



## Report on consumer behaviour (2nd edition)

Project deliverable D1.1



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101056874.

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How do **electric vehicle (EV) drivers** in seven european countries look at **vehicle-to-anything (V2X)** and **smart charging**?



The survey was conducted among more than **3000 EV drivers across seven European countries**: Hungary, Poland, Portugal, Slovenia, Austria, Norway, and the Netherlands.

**Indepth expert interviews** with representatives from EV drivers in these countries.

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GLOBAL EV ALLIANCE





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1. About the survey
2. A closer look at  
Smart Charging  
Vehicle-to-X
3. Conclusions



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# Survey in 7 European Countries

Country	Number of respondents
Norway	1526
The Netherlands	527
Portugal	247
Hungary	183
Poland	156
Austria	103
Slovenia	68

Country	EV market share new car sales	EV share total fleet
Norway	82.9%	22.9%
The Netherlands	28.5%	3.7%
Portugal	15.7%	1.2%
Hungary	5.0%	0.8%
Poland	3.5%	0.1%
Austria	18.5%	2.1%
Slovenia	2.1%	0.6%

Table 2: EV share in new passenger car market per. 31 July 2023 and EV share of total passenger car fleet per 31 December 2022. Source: ACEA (2023), European Alternative Fuels Observatory (2023), OFV (2023).

# Smart charging

## Statements part 1

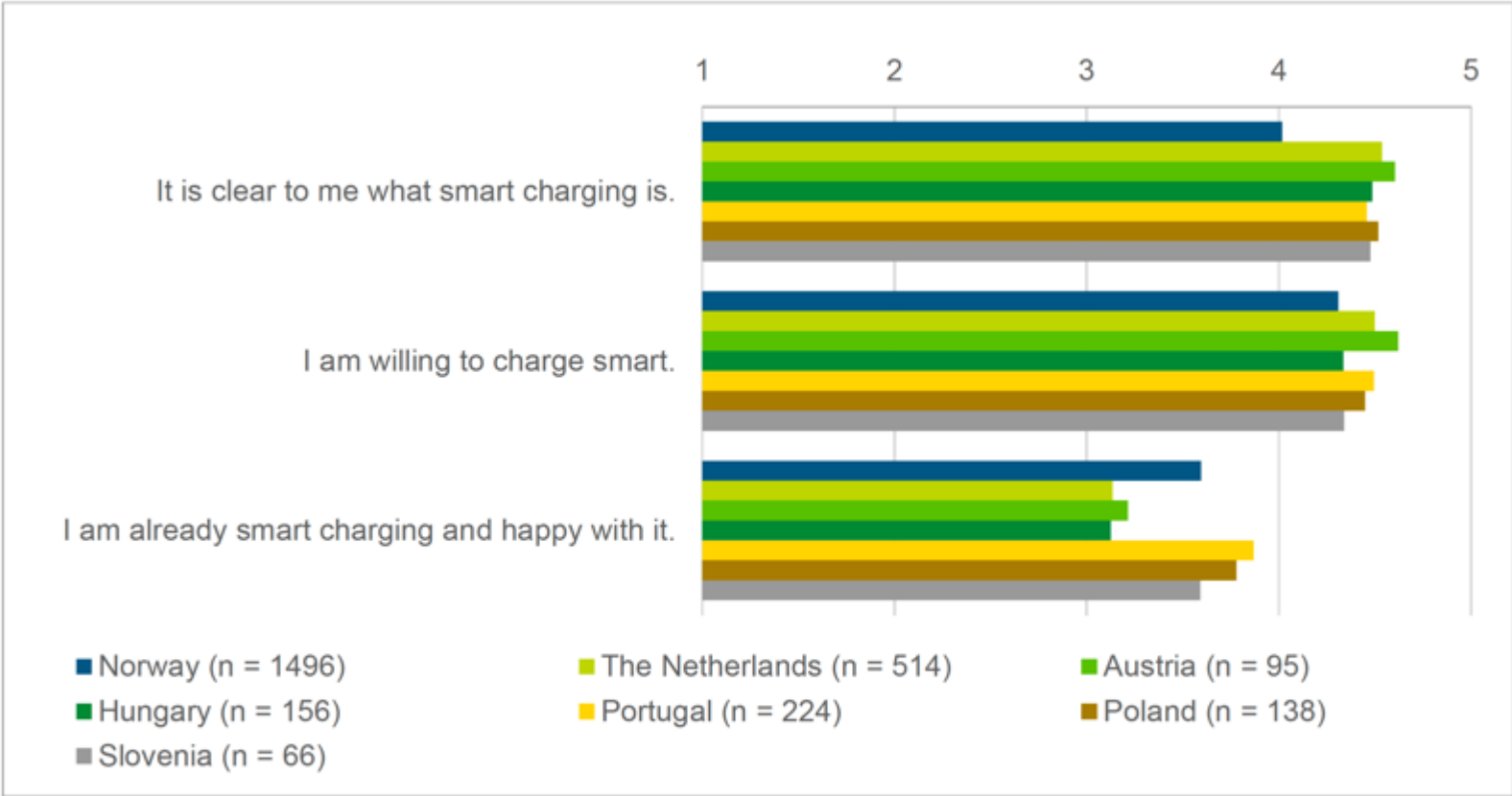


Figure 3: To what extent do you agree with the following statements about smart charging? On a scale from 1 (strongly disagree) to 5 (strongly agree).

# Smart charging

## How do EV-drivers charge smart?

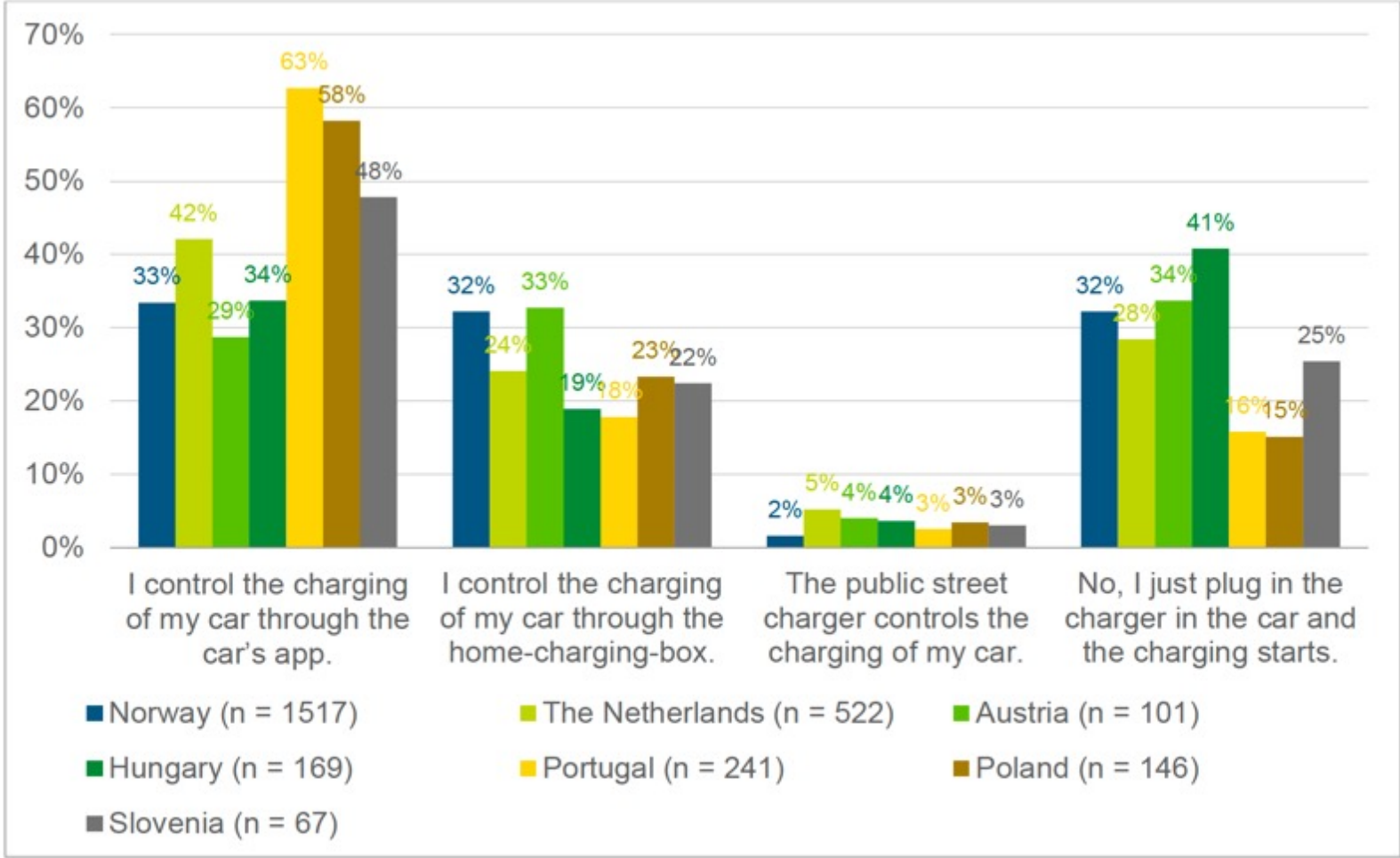
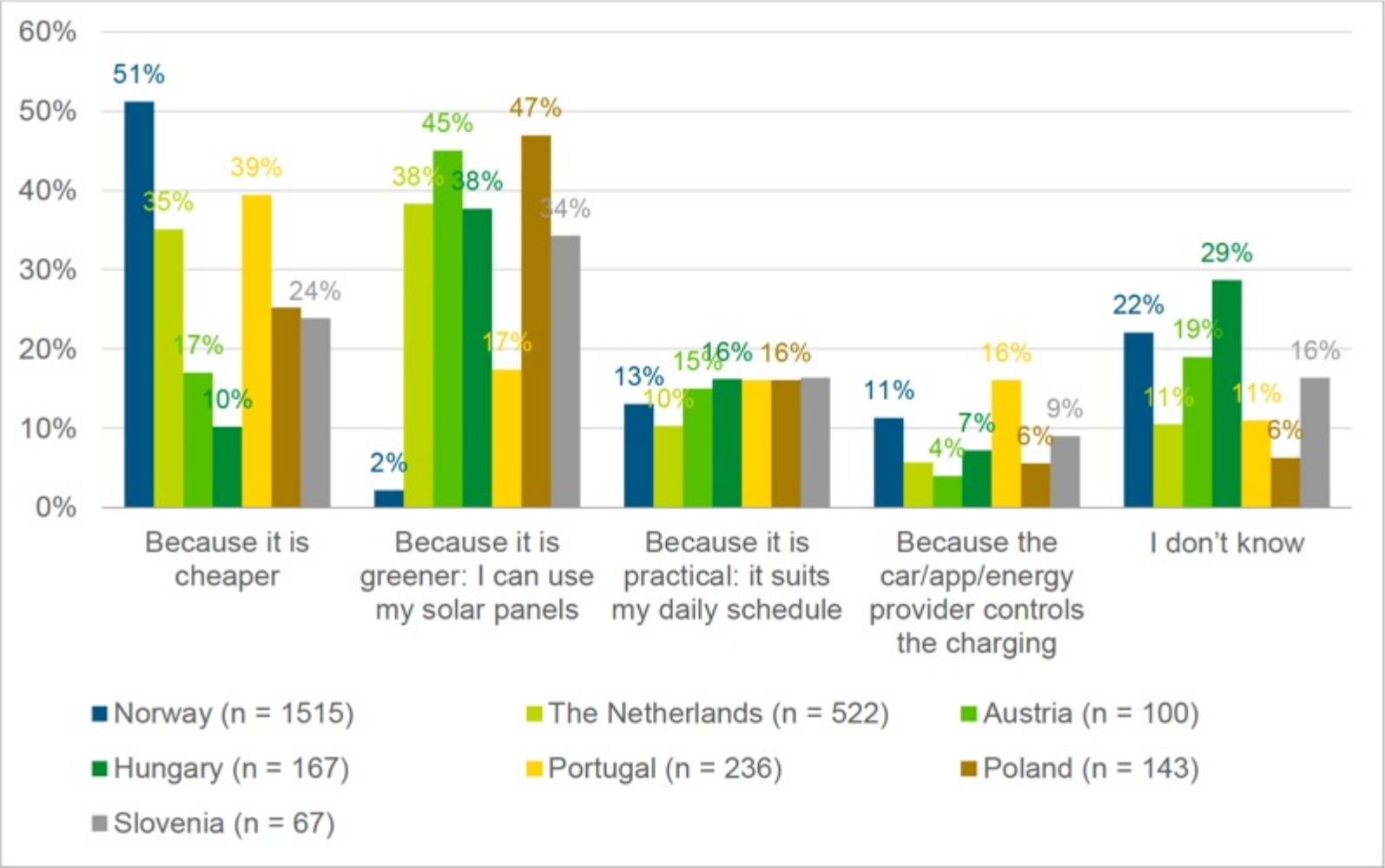


Figure 1: Do you control the charging of your car/do smart charging?

# Smart charging

## Why do EV-drivers charge smart?



# Smart charging

## Statements part 2

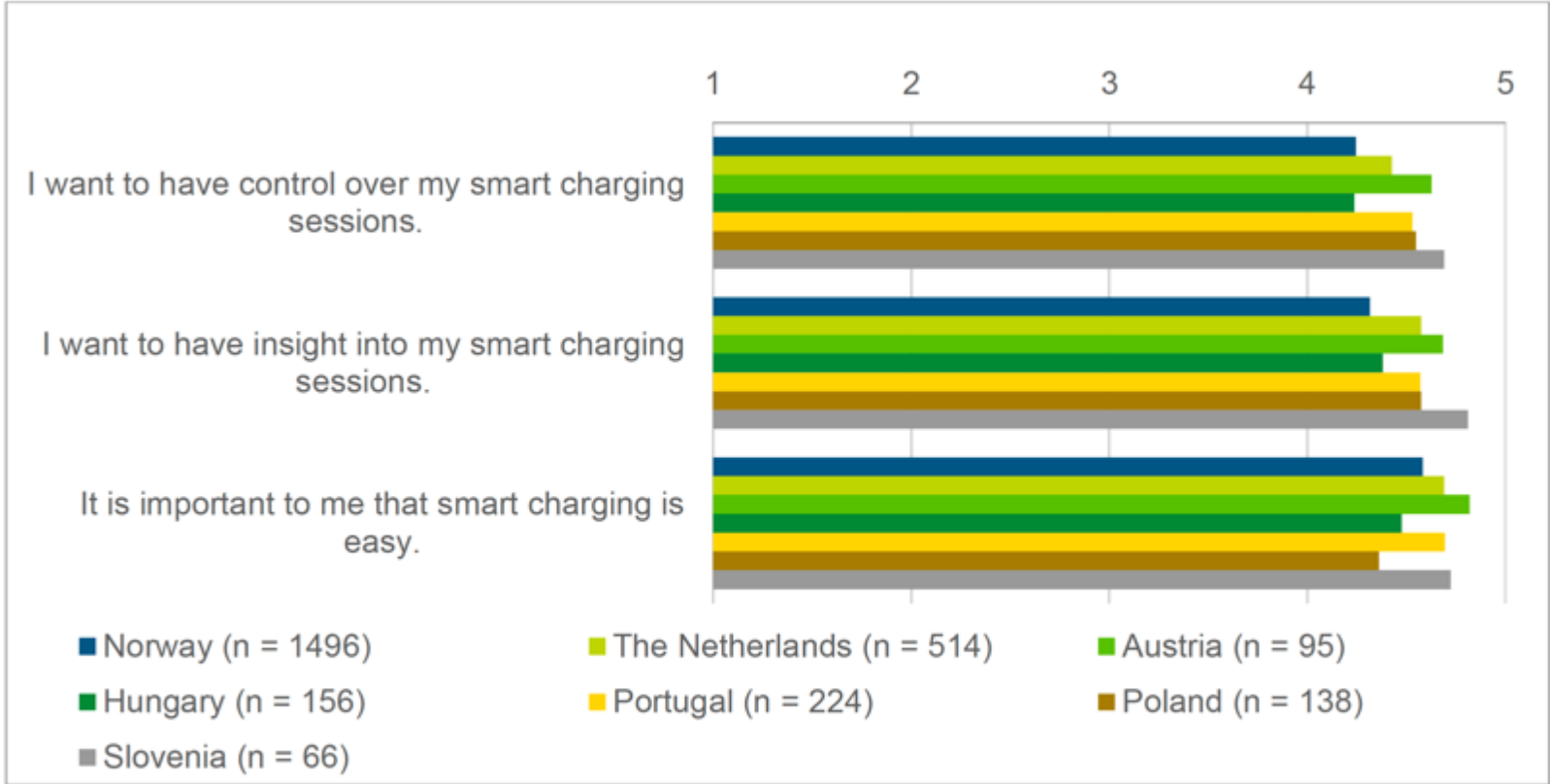


Figure 4: To what extent do you agree with the following statements about smart charging? On a scale from 1 (strongly disagree) to 5 (strongly agree).



# Smart charging

## Statements part 2

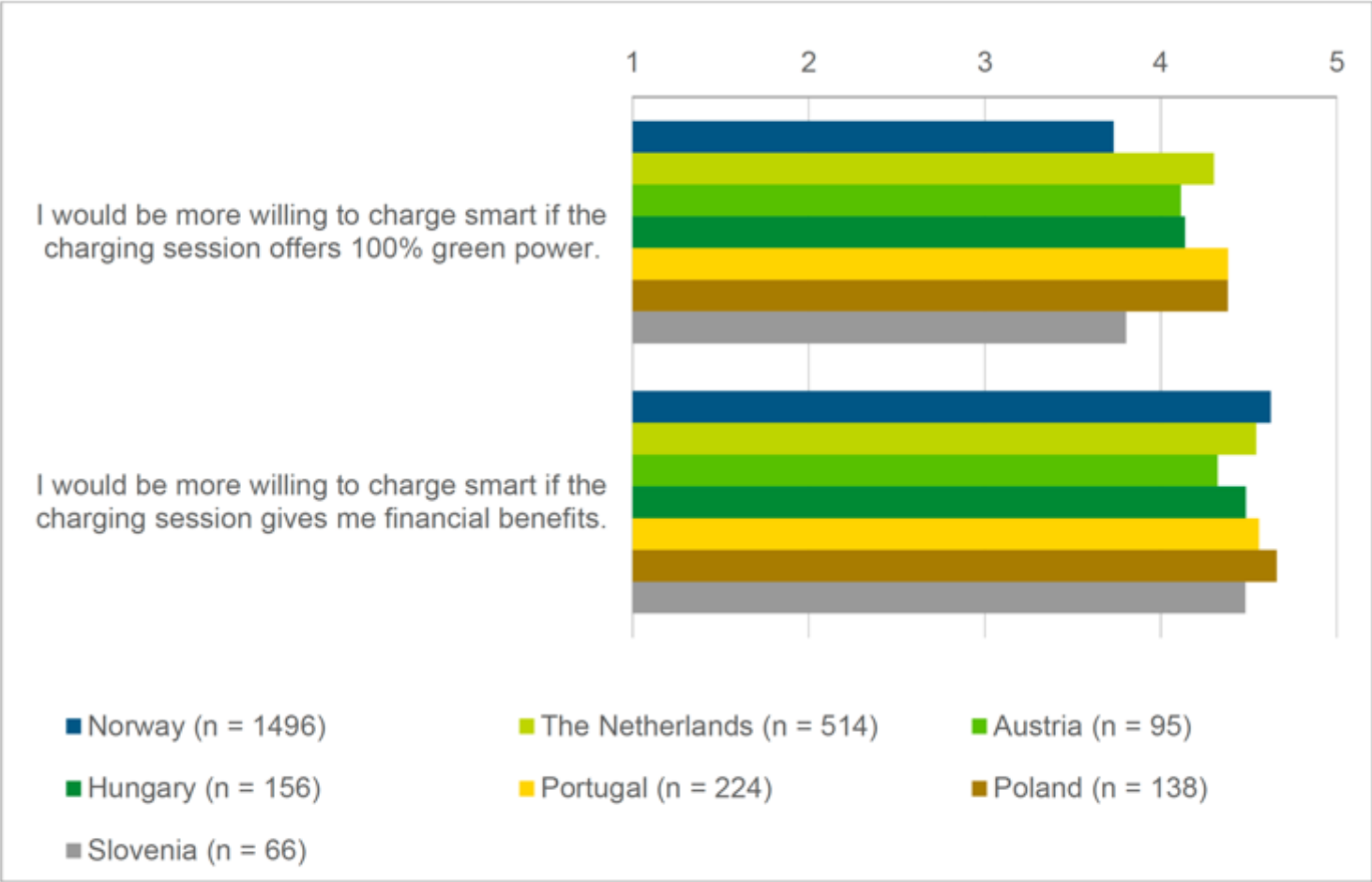


Figure 5: To what extent do you agree with the following statements? On a scale from 1 (strongly disagree) to 5 (strongly agree).

# Smart charging

## Who would you trust?

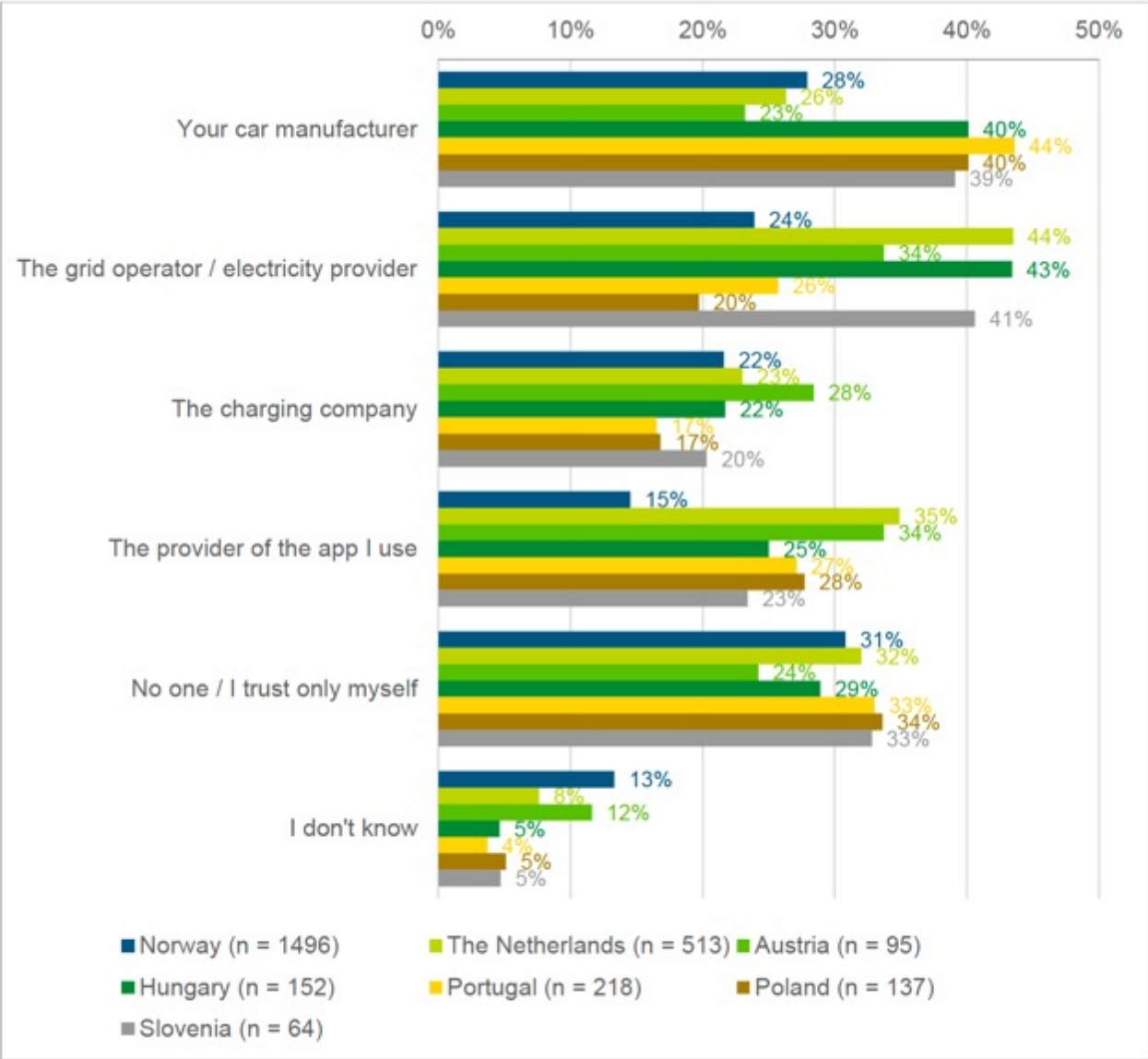


Figure 6: Who would you trust in terms of handing over control for the charging of your car? Multiple answers possible.

## Vehicle-to-X

What do you want to use the battery for?

	Norway	The Netherlands	Portugal	Hungary	Poland	Austria	Slovenia
Power my home when I want to	15%	53%	37%	47%	59%	67%	58%
Power my home when electricity from the grid is expensive	33%	57%	36%	42%	47%	40%	53%
Power my home when the grid is unstable	19%	35%	21%	51%	54%	46%	65%
Power the EV of another person	13%	14%	20%	20%	21%	16%	24%
Give electricity back to the grid to contribute to a stable energy network	11%	45%	16%	26%	22%	36%	34%
Give electricity back to the grid if I received financial compensation	29%	50%	36%	40%	32%	49%	55%
Power my caravan, electric BBQ, portable refrigerator, or similar additions I have for my road trip activities	27%	21%	19%	25%	29%	25%	29%
None of these options seem very relevant to me	35%	8%	19%	11%	6%	7%	3%

Table 3: If you were able to use the power from your EVs battery for other things than powering your EV (often referred to as Vehicle-to-anything), would you use it to...

## Vehicle-to-X

What do you want to use the battery for?

	Norway	The Netherlands	Portugal	Hungary	Poland	Austria	Slovenia
Power my home when I want to	15%	53%	37%	47%	59%	67%	58%
Power my home when electricity from the grid is expensive	31%	57%	36%	42%	47%	40%	53%
Power my home when the grid is unstable	19%	35%	21%	51%	54%	46%	65%
Power the EV of another person	13%	14%	20%	20%	21%	16%	24%
Give electricity back to the grid to contribute to a stable energy network	11%	45%	16%	26%	22%	36%	34%
Give electricity back to the grid if I received financial compensation	29%	50%	36%	40%	32%	49%	55%
Power my caravan, electric BBQ, portable refrigerator, or similar additions I have for my road trip activities	27%	21%	19%	25%	29%	25%	29%
None of these options seem very relevant to me	35%	8%	19%	11%	6%	7%	3%

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Give electricity back to the grid if I received financial compensation	29%	50%	36%	40%	32%	49%	55%
Power my caravan, electric BBQ, portable refrigerator, or similar additions I have for my road trip activities	27%	21%	19%	25%	29%	25%	29%
None of these options seem very relevant to me	35%	8%	19%	11%	6%	7%	3%

Table 3: If you were able to use the power from your EVs battery for other things than powering your EV (often referred to as Vehicle-to-anything), would you use it to...

# Vehicle-to-X

What are your concerns?

	Norway	The Netherlands	Portugal	Hungary	Poland	Austria	Slovenia
Battery degradation (reduced capacity of the battery)	47%	55%	70%	71%	68%	56%	68%
Loss of battery warranty	19%	23%	25%	22%	27%	33%	21%
Loss of data/privacy	4%	8%	5%	7%	7%	5%	10%
Fear that the car won't be charged enough by time of leave	50%	51%	34%	49%	26%	39%	42%
Lack of being in control of the charging process when external control is being applied	26%	29%	21%	27%	19%	30%	23%
That you don't get enough financial compensation for it	13%	21%	18%	32%	18%	19%	26%
That EV drivers don't get anything out of it	12%	4%	12%	11%	13%	10%	36%
I don't have any concerns	19%	15%	13%	9%	11%	21%	16%

Table 4: What are your concerns if you use your battery of the car for other things than powering your own EV?

# Vehicle-to-X

What are your concerns?

	Norway	The Netherlands	Portugal	Hungary	Poland	Austria	Slovenia
Battery degradation (reduced capacity of the battery)	47%	55%	70%	71%	68%	56%	68%
Loss of battery warranty	19%	23%	25%	22%	27%	33%	21%
Loss of data/privacy	4%	8%	5%	7%	7%	5%	10%
Fear that the car won't be charged enough by time of leave	50%	51%	34%	49%	26%	39%	42%
Risk of being in control of the charging process when external control is being applied	26%	29%	21%	27%	19%	30%	23%
That you don't get enough financial compensation for it	13%	21%	18%	32%	18%	19%	26%
That EV drivers don't get anything out of it	12%	4%	12%	11%	13%	10%	36%
I don't have any concerns	19%	15%	13%	9%	11%	21%	16%

Table 4: What are your concerns if you use your battery of the car for other things than powering your own EV?

## Conclusions (1)

- Very high willingness to use smart charging, but not all consumers are satisfied with how the technology works.
- Almost all the EV drivers in every country agree that smart charging should be easy and user friendly. They want to have control, insight and financial gain.
- Addressing user needs and expectations while effectively communicating the benefits of the technology will be key to widespread adoption





## Conclusions (2)

The original equipment manufacturer received the overall highest level of trust in terms of handing over control, but many respondents also stated that they only trust themselves and no third party.

This is an important barrier to overcome if smart charging technology (and V2G technology) is to be adopted among the majority of the consumers



## Conclusions (3)

Most drivers recognize the value of V2X with a strong preference for V2H options such as solar panels and smart house technology.

The willingness to participate in V2G is not very high but increases a lot when there are financial benefits.



## Conclusions (4)

8 out of 10 EV drivers have concerns related to V2X adoption. This is especially regarding:

- potential battery degradation
- handing over control of charging
- benefits from using the technology, like financial compensation for V2G adoption.



## Conclusions (5)

- Smart charging and V2X adoption varies a lot among the countries
- It is crucial to differentiate between smart charging and V2X, as they represent distinct concepts that require a differentiation of strategies for adoption.
- Differences in debates in the different countries.



## Conclusions (6)

The literature review shows a lack of consumer oriented research on smart charging and V2X technology.

The varying perceptions toward V2X adoption, concerns, and interests, needs to be taken into consideration when this new technology is being debated and developed.

