EXAMPLE SLIDES

Bidirectional Charging Study 2025

What is needed for success

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Objective

Initial Situation:

- Bidirectional charging is currently the focus of technical development and many political discussions. In addition to Vehicle-to-Home (V2H) and Vehicle-to-Grid (V2G), Vehicle-To-Business (V2B) is becoming increasingly important for the industry.
- First offerings for V2H are on the market. The regulatory requirements for implementing V2G in Germany are not yet in place.
- It is unclear under what conditions EV drivers will accept and use the technologies.

Research Questions:

- Which use cases for bidirectional charging are convincing? What are the usage drivers and barriers from the customer's point of view?
- Who integrates whom in V2x? Who do clients trust?
- How big is the successfully addressable market?
- What are the priority levers for successful marketing?

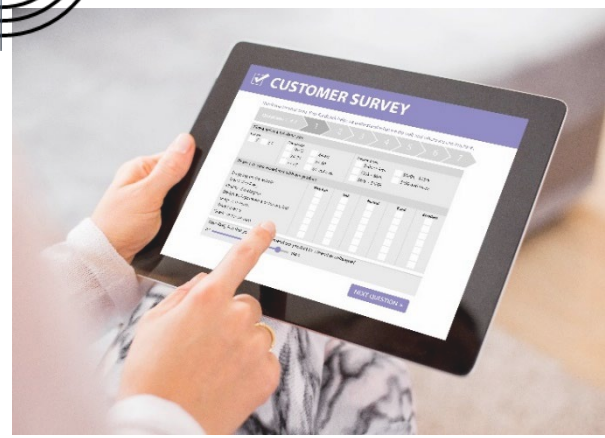
Target group

Survey:

- Target group: Owners of fully battery-powered electric vehicles (no plug-in hybrids), ICE drivers as a comparison group
- Survey: Online survey (CAWI)
- Market: Germany
- Recruitment: Social media, access panel
- Duration of interview: 15-20 minutes
- Data collection: April 2025

Sample size:

- Total: N = 2,368
  of which
  - BEV (pioneers)*: N = 859
  - BEV (early adopters): N = 1,003
  - ICE (reference group): N = 506



* The majority of participants in the social media panel are early EV adopters and more tech-savvy individuals. The report refers to this group as pioneers.

Respondents from the access panels are generally less tech-savvy and switched to an EV later on. The report refers to this group as early adopters.

Target group: segmentation of BEV drivers

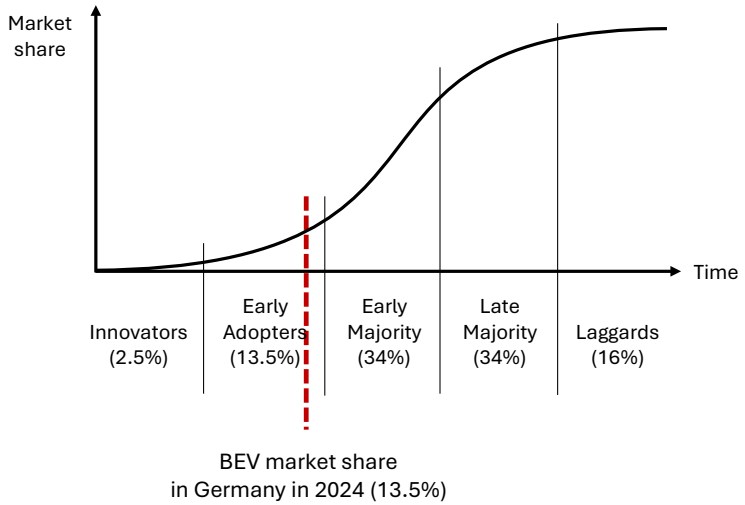
In order to identify trends, this study differentiates between two adopter segments, the „Pioneers" and the "Early Adopters".

Background to segmentation:

- The best-known model for the ramp-up of innovations segments adopters according to the time at which they switch (Fig.). It assumes (simplistically) that the time of switching correlates with motivation. Criticism: Many EV enthusiasts switch later due to the often long car ownership periods.
- This is why the present study segments according to involvement (i.e. what is implicitly assumed with the above-mentioned so-called Rogers segments). Operationally, the study maps this via recruitment:
  - **Pioneers** (high involvement): Recruitment via social media
  - **Early Adopters** (lower involvement): Recruitment via access panel

  If the results of Pioneers and Early Adopters differ, this indicates a trend.

Segments during the ramp-up of electromobility*:



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

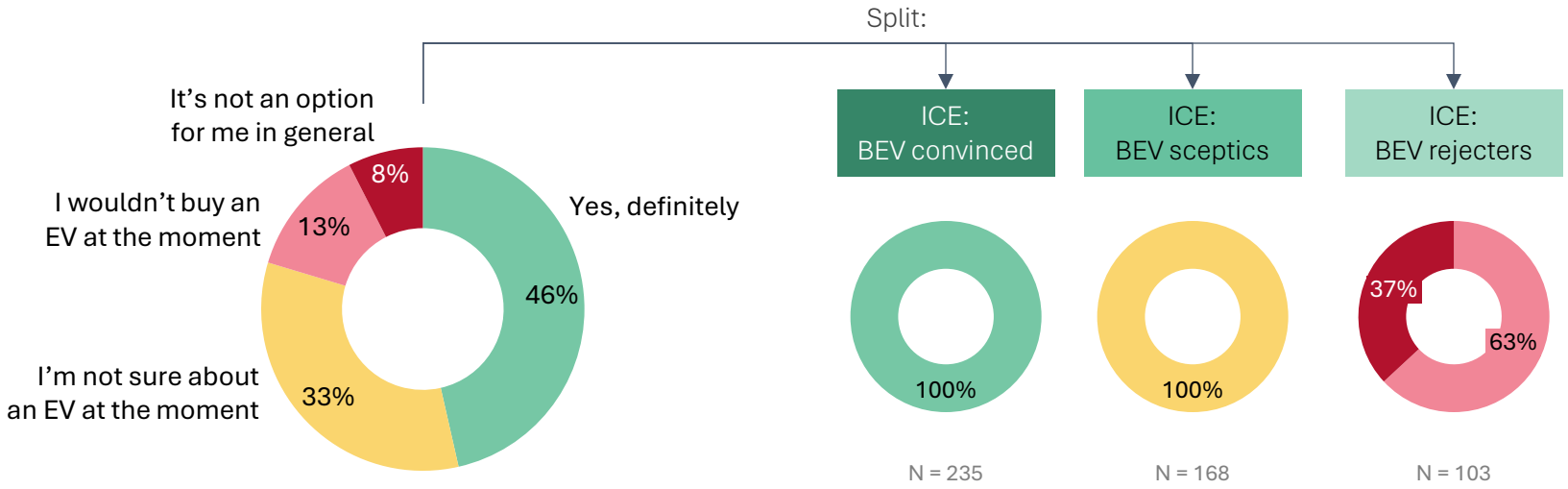
Reference group

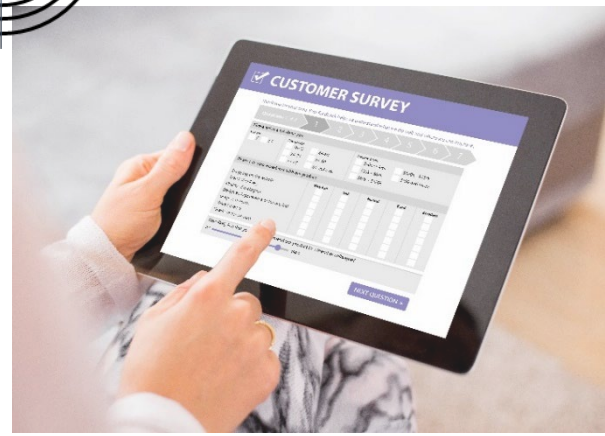
About the ICE reference group (internal combustion engine drivers):

In order to gauge the interest of future EV adopter segments, drivers of combustion engine vehicles were surveyed as a reference for the study.

Respondents were segmented according to their assessment of whether a BEV would be an option for their next car purchase.

Interest in a BEV*:





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

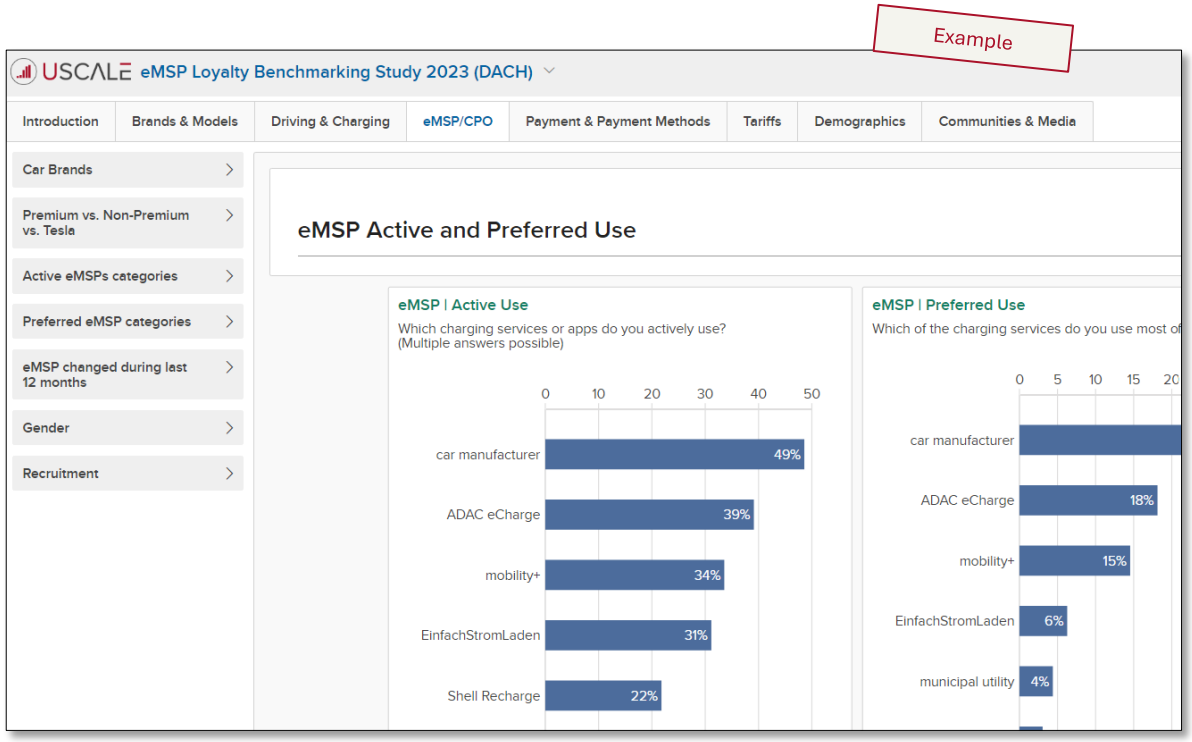
Dashboard for individual analyses

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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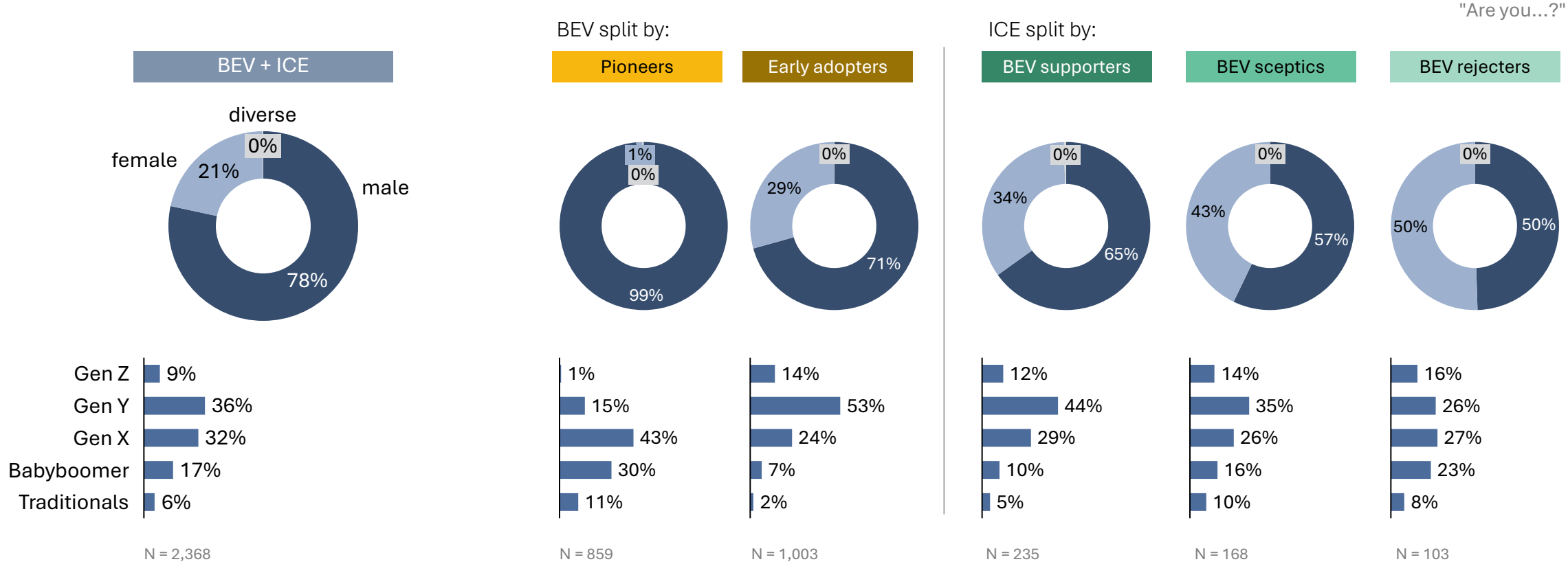
Gender and age

The vast majority of study participants are male and belong to Generation X.
Early adopters are younger and more often female.

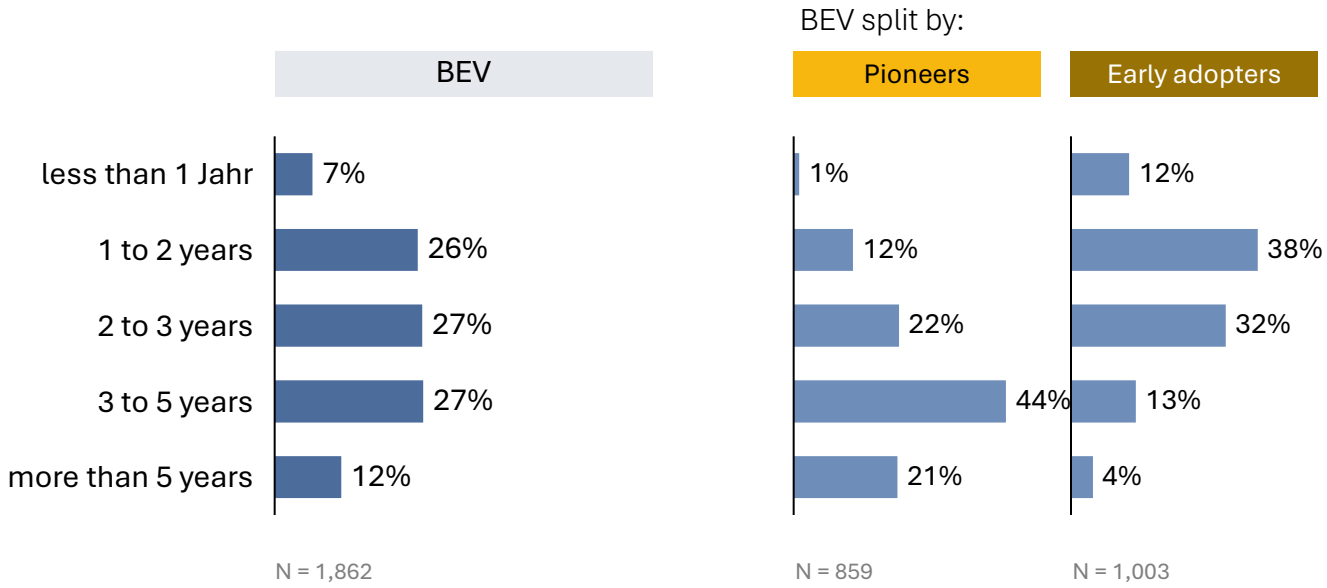
"Are you...?"



EV experience

The respondents have extensive experience with electric driving. The pioneers have been driving electric vehicles significantly longer than the next segment.

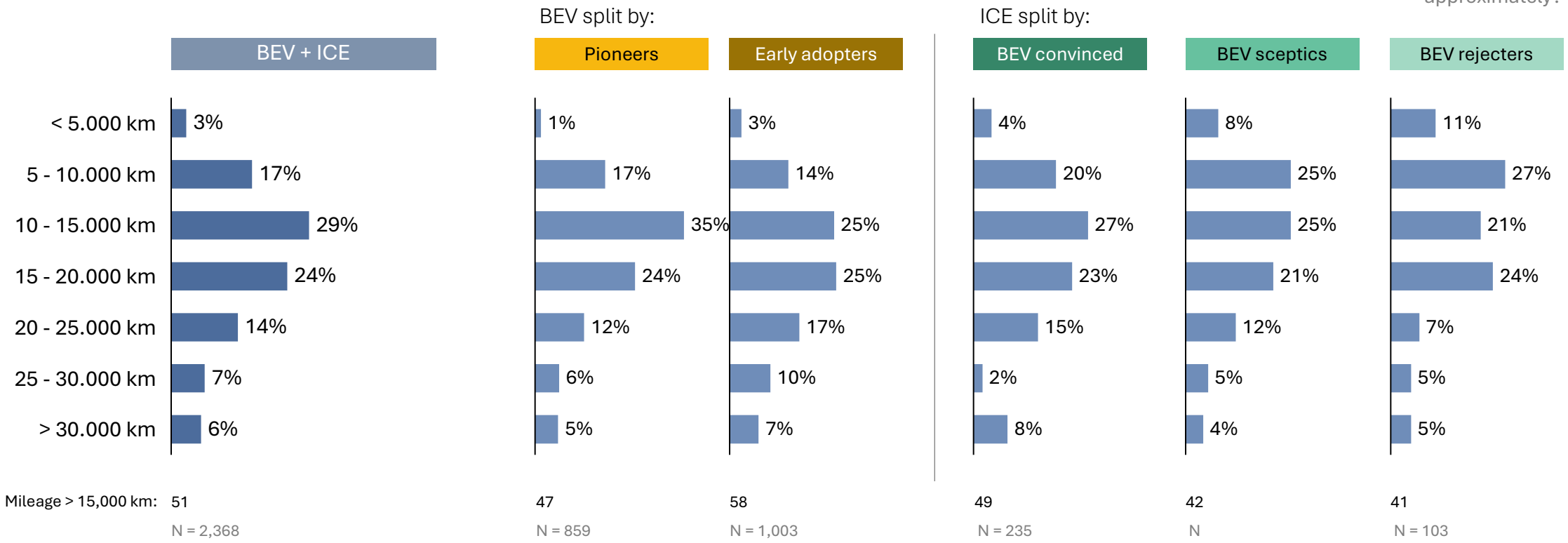
"How long have you been driving electric?"



Mileage per year

The average annual mileage is still higher than that of drivers of cars with combustion engines.

"How many kilometres do you drive with your [make + model] per year, approximately?"



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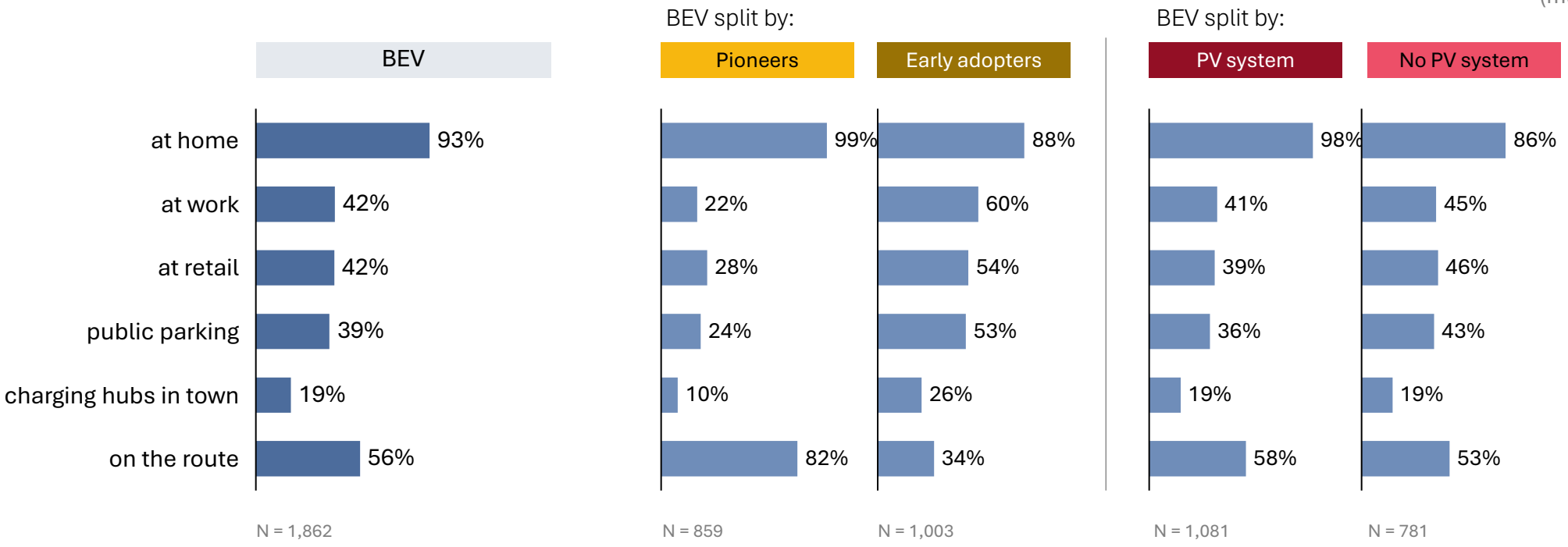
Charging habits of BEV drivers

Charging location

Over 90% of respondents in the study charge at home. Among PV system owners, the figure is almost 100%.

"Where do you charge your EV?"

(multiple answers possible)



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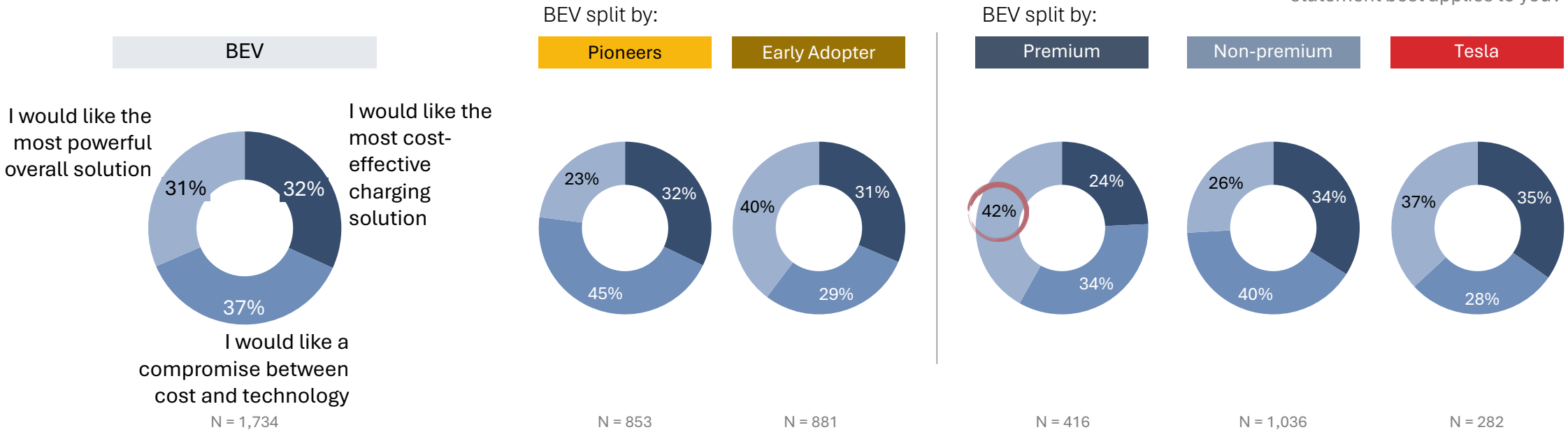
Segmentation feature: Charging solution type

Respondents are looking for an affordable solution, a high-performance solution and/or a compromise in roughly equal proportions. Drivers of premium brands prefer a high-performance solution.

Drive = battery electric AND charging location = at home:

"Regarding your charging solution at home, which statement best applies to you?"



* only if available

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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 roughly equally among the three application cases

- Vehicle-to-Home
- Vehicle-to-Grid and
- Vehicle-to-Business (at the employer's premises)

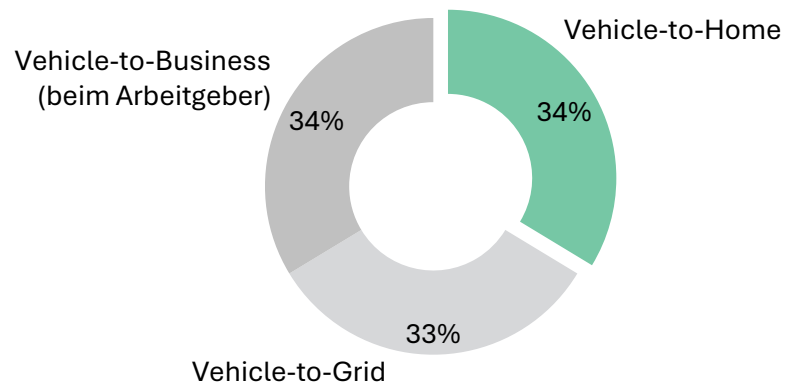
As an introduction, all respondents were given an explanatory text on the topic of bidirectional charging.

> *"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:

> *"One variant of bidirectional charging is 'Vehicle-to-Home'.*
> *With Vehicle-to-Home, the car transfers energy to your home, e.g. for cooking.*
> *The control system ensures that you always have enough energy in your car to drive."*

Breakdown of respondents into use cases:

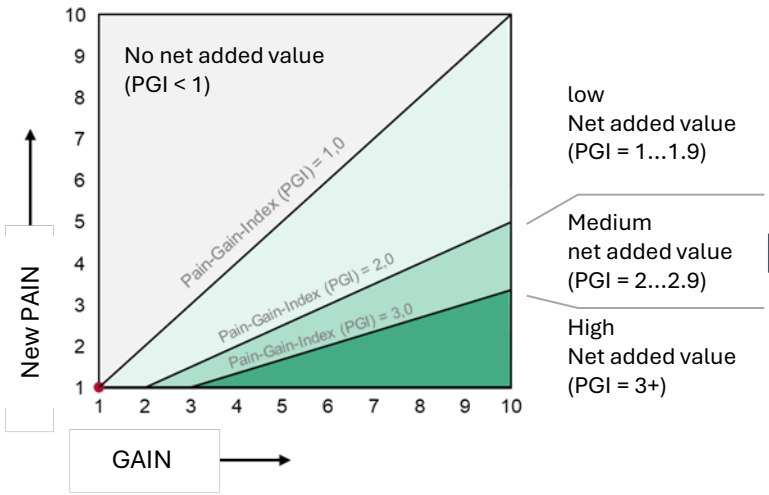


Vehicle-to-Home: Product-market fit

Die erreichbare Zielgruppe für V2H, also Befragte mit einem Netto-Mehrwert von über 3, ist unter den BEV-Fahrenden mit 34% sehr hoch. Selbst unter den BEV-Zweiflern und Ablehnern liegt sich bei immerhin rund 10%.

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

Schematic representation

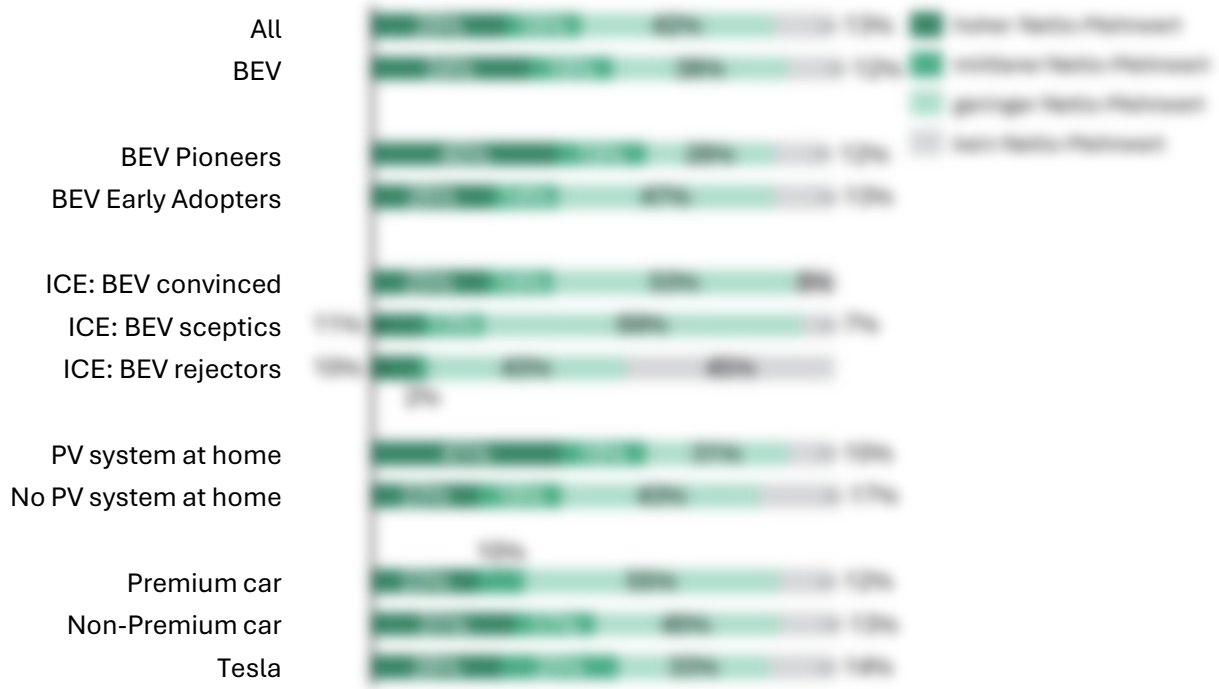


low
Net added value
(PGI = 1...1.9)

Medium
net added value
(PGI = 2...2.9)

High
Net added value
(PGI = 3+)

PGI = Pain-Gain Index



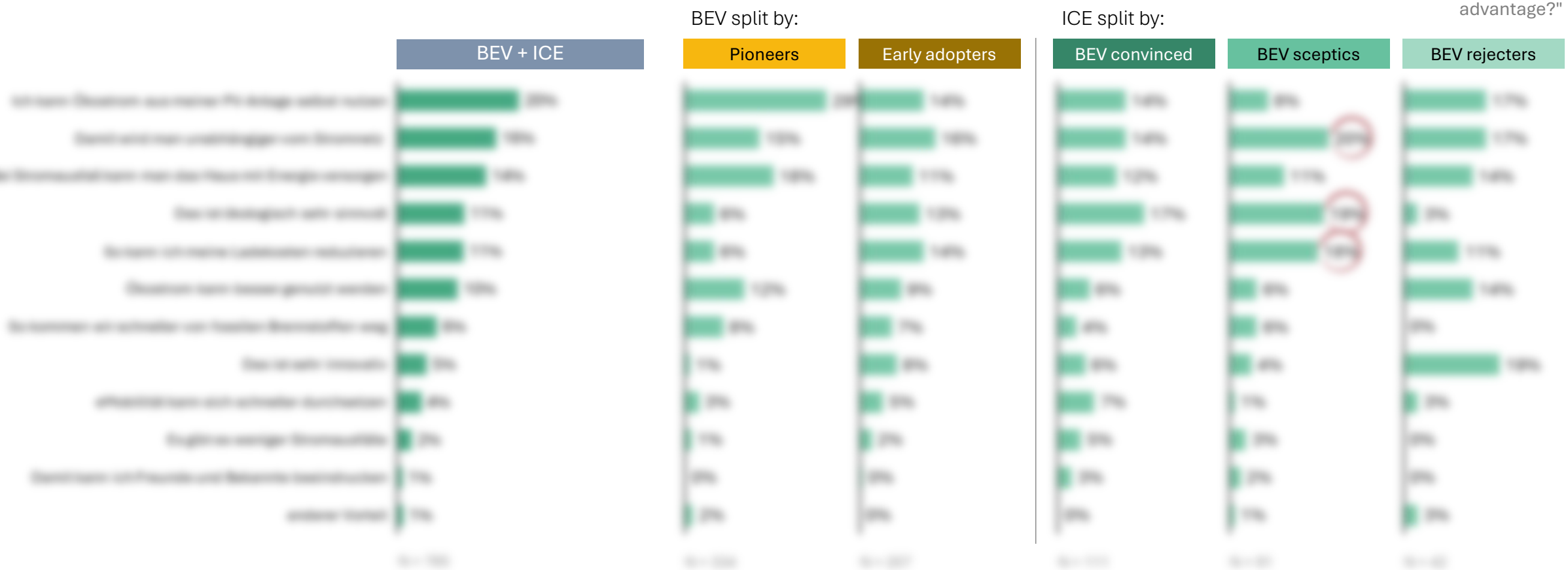
N = 42 - 785

Vehicle-to-Home: biggest driver of use

Auch bei der Frage nach dem größten Vorteil bleiben gerade beim nächsten Segment alle Aspekte der Trias aus Autarkie, Ökologie und Kosten gleichermaßen wichtig.

Advantage ≠ none:

"What do you think would be the biggest advantage?"

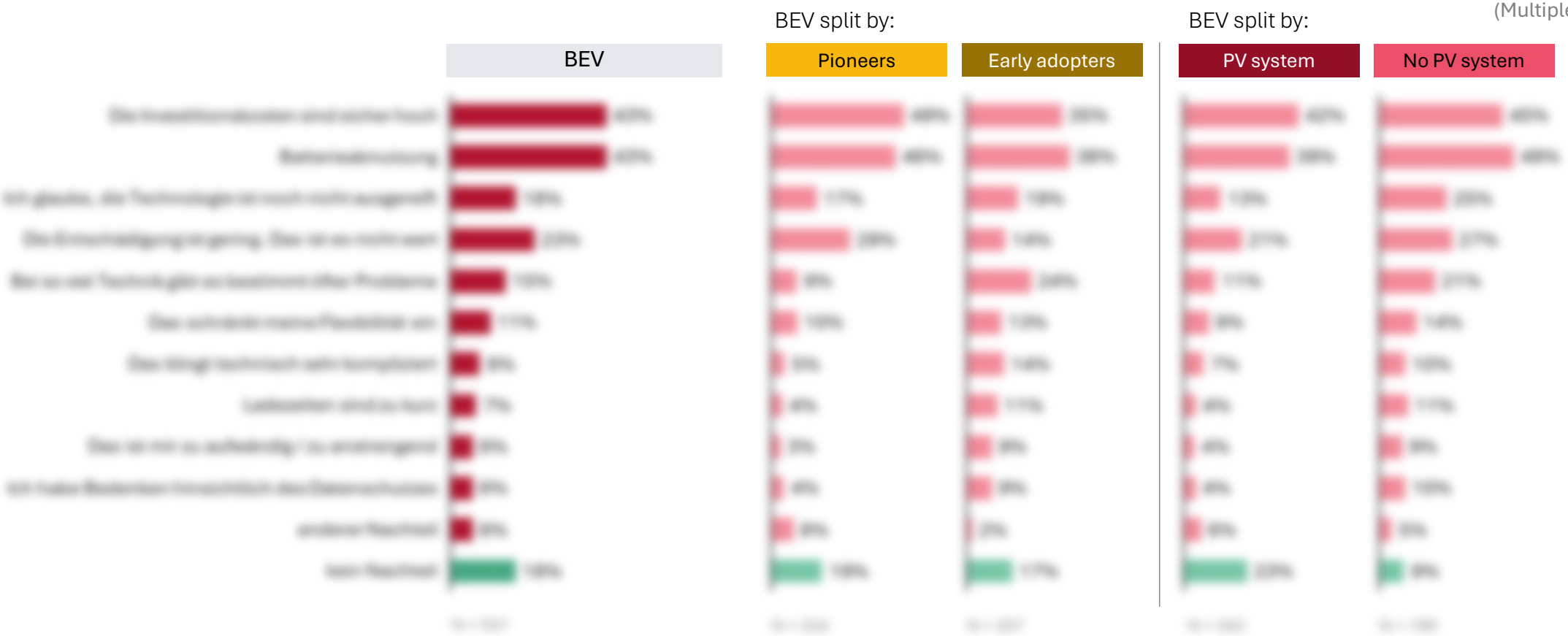


Vehicle-to-Home: barriers to use

PV-Anlagen-Besitzende und Nicht-Besitzende bewerten die Barrieren ähnlich. Nicht-Besitzende sehen die Barrieren in Summe etwas höher.

"Which of the following disadvantages are relevant in your opinion?"

(Multiple answers possible)



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Willingness to invest

Der kritische Wert für die Investitionsbereitschaft, um V2H nutzen zu können, liegt bei € 1.500,-. Oberhalb von € 1.500,- geht die Kaufbereitschaft deutlich zurück.

"For this to work, you need a wall charger that is 'bidirectional'. In addition, you need special equipment for the car, which must be ordered at the time of purchase.

Would the wall charger + special equipment for bidirectional charging be...?"

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

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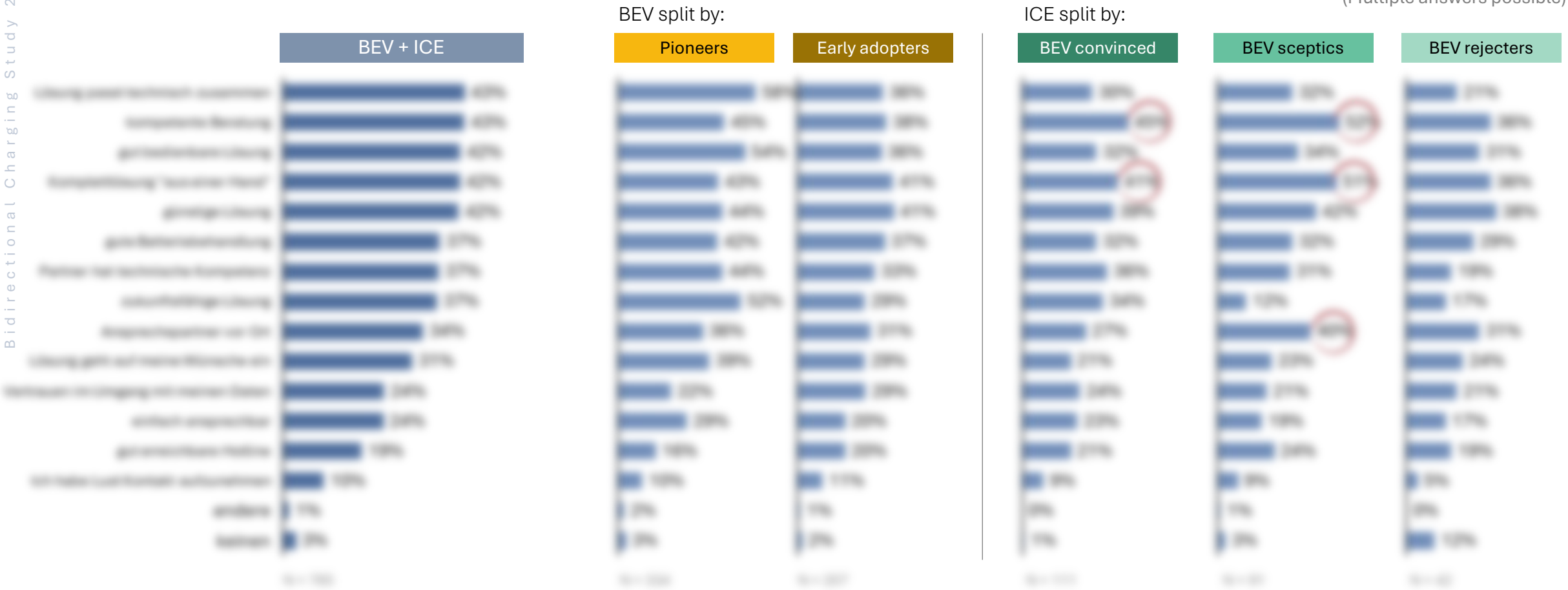
Choosing a solution partner

Early Adopter und die nächsten EV-Umsteigende würden bei der Wahl des Anbieters vor allem auf kompetente Beratung und eine Komplettlösung aus einer Hand achten.

"More and more partners are offering technical solutions for the installation and control of V2H.

Which aspects would be important to you when choosing a partner?"

(Multiple answers possible)



Trust in solution partners (detail: BEV early adopters)

Among respondents in the next segment, car dealers enjoy the second highest level of trust.

Aspects ≠ none:

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

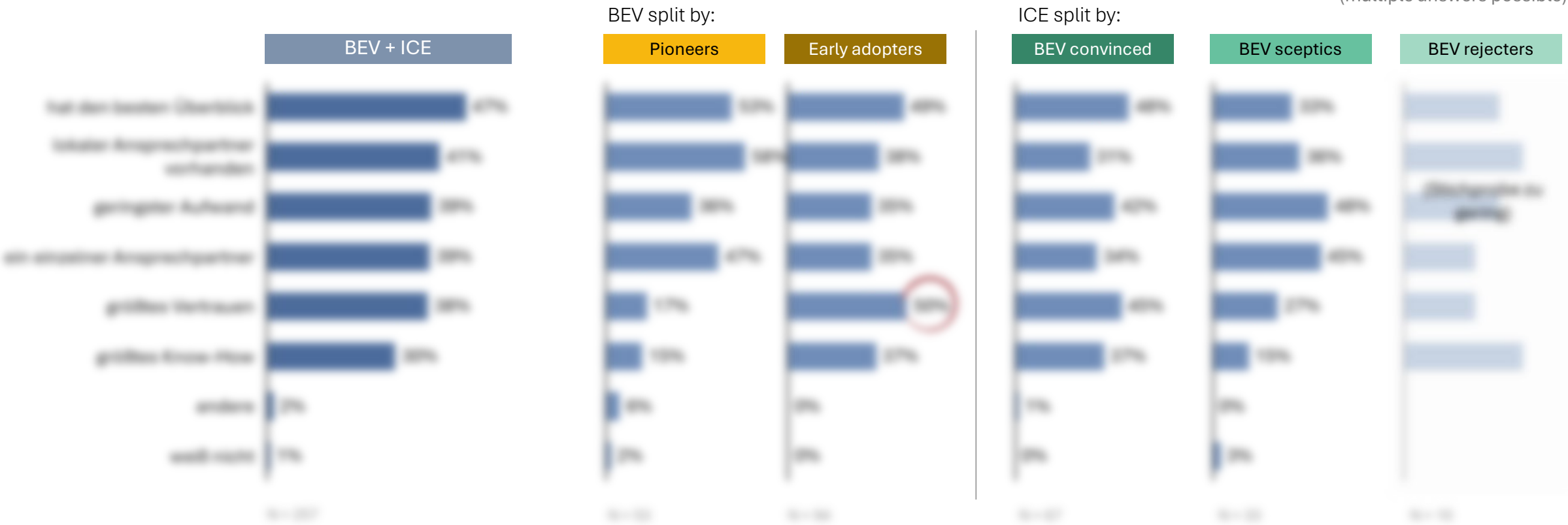
Early adopter (BEV)

Reasons for choosing a provider (energy supplier)

Planning type: Energy supplier
= happy to/definitely:

"Why would you buy from this provider as a 'one-stop shop'?"

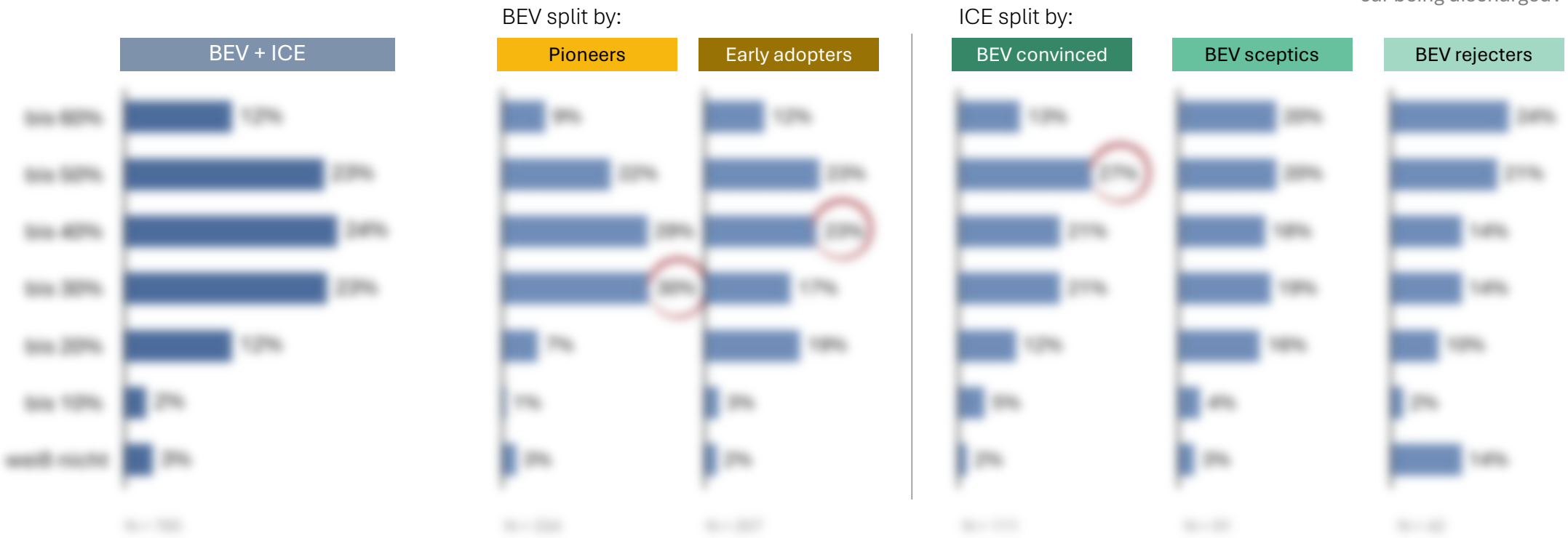
(multiple answers possible)



Discharge limit

Aktuelle EV-Fahrende halten eine Entladung des eigenen Autos durch V2H bis auf 30 bis 40% Rest-SoC für akzeptabel. Zukünftige EV-Adoptersegmente sind etwas vorsichtiger.

"To what level would you accept your car being discharged?"



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