



RESEARCH HIGHLIGHTS

If you build it, they may not come: Willingness to participate in managed EV charging

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Can managed EV charging programs help utilities handle rapid electric vehicle growth?

Context

Electric vehicles (EVs) are expected to play a major role in reducing greenhouse gas emissions. But their growing adoption also poses challenges for electricity grids. When many EV owners charge their vehicles at the same time—particularly during evening peak hours—it can strain the “last mile” of the electricity grid. The utility upgrades needed to accommodate a full switch to EVs would cost hundreds of billions of dollars for the United States.

Utilities are now working to confront this challenge. One option could be for utilities to manage the charging itself. This approach would require the EV owner to grant the utility control over their vehicle’s charging behavior, allowing the utility to shift when the vehicle charges to times when demand is low. This study investigates whether consumers would opt into managed charging programs, and whether such programs would cut down on electricity usage.

Research Design

The authors conducted a study with Peninsula Clean Energy (PCE), a utility in San Mateo on the San Francisco Peninsula that has one of the highest EV adoption rates in the country. The study’s authors ran a randomized experiment with the universe of eligible EV-owning households served by the utility, more than 12,000 households.

A portion of the households were asked by PCE if they would enroll in remote charging management, with a varying incentive to participate of \$40, \$20 or \$5 per month or no incentive. Customers were asked to sign up through *ev.energy*, a smart EV charging app, and were told: “[PCE’s] new smart charging app will charge your electric car automatically during times of day with the cleanest and cheapest electricity, while making sure it’s fully charged when you need it, and will tell you how much you’re spending when you charge at home.” Those who decided to join linked their EV to the app and had the option of allowing *ev.energy*’s algorithm to decide when to start charging each time they plugged in.

Because all the households in the sample were already on time-of-use pricing (i.e., they face lower prices in “off-peak” hours than in “peak” hours), for another segment of households, PCE raised the peak prices and lowered the off-peak prices for either the entire home or for just the EV in order to understand whether households would adjust their electricity consumption patterns in response to

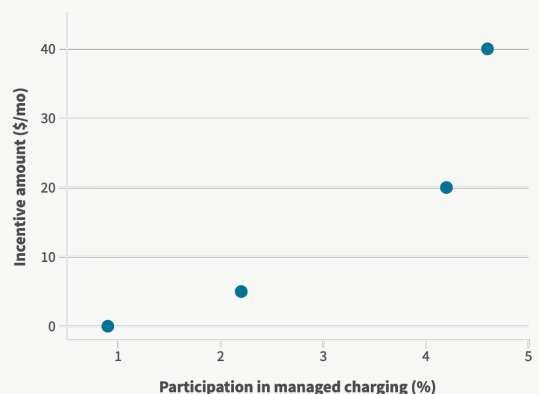
price incentives. There was no managed charging offered to these households. The authors compared their results to households that never participated in the program, as well as households for which PCE only monitored their EV charging patterns.

Findings

Very few households enrolled in the managed charging program, even when offered high incentives. As a result of this low participation, managed charging had no impact on overall electricity use.

Only 4.6 percent of eligible EV owners enrolled in the program, even when offered the highest incentive of \$40 per month—15 percent of the total electricity bill. When offered no participation incentive, just 1 percent of households enrolled; 2 percent at a \$5 incentive; and about 4 percent at a \$20 incentive. With so few households choosing to enroll, the managed charging program had no statistically significant impact on overall electricity use. Overall, the findings suggest that the enrollment rates are too low to alleviate the electricity supply problem, even if the program was able to

Figure 1 • Managed charging supply curve



dramatically adjust charging patterns. The adjustments the authors made to raise or lower time-of-use pricing also did not impact overall electricity use.

Even households that opted into the program rarely activated managed charging.

Once a household chooses to participate in the managed charging program, they then have the ability to activate the managed charging feature every time they plug in to charge their vehicles. Yet, households rarely granted this access. In fact, 20 percent of households who opted into the program never granted access. This shows that households have a preference for control over their own EV charging. That was the case in this study despite the fact that

the households were largely early EV adopters, lending that they would be particularly enthusiastic about EVs; lived in the heart of Silicon Valley, making them likely more willing to engage with apps; and had a relatively well-regarded utility, meaning they may be less averse to sharing data with them. Given these factors, one would expect the households to be more willing to actively engage than the typical American population.

CLOSING TAKE-AWAY

Managed charging could be one way that utilities confront electricity constraints as more EVs hook up to the grid. However, the study highlights how difficult it may be to get customers to voluntarily participate in such programs. To make managed charging programs more successful, regulators could require that EVs and/or high-capacity chargers be registered. Utilities could then track this equipment and make managed charging the default option—an approach that, in other settings, has substantially increased enrollment. However, the study’s findings suggest that households dislike giving utilities control over their EVs, so the benefits of a mandate would need to be weighed against this cost. Additionally, regulators could consider pricing reforms such as demand charges or capacity subscription services where customers pay for a specific amount of usage.