TRANSPORTATION ENERGY INSTITUTE

Consumer Survey: Driving Behavior and Alternative Vehicles

JUNE 2023

Powered by the 2023 NACS Consumer Fuels Survey

About the Transporation Energy Institute

The Transportation Energy Institute (formerly Fuels Institute), founded by NACS in 2013, is a 501(c)(4) non-profit research-oriented think tank dedicated to evaluating the market issues related to vehicles and the energy that powers them. By bringing together diverse stakeholders of the transportation and energy markets, the Institute helps to identify opportunities and challenges associated with new technologies and to facilitate industry coordination to help ensure that consumers derive the greatest benefit.

The Transportation Energy Institute commissions and publishes comprehensive, fact-based research projects that address the interests of the affected stakeholders. Such publications help to inform both business owners considering long-term investment decisions and policymakers considering legislation and regulations affecting the market. Research is independent, peer reviewed and unbiased, designed to answer questions, not advocate a specific outcome. Participants in the Transportation Energy Institute are dedicated to promoting facts and providing decision makers with the most credible information possible so that the market can deliver the best in vehicle and energy options to the consumer.

For more about the Transportation Energy Institute, visit **transportationenergy.org**

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Introduction

Policymakers throughout the world, along with global automakers and other key stakeholders, are putting into place plans and strategies to increase the market share of electric vehicles (EVs). Current strategies have ranged from vehicle manufacturing and purchase incentives to bans on other types of vehicle powertrains to grants for charging infrastructure.

There are clearly many questions to resolve in determining how we meet any significant increase in EV usage, but the critical final decision-maker in this transition is and will always be the consumer. EV sales provide the best snapshot of where we have been—and are—with respect to growth, but where could sales growth go? For that, it's important to measure what consumers value—and how an EV future would fit their needs and interests.

It is with this realization that the Transportation Energy Institute partnered with NACS to field some specific questions in their annual consumer survey. The results provide insight into the consumer mindset today relative to how they live with their current vehicles (predominantly powered by gasoline fueled internal combustion engines) and what they might consider relative to their next vehicle – both of which provide valuable information to those seeking to establish an EV market (inclusive of charging infrastructure) that truly satisfies the needs of the end user.

The current behaviors and perceptions of consumers provides valuable insight into what may appeal to them with regards to an evolving transportation system. Specific lifestyle attributes like size of household and income can be highly influential to a consumers' perspective and new transportation options must take attributes like these into consideration. Same is true for how consumers use their current vehicles, the frequency with which they drive and commute and how frequently they refuel and to what extent they fill their tank. These are key indicators to the consumers' mindset and changing that mindset will be much more difficult than providing a substitute transportation option that does not require such a change in behavior.

Finally, what consumers say they might be willing to consider in the future is a good indicator of what they think today, but how they will actually proceed in the future is highly uncertain. Past surveys indicating an expected pattern of behavior have not always been reliable predictors of the future. It is much more instructive to focus on their current patterns of behavior to better predict if a new option will fit into their lifestyle or if their lifestyle will have to adjust to fit a new option. The latter will present a much greater challenge.

As the transportation sector develops solutions to remove carbon emissions, it must simultaneously ensure that it is delivering solutions that consumers will accept. Constantly evaluating how consumers behave and what they think, can help guide strategies that can successfully service those customers while delivering a zero carbon future.

The results of the survey included in this paper are presented to help the reader better understand the nuances that relate to customer satisfaction with transportation, both from their perspectives about their vehicles as well as the energy that powers them. There are many ways to interpret the data and derive critical learnings. With the exception of broad observations, we have made an effort to keep most interpretation of the data out of the narrative to allow the reader to apply the data as they see fit. That said, we have sought to highlight key findings that we believe should be taken into careful consideration because they are very relevant to those interested in supporting the transportation system's evolution towards a market with zero carbon emissions.

Methodology

NACS has conducted national consumer sentiment surveys since 2007, with a specific focus on fueling issues. The 2023 NACS Consumer Fuels Survey was conducted by national public opinion research firm Bold Decision (bold-decision.com). A total of N=1,200 U.S. consumers, including N=1,048 who say they drive and fill up at least monthly, were surveyed from February 17-26, 2023. The margin for error for the study is +/- 2.83 at the 95% confidence level. When referring to survey respondents, we interchange "drivers," "consumers," "Americans," etc.

The survey captured a wide variety of demographic data, which is presented in many of the following figures. The following explains the abbreviations used in the figures.

- *HH = Household Size*
- *Dollar Ranges = Household Income*
- *Drive ICE = Current Vehicle is ICE*
- *Drive HEV/BEV = Current Vehicle is HEV or BEV*
- *M = Male*
- *F = Female*
- *NE = Northeast*
- *MW = Midwest*
- *S = South*
- *W = West*
- *Urb = Urban*
- *Sub = Suburban*
- *Rur = Rural*
- *HS = High School*
- *Some col = Some College*
- *Col grad = College Grad*
- *Post grad = Post College Graduate*
- *D = Democrat*
- *R = Republican*
- *I = Independent*

Understanding the Consumer

DRIVING BEHAVIOR

When seeking to affect any change in the transportation sector, it is first important to understand how people approach their mobility needs today. The U.S. Energy Information Agency (EIA) predicts that Americans will travel 2.9 trillion miles in 2023. With 231.1 million licensed drivers, the average driver will travel approximately 34 miles per day. But the average is based on cumulative driving behavior, and this behavior varies.

Americans certainly use their personally owned vehicles on a regular basis, with 83% saying they drive a vehicle at least once a week and 59% driving at least once a day. Consequently, the reliability and convenience of their personally owned vehicles are essential. Who drives each day does show some variability, with those 35 – 49 years of age showing the greatest potential to drive each day (68%) while those over the age of 65 showed the least (42%). Meanwhile more men than women (64% to 56%) said they drive every day.

FIGURE 1 : HOW OFTEN DO YOU DRIVE A VEHICLE?

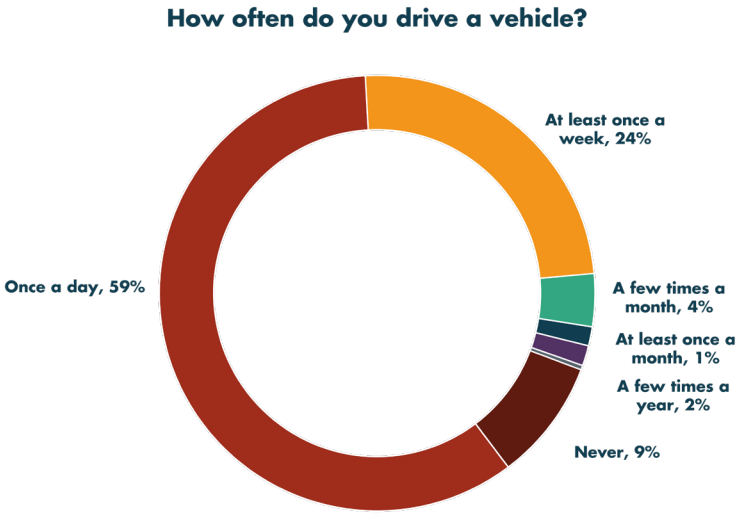

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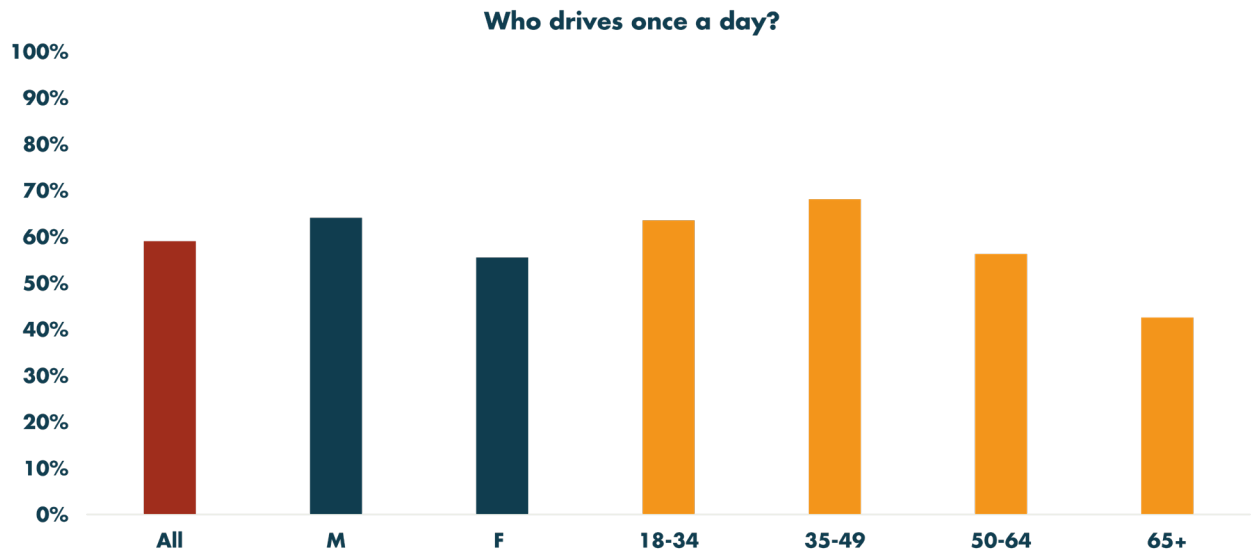
FIGURE 2 : WHO DRIVES ONCE A DAY?



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Of those who say they buy fuel at least once per year, 53% buy fuel for their vehicle at least once per week. This is consistent with another data set in the survey in which 56% say they commute to work every day while another 20% commute a few times per week.[1] This reliance on their vehicles for their employment infers an importance consumers place on easy access to reliable energy for their vehicles.

Given today's market composition, finding gasoline is not a significant challenge for most drivers considering there are more than 145,000 gasoline retail facilities in the United States. These stations provide ample opportunities to purchase gasoline when and where needed and sufficient redundancy in the market in the event a station is out of service.

When considering the necessary recharging infrastructure for EVs, driver needs will be different. It is generally assumed that many EV drivers will be able to charge their vehicles at home and/or the office, reducing the base demand for publicly available charging stations relative to that for gas stations. However, because charging an EV can take significantly longer than refueling a vehicle with gasoline, the required ratio of energy dispensing positions (gas pump nozzle or EV charger connector) to vehicles will likely be higher for chargers than for pumps. In addition, markets will need to develop charger redundancy to ensure EV drivers are not stranded without power should a station be out of service. The finding from the survey that consumers rely on their vehicles extensively and have a strong need for transportation energy helps focus attention on the deployment of charging infrastructure to meet consumer needs.

[1] The survey did not ask how an individual commutes. Although the survey itself is focused primarily on the use of personally owned vehicles, it is possible a respondent might commute using mass transit or some other method other than a personally owned vehicle. For purposes of this white paper, we assume the majority of those who commute do so with their own vehicle.

FIGURE 3 : HOW OFTEN DO YOU COMMUTE TO WORK?

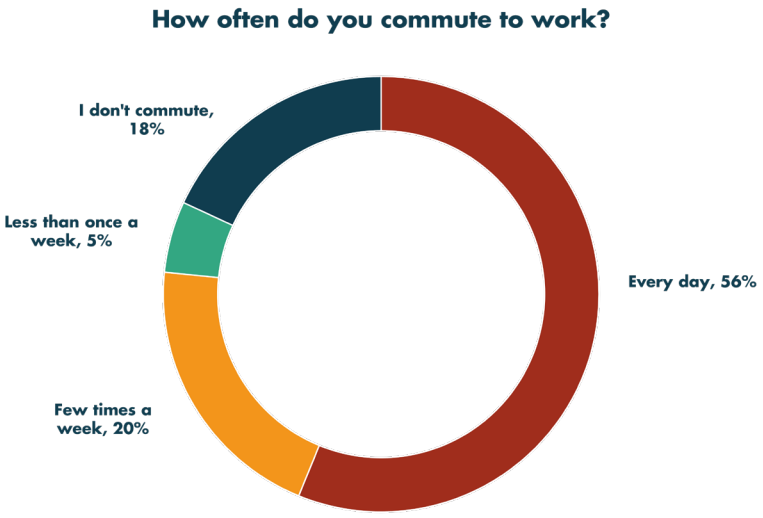

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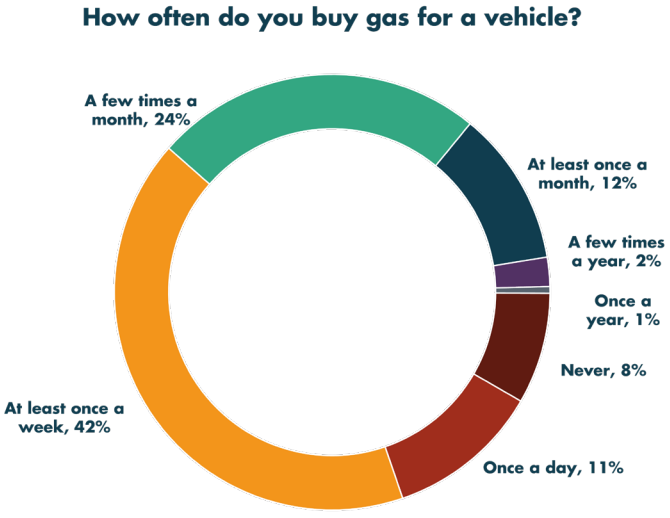
FIGURE 4 : HOW OFTEN DO YOU BUY GAS FOR A VEHICLE?



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CURRENT VEHICLES

Another facet to understand is the current driving experiences and vehicle preferences of consumers. Today, 88% of Americans who drive say their vehicle is gasoline-powered; 7% say they drive a hybrid electric vehicle (HEV) and 2% drive a battery electric vehicle (BEV). This ownership allocation is likely to change, especially considering the significant increase in BEV sales in recent years resulting in a 5.3% BEV share of all light duty vehicle sales in the U.S. in 2022.

FIGURE 5 : WHAT TYPE OF VEHICLE DO YOU COMMONLY DRIVE?

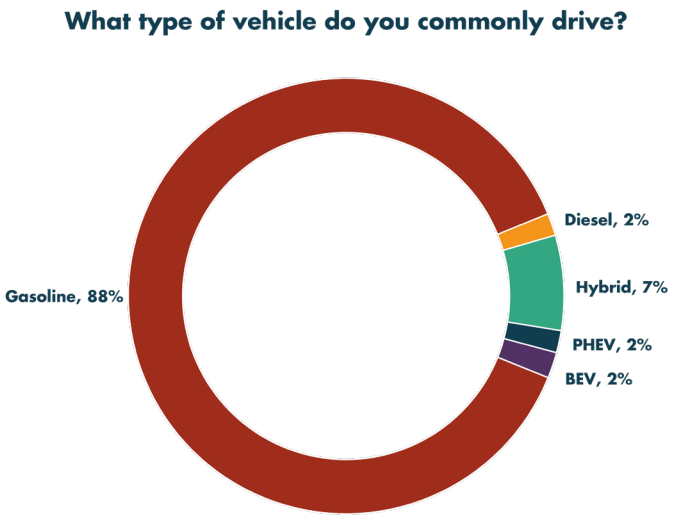

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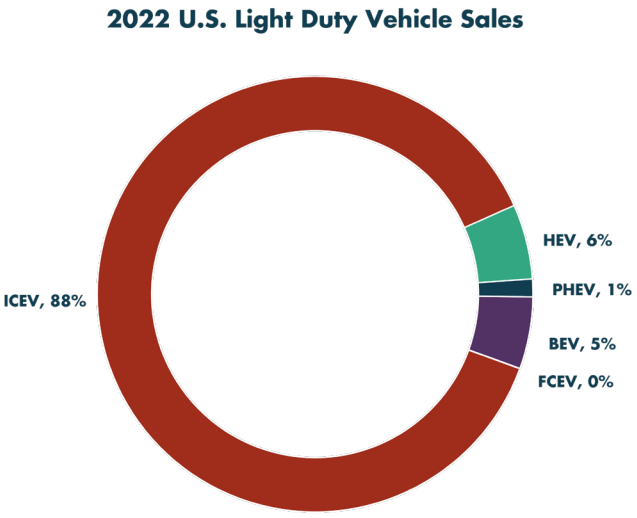
FIGURE 6 : 2022 U.S. LIGHT DUTY VEHICLE SALES



Wards Intelligence

Consumers have exhibited a distinct preference for certain vehicle styles in recent years. According to the survey, 57% of respondents say they drive a car, 28% drive a sport or crossover utility vehicle (SUV, CUV) and 10% drive a truck. Sales trends, however, indicate a more significant move away from passenger cars to utility vehicles with 55% of vehicles sold in 2022 classified as a SUV or CUV. Electric vehicle manufacturers recognize this trend and currently more EVs are being offered in these popular body styles with 59% of EV sales in 2022 being CUV or SUV.

FIGURE 7 : WHAT TYPE OF VEHICLE DO YOU COMMONLY DRIVE?

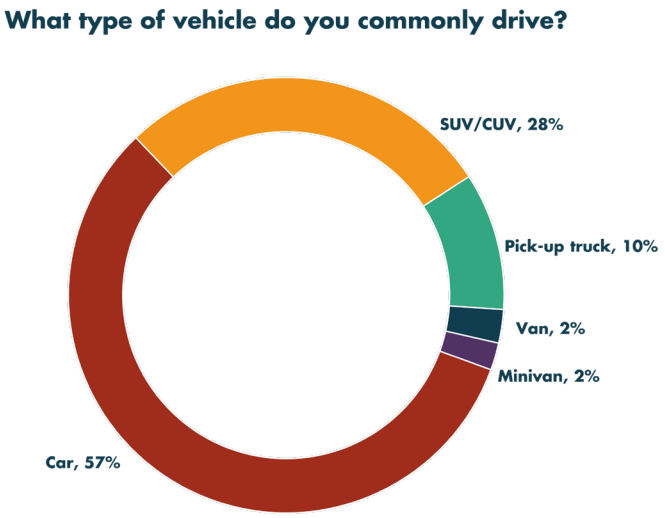


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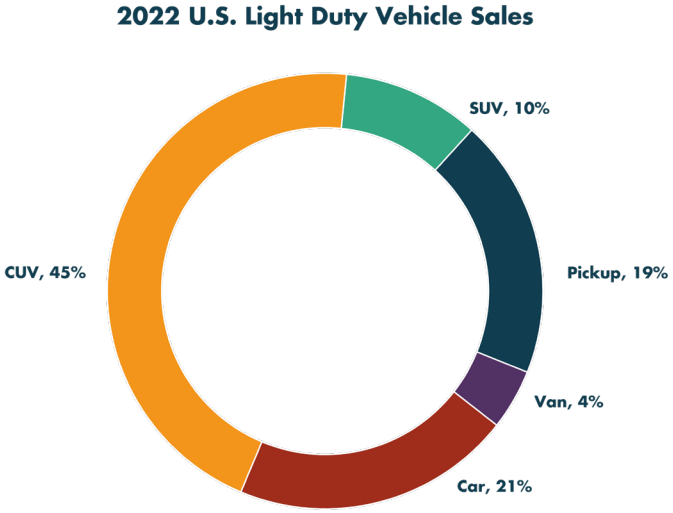
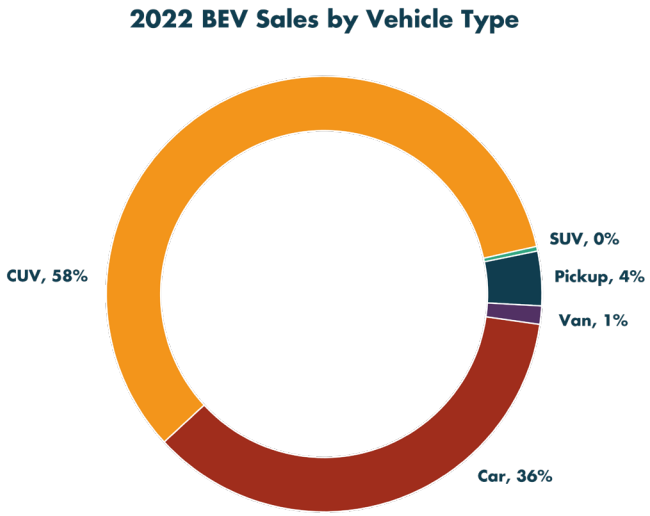
FIGURE 8 : 2022 U.S. LIGHT DUTY VEHICLE SALES



Wards Intelligence

FIGURE 9 : 2022 BEV SALES BY VEHICLE TYPE



Wards Intelligence

LIFESTYLE ATTRIBUTES

A study published by the Fuels Institute in 2018, "Driving Vehicle Sales – Utility, Affordability and Efficiency," concluded that vehicle purchase selection starts first with the driver's needs. A large family might not be able to rely solely on a subcompact vehicle; meanwhile, a person who commutes to work each day alone might not necessarily need a large SUV. With this perspective, understanding what the lifestyle of a consumer might be provides insights into what type of vehicle they may be interested in driving.

Starting with the household itself, 45% of survey respondents said they lived in a household with three or more people and 85% of these households include children under the age of 18. More than two-thirds (67%) of households reported an annual income of less than $75,000. For households with more than three people, more than half make less than $75,000 per year. A majority of respondents (56%) commute to work every day. The combination of family size, household income and commuting behavior has a significant influence over the vehicle a driver may purchase.

FIGURE 10 : HOW MANY PEOPLE LIVE IN YOUR HOUSEHOLD?

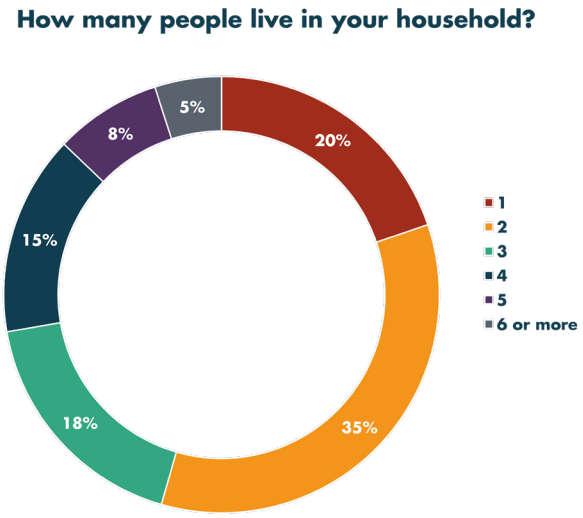


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FIGURE 11 : WHAT WAS YOUR 2022 TOTAL HOUSEHOLD INCOME?

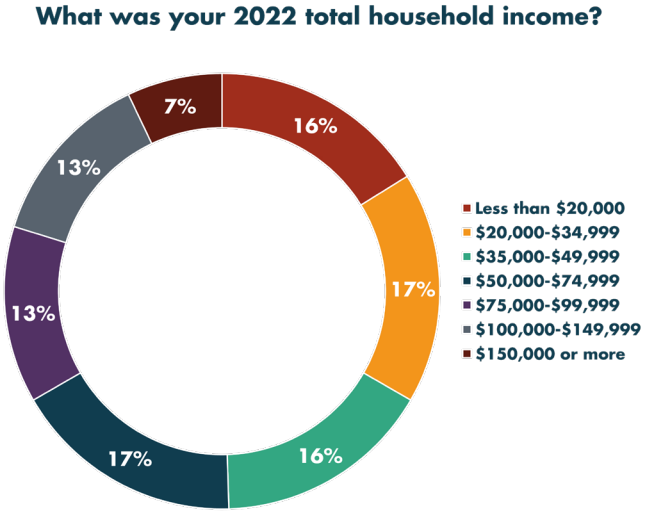

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FIGURE 12 : PERCENT OF HOUSEHOLDS (BY SIZE) MAKING LESS THAN $75,000 PER YEAR

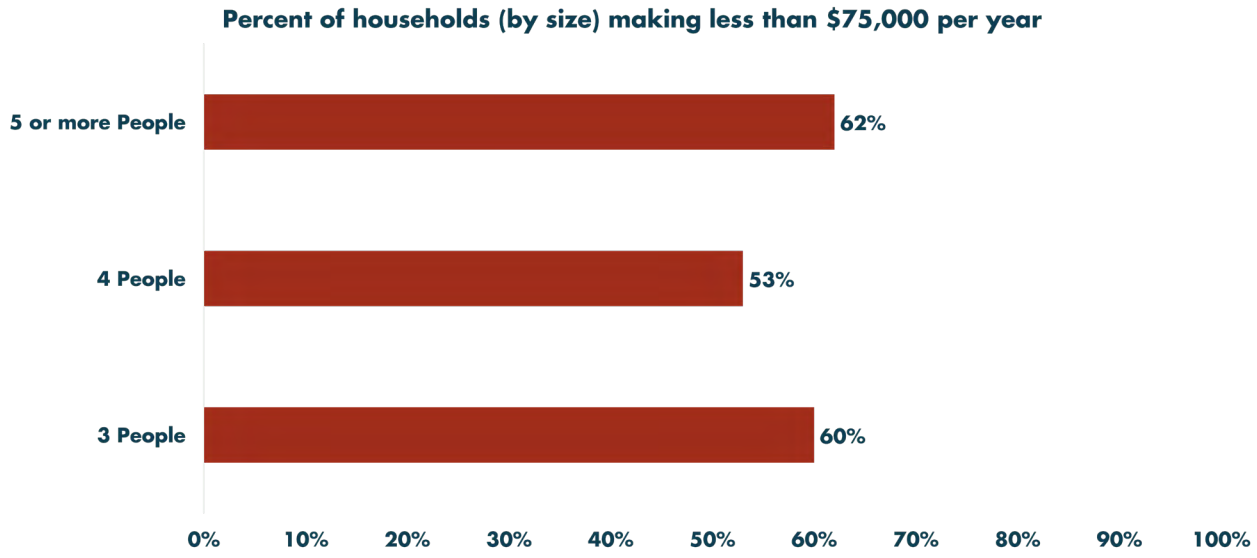

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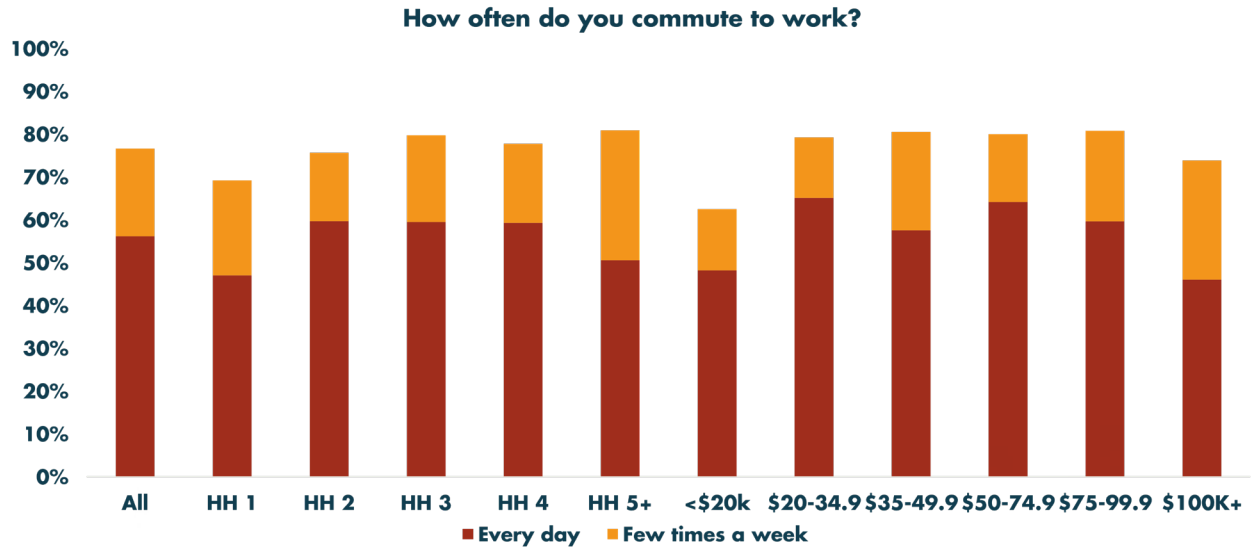
FIGURE 13 : HOW OFTEN DO YOU COMMUTE TO WORK?



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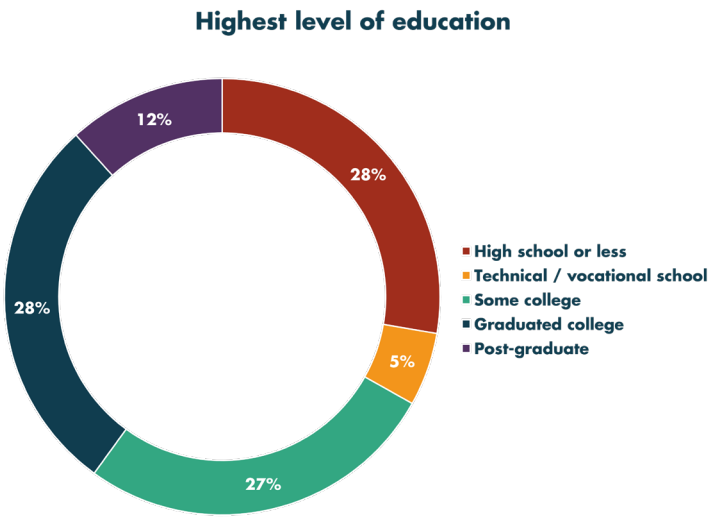
Beyond these fundamental attributes, 58% of respondents reported owning their home and 67% reported having completed at least some college level education. These two metrics, plus household income, are often associated with the profile of an EV driver.

FIGURE 14 : HIGHEST LEVEL OF EDUCATION



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Affordability of Transportation

In addition to the attributes presented in the previous section, understanding how a consumer views the affordability of transportation is another key factor in understanding how they may perceive different vehicle options. As any reporter or politician will tell you, retail gas prices are a serious issue for most Americans, with 87% of respondents saying prices have some or a great impact on their feelings about the economy in general. This sensitivity did not vary much when evaluating perception based upon age, household size or income, indicating that gas prices are a concern for the majority of consumers regardless of their personal situation.

FIGURE 15 : IMPACT OF GAS PRICES

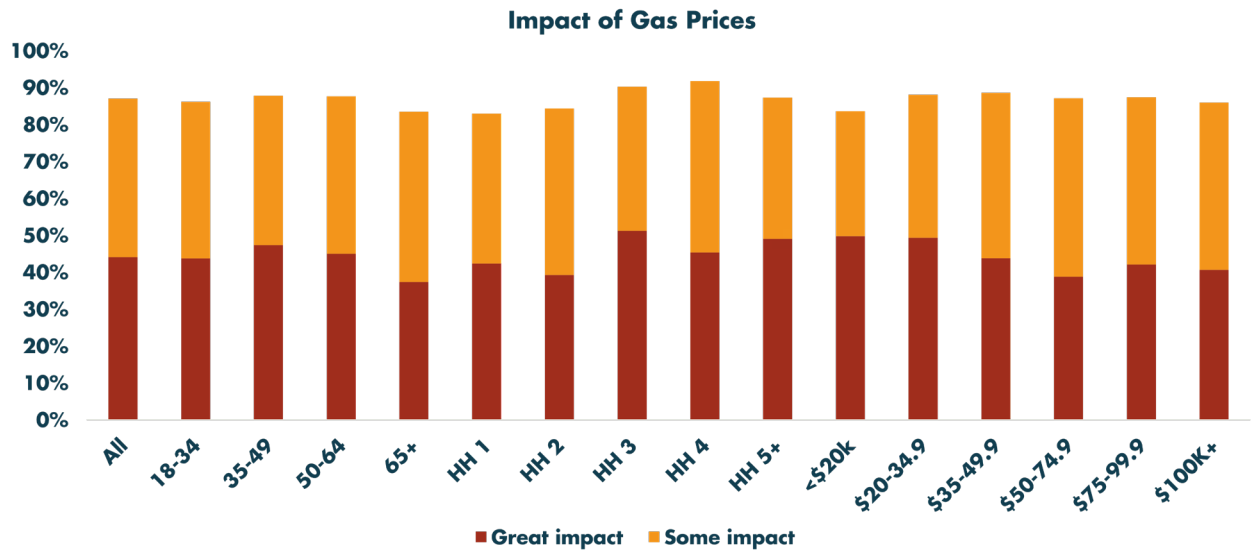

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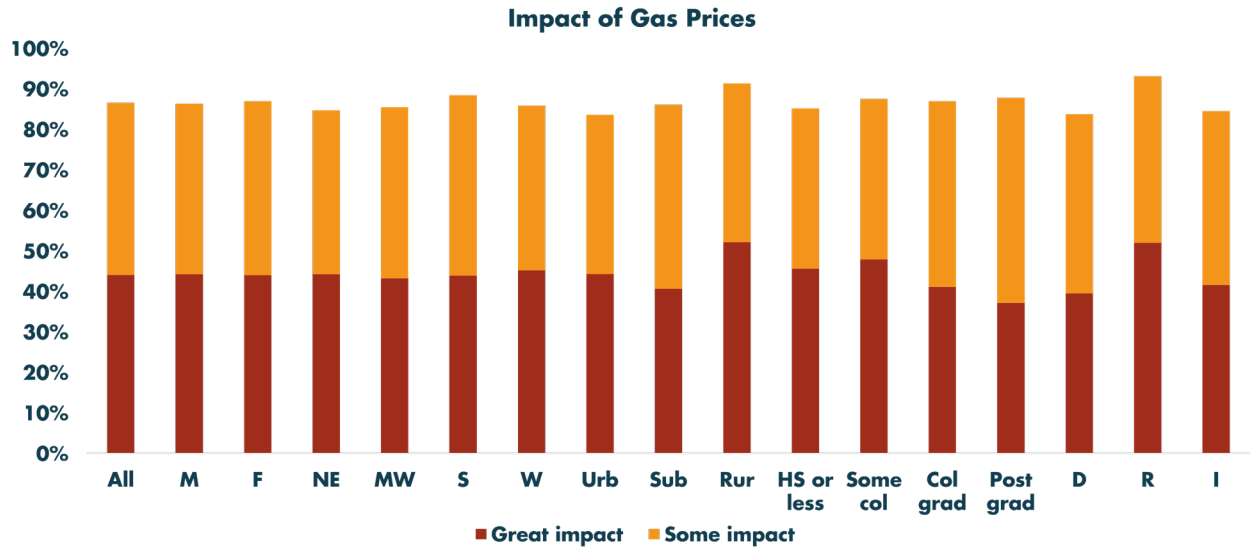
FIGURE 16 : IMPACT OF GAS PRICES



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The impact of gasoline prices is further evidenced by the priority Americans place on travel expense. Eighty percent (80%) of respondents have adjusted their spending habits due to high gas prices, with younger cohorts and those with larger families having changed their behavior slightly more than the average. Meanwhile, 70% of respondents expect gas prices to reach or exceed $5.00 per gallon in 2023 and this potential is a concern for 81% of them.

FIGURE 17 : ADJUSTED SPENDING DUE TO GAS PRICES

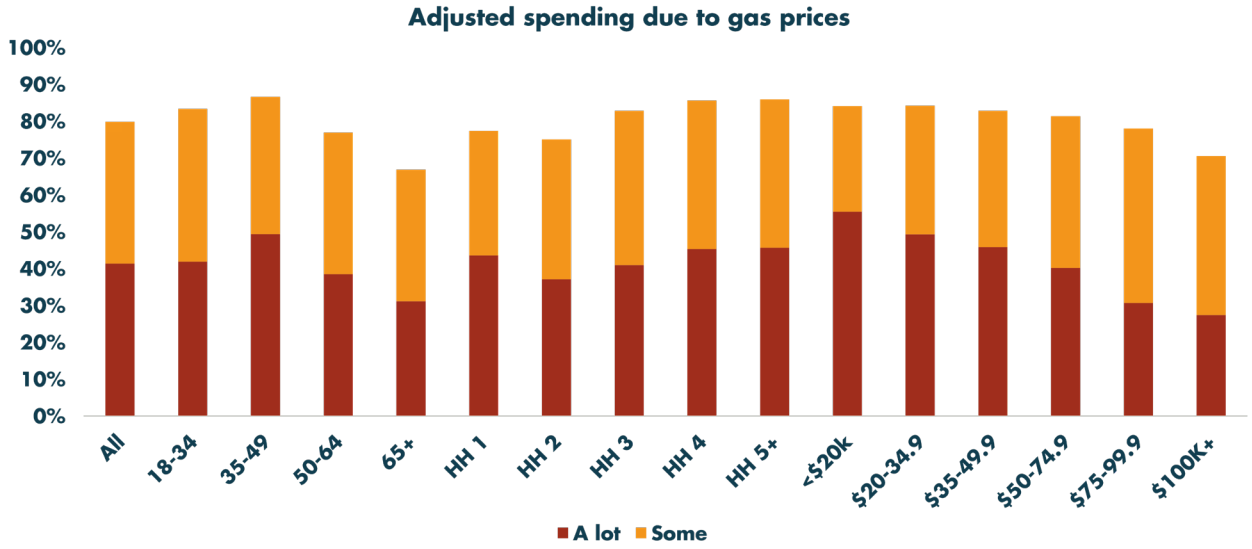

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FIGURE 18 : ADJUSTED SPENDING DUE TO GAS PRICES

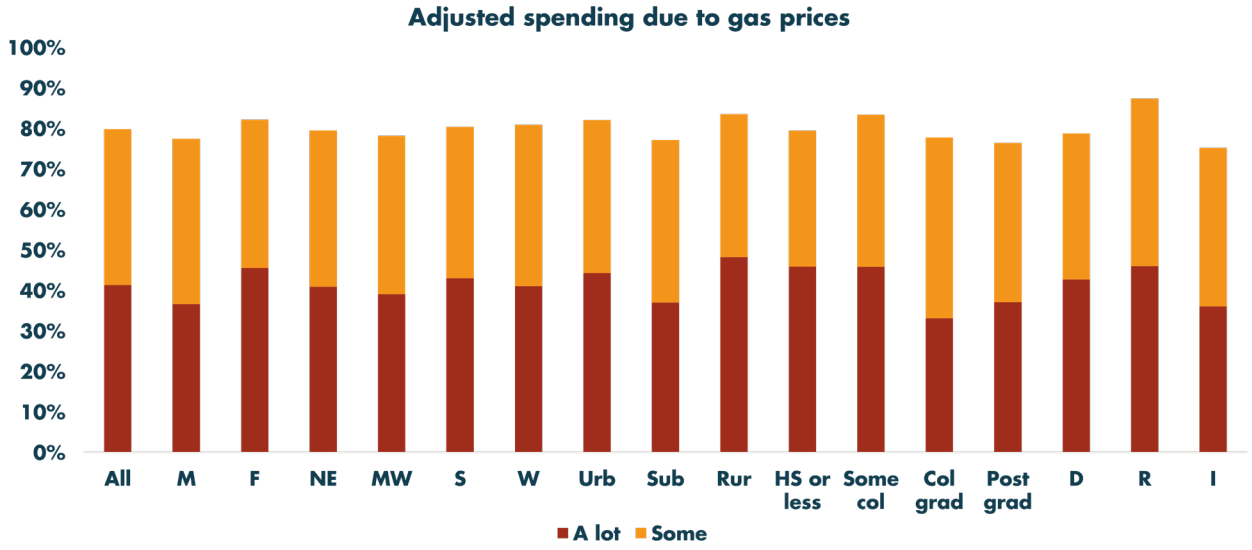

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FIGURE 19 : WILL GAS PRICES REACH/EXCEED $5.00 PER GALLON IN 2023?

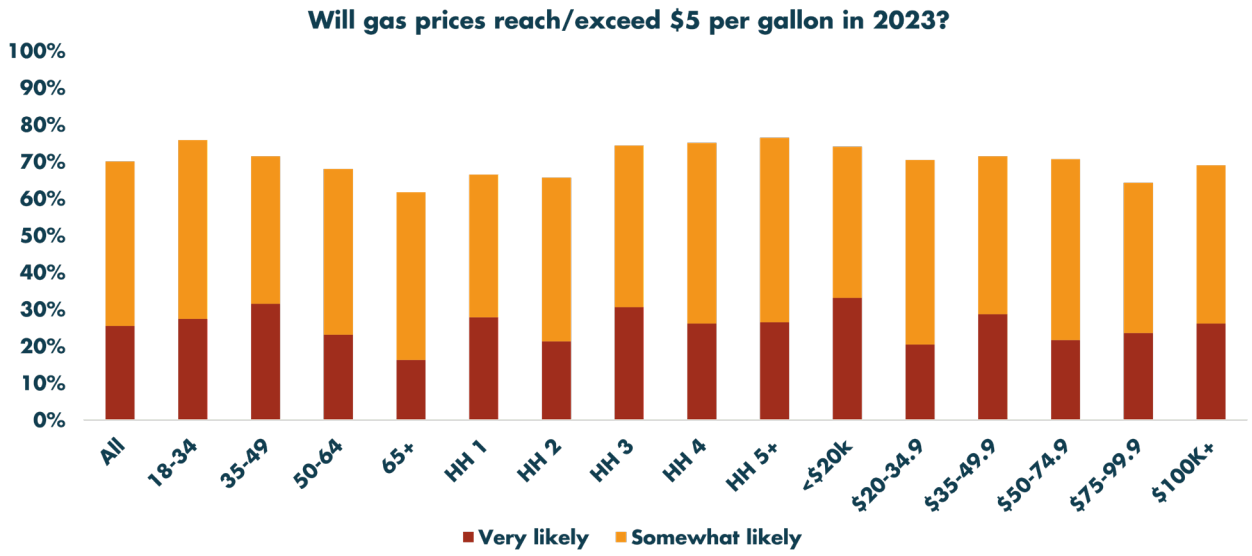

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FIGURE 20 : WILL GAS PRICES REACH/EXCEED $5.00 PER GALLON IN 2023?

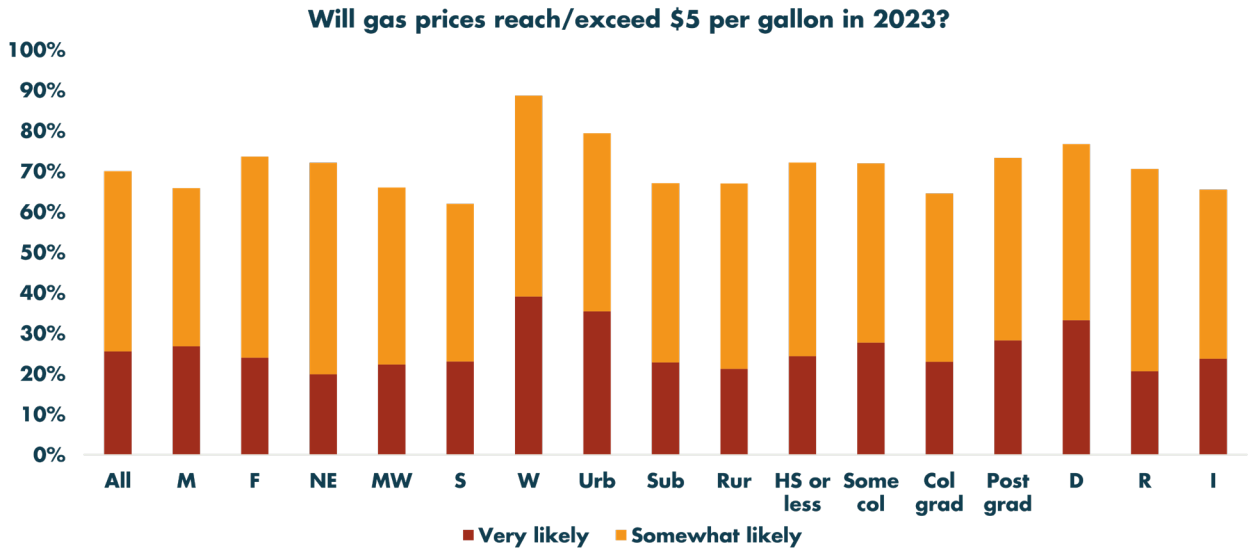

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FIGURE 21 : HOW CONCERNED ARE YOU THAT GAS PRICES WILL REACH/EXCEED $5.00 PER GALLON IN 2023?

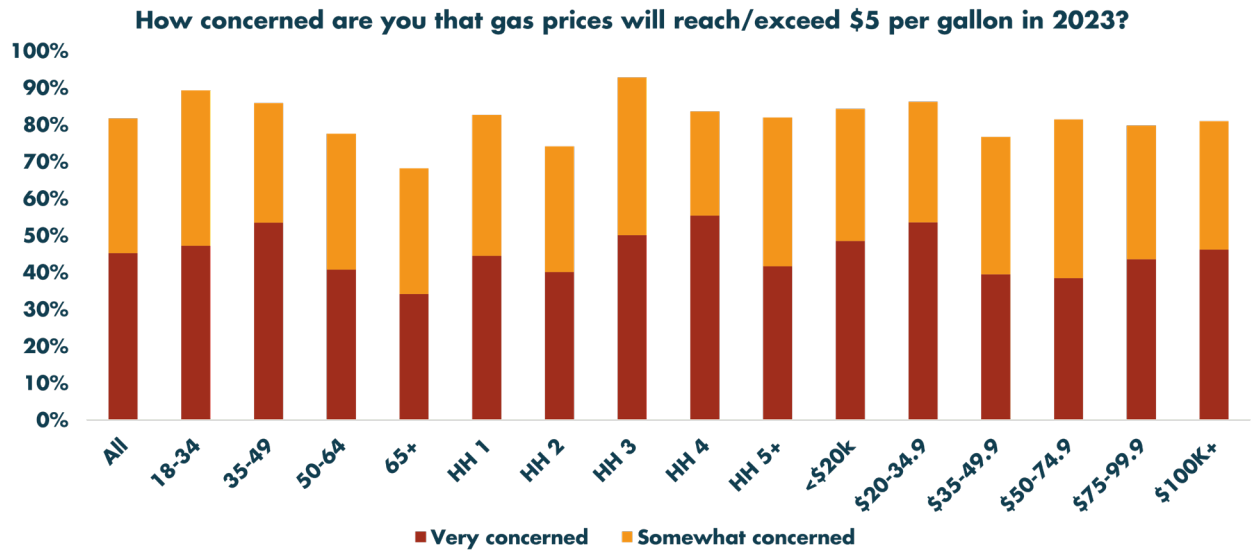

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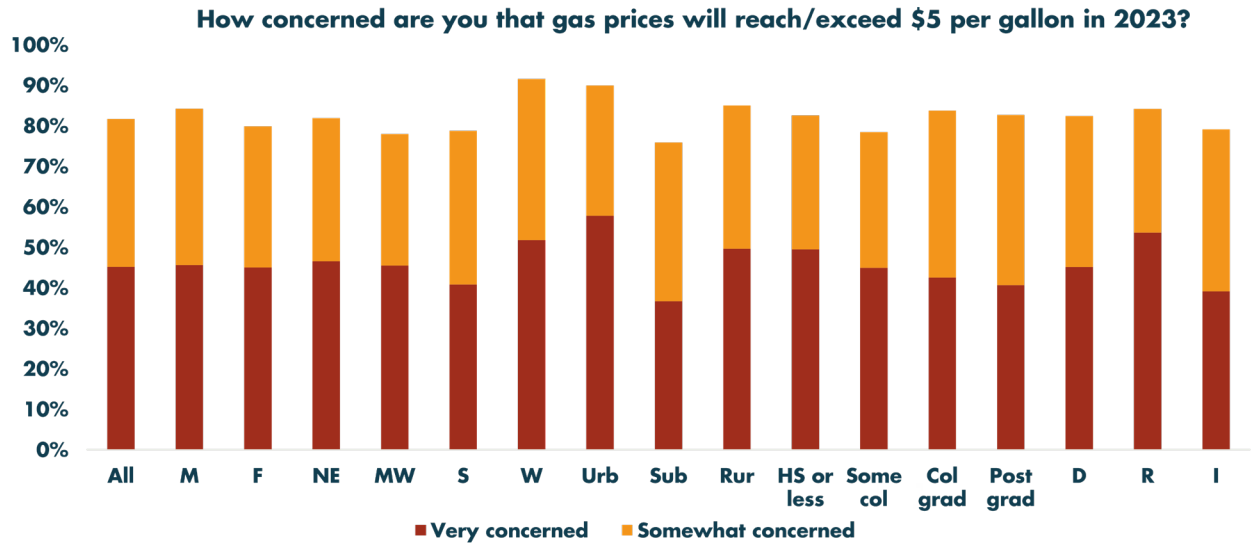
FIGURE 22 : HOW CONCERNED ARE YOU THAT GAS PRICES WILL REACH OR EXCEED $5.00 PER GALLON IN 2023?



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Consistent with the impact gas prices have on consumers, price is a determining factor for 68% of consumers when selecting where to buy gas, with more than half saying they would drive 10 minutes out of their way to save as little as 5 cents per gallon. That said, more than half of respondents refuel their vehicles to capacity, while 41% base their purchase volume on some financial basis (i.e., an amount that is included in their personal budget or how much money they possess at the time). Regardless of how much fuel they purchase, the majority of consumers consider refueling their vehicle a chore and very few enjoy the experience.

FIGURE 23 : WHAT IS MOST IMPORTANT WHEN BUYING GAS?

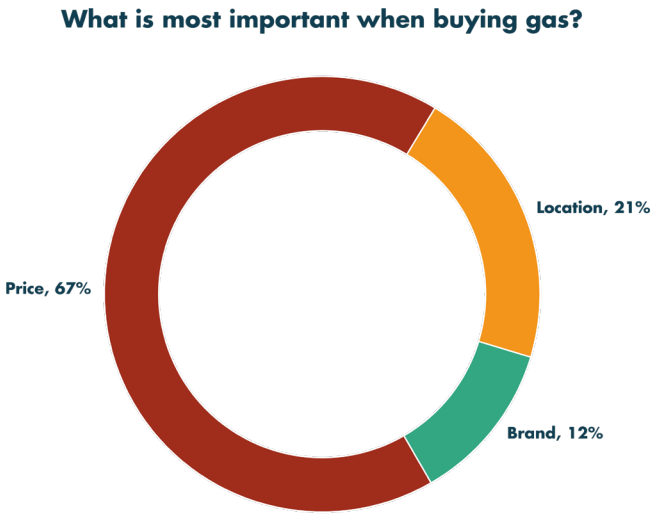

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FIGURE 24 : TO SAVE 5 CENTS PER GALLON...

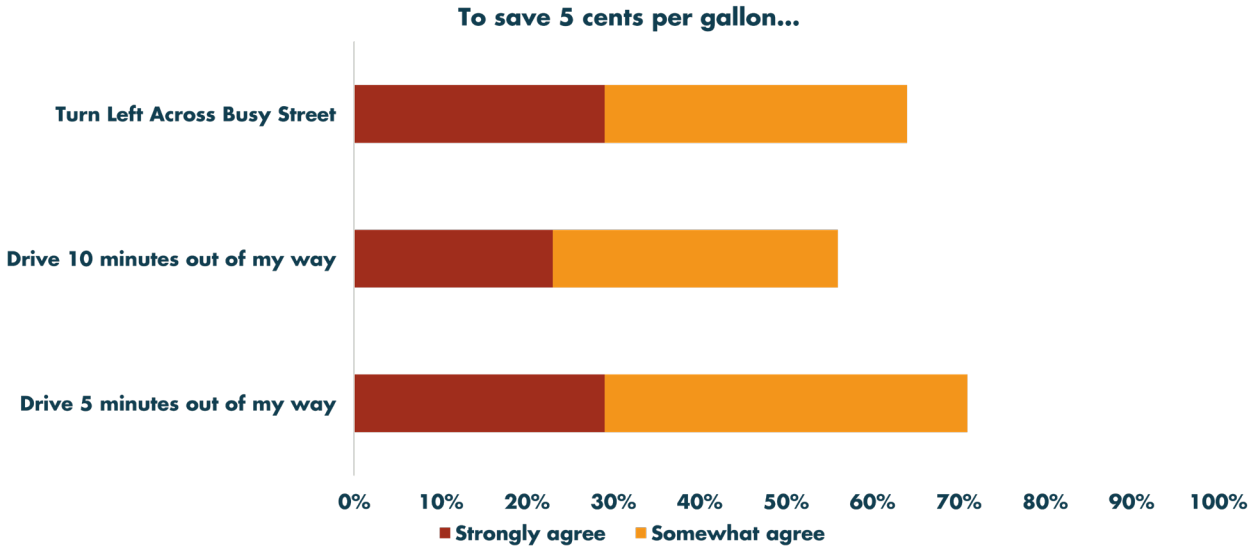

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FIGURE 25 : HOW MUCH GAS DO YOU TYPICALLY PURCHASE?

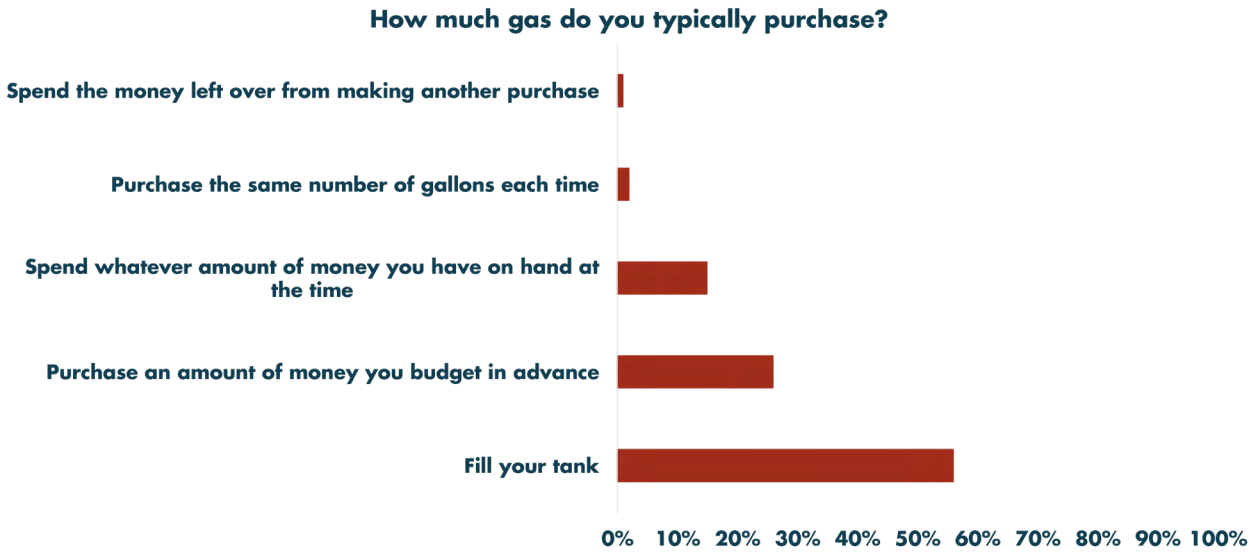

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FIGURE 26 : FEELINGS ABOUT FUELING A VEHICLE

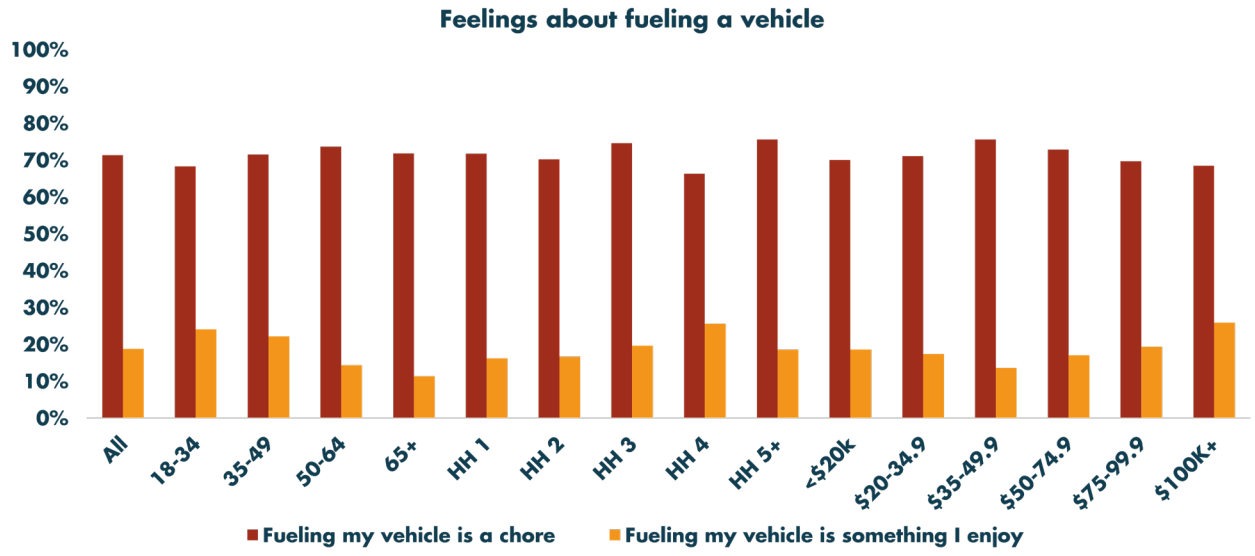

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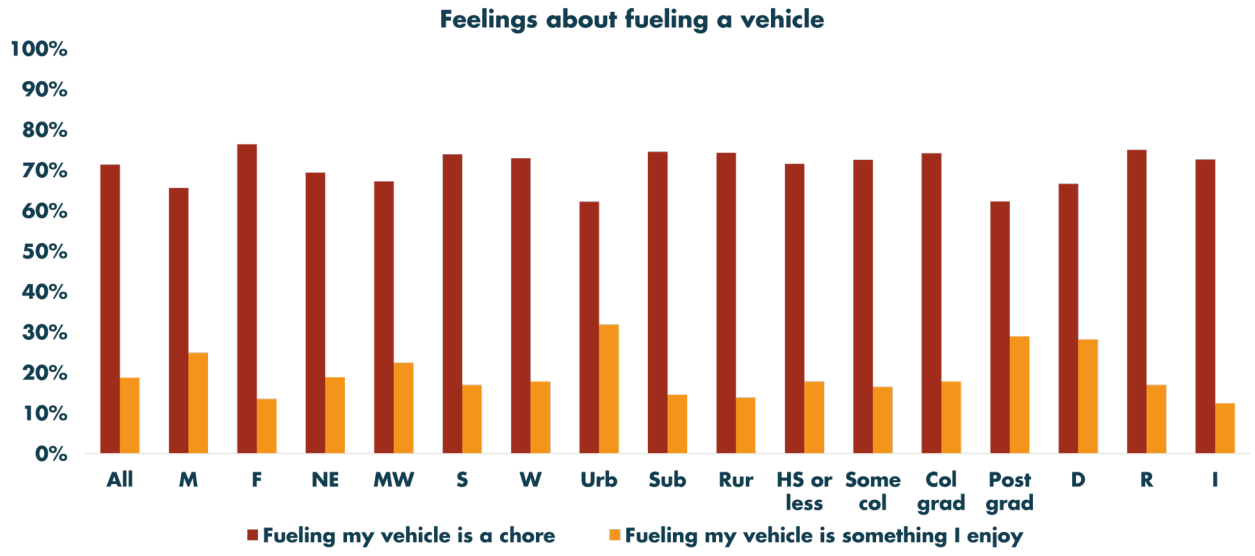
FIGURE 27 : FEELINGS ABOUT FUELING A VEHICLE



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Future Vehicle Preference

Having a clear understanding of consumer demographics, driving behavior and perspectives relevant to transportation needs and costs can provide additional insights regarding how likely consumers might be to transition to a new type of vehicle, which could happen relatively soon. In fact, nearly half of respondents (49%) expect to purchase a vehicle within the next two years.

When thinking about their next vehicle, there seems to be some indication that a significant number of drivers might consider changing powertrains. As a reminder, today 88% of respondents say their vehicle is gasoline-powered while 7% drive a HEV and 2% drive a BEV. Interest in alternatives for their next vehicle outpaces what they currently drive, with 43% willing to consider a HEV and 34% a BEV. Meanwhile, although stated interest in a gasoline vehicle lost ground compared with what they drive today, 80% still are very or somewhat likely to consider a gasoline vehicle for their next purchase.[2]

[2] This survey did not explore why someone may or may not consider purchasing a particular type of vehicle. At the time this white paper was published, the Transportation Energy Institute was completing a more in-depth survey focused on electric vehicles in which consumer motivations will be explored in greater detail. That report was expected in the summer of 2023.

FIGURE 28 : LIKELY TO PURCHASE/LEASE VEHICLE IN THE NEXT TWO YEARS

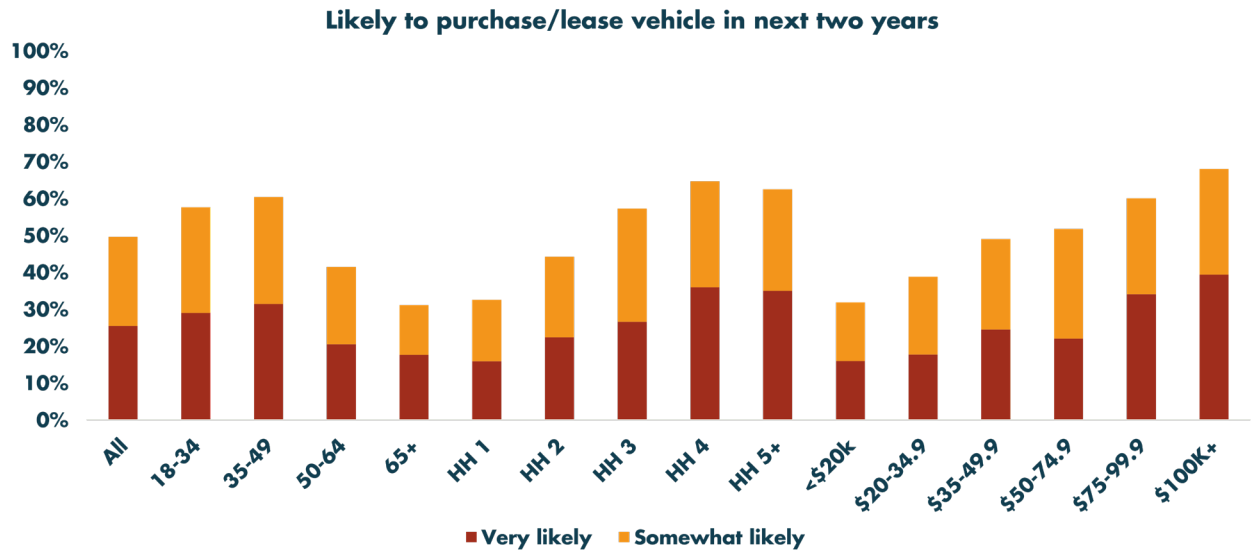

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FIGURE 29 : LIKELY TO PURCHASE/LEASE VEHICLE IN THE NEXT TWO YEARS

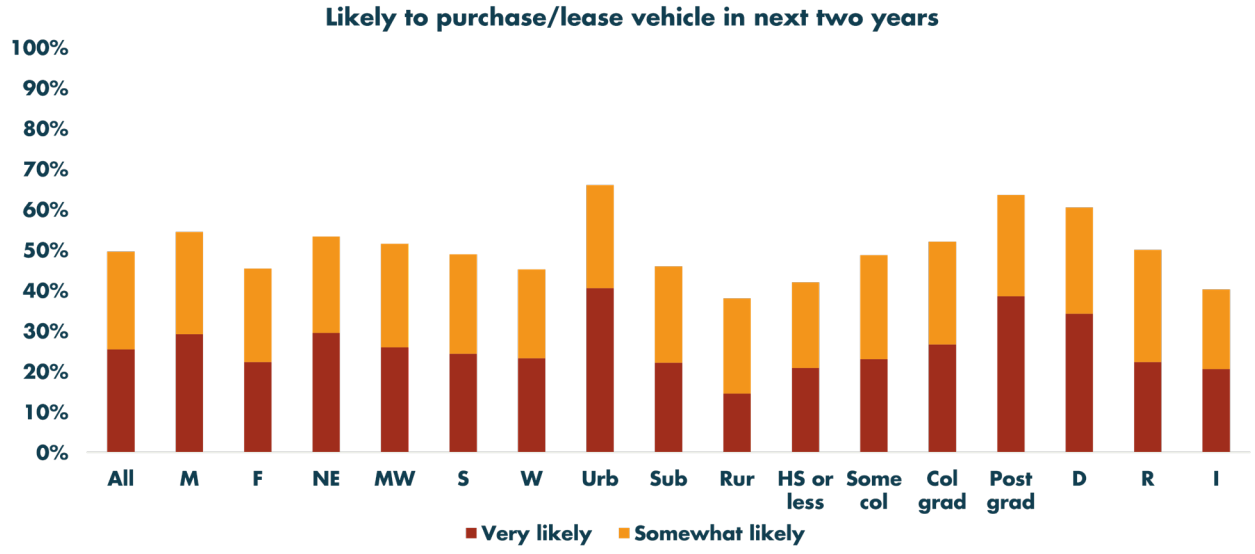

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FIGURE 30 : WHAT TYPE OF VEHICLE MIGHT YOU CONSIDER?

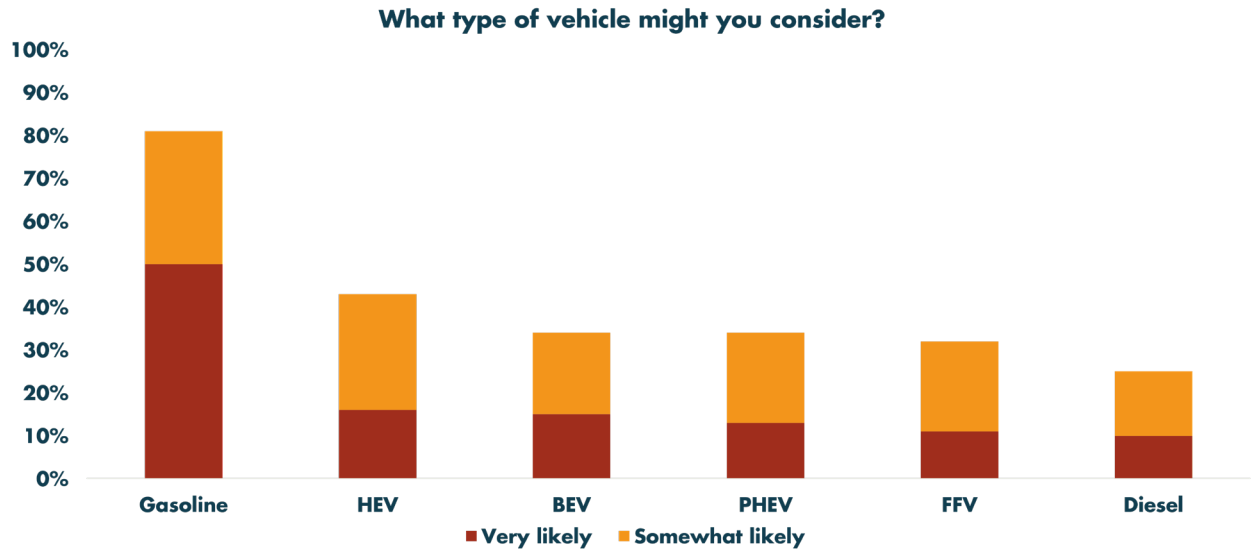

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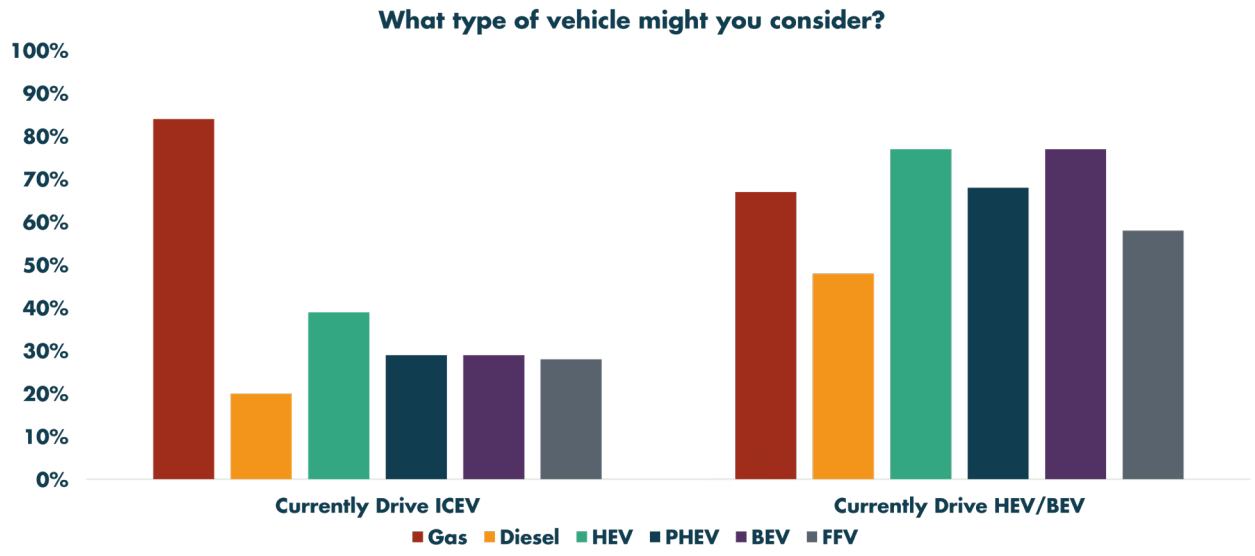
FIGURE 31 : WHAT TYPE OF VEHICLE MIGHT YOU CONSIDER?



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Those who currently drive a HEV or BEV (Note: to ensure adequate sample size for these cross comparisons, those who say they drive HEVs and BEVs have been combined into one category) seem quite satisfied with their vehicles, with significant majorities (77%) saying they were very or somewhat likely to consider a HEV or BEV for their next purchase. Even so, 67% would still consider a gasoline vehicle.

FIGURE 32 : LIKELY TO CONSIDER A GASOLINE-POWERED VEHICLE

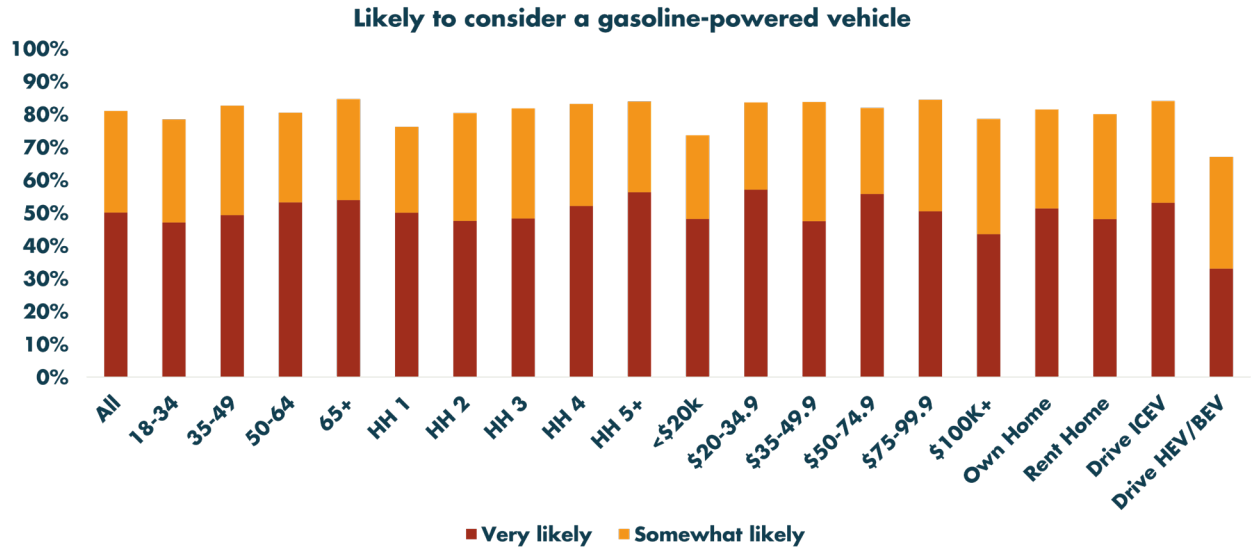

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FIGURE 33 : LIKELY TO CONSIDER A GASOLINE-POWERED VEHICLE

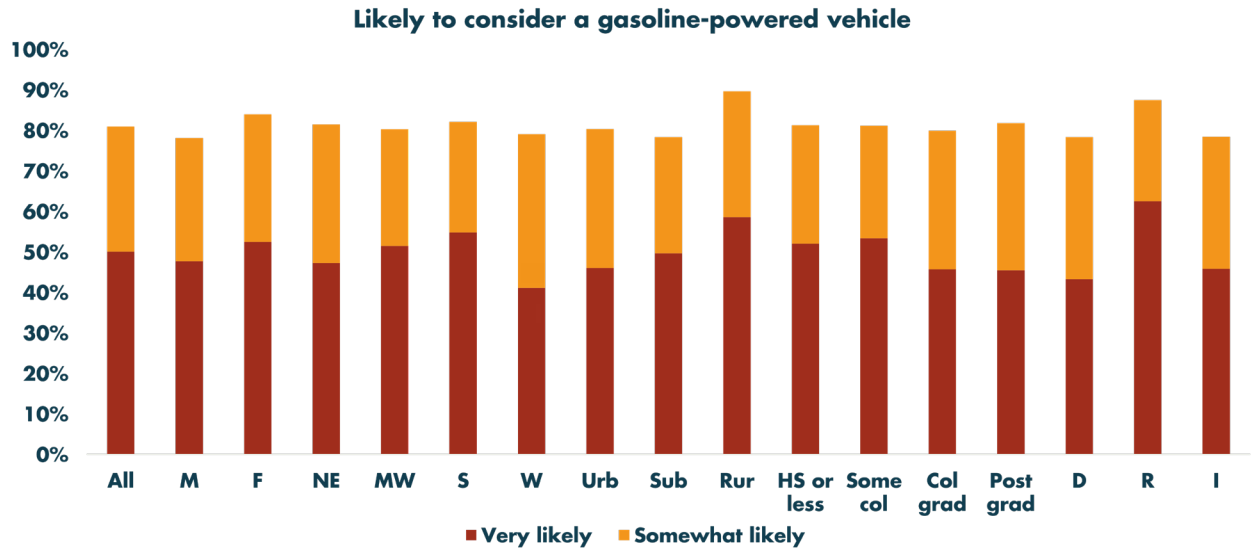

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FIGURE 34 : LIKELY TO CONSIDER A HYBRID ELECTRIC VEHICLE

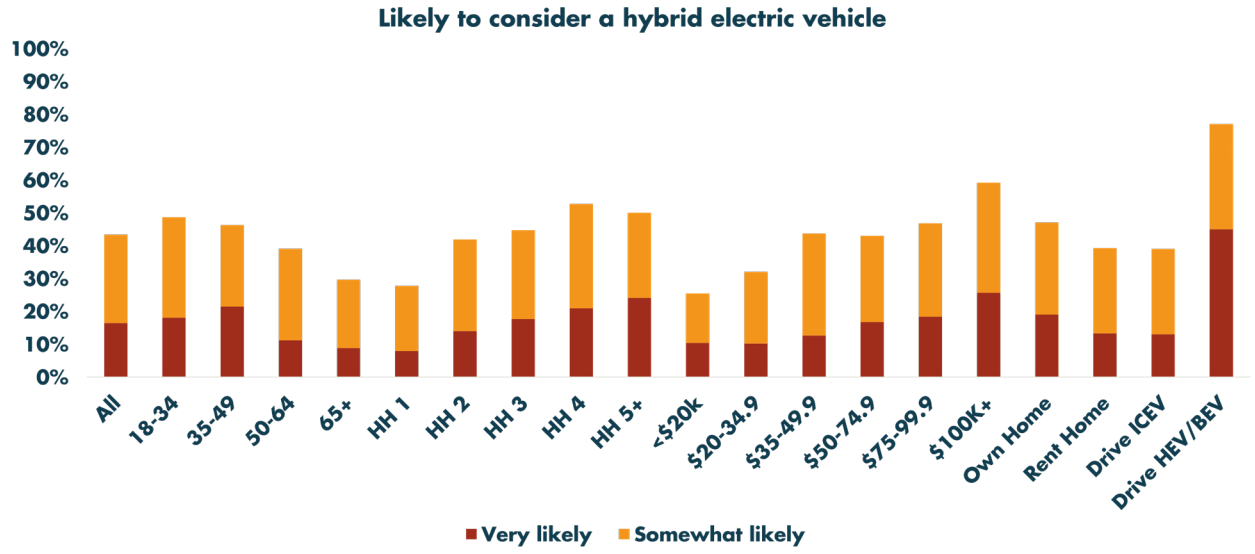

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FIGURE 35 :LIKELY TO CONSIDER A HYBRID ELECTRIC VEHICLE

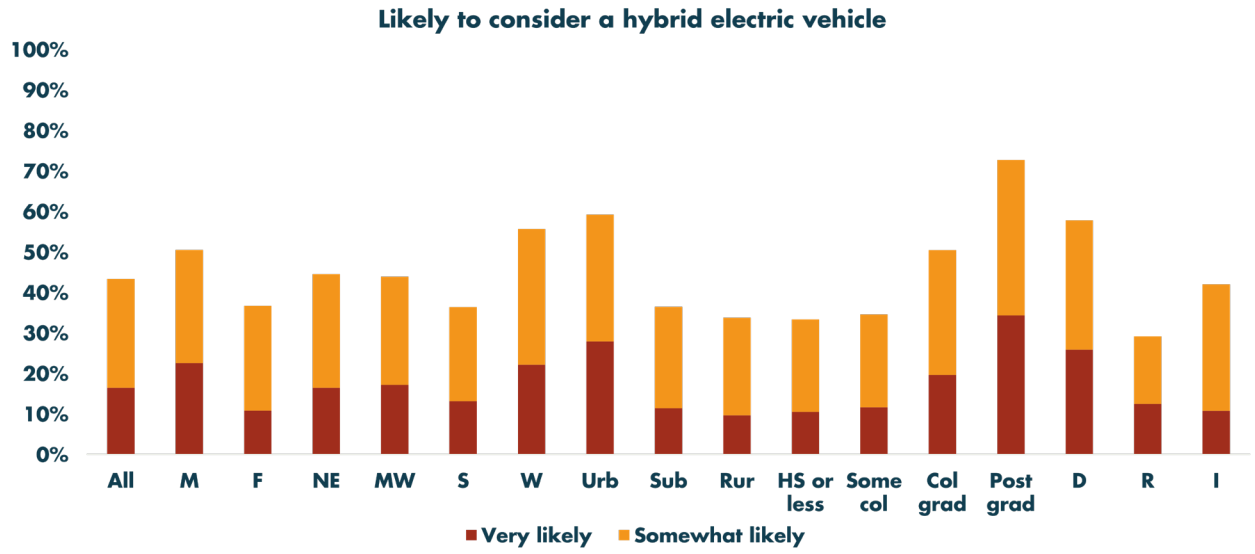

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FIGURE 36 : LIKELY TO CONSIDER A FLEX FUEL (E85) VEHICLE

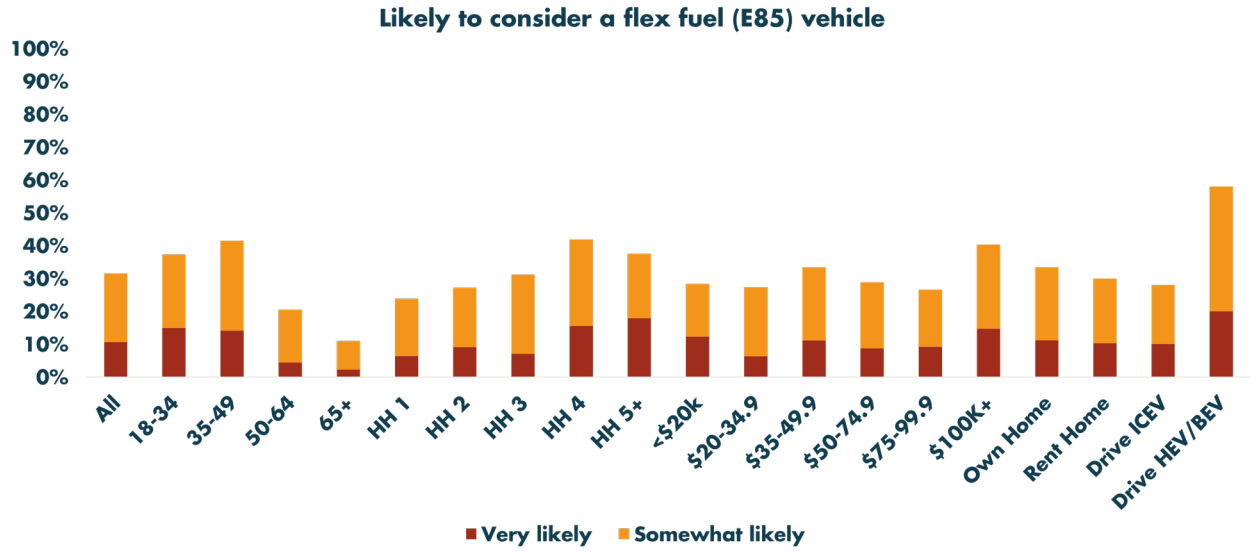

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FIGURE 37 : LIKELY TO CONSIDER A FLEX FUEL (E85) VEHICLE

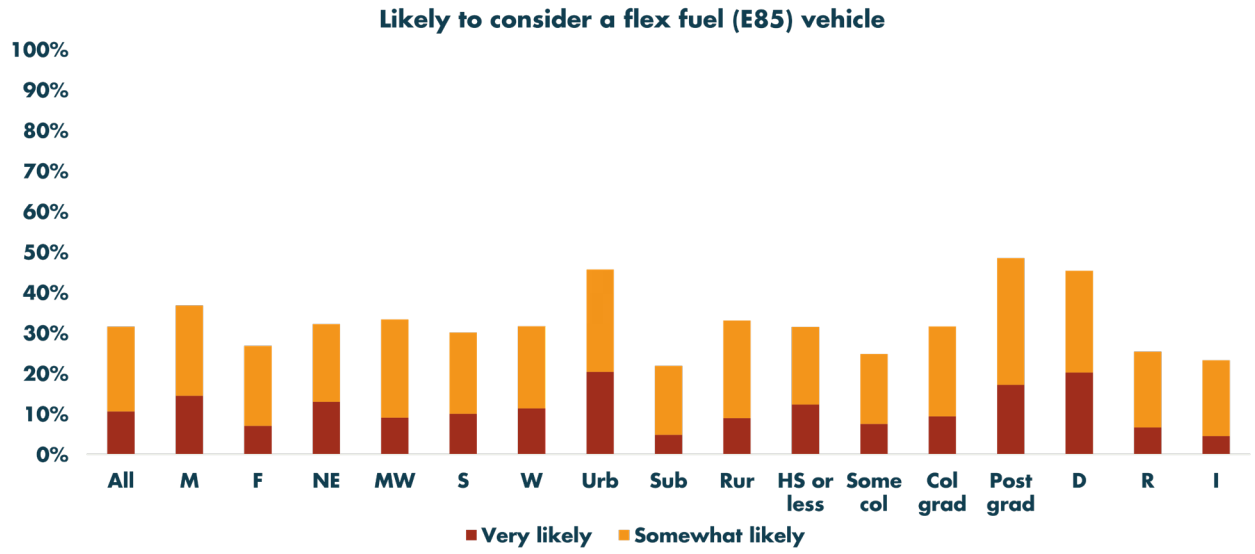

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FIGURE 38 : LIKELY TO CONSIDER AN ALL-ELECTRIC VEHICLE

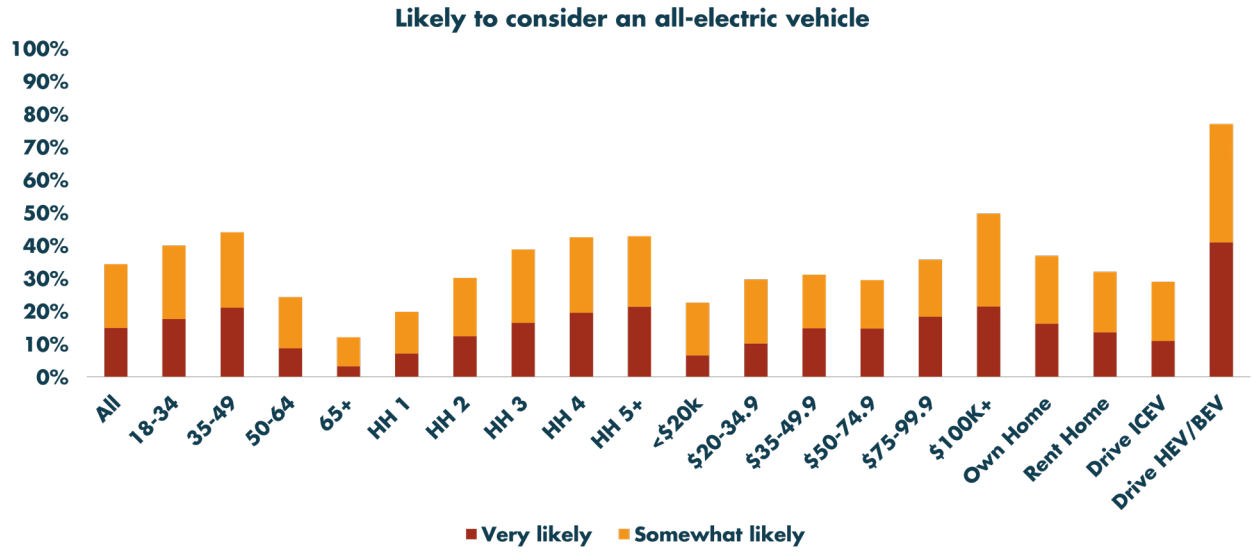

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FIGURE 39 : LIKELY TO CONSIDER AN ALL-ELECTRIC VEHICLE

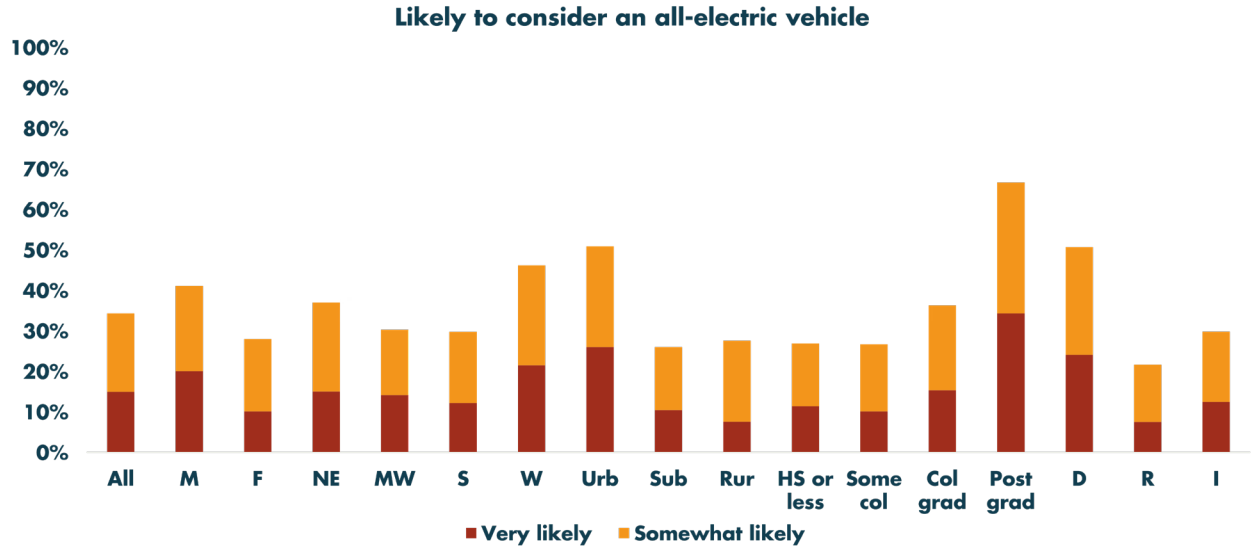

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FIGURE 40 : LIKELY TO CONSIDER A PLUG-IN HYBRID VEHICLE

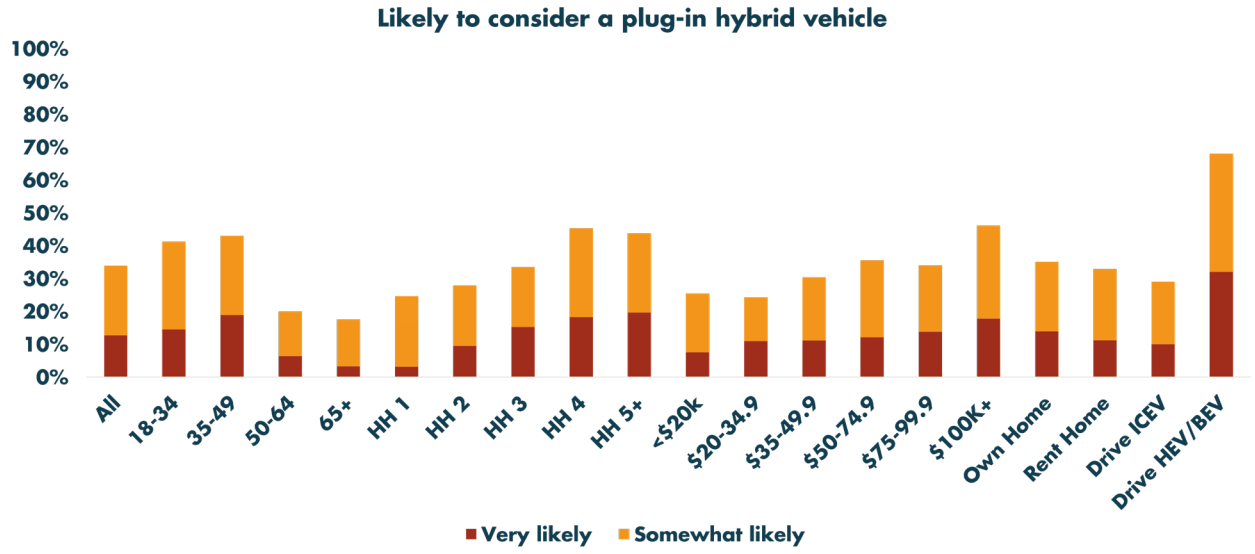

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FIGURE 41 : LIKELY TO CONSIDER A PLUG-IN HYBRID VEHICLE

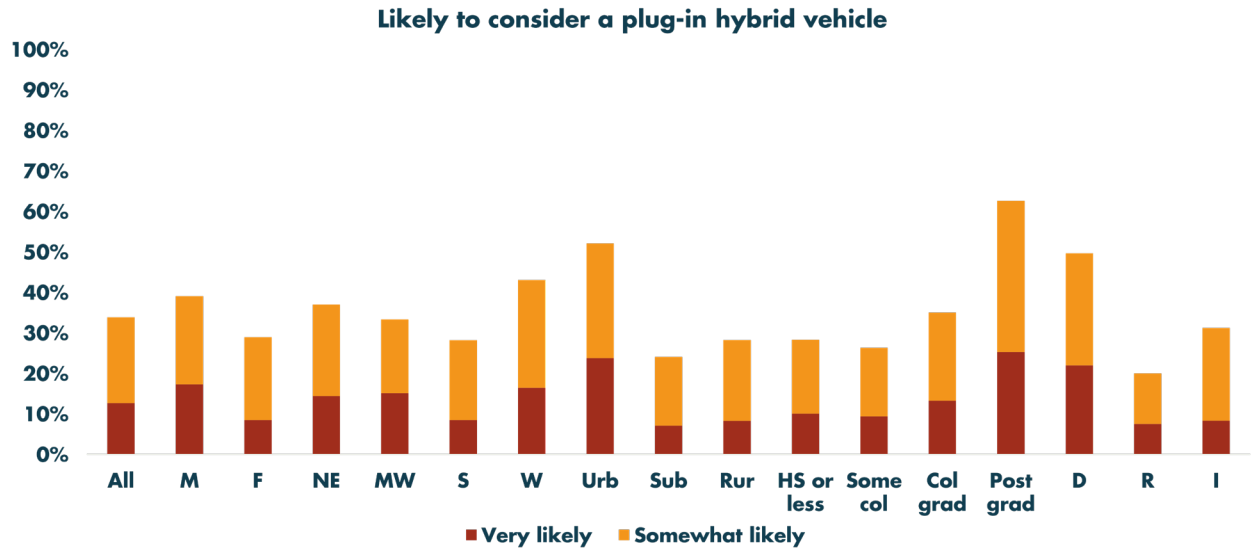

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FIGURE 42 : LIKELY TO CONSIDER A DIESEL-POWERED VEHICLE

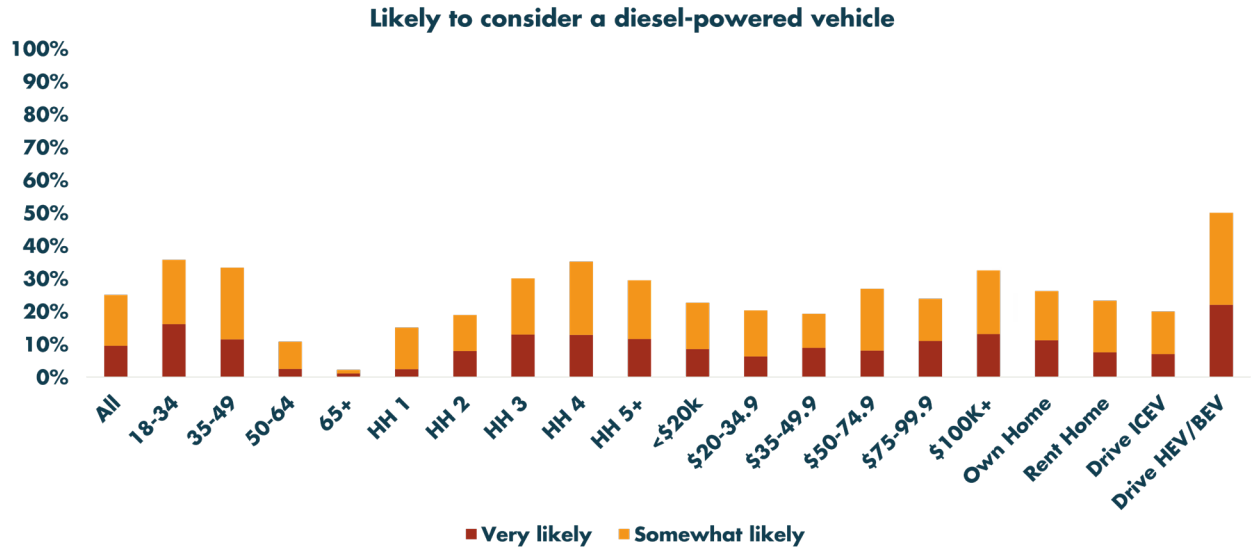

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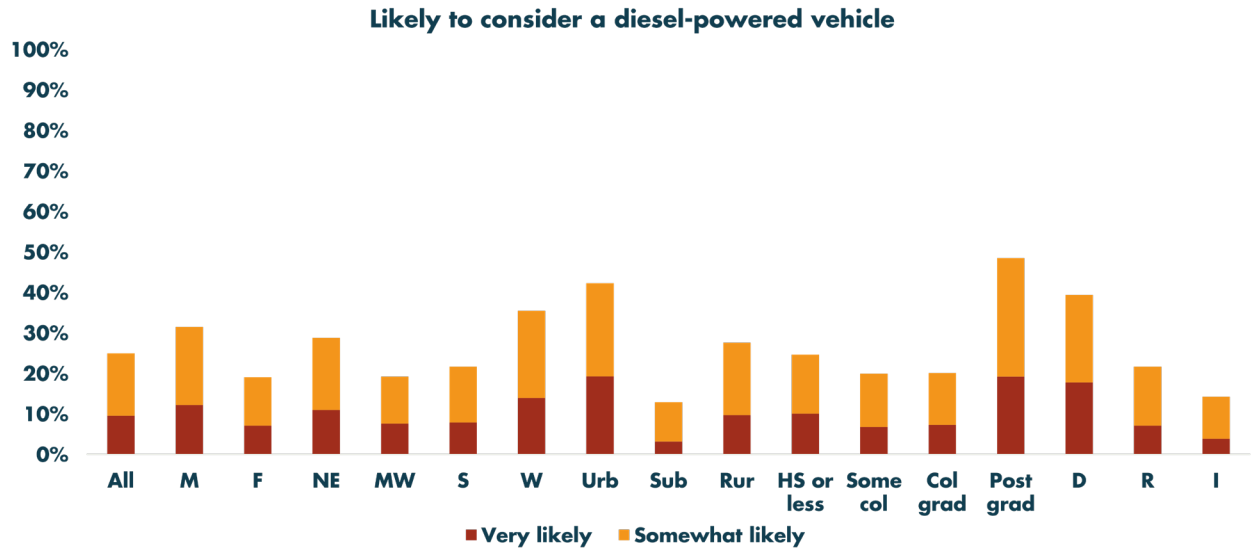
FIGURE 43 : LIKELY TO CONSIDER A DIESEL-POWERED VEHICLE



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Perceptions of Electric Vehicles

Likely due to extensive media coverage, Americans have a distorted perception about the size of the electric vehicle market, saying on average they believe that 21% of American drivers own an EV and that 23% of vehicles sold in 2021 were EV. This contrasts with the reality that less than 2% of Americans drive an EV and that EVs represented 2.9% of vehicles sold in 2021 and 5.3% in 2022. That said, half of respondents (49%) have a very or somewhat positive attitude toward EVs. EVs are viewed more positively by younger drivers, larger households and those who currently drive either an HEV or BEV, as well as by those who identified as "Democrat," those with higher levels of education and those who live in urban settings. And among the majority that currently drive a gasoline powered vehicle, 46% have a positive attitude towards EVs and 29% were very or somewhat likely to consider a BEV for their next purchase.

FIGURE 44 : HOW WOULD YOU DESCRIBE YOUR ATTITUDE ABOUT ELECTRIC VEHICLES?

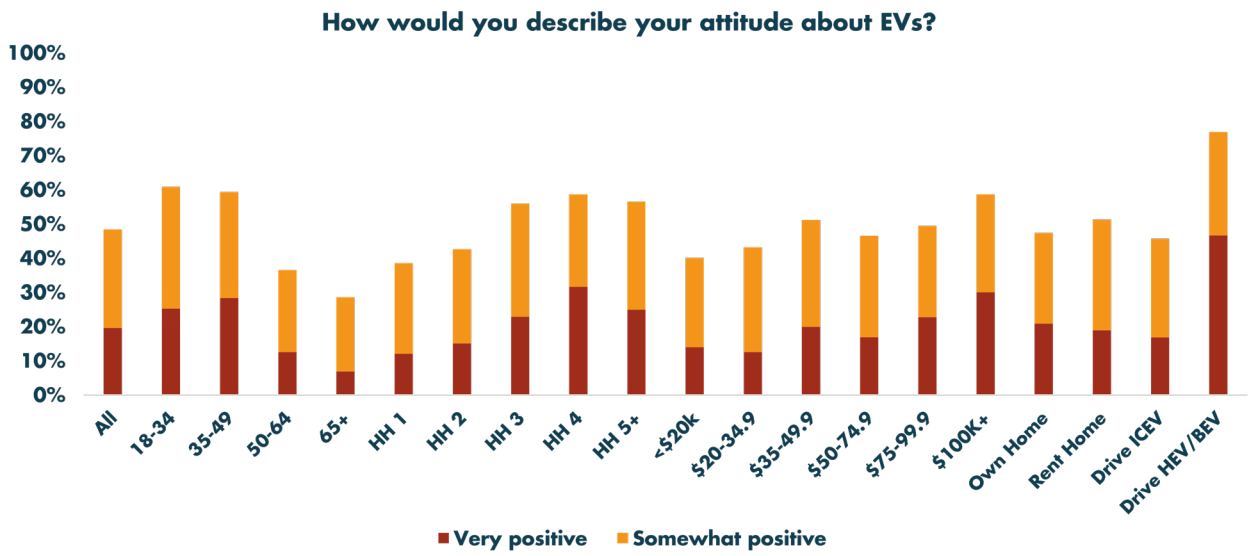

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FIGURE 45 : HOW WOULD YOU DESCRIBE YOUR ATTITUDE ABOUT ELECTRIC VEHICLES?

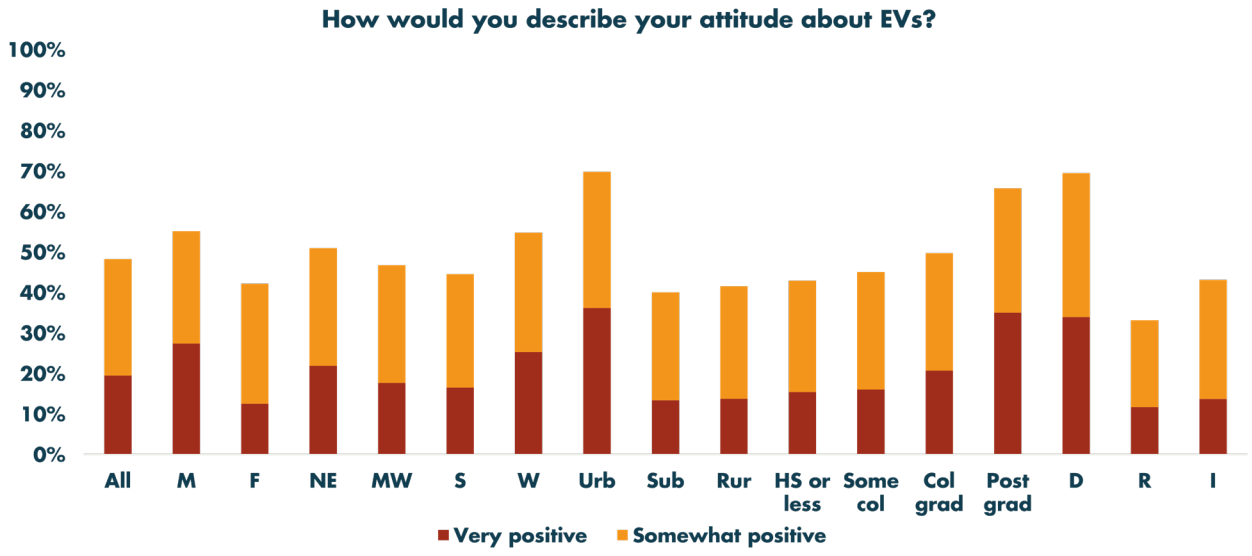

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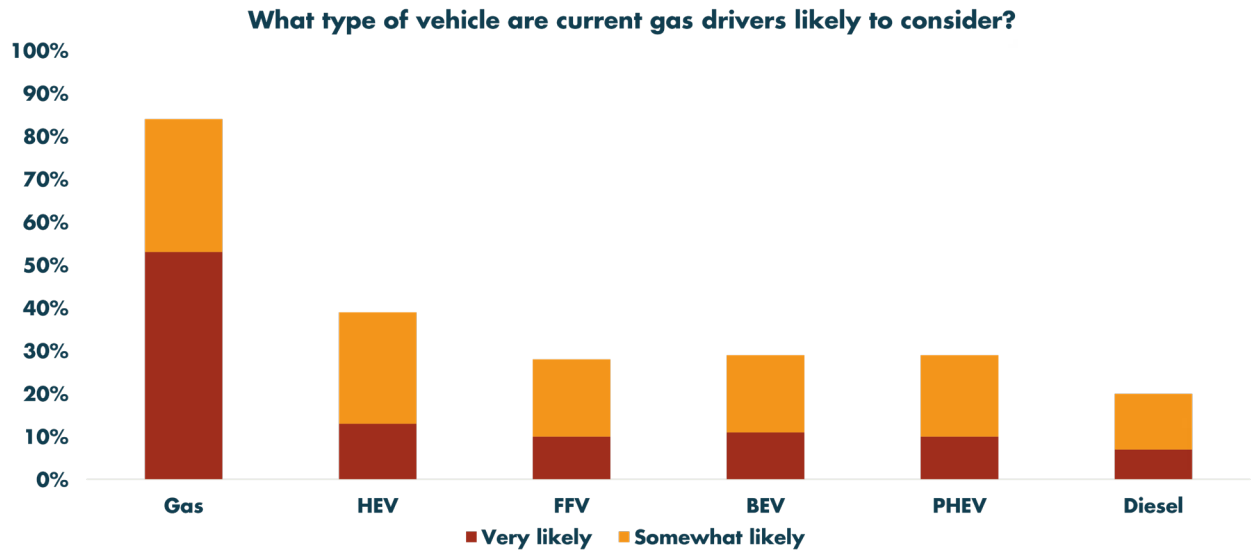
FIGURE 46 : WHAT TYPE OF VEHICLE ARE CURRENT GAS DRIVERS LIKELY TO CONSIDER?



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Most reports estimate that 80% of EV charging occurs at home or work, with the remaining 20% of charging occurring at publicly available charging stations. When asked if they had the ability to charge an EV at their home, less than half (48%) responded "Yes." This indicates that public charging infrastructure must be sufficient to satisfy their energy needs should they opt for a BEV. Younger and less affluent respondents, as well as those in smaller households and those who rent their residence, were less likely than the average to have the opportunity to charge at home. The majority (78%) of those who currently drive a HEV or BEV have the ability to charge at home. Meanwhile, only 38% of all drivers report having the ability to charge at work, yet 67% of those who currently drive a HEV or BEV report having the ability to do so. A minority of drivers (38%) think it would be somewhat or very easy to charge away from home.

FIGURE 47 : MY HOME HAS A SUITABLE LOCATION TO CHARGE AN ELECTRIC VEHICLE

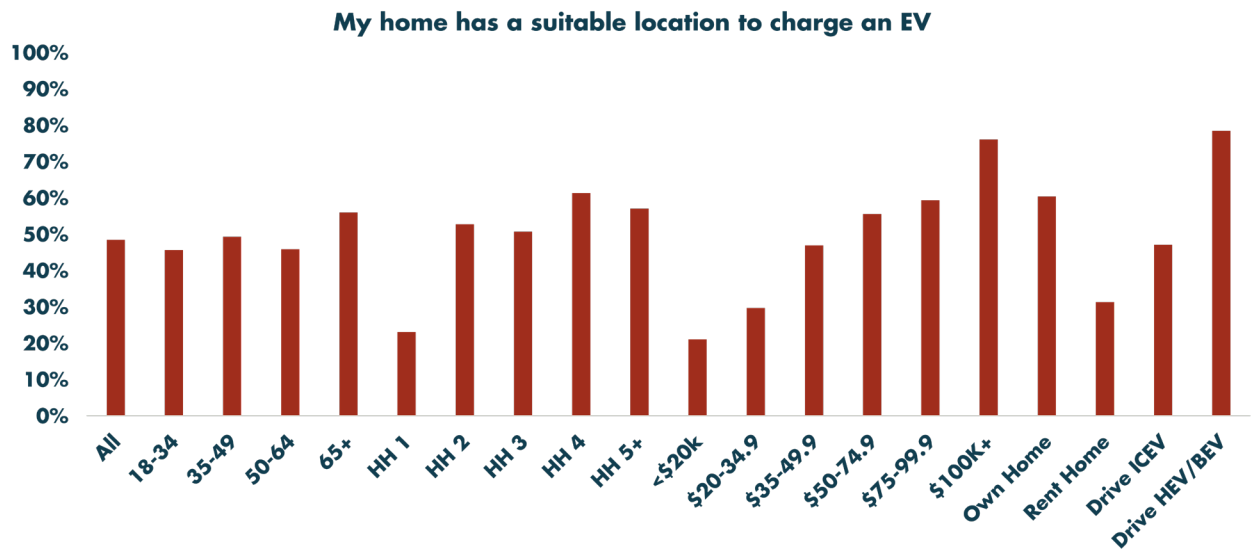

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FIGURE 48 : MY HOME HAS A SUITABLE LOCATION TO CHARGE AN ELECTRIC VEHICLE

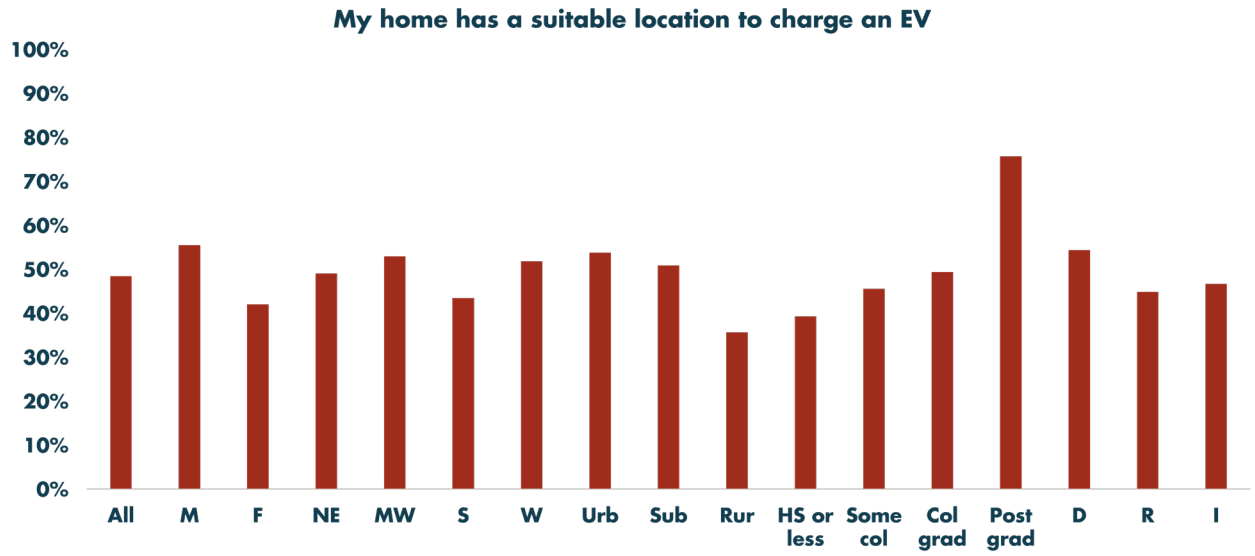

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FIGURE 49 : MY WORK HAS A SUITABLE LOCATION TO CHARGE AN ELECTRIC VEHICLE

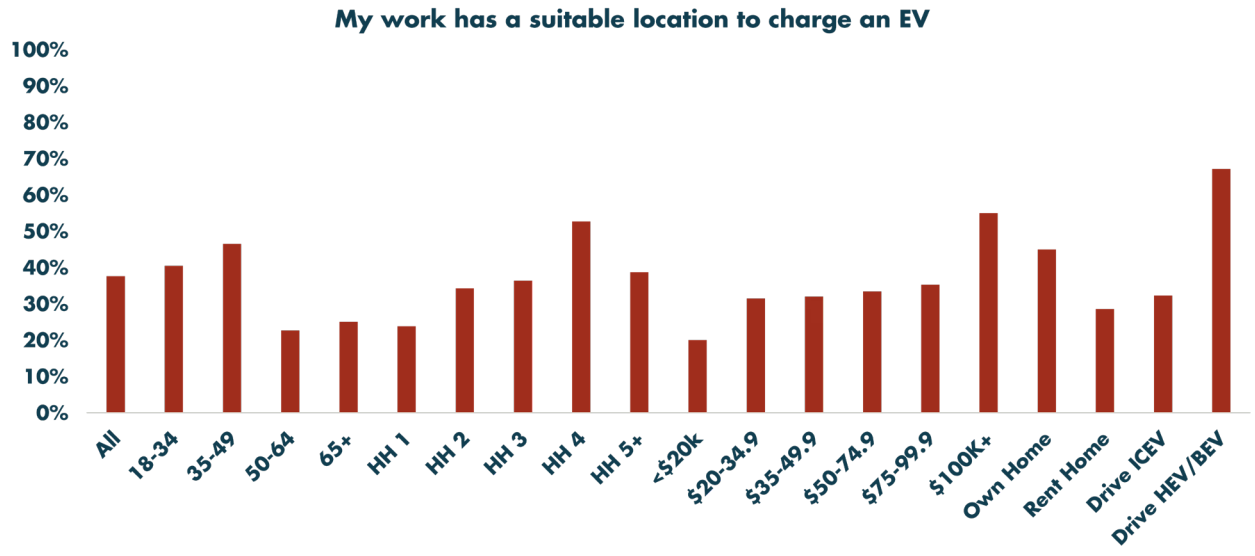

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FIGURE 50 : MY WORK HAS A SUITABLE LOCATION TO CHARGE AN ELECTRIC VEHICLE

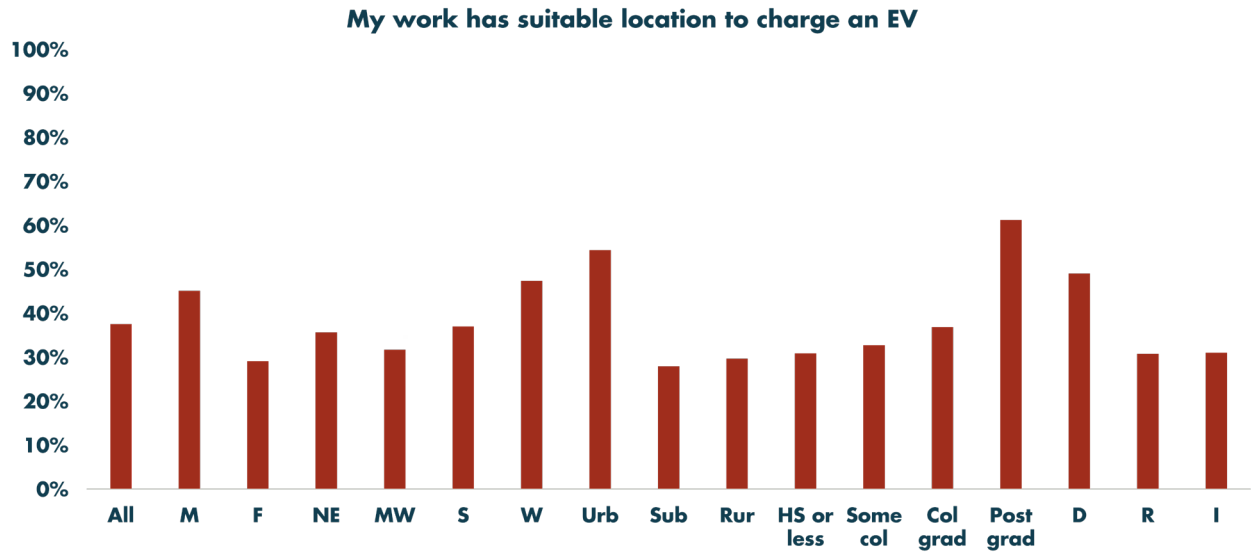

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FIGURE 51 : CHARGING AN ELECTRIC VEHICLE OUTSIDE OF YOUR HOME WOULD BE...

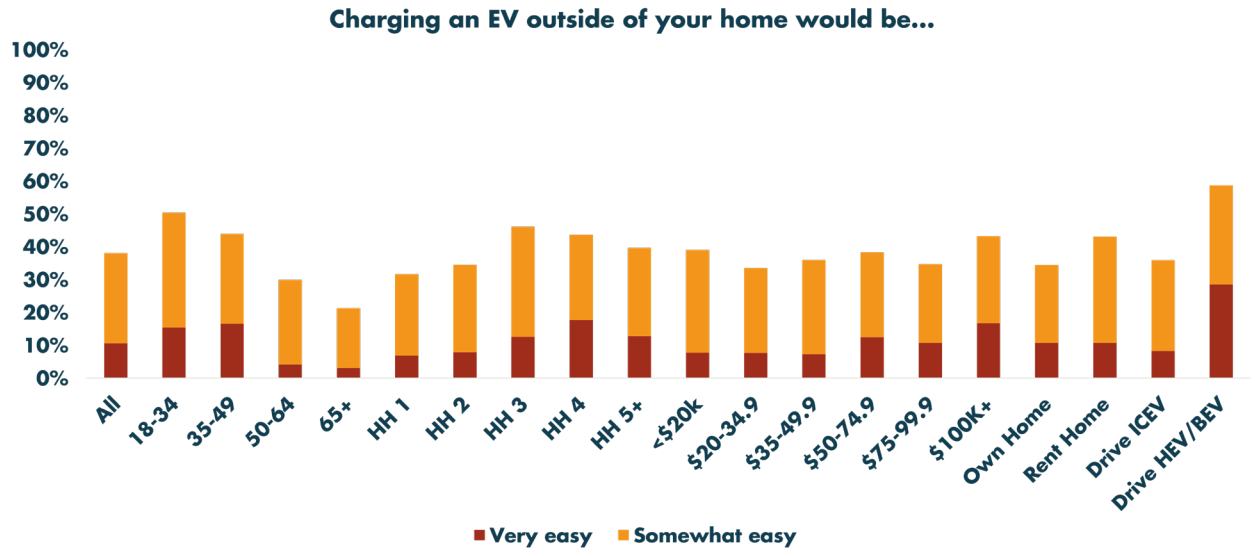

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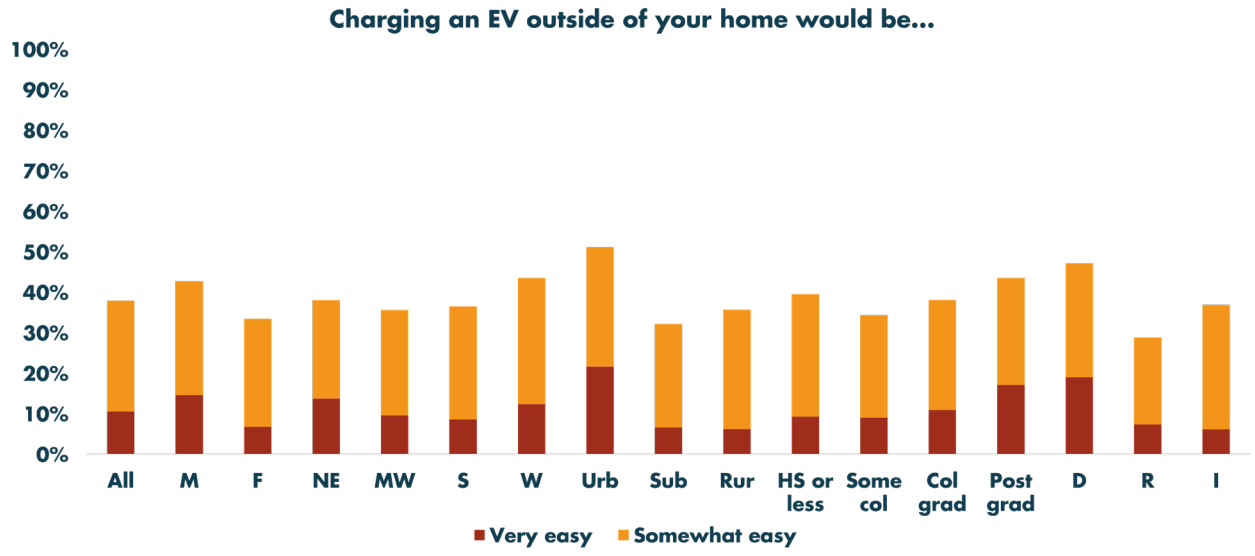
FIGURE 52 : CHARGING AN ELECTRIC VEHICLE OUTSIDE OF YOUR HOME WOULD BE...



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When asked which type of vehicle has the lower total cost of ownership, including purchase and cost of refueling, most people (44%) said gasoline powered vehicles. Only one group, those who currently own a HEV or BEV, said that these vehicles would cost less to own.

FIGURE 53 : WHICH TYPE OF VEHICLE HAS A LOWER OVERALL COST OF OWNERSHIP?

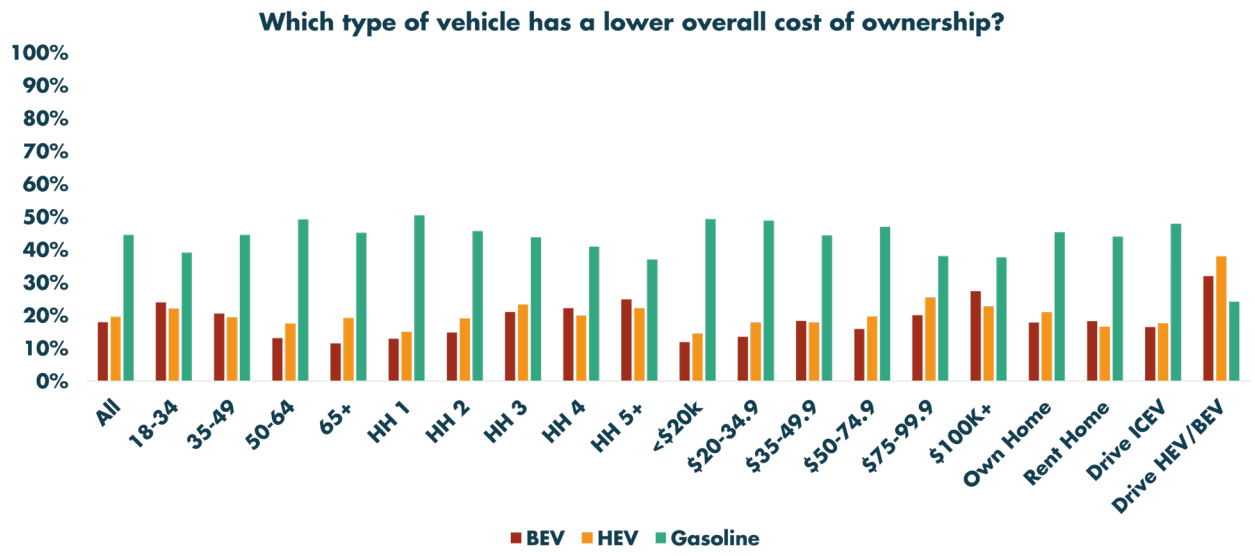

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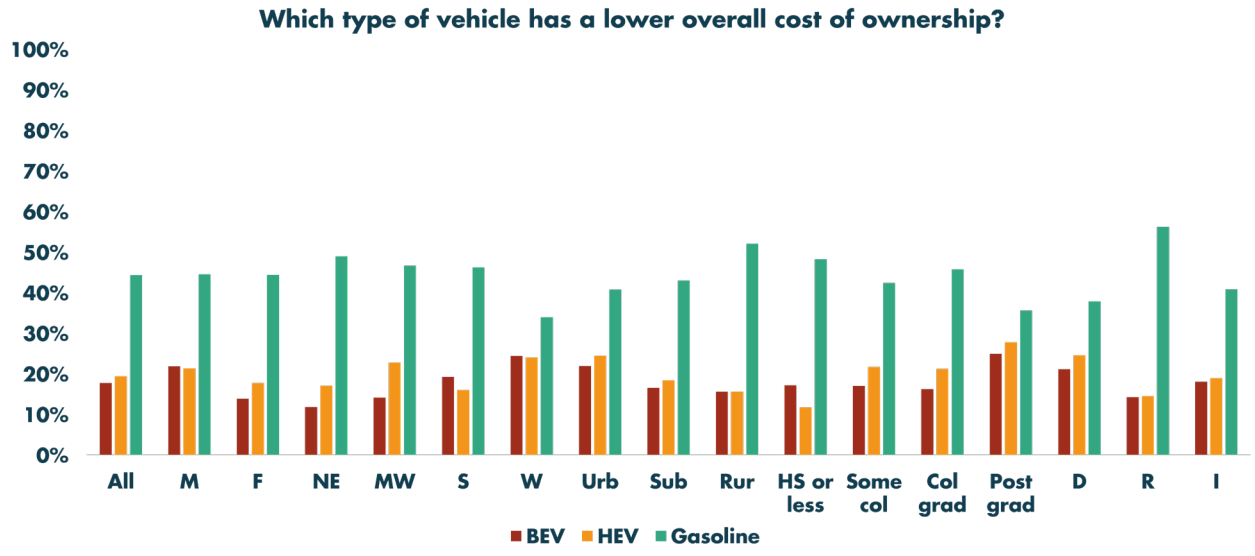
FIGURE 54 : WHICH TYPE OF VEHICLE HAS A LOWER OVERALL COST OF OWNERSHIP?



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Conclusion

Consumers purchase vehicles based upon their individual needs, budget considerations and personal preferences. Understanding how consumers approach their mobility requirements is critical to affecting change to the transportation sector. This survey is another tool available to better understand consumer behavior relative to the use of their personally owned vehicles. It provides valuable insight to help guide discussions about the evolution of the transportation sector.

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