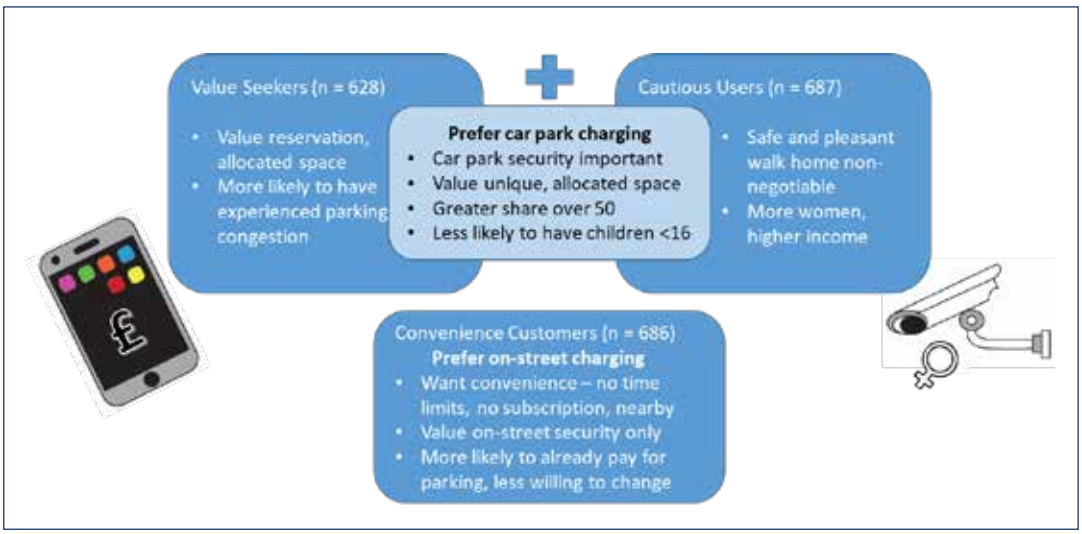

Figure 5: Grouping participants by preferences

A significant proportion of those who preferred the on-street charging alternative already pay for parking, often in the form of residents' permits in controlled parking zones. For them, on-street charging represents a smaller change to their current parking routines.

5 CONCLUSION

The expansion of public or shared residential charging infrastructure will be essential to encourage the mass adoption of EVs and to make EV uptake more equitable and accessible to groups without home charging options. Our research shows that such options can be provided in car parks as well as on-street. The best mix of options for a local area will depend on both the preferences of current and future local users and the form and design of the streets and car parks in the neighbourhood. It is not enough to consider local capacity in terms of space and electricity, but also the security and safety of the local environment, the level of parking pressure, and where people live in relation to where they can park and charge.

Implications	
For Policy Makers	**For Charging Providers and Operators**
Consider car park locations as well as on-street for public or shared residential charging infrastructure.	Deliver public or shared residential charging infrastructure where it is supported by local residents and communities.
Safety, security and the local environment on the walk between people's homes and where they park their car are important to a positive parking and charging experience.	Parking and charging fees should reflect that provision is being made for those who cannot benefit from charging on home electricity tariffs.
The option to book a parking space to charge is extremely important to users, and will be easier to deliver where hubs offer multiple chargers.	Some guarantee that a space will be available when needed is attractive to those customers used to parking pressure.

About the Project

This note was produced as part of the **Park and Charge Oxfordshire Project**, an **Innovate UK** funded Real World Demonstrator for electric vehicle charging for public spaces (Project Number 105428) involving **Zeta Group**, **Urban Integrated Limited ([ui!]uk), Oxfordshire County Council** and the **University of Oxford.** The commercial partners have created **EZ-Charge** to operate the charging hubs.

Part of this note is based upon academic articles in preparation. A preprint of our stated preferences analysis is available as:
Residential Neighbourhood Charging of Electric Vehicles: an exploration of user preferences
(Forthcoming) Hannah Budnitz, Toon Meelen, Tim Schwanen.

About the Authors

Hannah Budnitz is a Research Associate in Urban Mobility at the TSU. Her research concentrates on the interactions between land use and accessibility, sustainability and travel behaviour.

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About the Transport Studies Unit

The Transport Studies Unit (TSU) has been the centre of transport research excellence within the University of Oxford since 1973. The TSU hopes to inspire and inform change towards a more sustainable, just and accessible transport system by advancing understandings of the systems, processes and practices that shape the way people and goods move. Based within the world-leading School of Geography and the Environment at the University of Oxford, the TSU approaches global transport challenges from social science and holistic perspectives. Its work is organized in four broad themes: energy, climate and environment; politics, power and governance; everyday life and justice; and health and wellbeing.

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