

Once Consumers Adopt an Electric Vehicle, Do They Go Back?

How many, why, and what are the policy implications?

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The lack of repeat adoption of low carbon technologies has implications for climate change mitigation. In this insight, we explore how many electric vehicle owners dispose of their electric vehicles and do not buy another when purchasing their next car. We also investigate their reasons for discontinuing their electric vehicle ownership. We highlight the policy implications of these findings, comparing policies aimed at promoting adoption vis-à-vis sustaining adoption.

Background

A very recent article published in the journal *Nature Energy* suggests that 20% of plug-in electric vehicle (PEV) owners in California chose to discontinue their PEV ownership (Hardman and Tal 2021). Using an empirical modeling framework, the article infers that this discontinuance could be related to consumers' dissatisfaction with the inconvenience of charging, and the lack of level 2 (240-volt) home charging. Range, on the other hand, was not found to be correlated with discontinuance.

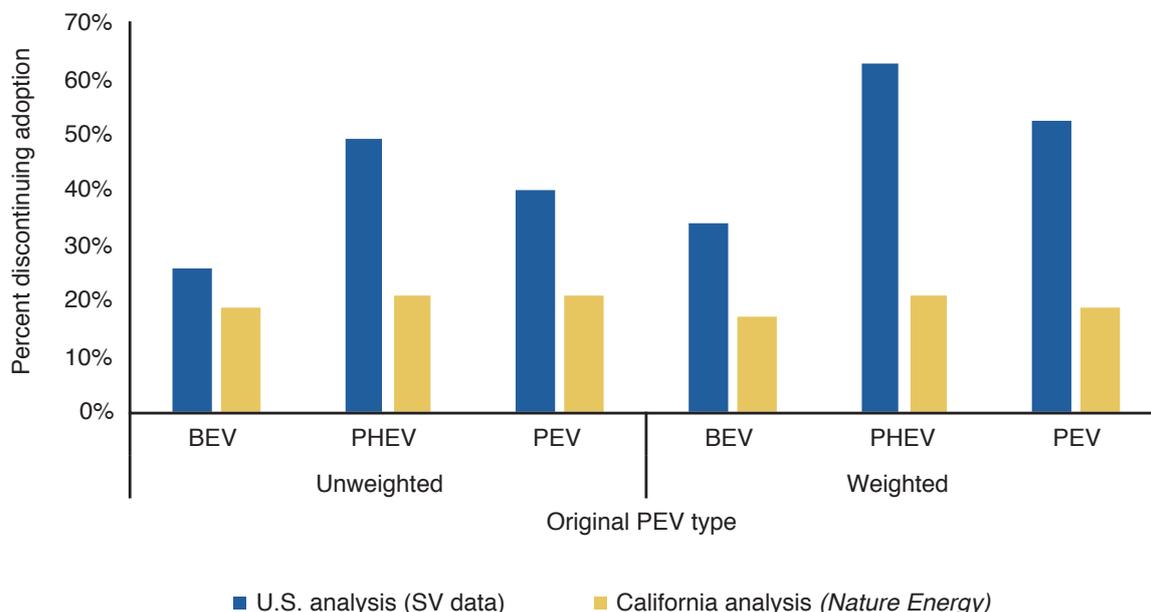
Findings

We extended this strand of research by carrying out an analysis using data from a 2017 model year nationally representative survey of new vehicle buyers in the United States (U.S.) by Strategic Vision (SV). The survey asked the respondents, a subset of whom (1,128) disposed of their PEVs, their reasons for choosing not to buy a PEV again. We did this analysis for two reasons – (i) to see how severe the issue of discontinuance might be at the national (instead of state) level, and (ii) to understand consumers' stated reasons for discontinuing owning PEVs. The findings from the analysis suggest that:

- Of all the new vehicle buyers in 2017 who disposed of their PEVs, roughly half (40%-52%) chose not to buy a PEV again (Figure 1). In other words, the issue of discontinuance appears to be more severe when considering the whole of the U.S. rather than just California. Discontinuance of PEV ownership is higher for below-median income¹ households buying new cars (44%-59%) than for above-median income households (36%-47%).
- The most frequently selected reasons for choosing not to buy a PEV again were: (i) the electric driving range of PEVs, (ii) the location and availability of charging stations, (iii) the recharging time, (iv) the cost of battery replacement, and (v) reduced performance, especially range, in cold weather (Figure 2). Most of the stated reasons, other than the location and availability of charging stations, contrast with the statistical findings in Hardman and Tal (2021), wherein battery range, recharging time, replacement cost and performance in cold weather, were not found to be associated with PEV discontinuance.
- With respect to range, PEV owners who disposed of their PEV in favor of non-PEVs stated a desirable PEV range of 225 miles on average. In contrast, the average range of their new non-PEVs was roughly 388 miles.

¹ As per the survey, the median income for U.S. households buying new vehicles in 2017 was US\$ 90,000.

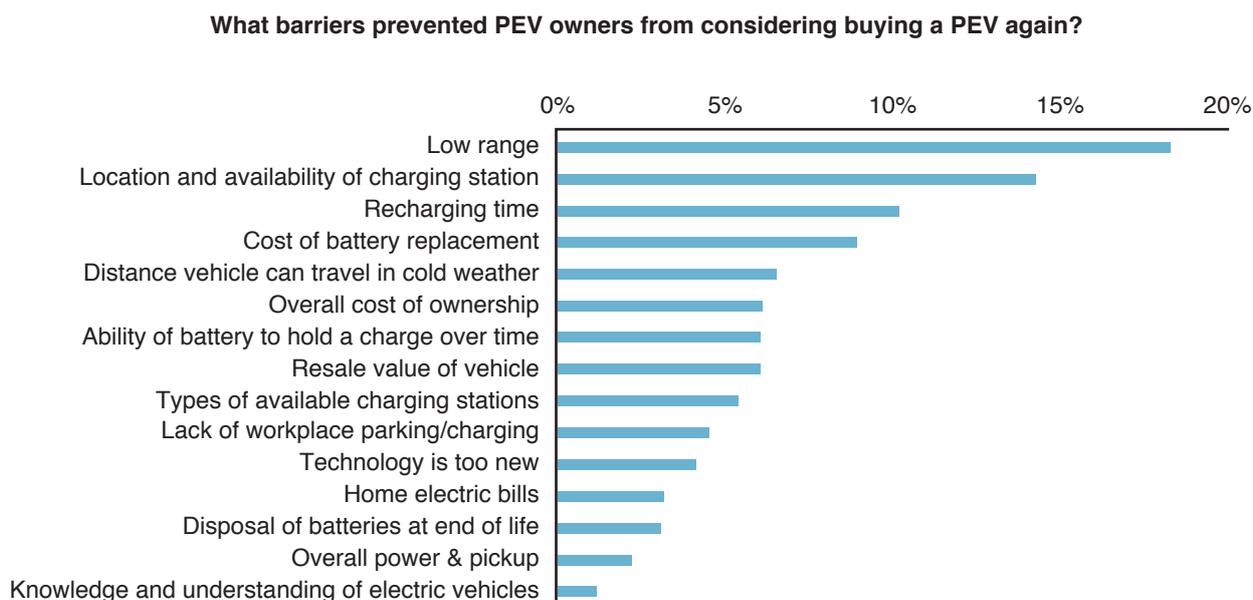
Figure 1. Percentage of PHEV, BEV and PEV (BEV and PHEV combined) owners who discontinued ownership (i) unweighted (left) and (ii) weighted (right).



Source: KAPSARC analysis.

Note: “BEV” = battery electric vehicle; “PHEV” = plug-in hybrid electric vehicle; “PEV”= plug-in electric vehicle; “SV data” = the nationally representative survey data from Strategic Vision; “weighted” refers to analyzing the survey responses together with the weights provided in the SV data, wherein the weights represent the ratio of national-level sales of a particular vehicle to the number of respondents who bought that vehicle in the sample; “unweighted” refers to analyzing the survey responses without using any weighting.

Figure 2. Barriers preventing PEV owners who disposed of their PEVs from considering buying a PEV again.



Source: KAPSARC analysis.

Implications

These findings have implications for the decarbonization of the passenger vehicle transport sector. The high rate of PEV owners switching back to non-PEVs suggests that the transition to zero tailpipe carbon dioxide (CO₂) emission vehicles could take a lot longer than predictions that do not account for such a dynamic indicate. Moreover, the early PEV owners tended to be more accommodating of the lower quality of early generation PEVs, given their prioritization of environmental friendliness and technological innovation (Dua, White, and Lindland 2019). The discontinuance issue could become more severe with mainstream buyers, as they are more focused on the overall value for money proposition from their vehicle purchases (Dua, White, and Lindland 2019). That being said, electric vehicles are also continuously improving, especially with respect to their range. Thus, how this issue of discontinuance pans out is a topic worthy of future exploration.

The fact that PEV owners are switching back to non-PEVs because of their dissatisfaction with current PEV ranges suggests that future battery cost reductions would still have to be directed toward improving vehicle range. As such, the solution would be to add more battery capacity rather than lowering vehicle prices. This could likely result in the PEV market continuing to depend on subsidies for longer to attract cost-conscious mainstream buyers, rather than becoming self-sustaining. This would thereby increase the load on government budgets.

The question of whether it is more beneficial to subsidize vehicle development rather than deployment remains to be answered. This means funding research and development (R&D) on longer-range and faster-charging PEV batteries, which could encourage the continued use of higher quality PEVs once adopted. This contrasts with the current strategy of subsidizing PEV deployment, irrespective of quality, which consumers might discontinue after their first purchase. Prior research on the hybrid electric vehicle market suggests that when consumers infer the quality of a technology experientially, an increase in initial exposure to a low-quality product tends to inhibit its subsequent diffusion (Heutel and Muehlegger 2015). In such a case, subsidies intended to speed up adoption in fact have the opposite effect when they propagate low-quality signals: Government subsidies for a given product could indicate to consumers that the product is not able to compete on quality, especially when the consumer hears not-so-positive feedback from others who have already bought it. Finally, it also raises the question of whether subsidy dollars are better spent on charging infrastructure deployment to create and sustain PEV adoption, instead of subsidizing PEV purchases that only drive adoption and not necessarily continued ownership. That being said, subsidies for PEV purchases in the new vehicle market are known to trickle down and support adoption in the used vehicle market by lowering their resale value (Turrentine, Tal, and Rapson 2018).

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