

AA01

A survey on charging technologies for Electric Vehicles (EVs)

This is a survey on **smart charging** and **vehicle-to-grid (V2G)** charging technologies for electric vehicles.

We'll give you some information on these technologies in the next pages.



Estimated survey time: 20 minutes.

AA02

Let's start!

Your participation is **anonymous**.

You can click "Pause the survey" at the bottom of the page to come back to it later, or end the survey at any time.

Let's start!AA03 **1. Can you please enter your unique Prolific ID?**PI18 **2. What is your total household income per year, including all earners in your household (after tax) in GBP?**

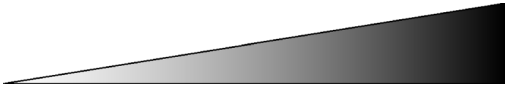
- ☐ <£19,999
- ☐ £20,000 – £29,999
- ☐ £30,000 – £39,999
- ☐ £40,000 – £49,999
- ☐ £50,000- £69,999
- ☐ £70,000+

☐ Prefer not to say

3. How much do you know about the following charging technologies for electric vehicles (EVs)?

IQ17

I know nothing I know a lot



Smart Charging

☐ ☐ ☐ ☐ ☐

Vehicle to grid (V2G)

☐ ☐ ☐ ☐ ☐

4. Are you taking part in a smart charging or a V2G trial?

IQ18

- ☐ No, I am not part of a trial.
- ☐ I don't know if I am part of a trial.
- ☐ Yes. Please provide the name of the trial or the company running the trial:

5. Do you have any EV chargers installed in your home?

IQ19

- ☐ I don't have a charger
- ☐ I use a 3-pin plug charging cable
- ☐ I have an unmanaged charger
- ☐ I have a smart charger
- ☐ I have a vehicle to grid charger
- ☐ I have more than one EV charger. Please give some details:

1 Active Filter(s)

Filter IQ19/F1

If any of the following options is selected: 3, 4, 5, 6
Then display the questionnaire page(s) VG (otherwise hide them)

VG03 

6. How long have you had a charger installed at home?

- ☐ Up to 3 months
- ☐ 4 to 12 months
- ☐ >1 to 2 years
- ☐ >2 to 3 years
- ☐ Other, please specify:

☐ I don't know

VG02 

7. What is the power rating of your home charge point, in kilowatts (kW)?

- ☐ 3.6 kW
- ☐ 7 kW
- ☐ Other, please specify:

☐ I don't know

IQ20

8. How did you usually travel to work prior to the Covid-19 pandemic (for example, in January 2020)?

- ☐ By my own car or a car from a car sharing pool
- ☐ By public transport (Train, bus)
- ☐ By cycling
- ☐ By walking
- ☐ Did not commute to work (e.g. because I work from home, retired)
- ☐ Other, please specify:

IQ21

9. Does your household have any of the following? (Select all that are appropriate)

- ☐ Smart energy meters
 - ☐ Solar panels
 - ☐ Solar water heaters
 - ☐ Home Battery (e.g. Powerwall)
 - ☐ Green Energy tariffs (e.g. Tesla Energy Plan)
 - ☐ EV specific tariffs (e.g. EV Everywhere)
-
- ☐ None of the above
 - ☐ I don't know

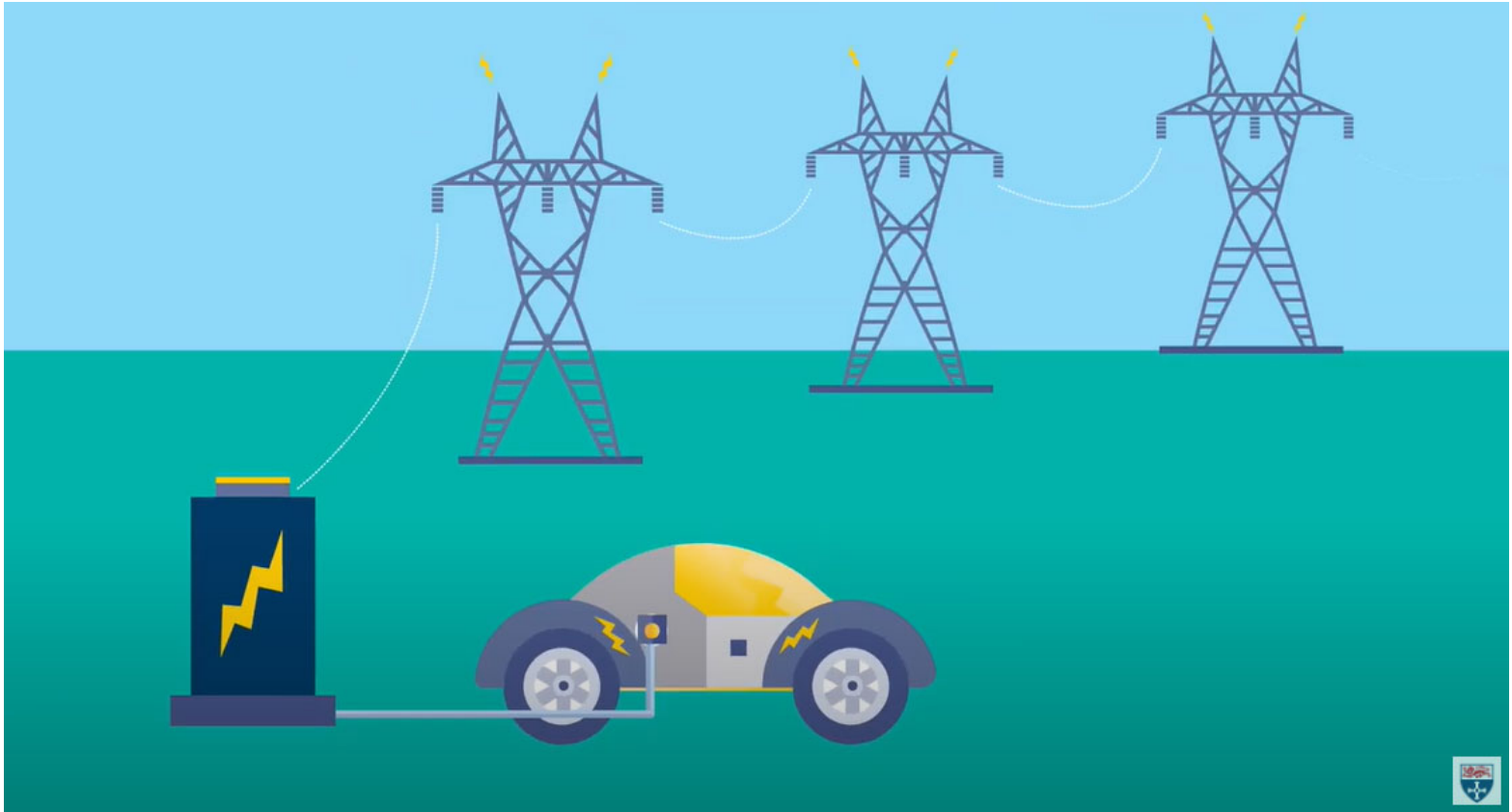
IN05

In the following pages, we are providing some **information** on charging technologies.

We will then ask you **8 questions** on these charging technologies.

IN06

Charging millions of EV batteries needs to be managed to prevent overloading the electricity grid and minimise costly upgrades, ultimately paid for by the consumers.



(Un)managed chargers?

There are two main categories of chargers:

1) With **unmanaged chargers**, the battery of the EV will be charged as soon as it is connected to the charging station.

2) **Managed chargers** such as **smart chargers** and **vehicle to grid (V2G) chargers** connect an EV to the grid using a charging device which includes a data connection.

These managed chargers may help manage electricity demand across a green electricity system and reduce costs for the consumer.

More on **smart chargers** and **V2G chargers** next.



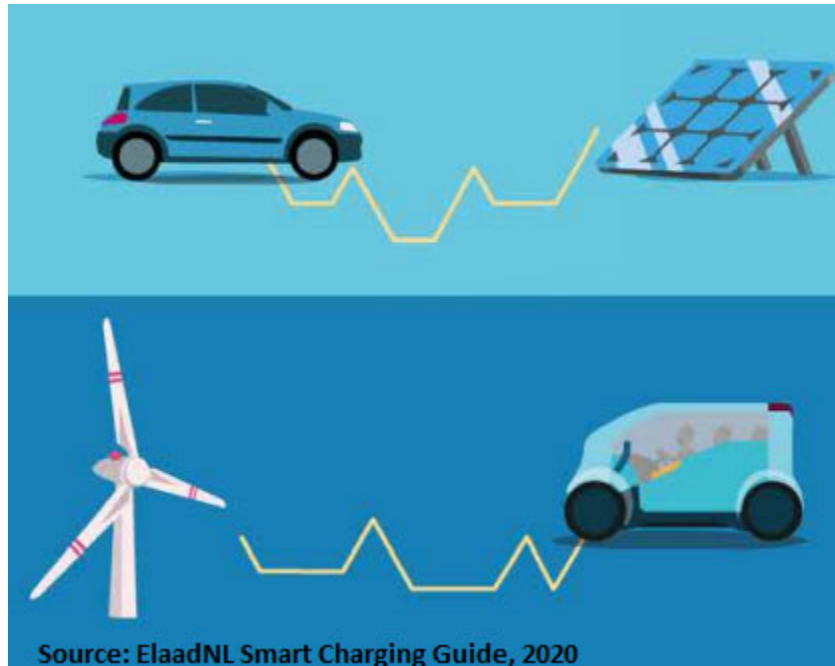
Managed Charging Devices
OVO/Kaluza-Indra charger (Top)
Octopus EV- Wallbox charger (Bottom)

What's a Smart Charger?

Smart chargers can manage the **time of charging** and the **speed of charging** (i.e. power rate).

For example, charging can start a couple of hours after the EV is plugged and it doesn't need to happen at full power.

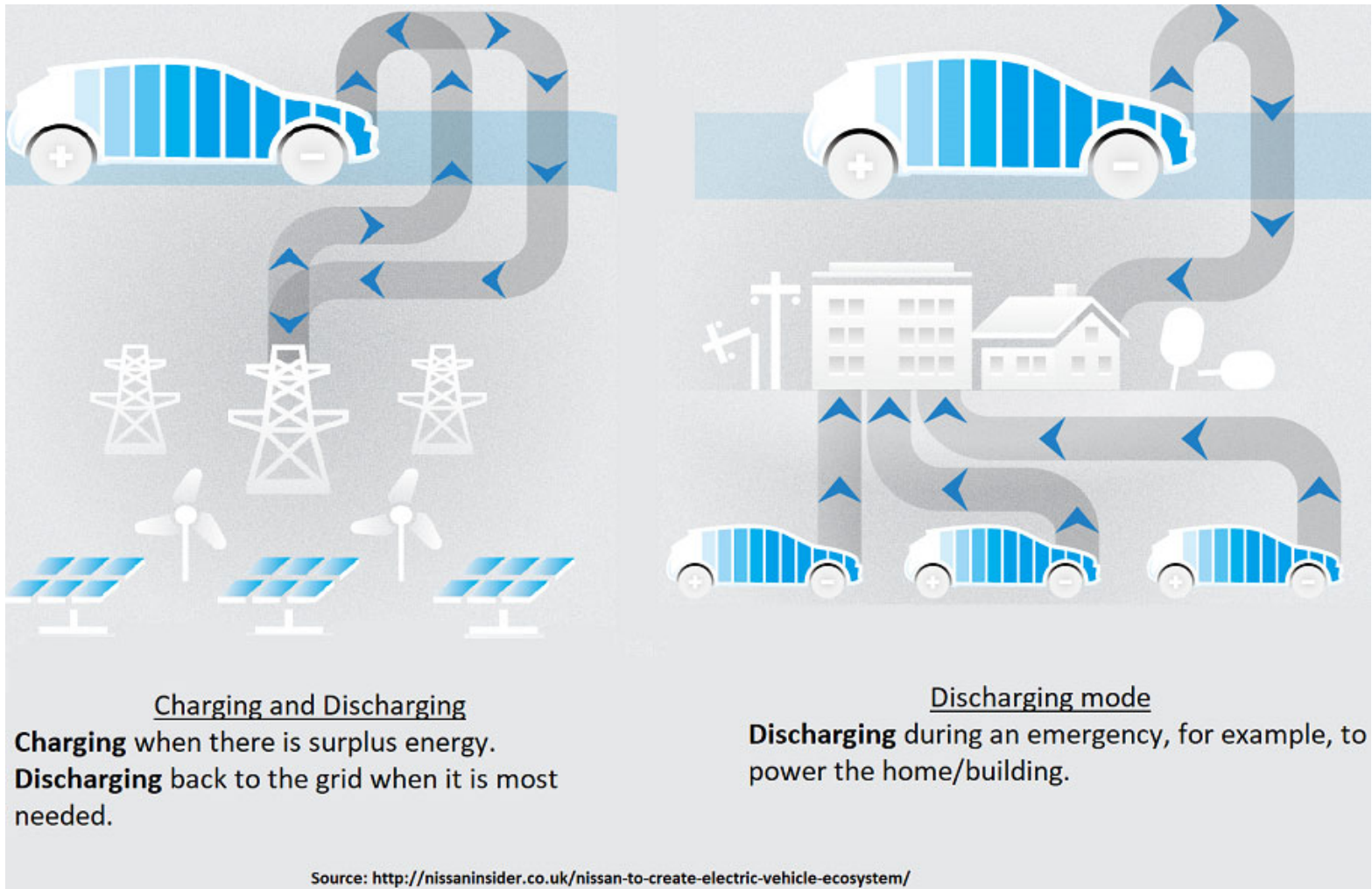
Smart charging can minimise grid congestion by avoiding charging at peak times (7-9am and 4-7pm in the UK) and/or make use of excess electricity generated by solar panels or grid electricity imported during cheaper periods.



What's a V2G charger?

A **vehicle-to-grid (V2G)** charger is similar to a smart charger in that it can also manage the **time** and **speed** at which charging takes place.

In addition, a V2G charger allows **switching the direction of charging** by allowing EVs to sell energy back to the grid when it is most needed, or most expensive, such as at times of peak demand.



The user is in control

Both smart chargers and V2G ensure that the vehicle is charged to meet driving requirements which the user can set, usually through a customer App. A screenshot from an example App is shown below.



At this point we like to know if we provided enough information on charging technologies.

What can be managed with a smart charger? (Select all that are appropriate)

- ☐ Power rate (i.e. speed of charging)
- ☐ Direction of charging
- ☐ Time of charging

☐ I don't know

To what extent do you agree or disagree with each of the following statements?

To answer these questions if you don't have an EV, imagine that you'll have one in the future.

[illegible]

GC02

How important are the following statements to you?

	Not at all important (0)	1	2	3	Very important (4)	I don't know
Having full control over the charge level of my EV's battery.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having a guarantee that my EV will be charged by a specified time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Adopting new technology as soon as it becomes available.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having full control as to when charging happens.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please tick option "I don't know" so we know that you read this text.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having minimal engagement with the charging process (e.g. I set my preferences once and I don't have to interact with the system after that).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Having a guarantee that my EV's battery will never fall below a specified charge level.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

IN08

The following section is specific to V2G chargers.

Compared to a smart charger, what is **unique** about a **V2G charger**?

- ☐ It allows managing the speed (i.e. power rate) of charging.
 - ☐ It allows managing the time of charging.
 - ☐ It allows bidirectional power transfer (i.e. charging and discharging of the EV battery).
-
- ☐ I don't know

To what extent do you agree with each of the following statements describing your attitudes towards vehicle-to-grid (V2G)?

I believe using V2G is very easy.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

I would be prepared to pay more for a V2G charger than for a smart charger.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

Charging my EV with V2G would be cheaper compared with unmanaged charging.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

V2G is as reliable as other charging technologies.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

I believe V2G can extend the EV battery life.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

To what extent do you agree with each of the following statements describing your potential concerns about vehicle-to-grid (V2G) technology?

“With V2G”...

I’m afraid the battery life could be shortened by the frequent charging and discharging.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

I would need to adapt my driving patterns.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

I fear the battery is not sufficiently charged when I want to start a trip.

Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
-------------------	----------	---------	-------	----------------	--------------

IC01 

How important are the following statements to you when assessing if you would use your electric vehicle (EV) for vehicle-to-grid (V2G).

V2G allows me to use my EV for back-up power for my home.

Not at all important (0)	1	2	3	Very important (4)	<i>I don't know</i>
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V2G helps me integrate my EV with my solar PV system.

Not at all important (0)	1	2	3	Very important (4)	<i>I don't know</i>
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Please tick option "Very important" so we know that you read this text.

Not at all important (0)	1	2	3	Very important (4)	<i>I don't know</i>
-----------------------------	---	---	---	--------------------	---------------------

V2G helps reduce my carbon emissions.

Not at all important (0)	1	2	3	Very important (4)	<i>I don't know</i>
-----------------------------	---	---	---	--------------------	---------------------

V2G contributes to a stable electricity network for all.

Not at all important (0)	1	2	3	Very important (4)	<i>I don't know</i>
-----------------------------	---	---	---	--------------------	---------------------

IC03 

I would use my car for V2G if I receive energy bill savings of:

No energy bill savings

Strongly disagree	Disagree	Neither	Agree	Strongly agree	<i>I don't know</i>
-------------------	----------	---------	-------	----------------	---------------------

5% energy bill savings

Strongly disagree	Disagree	Neither	Agree	Strongly agree	<i>I don't know</i>
-------------------	----------	---------	-------	----------------	---------------------

10% energy bill savings

Strongly disagree	Disagree	Neither	Agree	Strongly agree	<i>I don't know</i>
-------------------	----------	---------	-------	----------------	---------------------

Below are different options for charging an electric vehicle.

Please indicate for each option whether you would use it or not.

F101

	I would definitely not use it					I would definitely use it	I don't know
Unmanaged charging The battery of your electric vehicle will be charged as soon as you connect your car to the electricity grid.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
V2G charging Manage the rate, time and direction of charging.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>
Smart charging Manage the rate and time of charging.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		<input type="radio"/>

What do you think are the most attractive features of V2G that would make you want to use it?

F102

What do you think are possible barriers that would prevent you from using V2G?

F103

PI11

Some information about you

We ask these questions as they might help us identify trends about various demographic groups.

PI13

10. Current UK area of residence

[Please choose]



PI14

11. How would you describe your residential location?

- ☐ Urban
- ☐ Rural
- ☐ Other, please specify:

PI21

12. Do you own the property that you live in?

- ☐ I own the property I live in
 - ☐ I live in privately rented accommodation
 - ☐ I live in social housing or affordable-rented accommodation
-
- ☐ Prefer not to say

PI15

13. How old are you?

[Please choose]



PI16

14. What is your gender?

[Please choose]



PI17

15. What is your highest educational qualification?

[Please choose]



PI19

16. How many licensed drivers are there in your household? (including yourself)

[Please choose]



17. How many cars do you use in your household?

PI20

This can include vehicles that you have access to but do not own.

☐ 1

☐ 2

☐ 3

☐ Other, please specify:

☐

☐ I don't currently have access to a car

3 Active Filter(s)

Filter PI20/F1

If any of the following options is selected: **1**

Then hide the questionnaire page(s) **V2Q-V3EV** (otherwise display them)

Filter PI20/F2

If any of the following options is selected: **-1**

Then jump to page **jump1** after the next button was clicked

Filter PI20/F3

If any of the following options is selected: **2**

Then hide the questionnaire page(s) **V3Q-V3EV** (otherwise display them)

V101

Almost Done!

We'll ask some last few questions on the vehicles you drive. Then there is an optional section about data privacy.

If you indicated that you have more than one vehicle, you'll get the option to include information on some or all of your vehicles.

V107

18. What is the ownership type of this vehicle?

- ☐ Owned
- ☐ On lease
- ☐ Company car
- ☐ Other, please specify:

V108

19. What is the Brand, Model and Year of registration of this vehicle?

(Example: Nissan LEAF 2020; Nissan Qashqai 2019)

Brand

☐ Prefer not to answer

Model

☐ Prefer not to answer

Year

☐ Prefer not to answer

V109

20. For how long have you been using this vehicle?

- ☐ Up to 3 months
- ☐ 4 to 12 months
- ☐ 1+ to 2 years
- ☐ 2+ to 4 years
- ☐ 4+ to 6 years
- ☐ Other, please indicate:

V110

21. How frequently did you use this vehicle, pre-Covid lockdown?

- ☐ Daily
- ☐ Several times a week
- ☐ Few times a month
- ☐ Less than once a month
- ☐ I don't know

22. Where do you mostly park this vehicle overnight?

V111

- ☐ Residential off-street parking (driveway or garage)
- ☐ Residential on-street parking (e.g. kerbside)
- ☐ Public car park
- ☐ At work
- ☐ Other, please indicate:

23. What was your annual mileage in the past year, pre-Covid?

V112

Info recorded on MOT or provided to insurance provider.

(or mileage so far if you had the vehicle for less than a year)

Annual Mileage

- ☐ Miles (mi)
- ☐ Kilometres (Km)

V116

- ☐ I don't know

24. What's the type of your vehicle?

V106

- ☐ Internal combustion engine vehicle (ICE)
- ☐ Hybrid electric vehicle (HEV)
- ☐ Plug-in Hybrid Electric vehicle (PHEV)
- ☐ Battery electric vehicle (BEV)
- ☐ I don't know

1 Active Filter(s)

Filter V106/F1

If any of the following options is selected: **3, 4**

Then display the questionnaire page(s) **V1EV** (otherwise hide them)

V113

25. Where do you mostly charge this electric vehicle?

- ☐ At home, using a private charger (e.g. installed on a driveway or garage)
- ☐ At home, using a public charger (e.g. installed at kerbside, or in car park)
- ☐ At work
- ☐ At home and at work
- ☐ In public parking spaces (e.g. shopping centres, supermarkets, etc.)
- ☐ At filling stations or hubs of fast chargers (e.g. 50kW)

☐ Other, please indicate:

V114

26. How often do you plug this EV to the charger?

- ☐ Almost after every trip when there is a charger available
- ☐ Once a day (e.g. at home or at work)
- ☐ Twice a day (e.g. at home and at work)
- ☐ I don't plug my EV every day (e.g. I charge it 2-3 times a week)
- ☐ I don't know

V115

27. What is the capacity of the EV battery (i.e. traction battery)?

For example, 30kWh

kWh ☐ I don't know

V202

Would you like to enter the details of your second vehicle?

It would be useful for our work to get the details for all vehicles that you use in your household.

- ☐ Yes
- ☐ No, I'm done!

2 Active Filter(s)

Filter V202/F1


If any of the following options is selected: **1**
Then display the questionnaire page(s) **V2** (otherwise hide them)

Filter V202/F2


If any of the following options is selected: **2**
Then jump to page **jump1** after the next button was clicked

28. What is the ownership type of this vehicle?V205 


- ☐ Owned
- ☐ On lease
- ☐ Company car
- ☐ Other, please specify:

29. What is the Brand, Model and Year of registration of this vehicle?V206 


(Example: Nissan LEAF 2020; Nissan Qashqai 2019)

Brand ☐ Prefer not to answerModel ☐ Prefer not to answerYear ☐ Prefer not to answer**30. For how long have you been using this vehicle?**V207 

- ☐ Up to 3 months
- ☐ 4 to 12 months
- ☐ 1+ to 2 years
- ☐ 2+ to 4 years
- ☐ 4+ to 6 years
- ☐ Other, please indicate:

31. How frequently did you use this vehicle, pre-Covid lockdown?V208 

- ☐ Daily
- ☐ Several times a week
- ☐ Few times a month
- ☐ Less than once a month
- ☐ I don't know

V209 

32. Where do you mostly park this vehicle overnight?

- ☐ Residential off-street parking (driveway or garage)
- ☐ Residential on-street parking (e.g. kerbside)
- ☐ Public car park
- ☐ At work
- ☐ Other, please indicate:

33. What was your annual mileage in the past year, pre-Covid? (Miles or Kilometres)

V210

Info recorded on MOT or provided to insurance provider. (or mileage so far if you had the vehicle for less than a year)

Annual Mileage

V214

- ☐ Miles (mi)
- ☐ Kilometres (Km)

☐ I don't know

34. What's the type of your vehicle?

V204

- ☐ Internal combustion engine vehicle (ICE)
- ☐ Hybrid electric vehicle (HEV)
- ☐ Plug-in Hybrid Electric vehicle (PHEV)
- ☐ Battery electric vehicle (BEV)
- ☐ I don't know

1 Active Filter(s)

Filter V204/F1

If any of the following options is selected: 3, 4

Then display the questionnaire page(s) V2EV (otherwise hide them)

V211

35. Where do you mostly charge this electric vehicle?

- ☐ At home, using a private charger (e.g. installed on a driveway or garage)
- ☐ At home, using a public charger (e.g. installed at kerbside, or in car park)
- ☐ At work
- ☐ At home and at work
- ☐ In public parking spaces (e.g. shopping centres, supermarkets, etc.)
- ☐ At filling stations or hubs of fast chargers (e.g. 50kW)
- ☐ Other, please indicate:

V212

36. How often do you plug this EV to the charger?

- ☐ Almost after every trip when there is a charger available
- ☐ Once a day (e.g. at home or at work)
- ☐ Twice a day (e.g. at home and at work)
- ☐ I don't plug my EV every day (e.g. I charge it 2-3 times a week)
- ☐ I don't know

V213

37. What is the capacity of the EV battery (i.e. traction battery)?

For example, 30kWh

kWh ☐ I don't know

V309

Would you like to enter the details of your third vehicle?

It would be useful for our work to get the details for all vehicles that you use in your household.

- ☐ Yes
- ☐ No, I'm done!

2 Active Filter(s)

Filter V309/F1

If any of the following options is selected: 2

Then jump to page **jump1** after the next button was clicked

Filter V309/F2

If any of the following options is selected: 1

Then display the questionnaire page(s) **V3** (otherwise hide them)

38. What is the ownership type of this vehicle?

V301

- ☐ Owned
- ☐ On lease
- ☐ Company car
- ☐ Other, please specify:

39. What is the Brand, Model and Year of registration of this vehicle?

V303

(Example: Nissan LEAF 2020; Nissan Qashqai 2019)

Brand ☐ Prefer not to answerModel ☐ Prefer not to answerYear ☐ Prefer not to answer**40. For how long have you been using this vehicle?**

V304

- ☐ Up to 3 months
- ☐ 4 to 12 months
- ☐ 1+ to 2 years
- ☐ 2+ to 4 years
- ☐ 4+ to 6 years
- ☐ Other, please indicate:

41. How frequently did you use this vehicle, pre-Covid lockdown?

V305

- ☐ Daily
- ☐ Several times a week
- ☐ Few times a month
- ☐ Less than once a month
- ☐ I don't know

V306

42. Where do you mostly park this vehicle overnight?

- ☐ Residential off-street parking (driveway or garage)
- ☐ Residential on-street parking (e.g. kerbside)
- ☐ Public car park
- ☐ At work
- ☐ Other, please indicate:

43. What was your annual mileage in the past year, pre-Covid?

V307

Info recorded on MOT or provided to insurance provider.
(or mileage so far if you had the vehicle for less than a year)

Annual Mileage

V315

- ☐ Miles (mi)
- ☐ Kilometres (Km)

☐ I don't know

44. What's the type of your vehicle?

V302

- ☐ Internal combustion engine vehicle (ICE)
- ☐ Hybrid electric vehicle (HEV)
- ☐ Plug-in Hybrid Electric vehicle (PHEV)
- ☐ Battery electric vehicle (BEV)
- ☐ I don't know

1 Active Filter(s)
Filter V302/F1
If any of the following options is selected: **3, 4**
Then display the questionnaire page(s) **V3EV** (otherwise hide them)

V312

45. Where do you mostly charge this electric vehicle?

- ☐ At home, using a private charger (e.g. installed on a driveway or garage)
- ☐ At home, using a public charger (e.g. installed at kerbside, or in car park)
- ☐ At work
- ☐ At home and at work
- ☐ In public parking spaces (e.g. shopping centres, supermarkets, etc.)
- ☐ At filling stations or hubs of fast chargers (e.g. 50kW)

☐ Other, please indicate:

V313

46. How often do you plug this EV to the charger?

- ☐ Almost after every trip when there is a charger available
- ☐ Once a day (e.g. at home or at work)
- ☐ Twice a day (e.g. at home and at work)
- ☐ I don't plug my EV every day (e.g. I charge it 2-3 times a week)
- ☐ I don't know

V314

47. What is the capacity of the EV battery (i.e. traction battery)?

For example, 30kWh


kWh ☐ I don't know

EQ03

Section on privacy requirements

We would like to understand your privacy requirements over your data.


This section contains **5 questions** that could take up to 5 minutes to complete.

EQ06 

48. I consciously disable my smartphone's location service.


- ☐ Always
 - ☐ Frequently
 - ☐ Sometimes
 - ☐ Rarely
 - ☐ Never
 - ☐ I'm not sure
-

- ☐ I don't have a smartphone

EQ07 

49. Do you have a smart thermostat installed in your home?

- ☐ Yes
- ☐ No
- ☐ I don't know

EQ08 

50. Do you have a smart home personal assistant installed in your home?

For example, Amazon Echo or Apple HomePod

- ☐ Yes
- ☐ No
- ☐ I don't know

Done! We appreciate the time you've taken to answer this survey.

Your contribution will help shape future EV charging technologies.

The study results are expected to be published by June 2022.

For more information about the latest smart charging work, check our [Supergen Smart Charging Webinar Series](#)

To ensure Prolific captures that you have completed the study, please click on this [link](#).

[Contact Information](#)