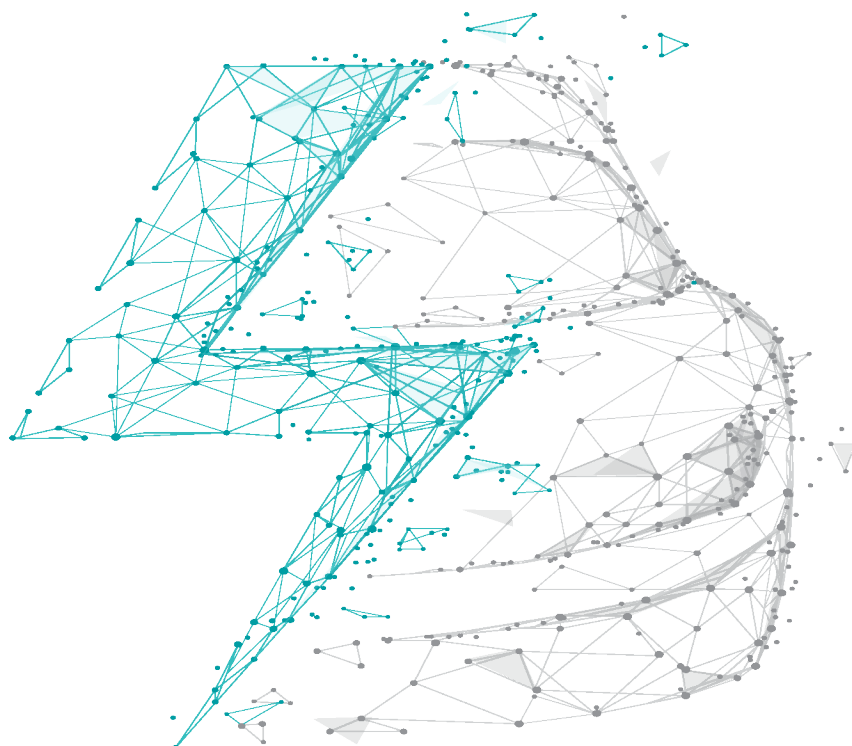




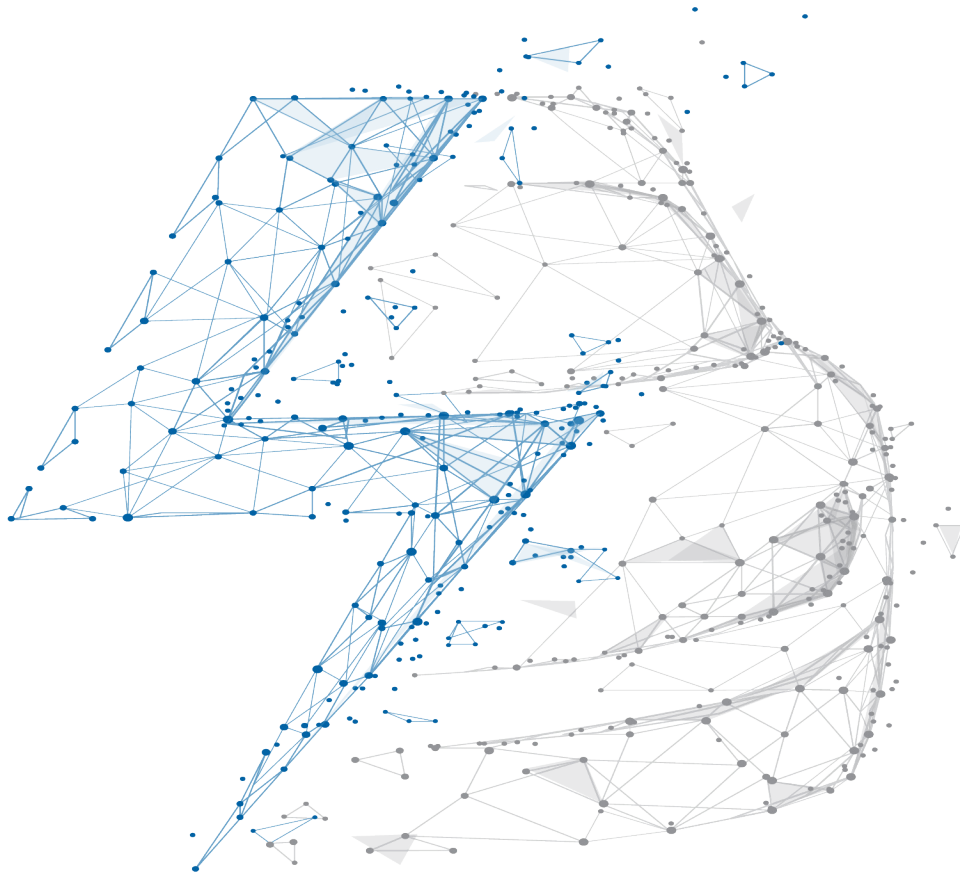
EV WATTS WHITEPAPER SERIES

In Their Own Words: Survey of EV Fleet Managers and EV Drivers



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IN THEIR OWN WORDS: SURVEY OF ELECTRIC VEHICLE FLEET MANAGERS AND DRIVERS

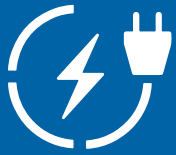
Summary

In 2022 and 2023, the EV WATTS team sent surveys to fleets and EV drivers that were participating in the EV WATTS project. Responses were received from 16 of the 45 fleet data partners and 200 of the 304 individual electric vehicle (EV) driver volunteers. Through the survey, the team collected information on the types of EVs being adopted, the types of vehicle charging being employed, perceived benefits of EV ownership, and factors that limit EV adoption.

According to the survey, battery electric vehicles (BEVs) are the most common EV type for both fleets and individual drivers, with plug-in hybrid electric vehicles (PHEVs) as a runner-up. Traditional internal combustion engine (ICE) vehicles remain common in fleets and are the vehicle type that an individual driver will most likely have as a secondary vehicle. Based on some of the limiting factors identified, both fleets and individual drivers likely believe that traditional ICE vehicles are necessary to meet some transportation needs—or at least that ICE vehicles can meet those needs more expediently.

For example, the market has not yet provided many of the types of EVs that could fully replace medium- and heavy-duty ICE vehicles. Fleets also noted that charging infrastructure—both public and onsite—is insufficient to support 100% EV fleets. In addition, the time involved in charging EVs can present a challenge in planning and operations. Individual drivers, too, cited limited public charging infrastructure and noted that it is difficult to take EVs on long trips.

However, both fleets and drivers identified multiple benefits to driving EVs. High on the fleet list were lower fuel and maintenance costs and reduced carbon footprints. Individual drivers, too, were pleased to be part of “saving the planet” and demonstrating those benefits to others. Drivers also noted improved performance over traditional vehicles (e.g., the quiet and smooth ride and high-tech capabilities).



Energetics led EV WATTS (Electric Vehicle Widescale Analysis for Tomorrow's Transportation Solutions), a multi-sector project

to facilitate the nation's move toward sustainable transportation. The project collected real-world use data from plug-in EVs and charging stations to address a growing need for practical information about vehicle electrification. The team analyzed these data to improve our understanding of driving and charging patterns. EV WATTS results are helping to demonstrate how the latest advancements in EVs and charging station technology address barriers, improve the business case for electrification, and determine what behavioral changes electrification may require.

The project used charging station data and vehicle usage data to build one of the largest datasets of its kind. The data collected for EV WATTS was aggregated and anonymized so that it can serve as a resource to researchers, policymakers, and other stakeholders. Using the data, the team created interactive dashboards that display statistics and findings from EVs and charging stations. The dashboards allow users to explore this anonymized dataset, looking at energy demand, use patterns, charging details, and more. EV WATTS dashboards are available at [EVWATTS.org](https://www.evatts.org).

Completed at the end of 2023, EV WATTS was sponsored by the U.S. Department of Energy (DOE). Input and other assistance were provided by DOE national laboratories, Clean Cities Coalitions, fleets, state and local governments, vehicle manufacturers, utilities, EV drivers, and charging station providers.



Introduction

EV WATTS developed interactive dashboards that provide valuable insights and a publicly available database that allows for further research. However, quantitative analysis does not tell the whole story; qualitative analysis is an important supplement. The project team developed and distributed online surveys to better interpret the data being collected from participating fleets and individual EV drivers.

Data and Methodology

In September 2022, the EV WATTS team sent a survey to fleets and EV drivers that were participating in—i.e., providing data to—the EV WATTS project at the time of the survey. In November 2023, the individual EV driver surveys were issued to newly recruited participants. Fleets were not included in the November 2023 survey.

The surveys included both multiple choice and open-ended questions.

Responses were received from 16 of the 45 fleet data partners. The survey comprised 12 questions to collect information on the partners’ fleet vehicles—including the mix of BEVs, PHEVs, and ICE vehicles—and on how well the EVs meet the fleets' needs.

A total of 304 individual EV driver volunteers participated in the EV WATTS project by agreeing to have telematics devices installed in their vehicles, allowing the EV WATTS team to track driving and charging behaviors. Of these volunteers, 200 responded to the surveys (32 to the 2022 survey and 168 to the 2023 survey).

Summary results are below.

Findings

Survey of EV Fleet Operators/Managers

Respondents were asked what types of vehicles are included in their fleets.

As the table shows, each respondent indicated the fleet includes at least some BEVs, although only one fleet noted that BEVs make up 50%-75% of the vehicles. The other 15 fleets stated that BEVs make up less than 25% of their vehicles. No fleet reported that PHEVs make up 25% or more of their vehicles.

The survey also asked about the types of charging available to their fleet vehicles. Most respondents have more than one type. AC Level 2 stations are the most common and the only type of charging on which any fleets rely exclusively (fleets selecting other types of charging always included multiple options).

What type(s) of vehicles are in your fleet?

Vehicle Type	Number of Fleets*
Battery Electric Vehicle (BEV)	16
Plug-In Hybrid Electric Vehicle (PHEV)	10
Neighborhood Electric Vehicle (NEV)	1
Hybrid Electric Vehicle (HEV)	8
Other Alternative Fuel Vehicle	5
Gasoline Internal Combustion Engine (ICE) - not hybrid	11
Diesel Internal Combustion Engine (ICE) - not hybrid	10

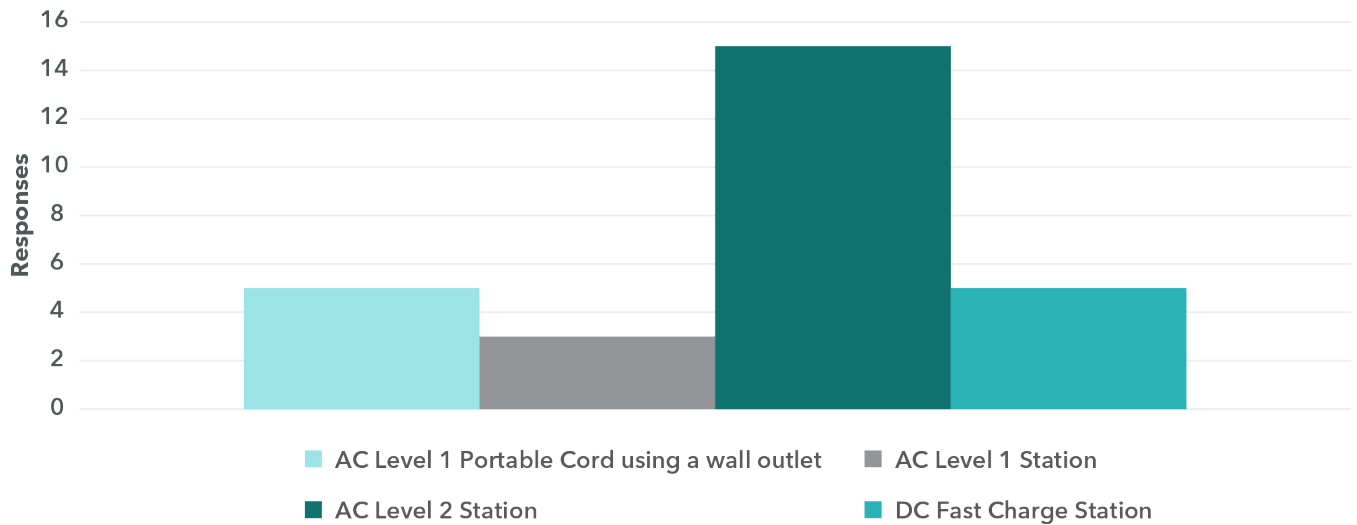
* 16 total responses





What type(s) of charging do your vehicles access at their base (primary parking) location?

Check all that apply.

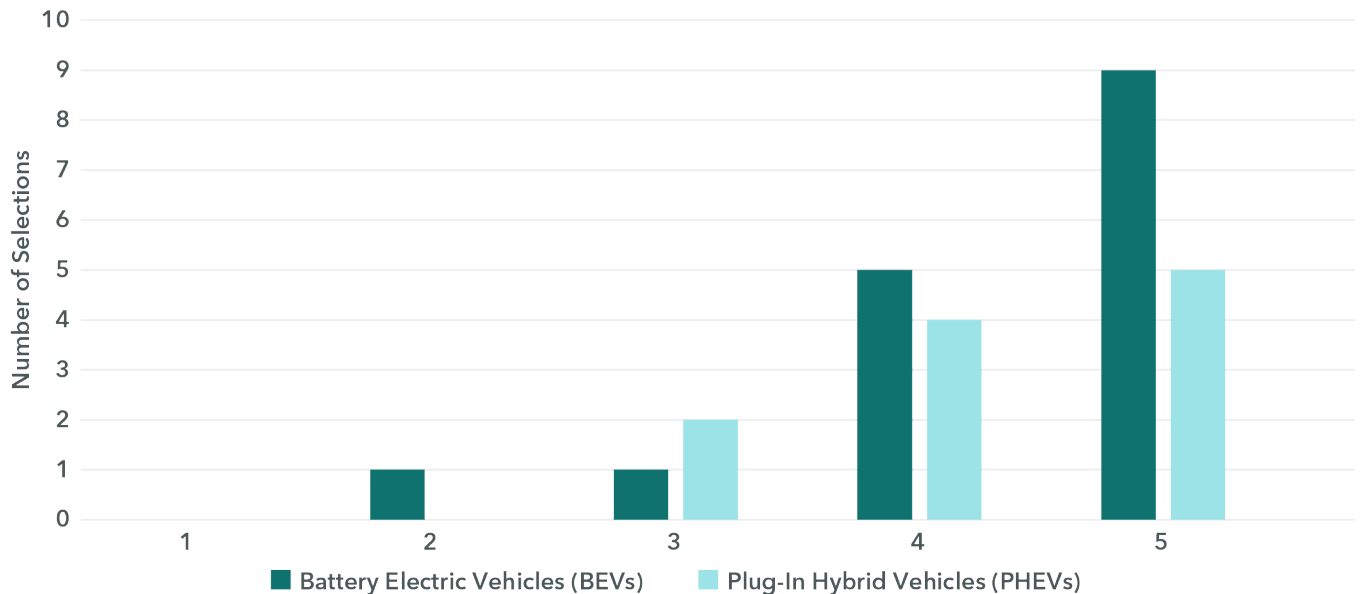


Most fleets expressed satisfaction in how well the BEVs and PHEVs are meeting their needs. Respondents were asked to rank both BEVs and PHEVs, separately, on a scale from 1 to 5, with 5 being the highest. Fleets with only one type of plug-in EV (BEV or PHEV) were asked to respond only about that vehicle type.

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How well do the plug-in electric vehicles in your fleet meet the needs/duty cycle of your fleet?

1 = do not meet need, 5 = fully meet need (skip if not applicable)





The survey asked respondents to select from a list of noticeable EV-provided benefits, as well as a list of factors that limit EV adoption. Both questions also provided options for open-ended responses. Only a few fleets are realizing a positive return on investment, but most are experiencing fuel cost savings and recognize the reduction in their carbon footprint that EVs provide. Several added that the exposure and experience from having EVs in the fleet are beneficial. The biggest limitation toward increased adoption appears to be the types of EVs currently available. However, 14 of the 16 respondents indicated that they plan to add more EVs to their fleets, and 2 respondents indicated that they might. None of the respondents said that they do not plan to add EVs.

What noticeable *benefits* have EVs provided to your fleet? Check all that apply.

Benefit	Number of Fleets
Fuel cost savings (taking into account the cost to charge)	14
Reduced maintenance cost	12
Positive return on investment	4
Reduction in carbon footprint	15
Convenience (saving on fueling and maintenance time)	9
Quieter operations	13
Improved driver satisfaction	10

Unique Responses:

- Allows people new to EVs to see them and experience them in person
- Community engagement tool for EV education
- Newer vehicle technologies
- Technology demonstration
- Very fun acceleration

What factors *limit* the use of EVs in your fleet? Check all that apply.

Limitation	Number of Fleets
EVs are not limiting	3
Base location lacks charging infrastructure	7
EVs take too long to charge	6
Public charging is inconvenient, regularly occupied, or non-operational	2
Battery capacity is too small for typical duties	5
Vehicle type is not available as an EV	11

Unique Responses:

- There are no trucks/vans available yet to meet [the fleet’s] construction needs.
- Battery range (2011 Leaf) has been disappointing and is so low now that employees are wary of driving.
- [The fleet is] waiting for a Ford F150 Lightning.
- EV dealerships are 3.5 hours away. EV services are not as accessible in rural areas.

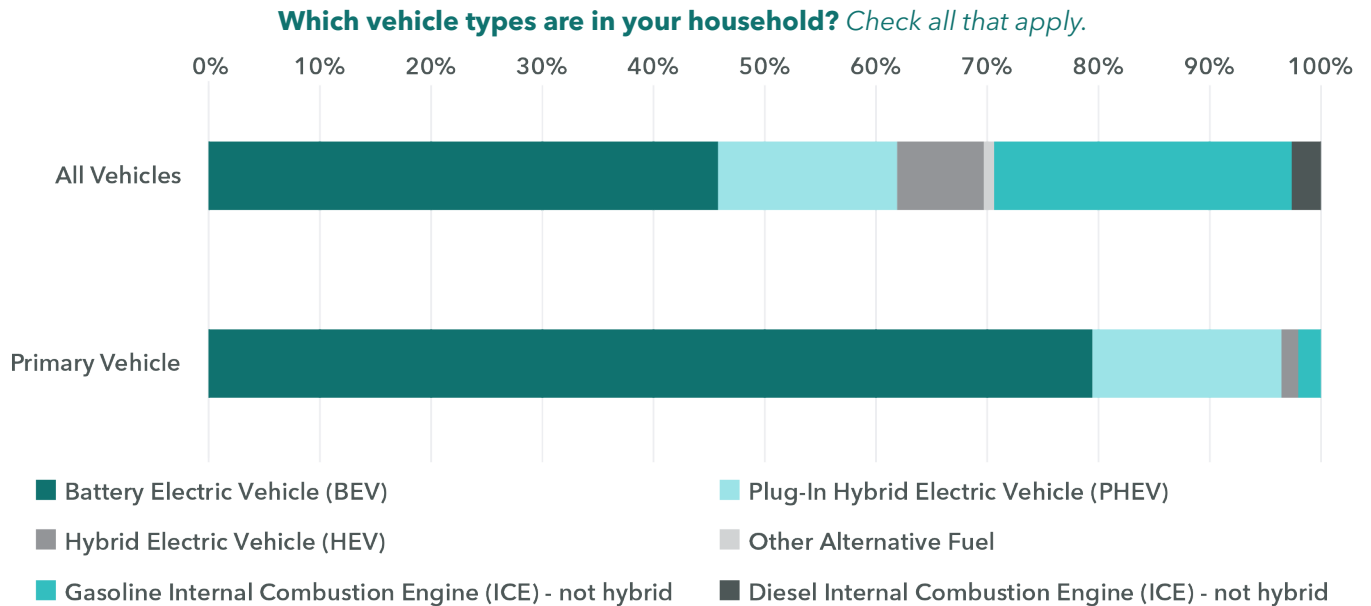




Survey of Electric Vehicle Drivers

The survey of individual EV drivers collected information on the vehicle type(s) they drive and their driving and charging experience.

About 97% of responses indicated that either a BEV or PHEV is the primary vehicle, although 38% of households have second vehicles that are not plug-ins, and most of these secondary cars are ICE vehicles.



The survey also asked drivers to share how the EVs in their households are typically used, with respondents asked to check all applicable options. The typical uses break down as follows:

- Local travel (94%)
- In-state travel (75%)
- Commuting to work (59%)
- Out-of-state travel (50%)
- For-hire work such as ride-sharing or deliveries (2%)

All but four respondents have access to charging at home, with approximately twice as many using an AC Level 2 station than an AC Level 1 portable cord with a wall outlet. Most respondents indicated a low (infrequent) reliance on public charging.

When asked whether their EVs meet their travel needs, 58% of the drivers reported that their needs are fully met, and 37% indicated their needs are mostly met. All respondents have noticed fuel cost savings, and most also agreed that their EVs reduce their carbon footprints (92%), increase

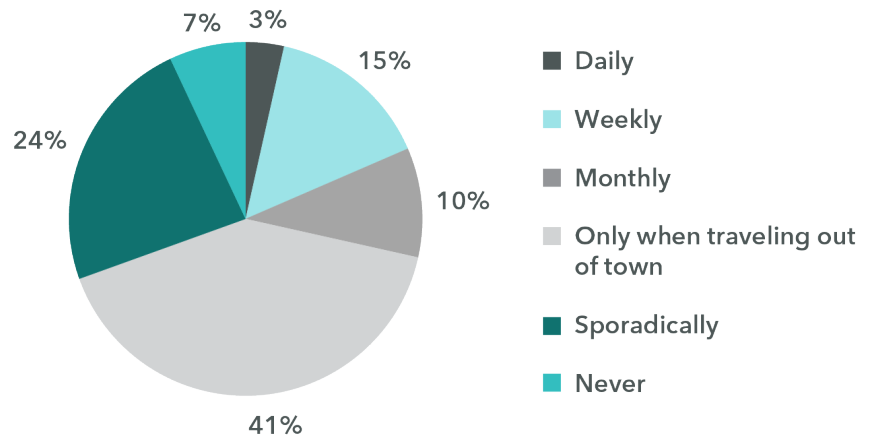




driving enjoyment (90%), reduce maintenance costs (88%), and add convenience due to reduced fueling and maintenance time (85%). This question also invited free-form answers, resulting in respondents identifying the following benefits:

- Teaching tool for my energy and EV education classes and outreach programming.
- Outreach education focused on EVs and renewable energy.
- Spreading the advantages of EV ownership to riders and encouraging them to switch to EVs.
- People talk to me about it everywhere I go. I've made friends because of it.
- Admiration from others.
- Saving the planet.
- Driving on sunshine from our solar.
- Charging with our solar system.
- Performance.
- Quiet and smooth ride (no transmission shifting).
- Reduced noise pollution.
- Regenerative braking (feels much safer).
- It's very pleasant to drive.
- Over-the-air (OTA) software improvements.
- High-tech capabilities, OTA updates, etc.
- Never going to a gas station.
- Staying out of [dealerships].

How often do you use public charging stations?

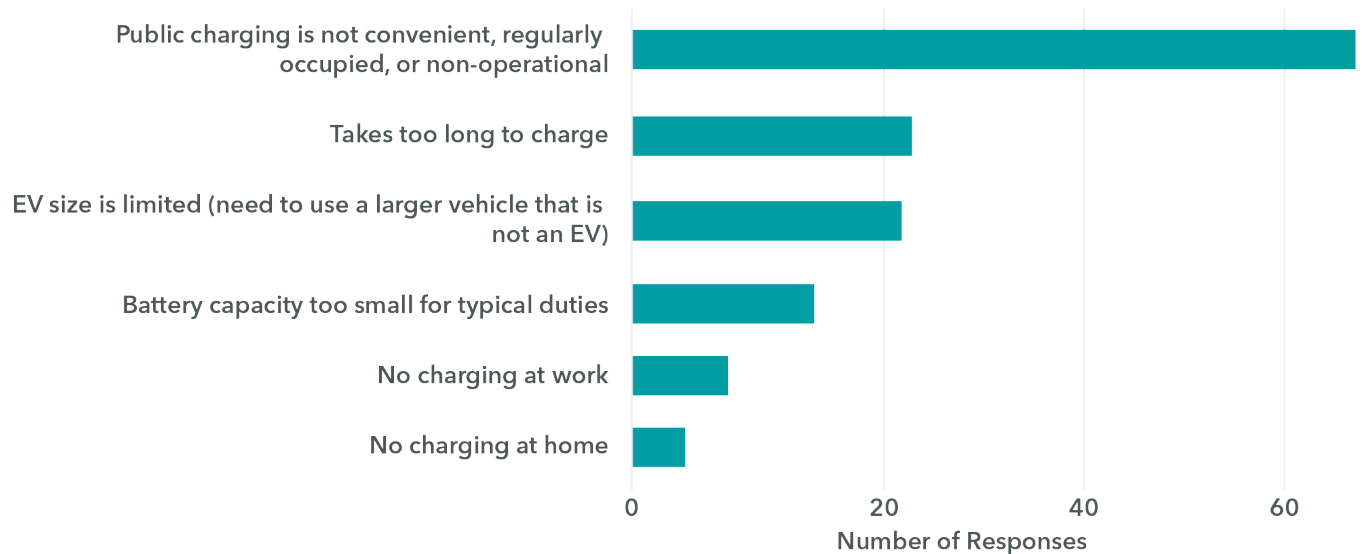


Regarding factors that limit EV use, about half the respondents stated that the use of their EVs is not limited. However, others made selections from the given choices (shown in the following chart) and/or provided their own responses (listed below the chart).





What factors limit EV use? *Check all that apply.*



The open-ended responses are below:

- Need ICE vehicle for long-distance (300+ miles) trips.
- Leaf doesn't have active battery cooling, and that limits longer trips.
- Difficult to plan and take trips over 250 miles.
- Battery capacity and charging time make long single-day trips and multi-day trips harder to do.
- Public charging is too far apart/non-existent in rural areas around where I live.
- Public charging is practically non-existent within my region.
- Generally, public charging infrastructure in our area is insufficient.
- MSRP of vehicle with decent DC charging time (<30 minutes).
- Limited EV cargo capabilities (other vehicle is ICE pickup, hauling large items for work and home remodel).
- I would like more places of business (where I stay for more than an hour) to provide Level 2 charging (for free, if possible).
- My Chrysler Pacifica has a gas fuel/oil refresh mode that can cut in every so often and uses almost a tank of gas. I think this detracts from the hybrid's purpose and is very annoying.
- EV can't go off-road (dirt roads).





Conclusions

The EV WATTS team makes the following observations, based on the survey responses:

- There is overall support and enthusiasm for EV deployment among those who took the surveys (station host, fleet manager, EV driver), although we recognize that there may be an inherent bias (i.e., participants who took the survey may be more enthusiastic about the topic).
- EVs appear to meet most light-duty fleet needs. Fleet managers with light-duty fleets are interested in extending electrified offerings to their medium- and heavy-duty fleets. However, the options are still very limited.
- Once individuals understand the slight nuances and extra planning that EV ownership involves, they find the technology worthwhile.
- Most enjoy EV driving and ownership but find that non-EVs are still necessary to meet some of their transportation needs.
- Drivers enjoy the performance and lower maintenance needs of EVs.
- EV drivers would like to see more public EV charging stations deployed, particularly in rural areas and on highways. Better public charging access would allow drivers to use EVs for all their driving needs.

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About Energetics



Energetics is a technology and management consulting firm helping public and private entities integrate clean energy technologies and strategies into real-world applications. For over 40 years, we have worked with lead investors, innovators, and stakeholders to inform and expedite the development and market success of novel energy technologies, strategies, and practices that deliver a sustainable future. Our collaborative approach, expert analysis, and technology insights provide clients valuable perspectives and solid foundations for decisive action. Our knowledge of cutting-edge technology, trends, and stakeholders supports development of effective strategies and partnerships. For more information about Energetics, visit www.energetics.com.

