Building on what is already working

Describing a more nuanced understanding of rebated EV consumer groups

June 12, 2023

John Anderson

Transparency & Insights - Center for Sustainable Energy

With thanks to Francis Alvarez, Meghna Eluganti, Stephanie Wilson, and Brett Williams

Center for Sustainable Energy™

About CSE

Mission-driven national nonprofit

Center for Sustainable Energy® (CSE) is a national nonprofit that accelerates adoption of clean transportation and distributed energy through effective and equitable program design and administration.

- Administer cutting-edge programs valued at over $4 billion for governments, utilities and the private sector across the U.S.
- Leader in data-driven incentive program design and administration for:
  - Electric vehicle and EV charging incentive programs
  - Renewable energy incentive programs (solar and storage)
- Headquartered in San Diego with more than 250 employees across the nation

Objective and trusted

- Governments, utilities and the private sector trust CSE for its data-driven and software-enabled approach, deep domain expertise and customer-focused team.
- CSE's fee-for-service business model frees it from the influence of shareholders, members and donors, and ensures its independence.
- CSE's data and insights have informed policy at the local, state and federal level.

One mission —

DECARBONIZE.®

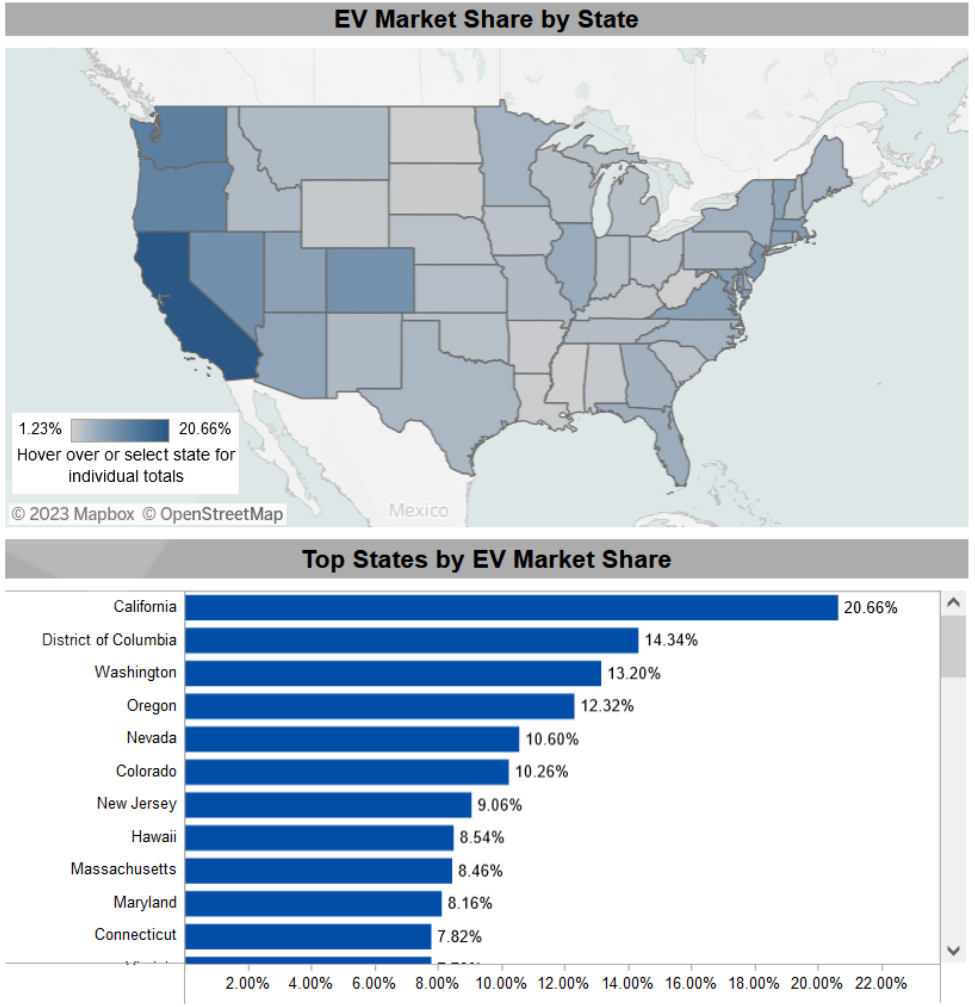
Our vision is a future with sustainable, equitable and resilient transportation, buildings and communities.

Center for Sustainable Energy®

Research Purpose

What do we know about what's working, and how can we reinforce it in a more nuanced way?

- Identify groups of EV-acquiring consumers
- Analyze consumer characteristics to find insights outreach to like consumers who have not yet acquired an EV
- Describe motivations, informational needs, challenges and concerns to inform messaging



Graphic from Alliance for Automotive Innovation (2023). Advanced Technology Sales Dashboard. Data compiled by the Alliance for Automotive Innovation using information provided by S&P Global Mobility and Hedges & Co. Last updated: 3/3/2023. Retrieved 6/7/2023 form https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard

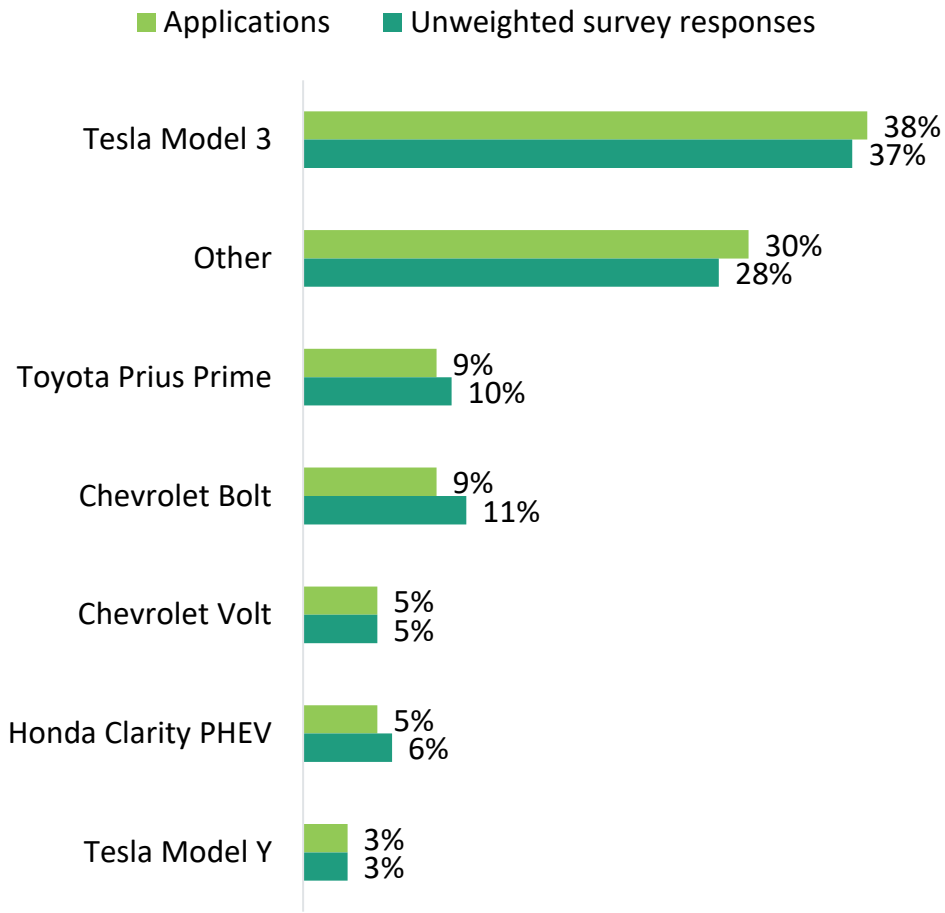
Key Takeaways

- The highest-value info channels are experience-based and peer-centric, though some groups prioritize expert opinions.
- Messaging emphasizing practical benefits, such as cost savings, charging convenience, and HOV/Carpool benefits may be particularly useful for more racially and ethnically diverse consumer groups.
- Finding info about electricity rates and metering options difficult across the board, especially so for young renters.
- Range, charging, and cost remain major concerns for EV buyers.

Process Flowchart

Application and Survey Data

Purchase/Lease Dates	1 June 2017 – 30 November 2020
Program Participants (Applications)	N = 198,922 PHEV: 57,162 (29%) BEV: 136,005 (68%) - Tesla: 92,142 (46%) - Non-Tesla BEV: 43,863 (22%) FCEV: 5,755 (3%)
Survey Response Dates	1 August 2017 – 24 March 2021
Survey Respondents (unweighted)	n = 33,524 PHEV: 9,599 (29%) BEV: 22,925 (68%) - Tesla: 14,597 (44%) - Non-Tesla BEV: 8,328 (25%) FCEV: 1,000 (3%)
Weighting Method	Iterative Proportional Fitting (aka raking)
Representative Dimensions	Vehicle technology type (PHEV vs. BEV), model, purchase vs. lease, residence county
Program as % of EV Market	43% (with FCEV, 42% without FCEV)



An average participant

Gender: male (72%)

Race/ethnicity: white (52%)

Age: 30–69 years old (83%)

Education: at least a bachelor’s degree in the household (83%)

Income: $75k–$175k (52%)

Housing: Homeowners (81%) of detached houses (77%) without solar (72%)

HH size: 2–4-person households (80%) with two drivers (63%) and 2–3 cars (71%)

Photo by dcbel on Unsplash

Most influential information sources

1. Another PEV driver
2. Vehicle test drive
3. Third-party vehicle review or car-buying website (e.g., Edmunds, Consumer Reports, KBB)
4. Manufacturer website
5. News story

Photo by Jorge Saavedra via Unsplash

Biggest concerns about EV

1. Vehicle range on a single charge is too limited
2. Vehicle price is too expensive
3. Too few opportunities for charging away from home
4. Time required for recharging vehicle is too long
5. Battery life is uncertain and replacement cost is too high

Photo by MyEnergi via Unsplash

Latent Class Analysis (LCA) Results

Classes were determined by:

Personal characteristics

- Gender
- Race/ethnicity
- Age

Household characteristics

- Highest education level
- Income
- Number of people
- Number of drivers

Housing characteristics

- Own or rent residence
- Residence type
- Solar

The number of classes were chosen by considering:

- Percentage of cases in each class
- Bayesian information criterion (BIC)
- Entropy
- Average latent class posterior probability

There were six resulting classes:

Class	Number of Survey Applicants (%)
Class 1	3,416 (11%)
Class 2	7,510 (23%)
Class 3	5,809 (18%)
Class 4	7,390 (23%)
Class 5	3,789 (12%)
Class 6	4,577 (14%)
Total	32,491

For more info about LCA:

B. E. Weller, N. K. Bowen, and S. J. Faubert, "Latent Class Analysis: A Guide to Best Practice," Journal of Black Psychology, vol. 46, no. 4, pp. 287–311, May 2020, doi: 10.1177/0095798420930932.

Class Summary

1

2

3

4

5

6

Class Summary

CALIFORNIA CLEAN VEHICLE REBATE PROJECT™

1

Single-person, lower-income HHs

Most gender identity diversity, more renters in multi-unit buildings, more LIC dwellers and first-time EV buyers

2

Older, white, enviro-couples

Higher-income, less practically motivated, lower incentive influence

3

High-income, white families

Homeowners, more often with solar, more practically motivated than Class 2

4

Smaller, more-diverse families

Almost entirely homeowners of detached houses, more skeptical, practically motivated, more Teslas

5

Young renters

More LIC and DAC dwelling, challenging charging environments, more practically motivated

6

Large, more-diverse HHs

Wider variety of motivations, more DAC dwelling, more influenced by incentives

An average participant

Gender: Male (72%)

Race/ethnicity: White (52%)

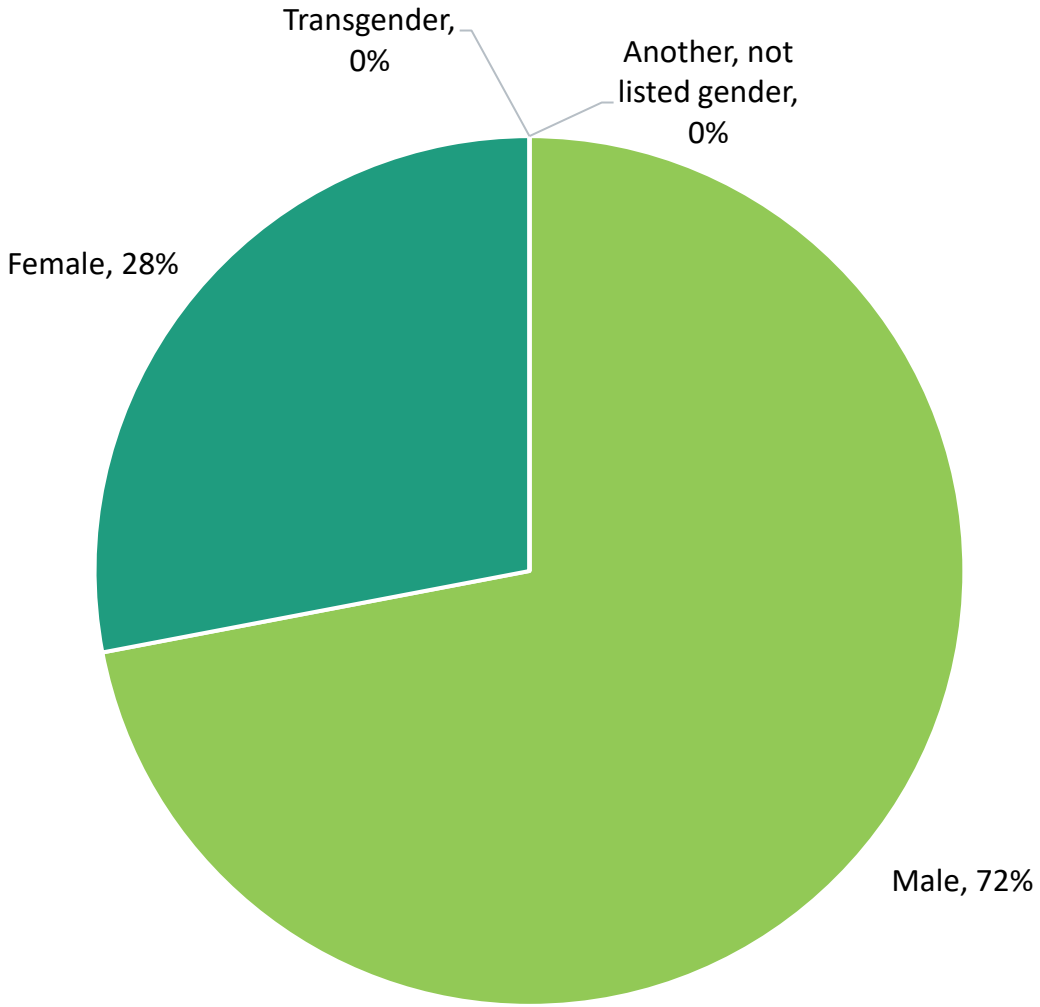
Age: 30–69 years old (83%)

Education: At least a bachelor's degree in the household (83%)

Income: $75k–$175k (52%)

Housing: Homeowners (81%) of detached houses (77%) without solar (72%)

HH size: 2–4-person households (80%) with two drivers (63%) and 2–3 cars (71%)



1 Single-person, lower-income households

More **female** (41%)

More **white** (63%), **Black or African American** (4%), **Native American or Alaska Native** (0%)

Lower Income: 80% < $125,000 household income

More **renters** (35%) of **apartments** (36%) and **attached houses** (14%)

Mostly **single-person households** (93%) with **one driver** (100%) and **one car** (73%)

Photo by Jordan Bauer via Unsplash

Class 1:
Single-person, lower-income households

Most influential information sources:

1. Another PEV driver
2. Third-party vehicle review or car-buying website (e.g., Edmunds, Consumer Reports, KBB)
3. Vehicle test drive
4. Manufacturer website
5. News story

Photo by Jordan Bauer via Unsplash

An average participant

Gender: male (72%)

Race/ethnicity: white (52%)

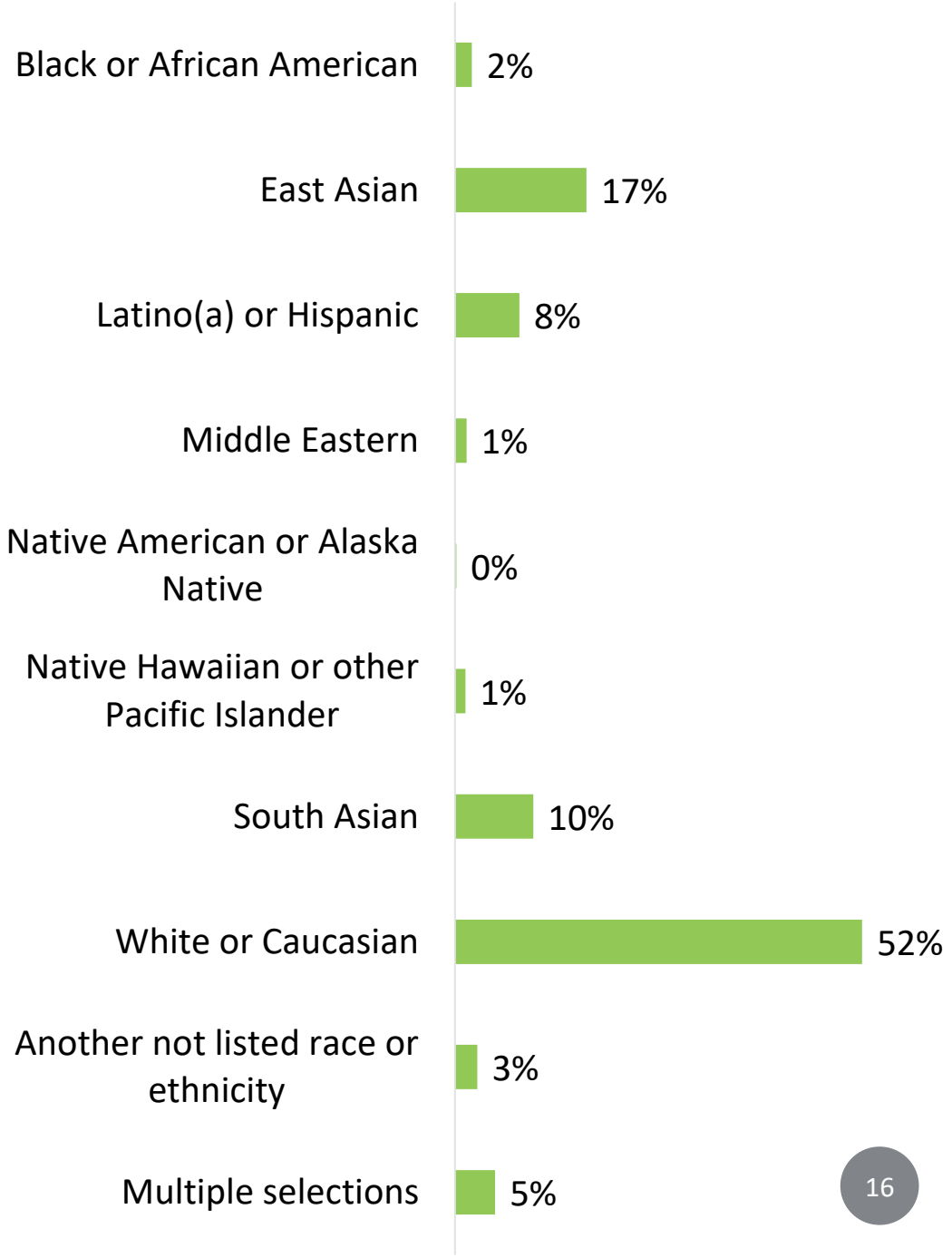
Age: 30–69 years old (83%)

Education: at least a bachelor's degree in the household (83%)

Income: $75k–$175k (52%)

Housing: Homeowners (81%) of detached houses (77%) without solar (72%)

HH size: 2–4-person households (80%) with two drivers (63%) and 2–3 cars (71%)



4

Smaller, more-diverse families

Diverse: more Black or African American (4%), East Asian (40%), Latino(a) or Hispanic (15%), Middle Eastern (3%), Native American or Alaska Native (0%), Native Hawaiian or Pacific Islander (3%), South Asian (23%), or another race or ethnicity (6%)

Higher income: 61% ≥ $125,000 household income

Almost entirely **homeowners** (99%) of **detached homes** (86%)

2–4-person households (92%), almost entirely **two drivers** (97%), most with **two cars** (60%)

Photo by Kadyn Pierce via Unsplash

6 Large, more-diverse households

Diverse: more Black or African American (3%), East Asian (37%), Latino(a) or Hispanic (19%), Middle Eastern (3%), Native Hawaiian or Pacific Islander (4%), South Asian (22%), another race or ethnicity (7%)

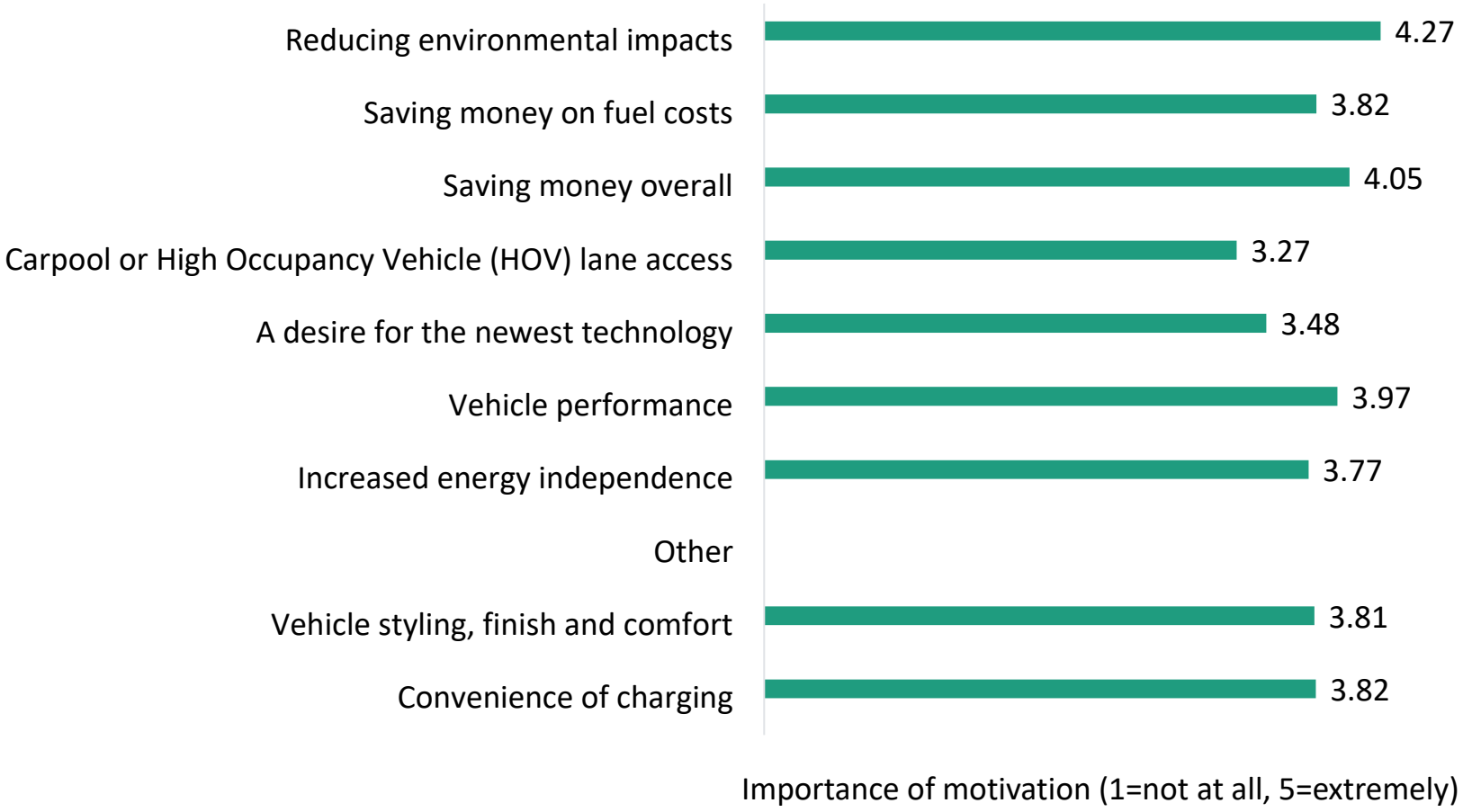
Age more evenly distributed: 21–29 (11%), 50–59 (37%); less 30–39 (13%), 70–79 (2%), 80+ (0%)

Mostly **homeowners** (88%), of **detached houses** (90%)

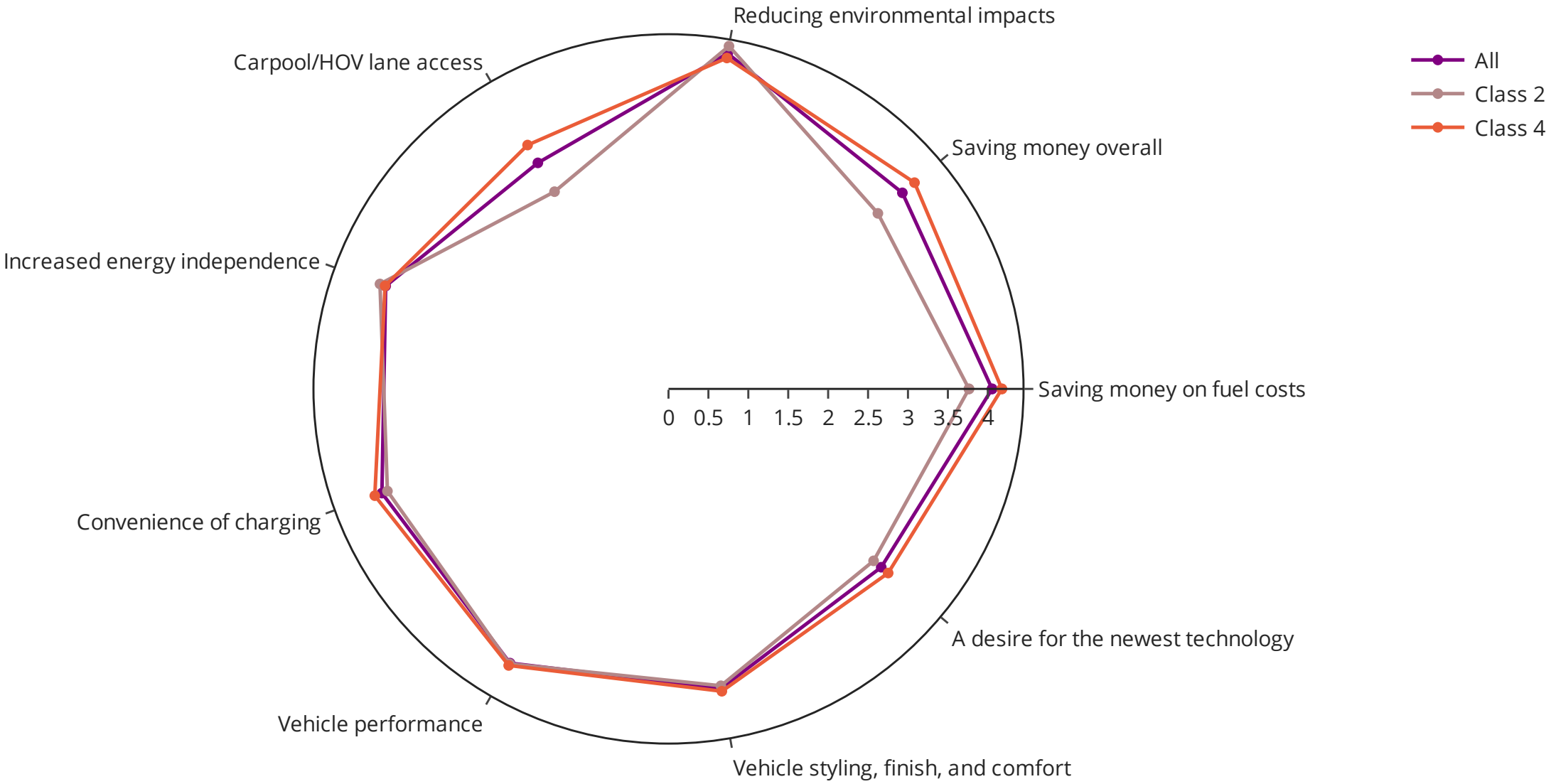
Entirely **3+ person households** (100%) with **2+ drivers** (100%); more **3+ car households** (81%)

Photo by Rajiv Perera via Unsplash

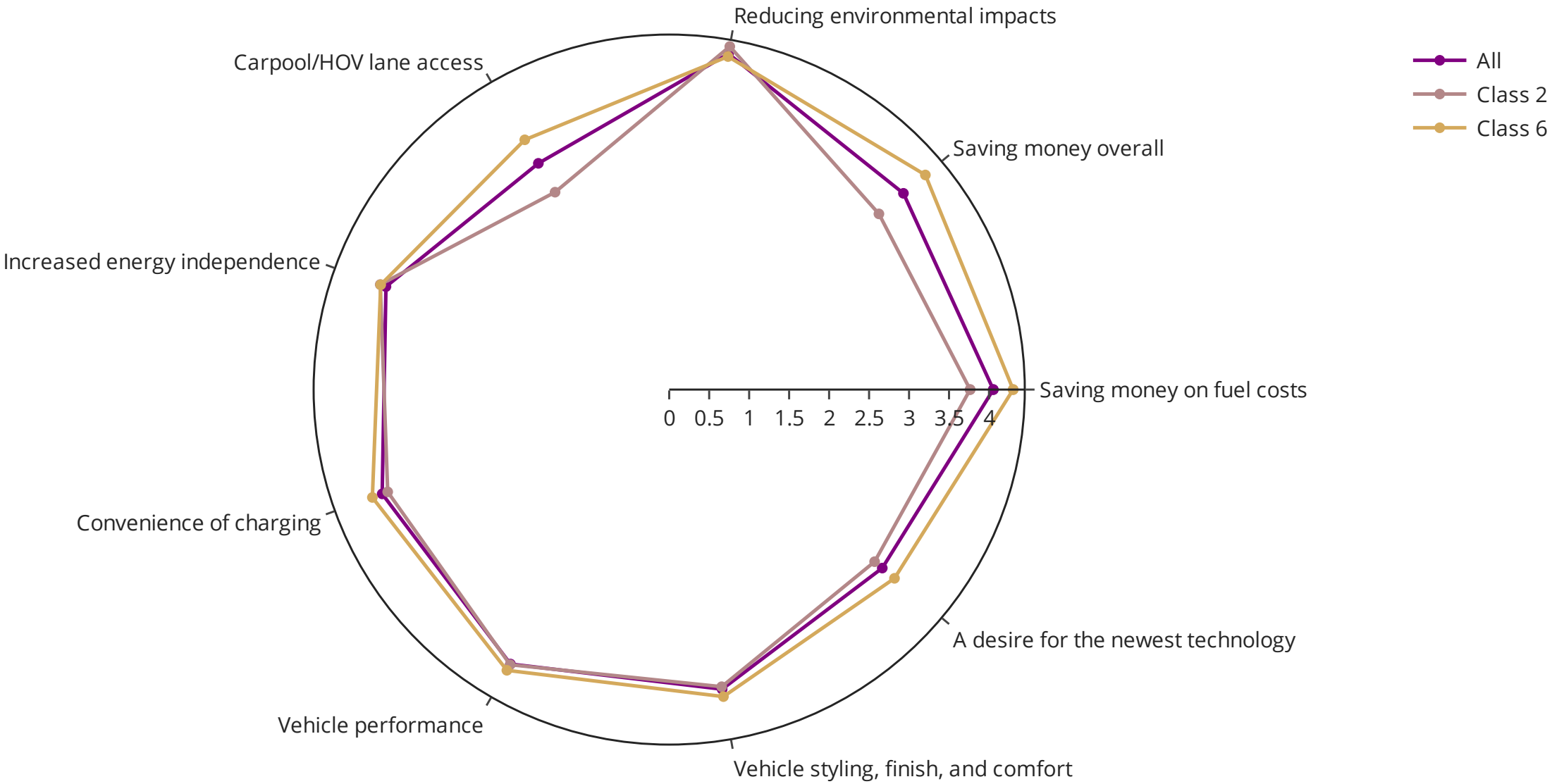
Motivations rated highly important across the board



Class 4 places more importance on practical considerations



Class 6 values practical considerations even more



An average participant

Gender: male (72%)

Race/ethnicity: white (52%)

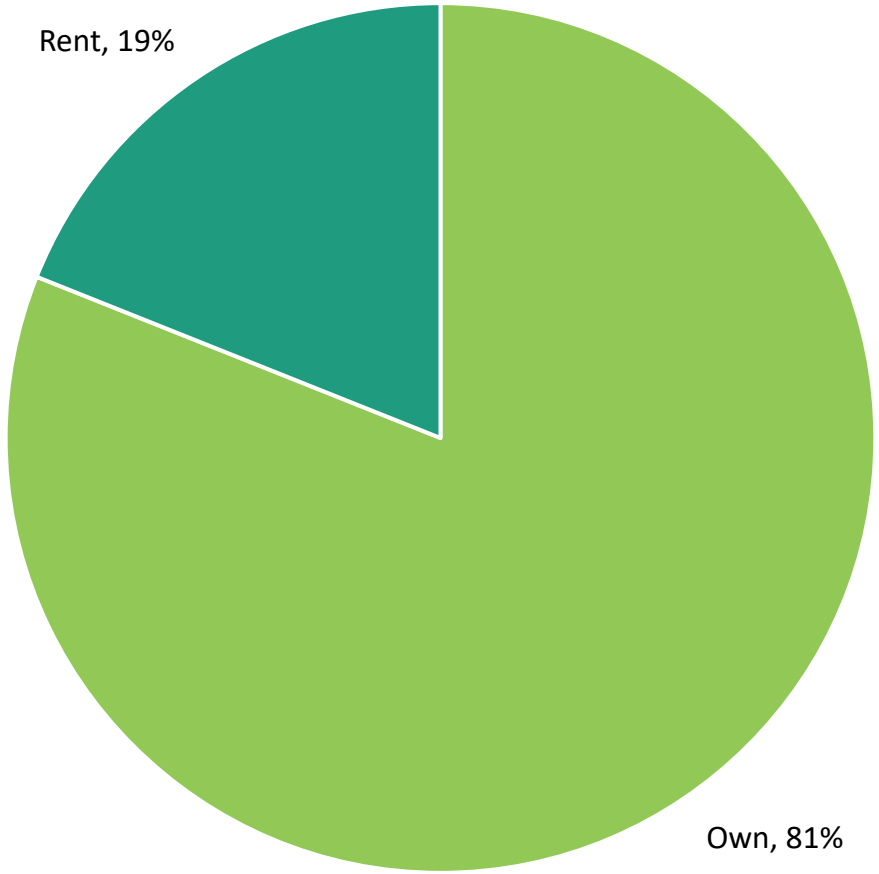
Age: 30–69 years old (83%)

Education: at least a bachelor's degree in the household (83%)

Income: $75k–$175k (52%)

Housing: Homeowners (81%) of detached houses (77%) without solar (72%)

HH size: 2–4-person households (80%) with two drivers (63%) and 2–3 cars (71%)



An average participant

Gender: male (72%)

Race/ethnicity: white (50%)

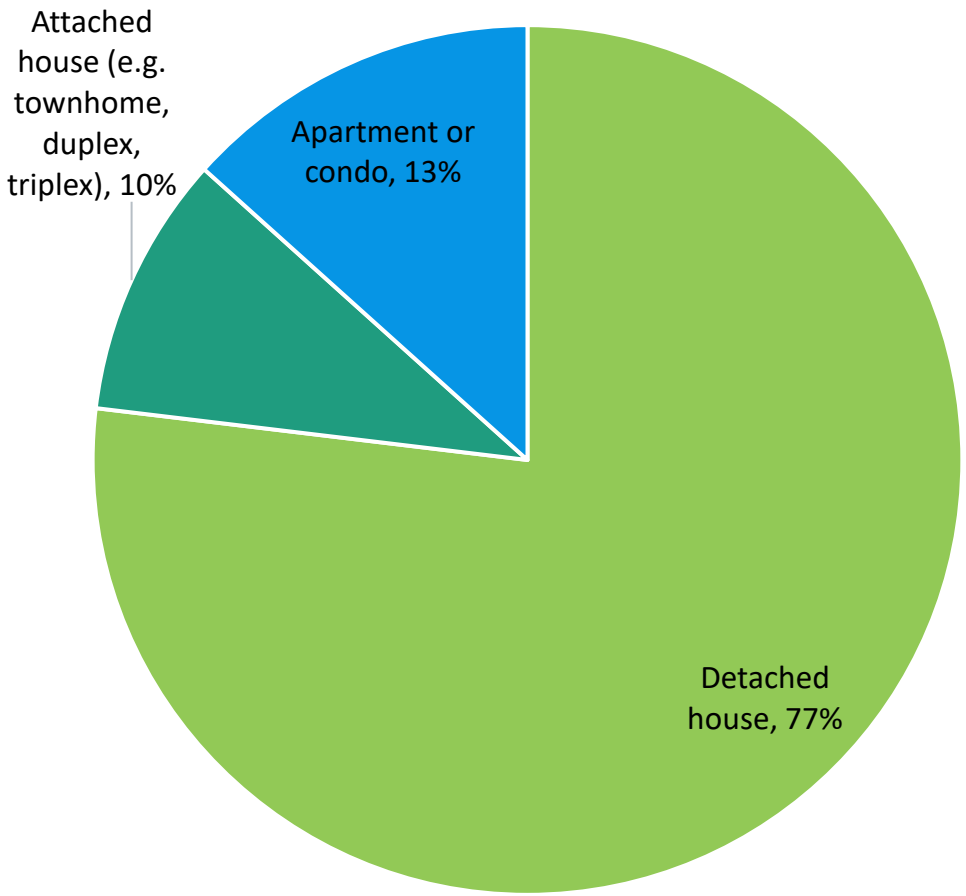
Age: 30–69 years old (83%)

Education: at least a bachelor's degree in the household (83%)

Income: $75k–$175k (52%)

Housing: Homeowners (81%) of detached houses (77%) without solar (72%)

HH size: 2–4-person households (80%) with two drivers (63%) and 2–3 cars (71%)



5 Young renters

Young: more 21–39 (66%); less ≥ 50 (13%)

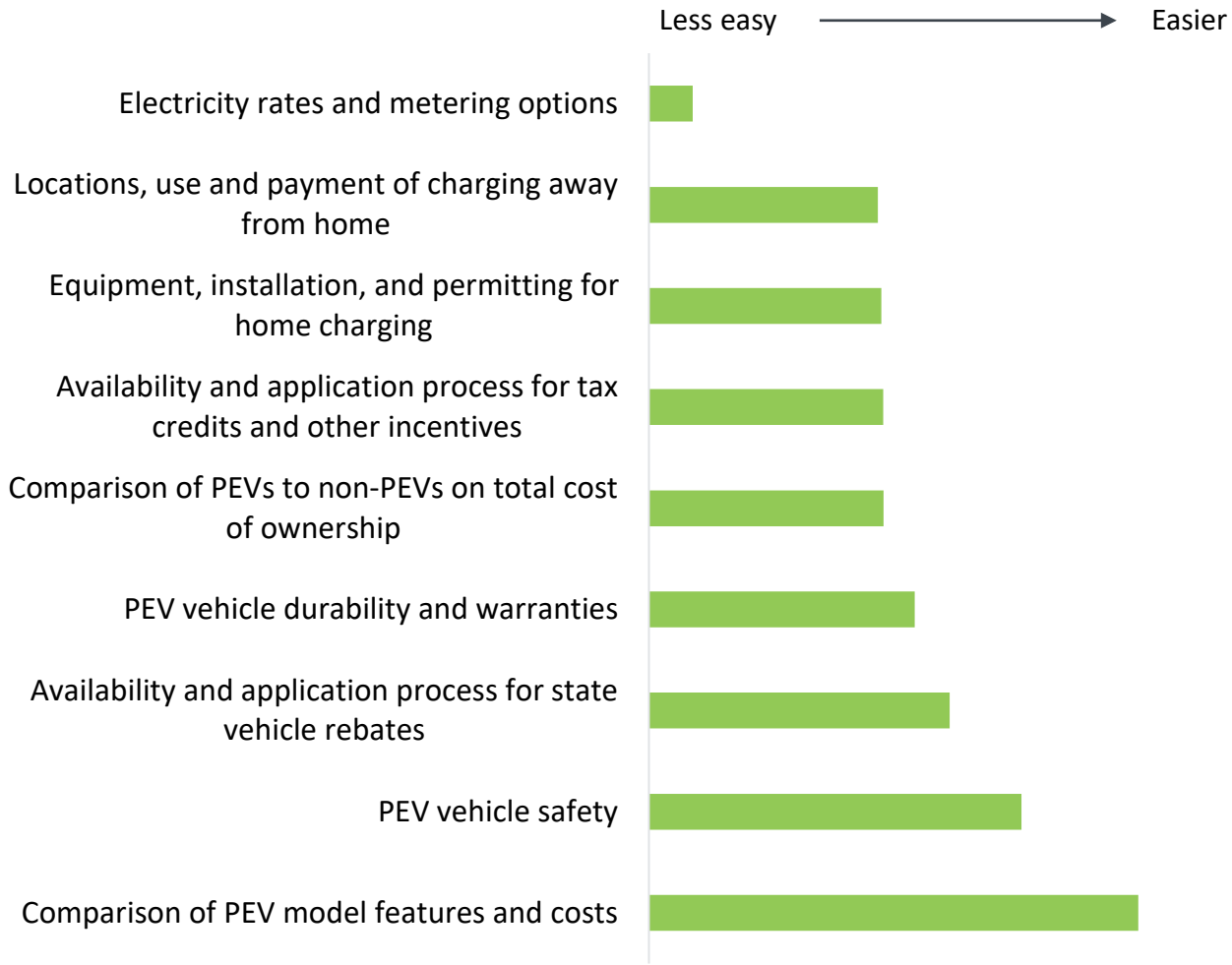
Lower income: 55% < $125,000 household income

Mostly renters (90%) of apartments (60%), almost entirely without solar (99%)

Mostly **two-person households** (84%) with **two drivers** (55%) and **1–2 cars** (85%)

Photo by Alek Kalinowski via Unsplash

Ease of finding information online



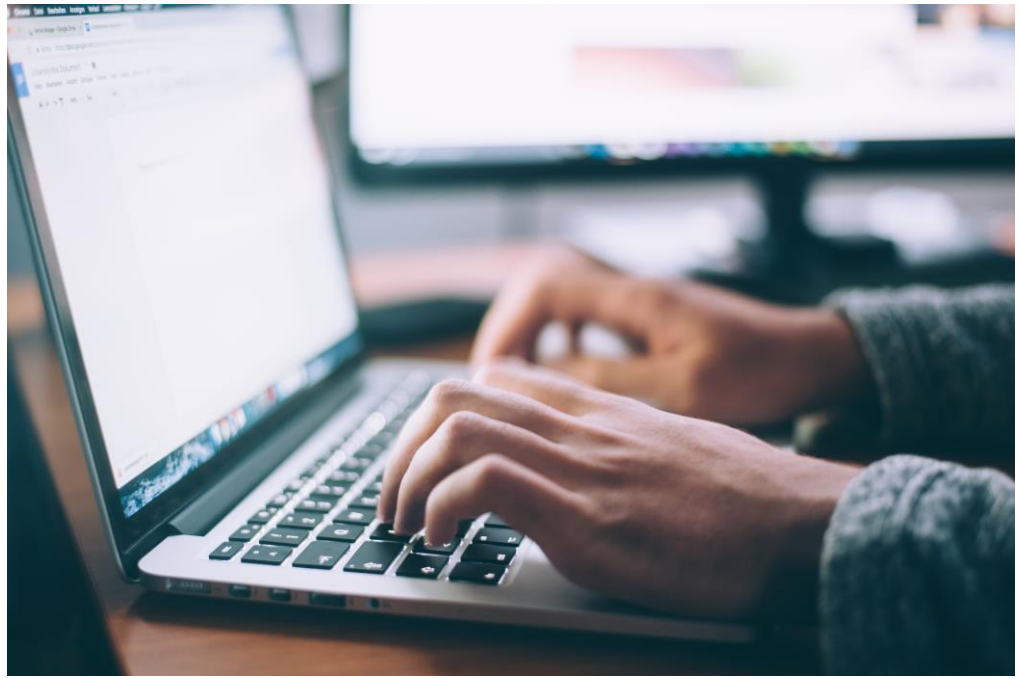


Photo by Glenn Carstens via Unsplash

Class 5:
Young, more-diverse renters

Difficulty finding information online:

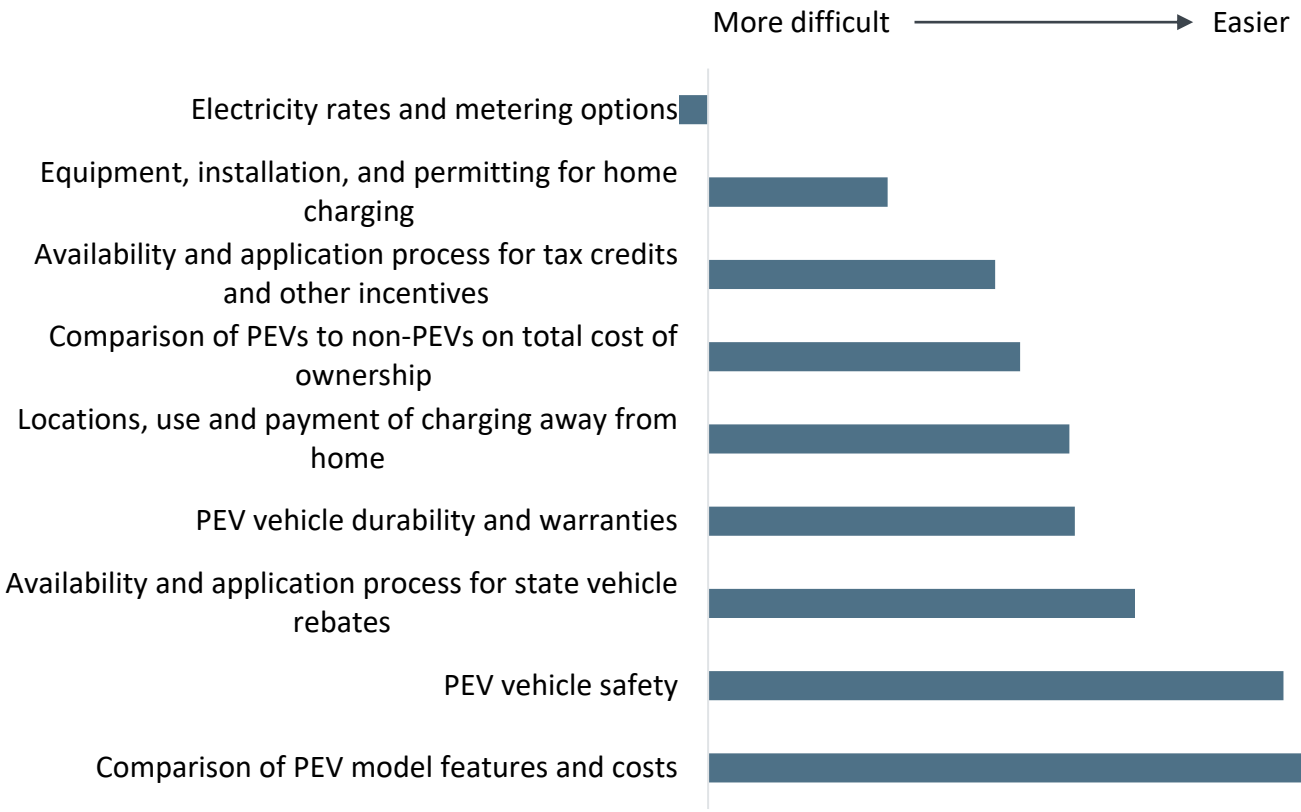


Photo by Alek Kalinowski via Unsplash

Key Takeaways

- The highest-value info channels are experience-based and peer-centric, though some groups prioritize expert opinions.
- Messaging emphasizing practical benefits, such as cost savings, charging convenience, and HOV/Carpool benefits may be particularly useful for more racially and ethnically diverse consumer groups.
- Finding info about electricity rates and metering options difficult across the board, especially so for young renters.
- Range, charging, and cost remain major concerns for EV buyers.

Thank you!

Contact Us

EnergyCenter.org

john.anderson@energycenter.org

HEADQUARTERS

3980 Sherman Street, Suite 170
San Diego, CA 92110

REGIONAL OFFICES

Boston MA • Brooklyn NY
Los Angeles CA • Oakland CA
Sacramento CA • Stony Brook NY

TELEPHONE

858-244-1177