EXCERPT
(from a total of ca. 210 pages)

Bidirectional Charging Study 2026

A Five-Market Customer Acceptance Study

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Objective

Initial Situation:

- Bidirectional charging is currently the focus of technical development and many political discussions, with V2H, V2G and V2B gaining importance for the industry.
- As grid expansion lags behind EV growth, bidirectional charging is becoming a key enabler for further e-mobility adoption and new business models for manu-facturers and energy service providers.
- With the recent German EnWG reform, the regulatory framework for V2G in Germany is finally being put into practice. First offerings are on the market.

Research Questions:

- Which use cases for bidirectional charging are convincing? What are the usage drivers and barriers from the customer's point of view? How big is the successfully addressable market?
- What is the willingness to pay for V2x components? And what is the expected remuneration?
- Who integrates whom in V2x? Who do clients trust? Which differences are to consider between target groups and different European markets?

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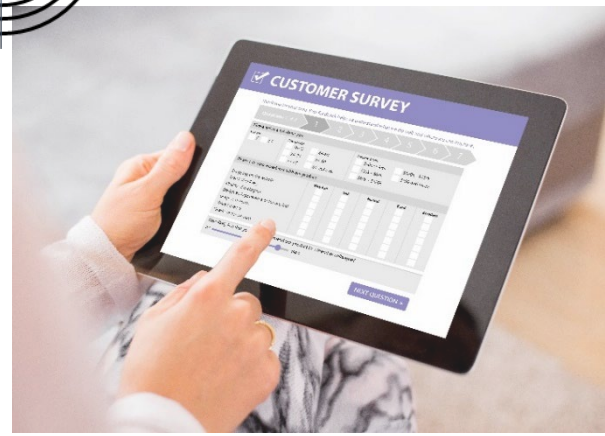
Target group

Survey:

- Target group:
  - › Drivers of fully-electric battery cars (BEV), self-selecting sample
  - › Drivers of ICE cars, a census-based, stratified sample representative by age, gender and region
- Survey: Online survey (CAWI)
- Market: France, Germany, Netherlands, Sweden, UK
- Recruitment: Multiple access panels
- Length of interview: 15 min
- Field phase: February 2026



Sample

- Total sample: N = 11,177, thereof: N = 4,505 BEV driver, N = 6,672 ICE driver

  of which:
  - Germany: N = 885 (BEV), N = 1,284 (ICE)
  - UK: N = 984 (BEV), N = 1,242 (ICE)
  - France: N = 876 (BEV), N = 1,591 (ICE)
  - Netherlands: N = 895 (BEV), N = 1,304 (ICE)
  - Sweden: N = 865 (BEV), N = 1,251 (ICE)

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Target group segmentation: BEV adopter segments

The study differentiates between three adopter segments in order to identify trends.

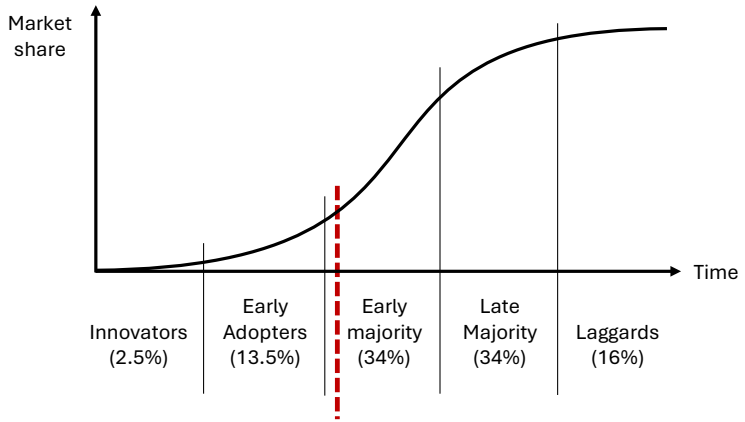
BEV driver segmentation:

- The best-known model for the ramp-up of innovations segments adopters according to the time of conversion (figure). It assumes (simplistically) that the time of adoption correlates with motivation. (Criticism: Many EV enthusiasts switch later due to the usually long car ownership periods.)
- This study therefore distinguishes between the date on which respondents registered their first own EV. This results in three segments:

EV Pioneers	EV Regulars	EV Newbies
> 3 years experience	2 to 3 years of experience	< 2 years experience

If the results differ, this indicates a trend.

Segments in the ramp-up of electric mobility*:



Market share of BEVs in Germany in 2025 (approx. 18%)

* The classification shown is based on Everett Rogers' diffusion model (LINK).

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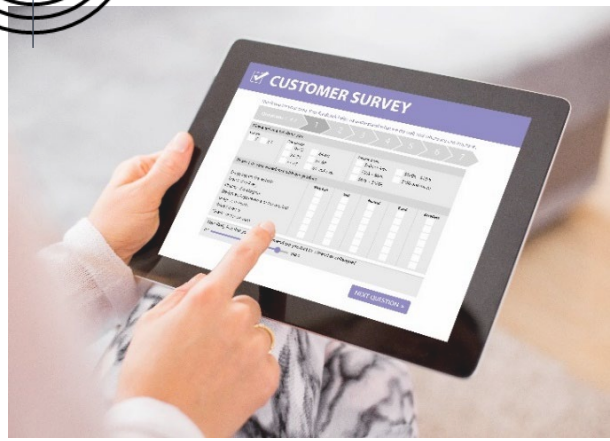
Target group segmentation: ICE adopter segments

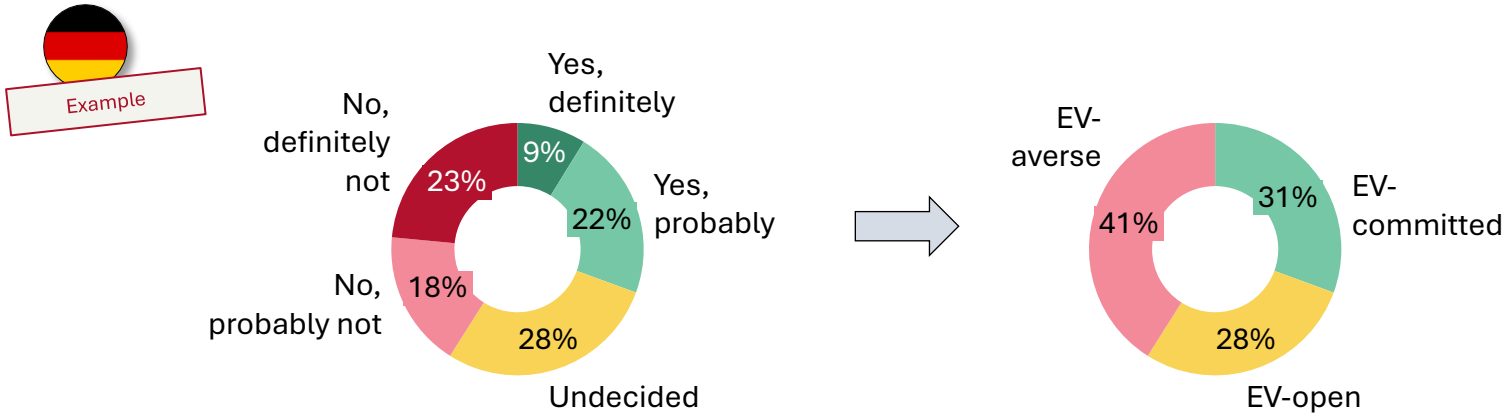
The study differentiates between three EV adopter segments among ICE drivers in order to segment respondents and enable projections.



ICE driver segmentation:

In order to gauge the interest of future EV adopter segments in V2X, stratified ICE drivers were surveyed as well. Respondents were segmented according to their openness to purchase a BEV as their next vehicle.

Interest in a BEV*:



* "If you had to buy a car now, would you buy an electric car?"

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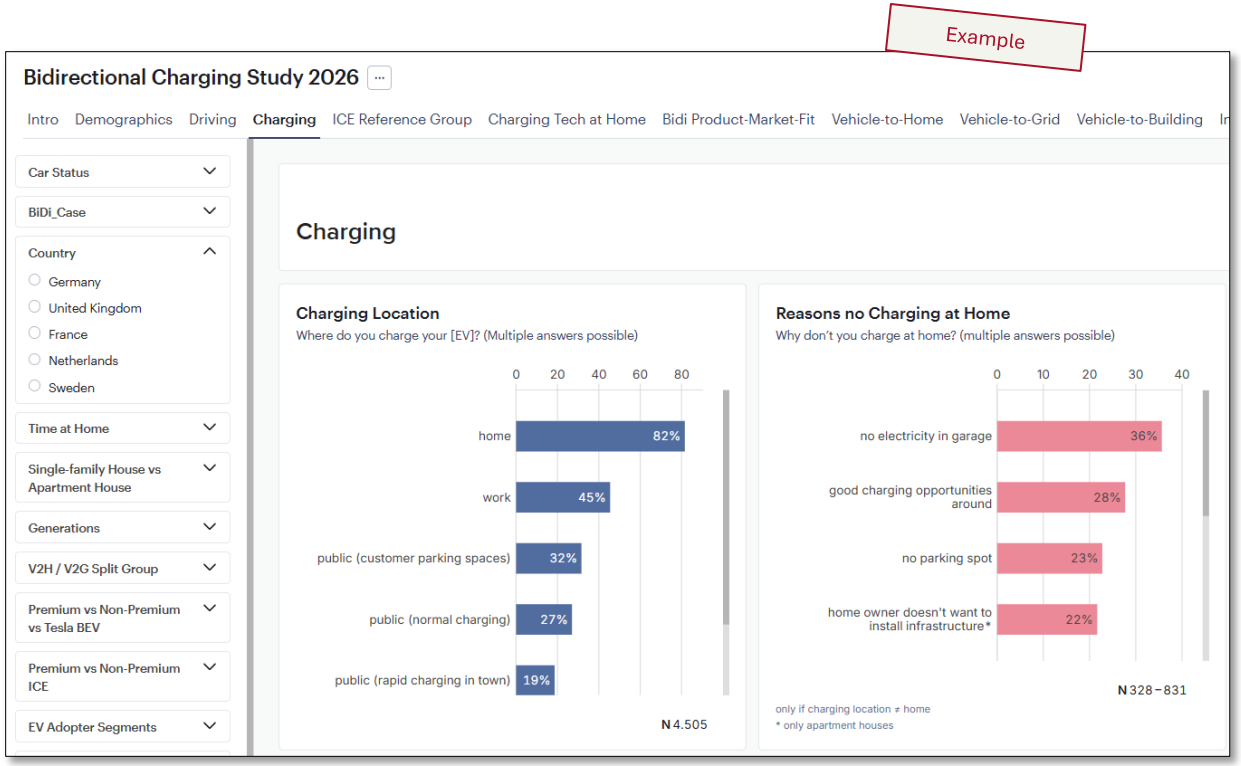
Dashboard for individual analyses

Deep dives into individual subgroups.

Only selected splits are shown in this document.

The associated dashboard allows splits according to any other variables.

To log in, please contact your USCALE representative.



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7. Vehicle-to-building
   - Product-market fit
   - Expected remuneration

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Management summary

- Familiarity with bidirectional charging – roughly 40% of BEV drivers and 20% of ICE drivers state to know what bidi charging is. Another 30% and 30%, respectively, have "heard of it".
- **Technical readiness**
  - The vast majority of BEV drivers have their **main parking space at home** (~90% in single-family houses, ~60% in apartment houses). Among ICE drivers, these values are only slightly lower.
  - However, with ICE drivers, only less than 50% state that they **expect to be able to charge at home**, since they may have switched to an EV. The interest in changing to an EV strongly correlates with the possibility to charge at home.
  - Virtually all BEV drivers **spend enough time at home** for a V2H contract to make sense. During the week, 40% are often at home in the morning or afternoon, 80% in the evening, 90% at night. ICE drivers spend more time at home, all values are 5-10% higher for ICE drivers. As weekends, daytime presences at home is considerably higher, while evening/night presences is considerably lower than on weekdays.
- **User readiness**
  - The general interest is high. When asked directly whether **V2H and V2G is an option** for them, respondents are more cautious. 40 to 70 % of BEV drivers answer "yes", 30 to 60% of ICE drivers answer "yes", while German and British respondents are the most interested and French respondents are the least open. For V2B, values drop by 20% for all markets.
  - **When probing more critically** for concrete pros and cons and declining the **successfully addressable target group** from this, strong interest to – as expected – significantly lower and therefore more realistic, at 10 to 20% among BEV drivers and 5 to 10% among ICE drivers. Surprisingly, the **impact of a PV already installed** on the V2H interest is low.
  - The **critical value for** willingness to invest for V2H is ca. € 1,000. The **critical value for** revenue expectation for V2G is € 500. for a daily plug-in time of 4-8h. This means that, given the actual, i.e. realistically achievable costs and revenue potentials, a very large share of potential customers can be addressed successfully.
  - The share of respondents considering bidi capability when buying a new car is 75% (BEV) and 60% (ICE).
- **Across countries**, respondents in Germany and the UK are noticeably more open to V2X than those in France, the Netherlands, and Sweden. The differences apply equally to BEV and ICE drivers. On average, the **addressable market in DE and UK is 50% higher** than in FR, NL, and SE.

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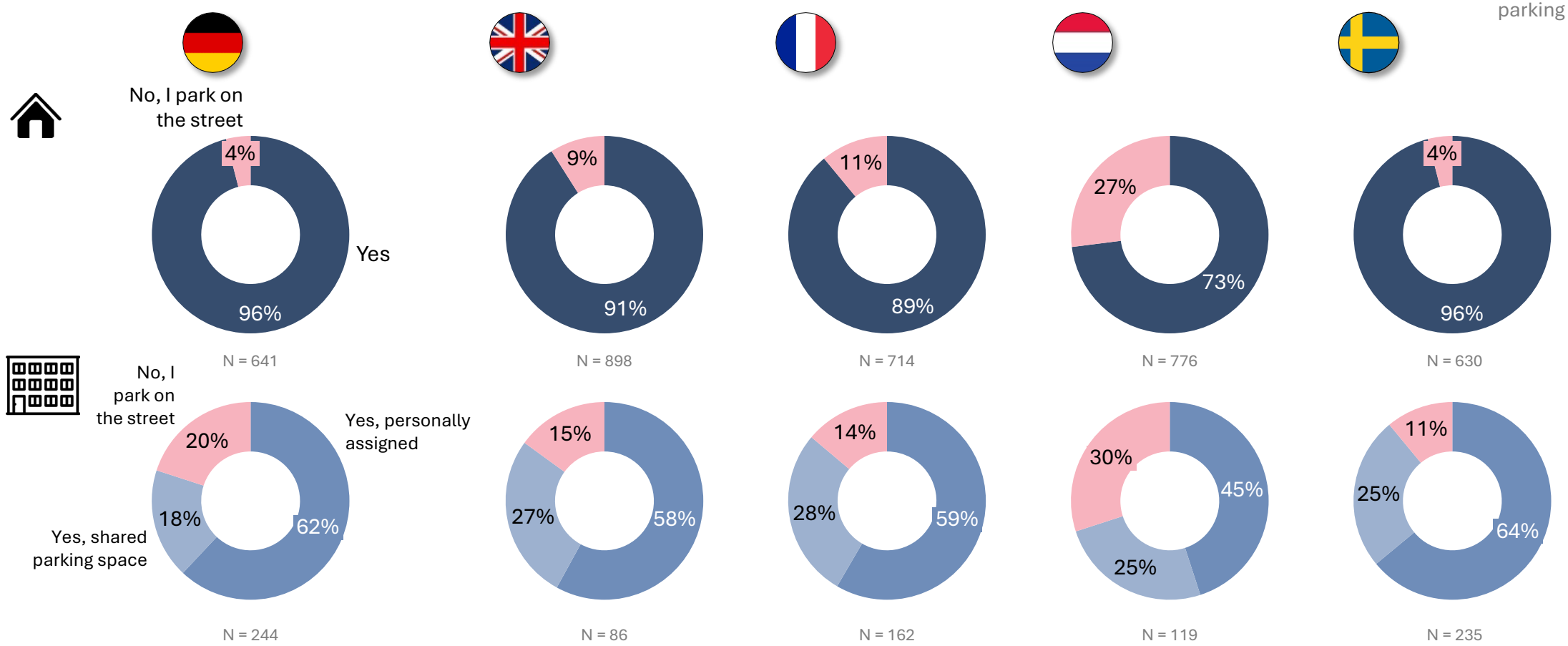
Parking situation

The vast majority of EV drivers have their own parking space at home.

BEV

"Do you have a private parking space?"



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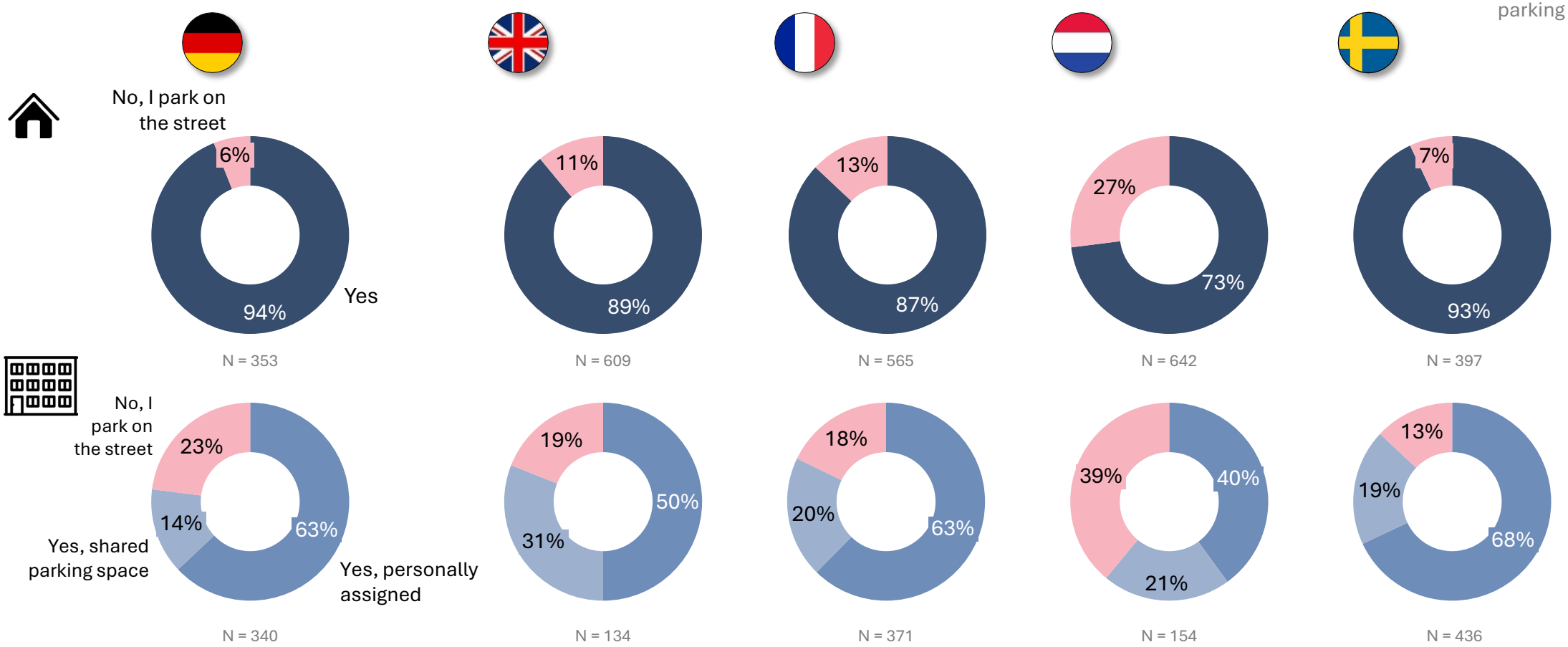
Parking situation

Also, the vast majority of ICE drivers have their own parking space at home.

ICE

"Do you have a private parking space?"



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Parking time weekdays

BEV

Private parking space location = directly/near my property/building:

"**During the week:**

When is your car parked at home in a parking space?"

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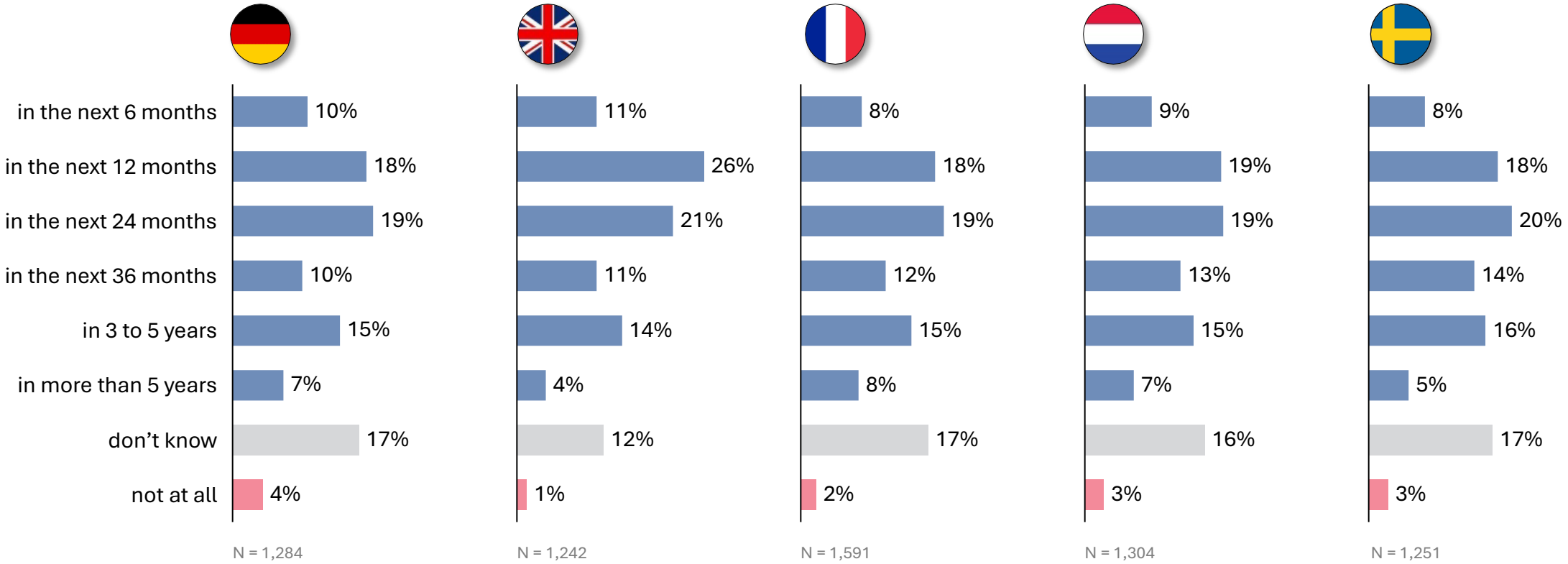
Next car purchase

Just under half of combustion engine drivers surveyed plan to buy their next (new or used) car in the next 24 months.

ICE

"When do you expect to buy your next car?"



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EV purchase intent

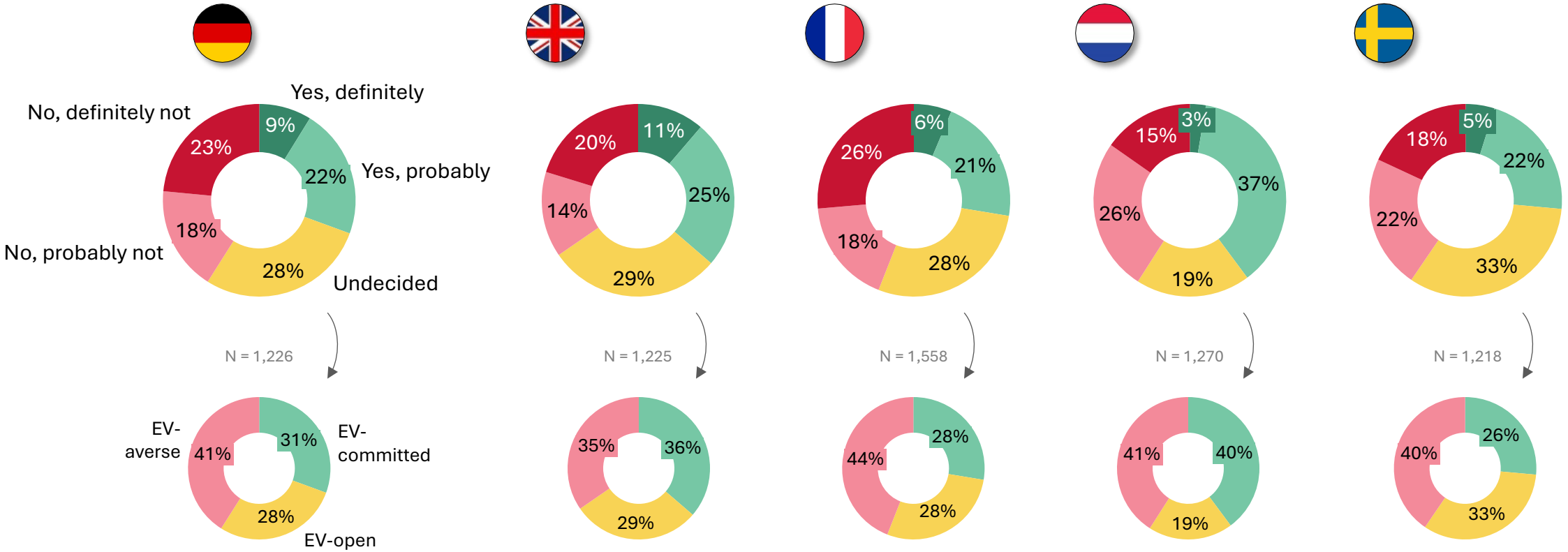
ICE

Next purchase ≠ not at all:

"If you had to buy a car now:

Would you buy an electric car?"

Just around one third of those surveyed would consider a BEV. The number is slightly higher in the Netherlands. For further analysis, the respondents are split into three EV adoption segments (EV-committed, EV-open, EV-averse).



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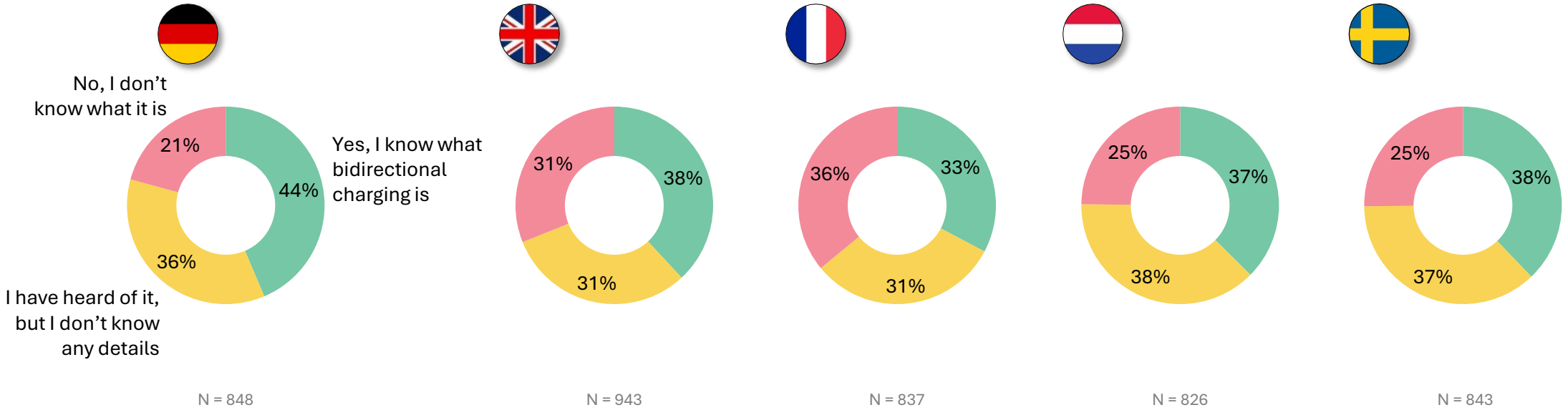
Familiarity with bidirectional charging

BEV

"In the context of electric cars, “bidirectional charging” is often mentioned. Have you ever heard of it?"

A solid one third of BEV drivers are familiar with the concept of bidirectional charging. Another strong third have at least heard of it.



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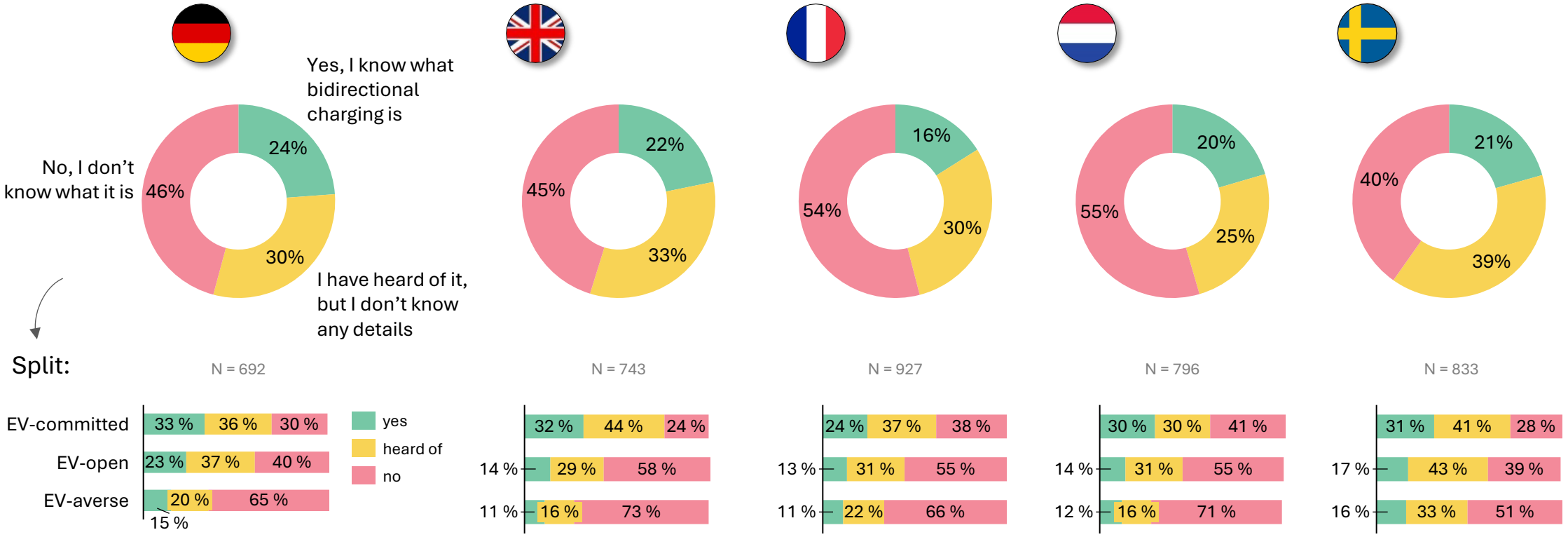
Familiarity with bidirectional charging

ICE

As expected, the share of ICE drivers who are familiar with the bidirectional charging concept is lower than among BEV drivers.

"In the context of electric cars, “bidirectional charging” is often mentioned. Have you ever heard of it?"



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Preliminary remarks on the “vehicle-to-home" use case

In order to obtain as differentiated answers as possible on the various applications of bidirectional charging, the respondents were divided among the three applications

- Vehicle-to-Home
- Vehicle-to-Grid and
- Vehicle-to-building (at work)

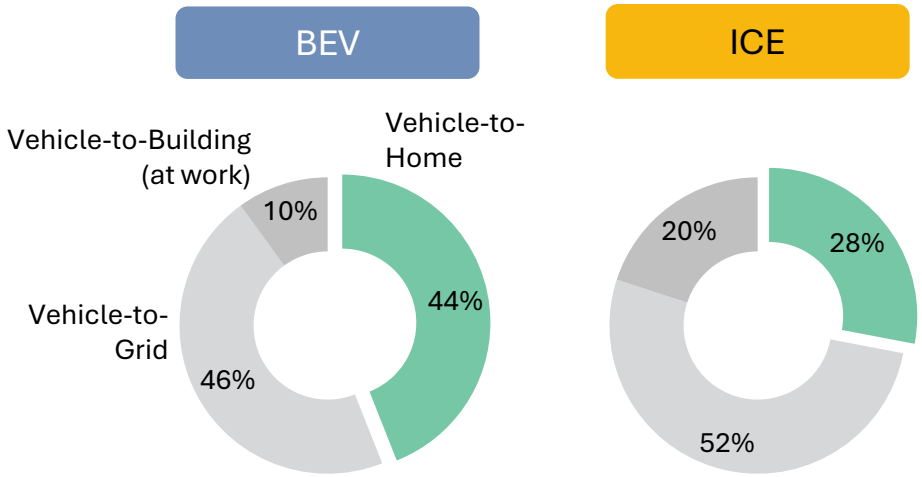
As an introduction, all respondents were given an explanatory text on the topic of bidirectional charging.

> *"In the following, we would like to hear your opinion on bidirectional charging.*
> - *Bidirectional charging means that your EV not only charges electricity but can also supply electricity to your home or the grid, for example.*
> - *This means that your car can absorb energy when the sun is shining, the wind is blowing or demand is low, i.e. when electricity is available at a much lower price.*
> - *When needed, your car transfers energy to your home or the public grid."*

In order to give respondents a better understanding of the various use cases, the survey provided a more detailed explanation of each use case. The explanatory text for vehicle-to-home was as follows:

> *"With vehicle-to-home, your car becomes a kind of large power bank for your home. The car can then supply electricity to your home when needed. You specify in the app when you want to leave, and the control system ensures that you always have enough electricity in your car to drive."*

Breakdown of respondents into use cases:



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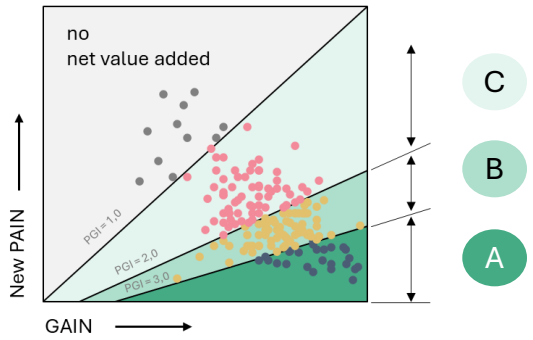
Research methodology: measuring product-market fit

An innovation solves a pain point and/or creates gain. At the same time, it always introduces new pain. Whether the product-market fit of an innovative offering is attractive to a target group depends on the ratio between the gain and the new pain.

1 Identify gains and new pain, determine net value added

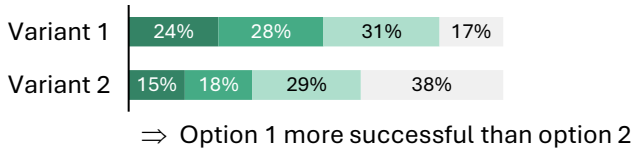
Determine net value added from gains and new pains seen by the target group:



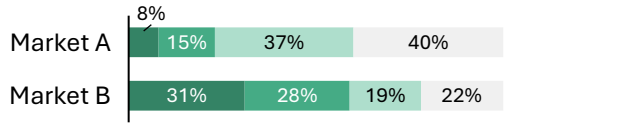
- C: Low net value added = unreachable target group
- B: Medium net value added = the 'next' segment
- A: High net value added = addressable target group

2 Identify target group with high net value added

Compare and prioritise product variants and target markets:



⇒ Option 1 more successful than option 2

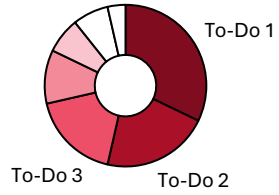


⇒ Market 1 more successful than market 2

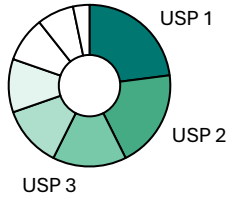
- addressable target group
- the 'next' segment
- unreachable target group

3 Optimise product-market fit

Prioritise and reduce barriers to use:



Prioritise and market usage drivers:



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Vehicle-to-home: product-market fit

BEV ICE

"In summary: How do you personally rate the advantages and disadvantages of vehicle-to-home?"

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Vehicle-to-home: biggest usage driver

BEV

Advantage ≠ none:

"What do you think is the biggest advantage?"

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Vehicle-to-home: biggest barriers to use

BEV

Disadvantage ≠ none:

"What do you think is the biggest disadvantage?"

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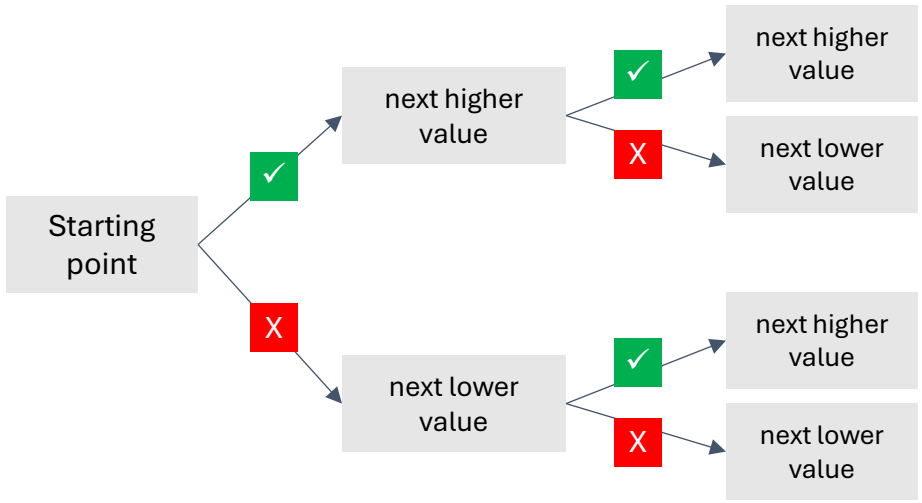
Research methodology: willingness to invest according to Gabor-Granger

The willingness to invest is assessed using the Gabor-Granger method, a survey-based pricing technique that tests purchase intent at different price points to estimate respondents' willingness to pay and derive a demand curve.



Scheme for Gabor-Granger price ladder:

[illegible]	X
[illegible]	X
[illegible]	Start
[illegible]	X
[illegible]	X

* 16–24h: on weekdays at least once "sometimes"
8–16h: on weekdays at least twice "sometimes", or once "frequently / always"
4–8h: all remaining cases

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Willingness to invest

BEV

"Initial estimates from reputable providers suggest potential savings of up to € 200 to € 400 per year per household.

In your opinion, would the wall charger + special equipment for bidirectional charging be...?"

(Survey method: Gabor-Granger with starting point € 1,500)

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Most important criteria for choosing a solution partner

ICE

"And what would be the most important aspect for you?"

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Trust in solution partners (overview)

BEV

Aspects ≠ none:

"For an integrated solution at home:
Which provider do you trust most to meet your requirements?"

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Expected remuneration (all markets)

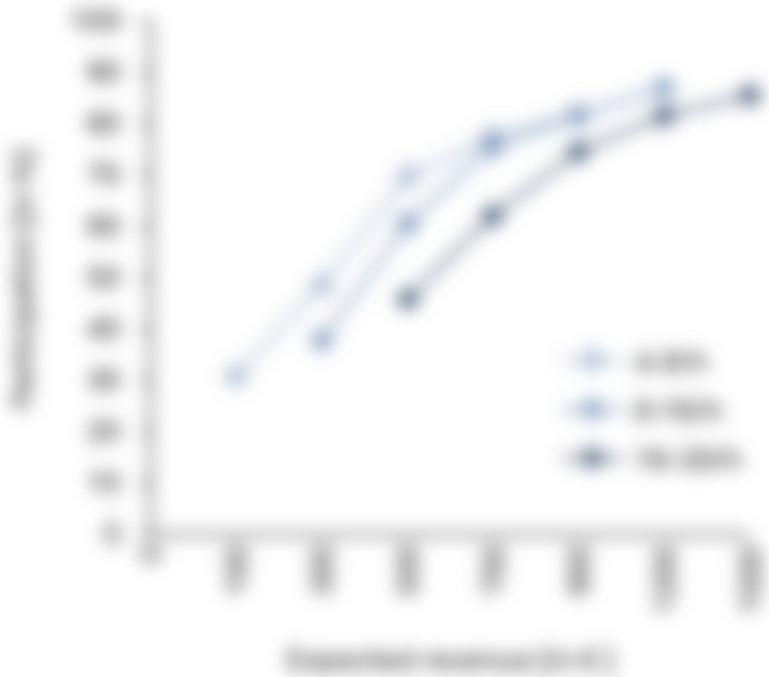
The expected compensation depends on the dwell time at the charger. On average, even the respective average compensation offer is considered attractive by three quarters of BEV driving respondents.

"Let's assume that your electric car is at home for [...] hours a day and is available for vehicle-to-grid (V2G) use. You allow your utility company to use your car for V2G during this time.

How much would you need to earn annually to participate?

If you had your car connected for an average of [...] hours per day and the utility company paid you [Euro] per year, would you participate?

BEV



4 – 8h

8 – 16h

16 – 24h

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SCALE YOUR USER
SCALE YOUR BUSINESS

Dr Axel Sprenger

Managing Director
USCALE GmbH

mail	axel.sprenger@uscale.digital
phone	+49 172-1551 820
web	www.uscale.digital
post	Silberburgstrasse 112 70176 Stuttgart