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Electrifying Ridehailing: Segmenting Transportation Network Company Drivers Based on Their Electric Vehicle Charging Practices

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Issue

Electrifying ridehailing services provided by transportation network companies (TNCs) can reduce greenhouse gas emissions and air pollution while providing fuel and maintenance cost savings to TNC drivers. Policy levers have emerged to nudge the industry in this direction. California's Senate Bill 1014 establishes a "clean miles standard" requiring an increasing percentage of ride-hailing services be provided by zero-emissions vehicles, such as plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs)—together referred to as plug-in vehicles (PEVs). In spring 2019, researchers at UC Davis surveyed 732 TNC drivers in the US who already use a PEV, to understand their use and charging of their PEV. This is the second in a series of briefs highlighting the results of the survey. There is limited understanding of how drivers' charging practices affect the potential benefits of electrifying TNCs. This research identifies segments of TNC-PEV drivers based on their vehicle charging practices (i.e., location, level, and time of day) to inform infrastructure planning.

Key Research Findings

Seven clusters were identified based on charging practices (Figure 1). The researchers estimated each cluster's contribution to the total ridehailing hours driven by the whole sample as a proxy for each cluster's electric vehicle miles traveled. Estimates are proxies because of a lack of data on the proportion of miles PHEVs are driven in electric, gas, or mixed-fuel modes.

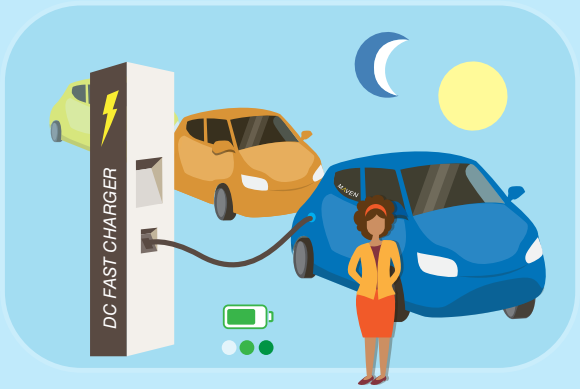
The different characteristics for each charging cluster highlight the importance of targeted programs to promote PEV adoption among TNC drivers. A slight majority of drivers (52%), comprising three clusters, primarily use home-charging. These clusters are characterized by high rates of homeownership and high levels of income and/or education. A small cluster, 8%, of drivers are non-chargers, who tend to rent in multi-unit buildings and have lower incomes. A non-targeted promotional program encouraging all TNC drivers, or those who drive many hours, to adopt any type of PEV regardless of their home charging opportunities and resources could be inefficient and result in some people acquiring PHEVs because they lack feasible options for charging a vehicle while at home.

Results suggest that home-based charging infrastructure expansion, particularly at multifamily housing, as well as public DC fast charging, are necessary to support TNC electrification. The cluster of drivers who used mainly public DC Fast Chargers were the largest cluster (25% of drivers surveyed), accounting for the highest proportion of estimated driving hours (31%). However, the three clusters who relied mainly on home charging produced a higher combined percentage of driving hours (45%) than the two groups who relied mainly on public Level 2 and DC Fast charging (38%).

More Information

This policy brief and the others in this series are drawn from "Characteristics and Experiences of Ride-Hailing Drivers with Electric Vehicles," and the forthcoming paper "Driving and Charging Electric Vehicles on Ride-hailing in the United States," both authored by Angela Sanguinetti and Ken Kurani of the University of California, Davis. The papers and additional policy briefs can be found here: https://www.ucits.org/research-project/2021-35/.

For more information about the findings presented in this brief, contact Ken Kurani at knkurani@ucdavis.edu.



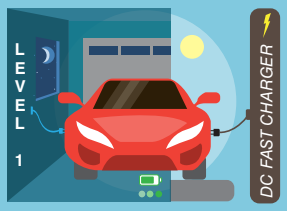
Fast Chargers

(25% of sample, 31% of TNC-PEV driving hours)

This cluster relied almost entirely on public DC Fast Charging. They tend to accomplish about half their charging during the day and half at night. Only BEVs can fast charge. This cluster has the highest tolerance for interrupting a "shift" of ridehail driving to charge. Despite this high tolerance, they spend less time away from active driving on TNC platforms to charge than do other TNC-PEV drivers who rely on public charging. Drivers in this cluster who rented the BEV they drove on TNCs made up about one-fourth of this segment but accounted for more than one-half the segments' estimated hours per week driving on TNCs. Compared to other clusters, Fast Chargers had a higher proportion of women than any other cluster (but still less than 50%) and were more likely to be 30-40 years old, rent their residence, live in multi-unit dwellings, and drive in the cities with the highest density of public charging locations (DC Fast and Level 2).

Home-based Mixed-power Chargers

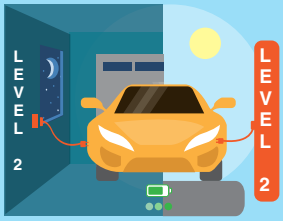
(14% of sample, 12% of TNC-PEV driving hours)



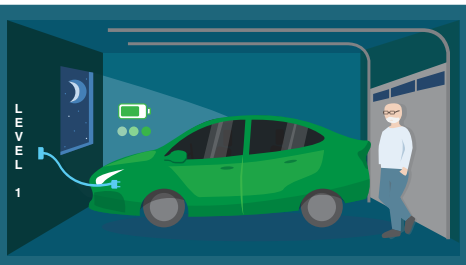
This cluster did most of their charging at home, Level 1, and overnight. However, unlike the other home-based clusters, this cluster charges more at other locations and other power levels and does more charging during the day. About half drove PHEVs and half BEVs. Like the other home-based clusters they were more likely to own their residence. However, unlike those other home-based clusters, they were more likely to live in multi-unit dwellings. They are more likely to be in their 50s and have a graduate or professional degree than the overall sample.

Mixed-location Level 2 Chargers

(10% of sample, 10% of TNC-PEV driving hours)



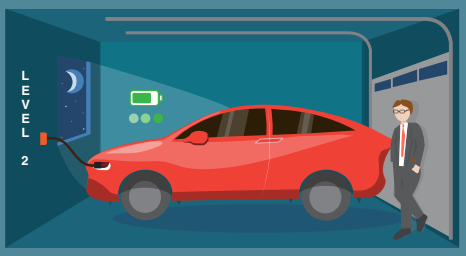
In comparison to the Home-based Mixed-power Chargers, Mixed-location Level 2 Chargers are less reliant on home—about half their charging is done at home and the other half at workplace or public chargers. As follows from this, about half their charging is done at night and half during the day. Most of their charging is done at Level 2; most drove BEVs. Compared to the overall sample, this cluster is more likely to own their residence and live in a single-family home or small multi-unit dwelling. They are even more likely to be male and aged 50 to 60. They had the highest average income of any cluster.



Home Level 1 Nighttime Chargers

(19% of sample, 18% of TNC-PEV driving hours)

This cluster relies almost completely on charging at home, at Level 1, and at night. Most drove PHEVs. They are more likely live in a single-family residence which they own than any other cluster. They are more likely than other clusters to be in their 60s and more likely than the overall sample to have completed less than a college-level education.



Home Level 2 Nighttime Chargers

(19% of sample, 15% of TNC-PEV driving hours)

This cluster almost exclusively charges at a home-based, Level 2 charger and at night. BEV drivers are a slight majority of the cluster. Like the Home Level 1 Nighttime Chargers they are likely to be 60-somethings who live in a single-family residence they own, and they are more likely than the overall sample to have higher education levels and higher incomes.

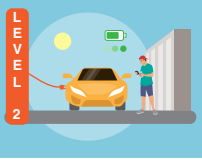
Non-chargers

(8% of sample; 8% of TNC-PEV driving hours)

This cluster of PHEV drivers never charge their vehicle. Compared to the overall sample, they were more likely to rent in a multi-unit dwelling and to be in their 30s to 40s. Again while mostly male, this cluster has the highest percentage of females of any cluster.

Public Level 2 Chargers

(7% of sample, 7% of TNC-PEV driving hours)



This cluster relied almost entirely on Public, Level 2 charging and did most of their charging during the day. A slight majority drove PHEVs. Similar to DC Fast Chargers, drivers in this cluster are more likely to rent in a multi-unit dwelling and drive in cities with high densities of public charging locations (DC Fast and Level 2). Unlike DC Fast Chargers, Public Level 2 Chargers are disproportionately likely to be male. They tend to be younger than the overall sample.

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