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Refueling Behavior of California Fuel Cell Vehicle Drivers

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Issue

California has a goal of reaching 100% zero emission vehicle (ZEV) sales by 2035. Most ZEV sales to date have been plug-in electric vehicles, with fuel cell electric vehicles (FCEVs) making up only around 1% of ZEV sales. The market for FCEVs may be constrained because, unlike plug-in electric vehicles, FCEVs need an entirely new refueling infrastructure network. To date, only 48 hydrogen refueling stations are operational in California. This number will need to increase substantially for FCEVs to become a viable option for consumers.

Researchers at the University of California, Davis surveyed more than 700 FCEV drivers about their use of hydrogen fueling stations in California to understand consumer preferences and inform the development of future hydrogen infrastructure.

Key Research Findings

FCEV drivers may have preferences for renewable hydrogen over hydrogen produced from fossil fuels. While 70% of FCEV drivers choose to refuel at the station closest to them, those who choose to travel further away are more likely to use a fueling station with renewable hydrogen. This suggests that some FCEV drivers may prefer to use renewable hydrogen.

FCEV drivers' purchase decisions are highly dependent on the availability of their most frequently used fueling station. Seventy percent (70%) of survey respondents

indicated they would not have purchased their FCEV if their primary station were not available. The 30% of respondents who would have purchased their FCEV even in the absence of their primary station use significantly more stations than those who would not have purchased their FCEV. This finding highlights the fragility of the hydrogen fueling network—the loss of just a few stations could slow FCEV adoption.

Around one fifth of California households currently have reasonable access to hydrogen refueling. The researchers defined reasonable access to hydrogen refueling as having three stations within 10 miles of home, workplace, or commute. This was based on the findings that FCEV drivers' closest station is an average of 10 miles away and FCEV drivers use 2.4 stations on average, while also accounting for current station reliability issues (meaning drivers may need access to more stations than they would typically use). Using the criterion, about 22% of California households have reasonable access to hydrogen refueling.

Access to hydrogen stations in California is limited to the Sacramento, Bay Area, and Los Angeles regions (Figure 1). Census blocks with access to even a single station are almost entirely limited to California's largest metro regions. Census blocks with access to three stations (the researchers' criteria for reasonable station access) are further constrained to small areas within these regions.

FCEVs are used for similar commutes as conventional and plug-in electric vehicles, but are used less often for longer trips. FCEVs would theoretically be better suited

for long-distance travel than plug-in electric vehicles, due to their longer ranges and faster refueling times. This finding that FCEVs are less frequently used for long trips may be explained by the lack of a refueling network along longer-distance routes.

Policy Considerations

These findings show that access to hydrogen fueling infrastructure is an important and currently limiting factor in the decision to purchase an FCEV. Another potentially limiting factor not considered in this analysis is the reliability of the stations that do exist. As of December 2021, half all California hydrogen stations were offline, a situation that was present throughout 2021. The impact of this unreliability on FCEV adopters' decision to continue FCEV ownership and potential adopters' decision to purchase an FCEV is not clear. More research is needed to understand the impact of station reliability on the FCEV market.

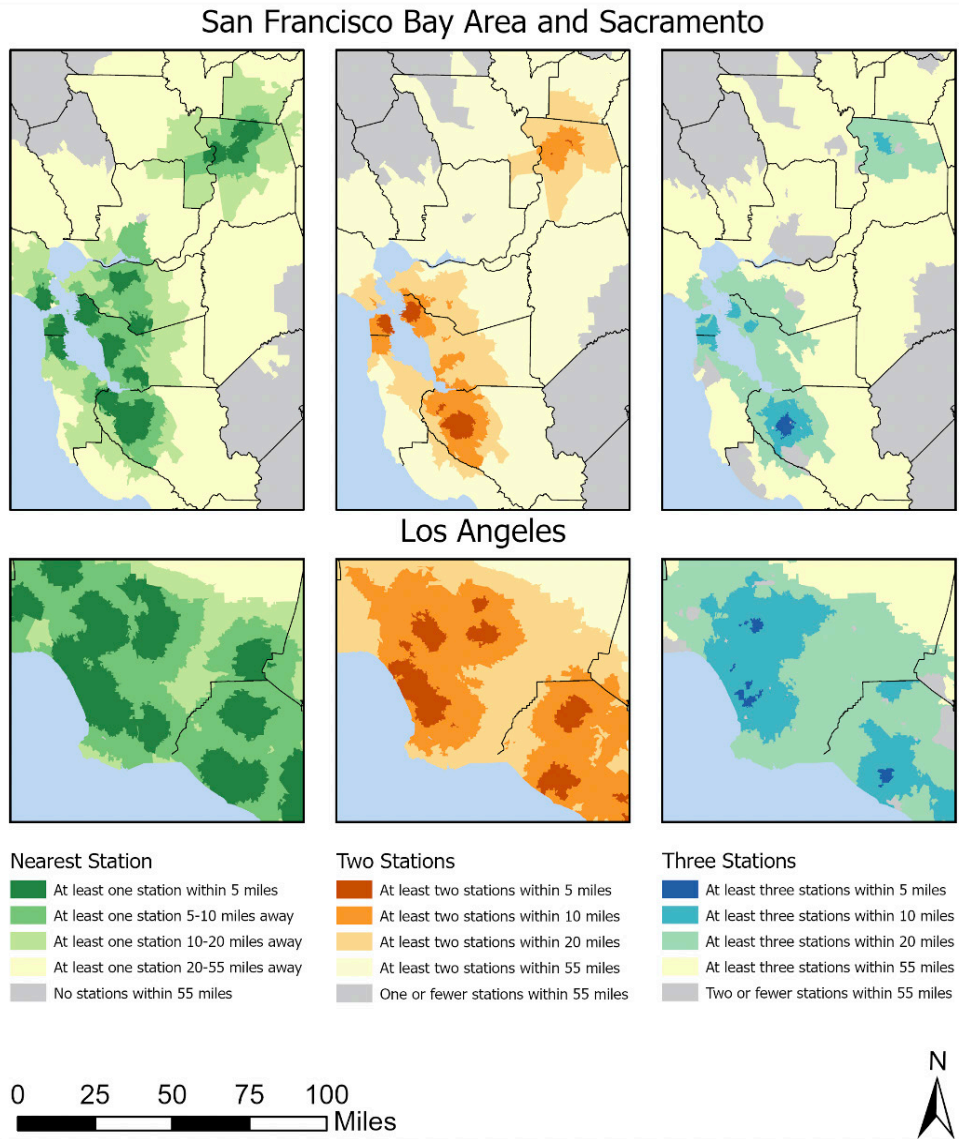


Figure 1. Maps of census blocks with access to one, two, or three hydrogen stations within various distances of census blocks in the Sacramento and San Francisco Bay Area (top) and Los Angeles (bottom) regions

More Information

This policy brief is drawn from the report “Refueling Behavior of California Fuel Cell Vehicle Drivers,” prepared by Scott Hardman, Adam Davis, and Gil Tal of the University of California, Davis. The full report can be found here: <https://www.ucits.org/research-project/2021-33/>.

For more information about the findings presented in this brief, contact Scott Hardman at shardman@ucdavis.edu.

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