01

A survey on charging technologies for Electric Vehicles (EVs)

AA01

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.

Page 02

intro2

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!

Page 03 prolific

AA03 🗉

1. Can you please enter your unique Prolific ID?

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+
- O Prefer not to say

3. How much do you know	about the following charging technol	logies for ele	ctric ve	hicles	(EVs)?	[IQ17 □
		I know nothing			I	know a lot
Smart Charging		\circ	\circ	\circ	\circ	\circ
Vehicle to grid (V2G)		0	0	0	0	0
4. Are you taking part in a	smart charging or a V2G trial?					IQ18 •
\bigcirc No, I am not part of a trial						
○ I don't know if I am part o	f a trial.					
Yes. Please provide the nar	me of the trial or the company running th	ne trial:				
5. Do you have any EV charI don't have a chargerI use a 3-pin plug charging	gers installed in your home?					[IQ19 []
\bigcirc I have an unmanaged char	ger					
\bigcirc I have a smart charger						
○ I have a vehicle to grid cha	-					
	harger. Please give some details:					
O						11
	1 Active Filter(s)					
	Filter IQ19/F1 If any of the following options is selected Then display the questionnaire page(s) V		e them)			

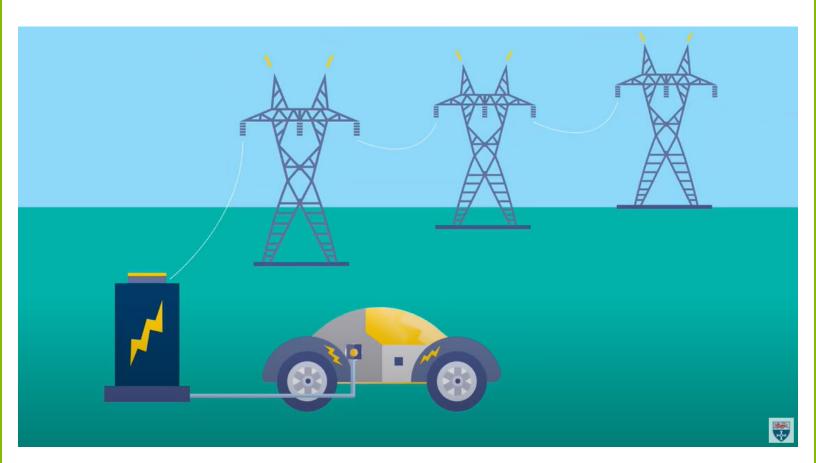
	VG03 □
6. How long have you had a charger installed at home?	(1003 =
○ Up to 3 months	
○ 4 to 12 months	
○ >1 to 2 years	
○ >2 to 3 years	
Other, please specify:	
○ I don't know	
	VG02 □
7. What is the power rating of your home charge point, in kilowatts (kW)?	(1002 =
○ 3.6 kW	
○ 7 kW	
Other, please specify:	
○ I don't know	

VG

8. How did you usually travel to work prior to the Covid-19 pandemic (for example, in January 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:	IQ20 : 202U)?
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)	IQ21 □
☐ None of the above ☐ I don't know	
	Page 07
In the following pages, we are providing some information on charging technologies. We will then ask you 8 questions on these charging technologies.	(IN05

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.



IN01

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.





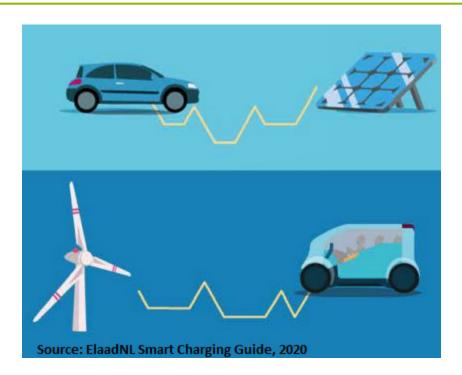
Managed Charging Devices OVO/Kaluza-Indra charger (Top) Octopus EV- Wallbox charger (Bottom)

IN07

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.

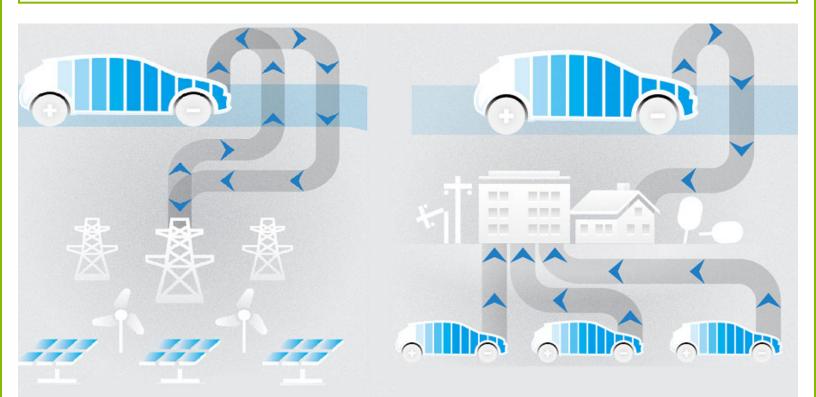


What's a V2G charger?

IN03

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.



Charging and Discharging
Charging when there is surplus energy.
Discharging back to the grid when it is most needed.

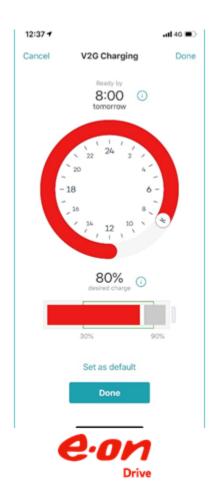
<u>Discharging mode</u> **Discharging** during an emergency, for example, to power the home/building.

Source: http://nissaninsider.co.uk/nissan-to-create-electric-vehicle-ecosystem/

The user is in control

IN02

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.



Page 13
Check

Œ	N	0	4		

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)

\Box	Power	rate	(i e	sneed	٥f	charging)
\cup	Power	rate	(i.e.	speed	OI	charging)

□ Direction 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.

GI01	

	Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
I am concerned about third parties managing my EV charging, even if my car is always ready to go when I need it.	0	0	0	0	0	0
A financial reward makes it more attractive for me to make my EV available for charge management.	\circ	0	\circ	\circ	0	0
I am comfortable starting a regular trip with 70% charge on my EV battery.	\circ	0	\circ	\circ	0	0
I would pay an extra cost to be able to charge my EV regularly at peak times (7-9am and 4-7pm).	0	0	\circ	0	0	0
I don't need to receive a financial reward for my contribution to a stable electricity network.	0	0	0	0	0	0
In case of an emergency, I allow an operator to stop my charger for up to 1 hour to prevent serious electric grid issues. I always retain the ability to override the command.	0	0	0	0	0	0

	_						
How	important	are	the	following	statements	to	vou?

_					-
G	C	n 2	•	1	

	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.	0	0	0	0	0	0
Having a guarantee that my EV will be charged by a specified time.	0	\circ	0	\circ	\circ	0
Adopting new technology as soon as it becomes available.	0	\circ	\circ	\circ	0	0
Having full control as to when charging happens.	\circ	\bigcirc	\circ	\bigcirc	\circ	0
Please tick option "I don't know" so we know that you read this text.	0	\circ	\circ	0	0	0
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).	0	0	0	0	0	0
Having a guarantee that my EV's battery will never fall below a specified charge level.	0	0	0	\circ	0	0

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 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 V20	G charger than for a s	smart charger.							
Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know					
Charging my EV with	V2G would be cheap	er compared with un	managed 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? 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 adap	t my driving patterns	s.							
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			

_		
(
I TC	ገበ 1	

I don't know

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	e my EV for back-up	power for my nome.			
Not at all important (0)	1	2	3	Very important (4)	I don't know
V2G helps me integra	ate my EV with my s	olar PV system.			
Not at all important (0)	1	2	3	Very important (4)	I don't know
Please tick option "Ve	ery important" so we	know that you read th	nis text.		
Not at all important (0)	1	2	3	Very important (4)	I don't know
V2G helps reduce my	v carbon emissions.				
Not at all important (0)	1	2	3	Very important (4)	I don't know
V2G contributes to a	stable electricity net	work for all.			
Not at all important (0)	1	2	3	Very important (4)	I don't know
I would use my ca	r for V2G if I recei	ve energy bill saving	gs of:		IC03 🗉

No energy bill savings

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

5% energy bill savings

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

10% energy bill savings

Strongly disagree Disagree Neither Agree Strongly a

Below are different options for charging an electric vehicle. Please indicate for each option whether you would use it or not.						FI01 •
	I would definitel not use				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.	0	0	0	0	0	0
V2G charging Manage the rate, time and direction of charging.	\bigcirc	\bigcirc	\circ	\bigcirc	\circ	0
Smart charging Manage the rate and time of charging.	\circ	\bigcirc	\circ	\bigcirc	\circ	0
What do you think are the most attractive features of V2G t	nat wou	iu mak	e you v	vant to	use it?	/1
What do you think are possible barriers that would prevent	you from	m using	V2G?			FI03 II

	Page 21
Some information about you	PI11
We ask these questions as they might help us identify trends about various demographic groups.	
10. Current UK area of residence	PI13 •
[Please choose]	~
11. How would you describe your residential location?	PI14 •
Urban	
○ Rural	
Other, please specify:	
12. Do you own the property that you live in?	PI21 •
○ 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]	
	DT16 T
14. What is your gender?	PI16 •
[Please choose]	
15. What is your highest educational qualification?	PI17 🖪
[Please choose]	
	PI19 •
16. How many licensed drivers are there in your household? (including yourself)	
[Please choose] V	

This can include vehicles that you have access to but do not own.
\bigcirc 1
○ 2
○ 3
Other, please specify:
○ I don't currently have access to a car

3 Active Filter(s)

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

Filter PI20/F1
If any of the following options is selected: 1

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

PI20 🗉

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)

Almost Done!

V101

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.

18. What is the own	nership type of this vehicle?	V107 🗉
Owned		
On lease		
Company car		
Other, please speci	ny:	
	nd, Model and Year of registration of this vehicle? F 2020; Nissan Qashqai 2019)	V108 □
Brand	☐ Prefer not to answer	
Model	☐ Prefer not to answer	
Year	☐ Prefer not to answer	
		V109 🗉
20. For how long ha	eve you been using this vehicle?	(V103L
O Up to 3 months		
○ 4 to 12 months		
○ 1+ to 2 years		
○ 2+ to 4 years		
○ 4+ to 6 years		
Other, please indica	rate:	

V110 🗉

21. How frequently did you use	e 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 (expression) 	e.g. kerbside)	
O Public car park		
○ At work		
Other, please indicate:		
		V112
_	eage in the past year, pre-Covid?	
Info recorded on MOT or provided (or mileage so far if you had the v		
(or fillleage so far if you had the v	enicle for less than a year)	
Annual Mileage		(111.5
○ Miles (mi)		V116 □
○ Kilometres (Km)		
○ I don't know		
24. Whatlathatana af www.		V106 🗉
24. What's the type of your vel		
Internal combustion engine vel	iicie (ICE)	
Hybrid electric vehicle (HEV)Plug-in Hybrid Electric vehicle ((DHEV)	
Battery electric vehicle (BEV)	,FIILV)	
I don't know		
O I GOLL KLIOW		
	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)	

Page	23
	V1EV

		VILV
		V113 🗉
25. Where do you mostly charg	e this electric vehicle?	
	er (e.g. installed on a driveway or garage)	
	(e.g. installed at kerbside, or in car park)	
○ At work		
At home and at work		
	hopping centres, supermarkets, etc.)	
At filling stations or hubs of fast	t chargers (e.g. 50kW)	
Other, please indicate:		
26. How often do you plug this	EV to the charger?	V114 🗉
 Almost after every trip when th 		
Once a day (e.g. at home or at	-	
Twice a day (e.g. at home and a		
I don't plug my EV every day (e.g. at nome and a	•	
☐ I don't know	s.g. 1 charge it 2-3 times a week)	
O I don't know		
27 What is the capacity of the	EV battery (i.e. traction battery)?	V115 □
For example, 30kWh	Ev battery (i.e. traction battery):	
kWh 🗌 I don't know	<i>'</i>	
		Page 24
		V2Q
Would you like to enter the det	ails of your second vehicle?	V202 □
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	

V209 🗉

28. What is the ow	nership type of this vehicle?		V205 ·
○ Owned	to the contract of the contrac		
On lease			
○ Company car			
Other, please spec	cifv:		
O Tanan, product space	,.		
29. What is the Bra	nd, Model and Year of registra	tion of this vehicle?	(V206 □
	AF 2020; Nissan Qashqai 2019)		
Brand		Prefer not to answer	
Model		Prefer not to answer	
Year		Prefer not to answer	
30. For how long ha	ave you been using this vehicle	?	(V207 □
Oup to 3 months	, ,		
0 4 to 12 months			
1+ to 2 years			
2+ to 4 years			
○ 4+ to 6 years			
Other, please indic	cate:		
O			
31. How frequently	did you use this vehicle, pre-C	ovid lockdown?	V208 •
31. How frequently O Daily	did you use this vehicle, pre-C	ovid lockdown?	V208 ·
		ovid lockdown?	V208 ⁻
O Daily	eek	ovid lockdown?	V208 ⁻
DailySeveral times a w	eek h	ovid lockdown?	V208 ⁻
DailySeveral times a wFew times a mont	eek h	ovid lockdown?	V208 :
DailySeveral times a wFew times a montLess than once a r	eek h	ovid lockdown?	V208 :

32. Where do you mostly par	k this vehicle overnight?
 Residential off-street parking 	(driveway or garage)
 Residential on-street parking 	(e.g. kerbside)
O Public car park	
○ At work	
Other, please indicate:	
22. What was your appual m	ileage in the past year, pre-Covid? (Miles or Kilometres)
_	ed to insurance provider. (or mileage so far if you had the vehicle for less than a year)
Annual Mileage	WO LA D
○ Miles (mi)	V214 □
○ Kilometres (Km)	
○ I don't know	
34. What's the type of your v	V204 D
 Internal combustion engine \(\cdot \) 	
Hybrid electric vehicle (HEV)	chiele (IGE)
 Plug-in Hybrid Electric vehicle 	e (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)

		Page 26 V2EV
35. Where do you mostly cha	rge this electric vehicle?	V211 □
*	rger (e.g. installed on a driveway or garage)	
	ger (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 factors	ast chargers (e.g. 50kW)	
Other, please indicate:		
O		
		V212 ·
36. How often do you plug thi		
○ Almost after every trip when	-	
Once a day (e.g. at home or a		
Twice a day (e.g. at home and		
	(e.g. I charge it 2-3 times a week)	
○ I don't know		
37 What is the canacity of th	ne EV battery (i.e. traction battery)?	V213 □
For example, 30kWh	e EV Dattery (i.e. traction battery):	
kWh 🗌 I don't kn	ow	
		Page 27
		V3Q
		(V309 □
Would you like to enter the d	•	(*303
It would be useful for our work to	o 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)	l l

		Vs
38. What is the ownership typ	ne of this vehicle?	V301 □
Owned	of this vehicle.	
On lease		
Company car		
Other, please specify:		
39. What is the Brand, Model (Example: Nissan LEAF 2020; Nis	and Year of registration of this vehicle?	V303 🖪
Brand	☐ Prefer not to answer	
Model	☐ Prefer not to answer	
Year	☐ Prefer not to answer	
40. For how long have you be	en 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 us	se this vehicle, pre-Covid lockdown?	(V305 <u>•</u>
○ 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)	
O Public car park		
○ At work		
Other, please indicate:		
Info recorded on MOT or provided		V307
(or mileage so far if you had the v	rehicle for less than a year)	
Annual Mileage		
○ Miles (mi)		(V315 □
○ Kilometres (Km)		
○ I don't know		
44. What's the type of your ve	hicle?	V302 □
 Internal combustion engine ve 		
Hybrid electric vehicle (HEV)	mcie (ICL)	
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)	

	V3EV
45. Where do you mostly charge this electric vehicle?	V312 ·
 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:	
46. How often do you plug this EV to the charger?	V313 •
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)	
\bigcirc 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	
	Page 30
	jump1
Section on privacy requirements	EQ03
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.	

	SA
48. I consciously disable my smartphone's location service.	EQ06 □
○ 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?	(140)
○ Yes	
○ No○ I don't know	
O I don't know	
50. Do you have a smart home personal assistant installed in your home? For example, Amazon Echo or Apple HomePod	EQ08 •
○ Yes	
○ No	
○ I don't know	

Page	32
	ΙP

EQ09 🗉

Please indicate if you are willing to share the information with the V2G provider, the V2G provider and their business partners, or to none of them.

	V2G provider	V2G provider and business partners	Not willing to provide this information
State of charge of the EV battery	\circ	0	0
Real-time location information of your mobile phone	\circ	\circ	0
Real-time location information of your vehicle	\circ	\circ	0
Expected time of departure/arrival	\circ	\circ	0
Daily mileage	\circ	\circ	0
Charging locations (e.g. home, work, etc.)	\circ	\circ	

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EQ11

Final question of the survey!

To what extent do you agree with each of the following statements?					EQ10 •	
	Strongly disagree	Disagree	Neither	Agree	Strongly agree	I don't know
I consent to share my personal information via the internet if I have better control over what data is shared, with whom and how it is used.	0	0	0	0	0	0
I consent to share my personal information via the internet in return of a personalised service.	0	0	\circ	0	0	0
I consent to share my personal information via the internet in return of a financial reward.	0	0	\circ	0	0	0
The exchange of personal information online is essential for the functioning of society.	0	0	\circ	0	0	0
Please tick option "Strongly disagree" so we know that you read this text.	0	0	\circ	0	0	0
As a result of using V2G I feel that information about me is out there that could invade my privacy.	0	\circ	\circ	0	0	

Last Page

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