

# Learnings from an in-depth portfolio-level evaluation of EV programs

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## ABSTRACT

Transportation electrification is a key component of the Sacramento Municipal Utility District's (SMUD's) strategy to achieve its accelerated goal of carbon-neutrality by 2030. SMUD has identified that approximately two-thirds of its customer-side carbon emissions are from transportation. To reduce these emissions, SMUD has promoted a wide range of programs aimed at increasing electric vehicle (EV) adoption within their territory and managing when customers charge their EVs.

This paper will present findings from an innovative and comprehensive study from late 2020 of nearly a dozen of SMUD's residential and nonresidential EV programs and incentives. The programs span the entire customer journey from EV consideration through acquisition and use from advertising campaigns, ride and drive events, online vehicle comparison tools, and dealer engagement programs to Time-of-Day (TOD) rates, rebates for EV chargers and forklifts, and support for workplace and public charging.

Study findings are drawn from robust quantitative research among over 600 EV drivers as well as 25 qualitative in-depth interviews among EV dealers and commercial customers. The quantitative web surveys include a conjoint experiment to gauge customer preferences related to EV TOD rate discounts and a chip allocation exercise to ascertain the relative importance of various programs and incentives to customers' EV adoption and use. An array of qualitative in-depth interviews with car dealers, commercial charging site hosts, and electric forklift users provided insights on program value points and experience.

## Introduction

In 2020, SMUD's Board adopted a Climate Emergency Resolution that accelerated its goal and called on the Board to work towards carbon neutrality by 2030 (SMUD, 2020). SMUD had identified that approximately two-thirds of its customer-side carbon emissions are from transportation. Its Transportation Electrification portfolio is an important element of SMUD's path to carbon neutrality and includes offerings in residential vehicle incentives, dealership incentives, residential outreach, commercial charger incentives, and commercial vehicle incentives.

This paper is based on DNV's evaluation of SMUD's EV programs to support its customers' EV journey that span the gamut from Marketing, Education & Outreach to EV adoption and ongoing EV charging and use. This paper presents insights on the extent to which SMUD's interventions influenced the adoption of EVs and the programs most effective at encouraging the customer decision to adopt EVs.

Figure 1 below lists SMUD's EV programs, categorized by the point at which they will impact the customer's EV journey.

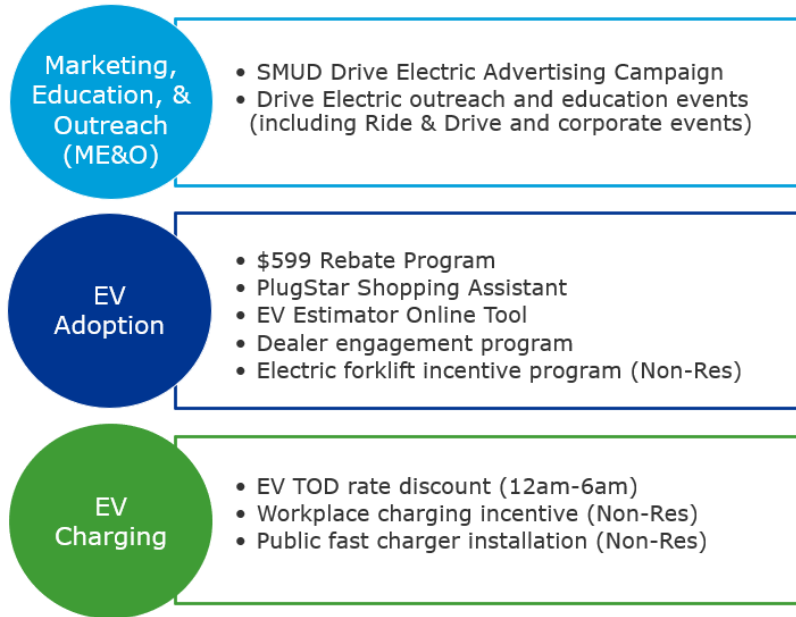


Figure 1. List of SMUD EV Programs, classified by point of customer interception

## Research Approach

Evaluating SMUD’s EV programs entailed a multi-prong research approach that included:

- Online surveys with 714 residential EV drivers who participated in SMUD’s EV TOD rate and/or availed of its \$599 incentive for charging equipment out of a participating customer population of 8,110 drivers
- Phone interviews with 8 auto dealership sales staff out of 20 participating dealers
- Phone interviews with 10 workplace charging participant site managers, directors, and owners out of 17 participants.

The results presented below are based on residential EV drivers’ experience and journey from awareness, consideration, and purchase to ongoing use. Key takeaways are presented within the classifications listed above: Marketing Education and Outreach, EV Adoption, and EV Charging. These findings include insights for SMUD programs that indirectly encourage EV adoption by strengthening the EV ecosystem and serve residential EV drivers through the purchase process and use of EVs such as auto dealer engagement programs and workplace charging programs respectively.

## Results

### Portfolio-Wide Results: Financial incentives have highest relative importance among programs to drive EV adoption

A key objective of the EV driver survey (n=714) conducted amongst EV drivers who participated in SMUD’s EV TOD rate and/or availed of its \$599 incentive for charging equipment was to understand the importance that various SMUD programs and incentives had on the customer decision to acquire an EV, both when considered on their own and in the context of other manufacturer, federal, and state incentives. These EV programs and incentives included the following:

- SMUD Drive Electric Advertising Campaign
- SMUD Ride-n-Drive and Corporate events

- EV dealerships certified by Plug-in America
- SMUD Plugstar Shopping Assistant Online Tool
- SMUD EV Estimator Online Tool
- SMUD Public Fast Charger Installations
- SMUD Workplace charger installations
- SMUD discounted electricity rate for EV charging (between midnight and 6am)
- SMUD \$599 cash or free Level 2 EVSE also advertised as “Charge free for 2 years”<sup>1</sup>
- Manufacturer Incentives (sales, trade-in specials)
- Federal tax credit for electric vehicles (up to \$7,500)
- State Clean Vehicle Rebate Project rebate (up to \$2,000)

Survey respondents were asked: “We would like to understand the relative importance of various incentives had on your decision to acquire your EV. Please allocate 100 points across the various incentives and initiatives listed below according to **the relative importance of each of these in terms on your decision to purchase or lease your electric vehicle(s).**” In this question, zero points assigned to an incentive or initiative indicated it was not relevant to them or had no influence on their decision to adopt EVs whereas 100 points allocated to an initiative or incentive indicated it was most important program in their decision to adopt EVs. Respondents were asked to use all 100 points and distribute these across the incentives that were important to them. Because it was expected that the impact of federal incentives would be substantially higher than SMUD’s smaller programs, researchers wished to understand SMUD’s program impacts isolated from federal program impacts prior to considering the collective impact of all SMUD and federal programs. Respondents were therefore asked to undertake the point allocation exercise twice – first considering just SMUD’s EV incentives and programs and then repeating the exercise when also factoring in manufacturer, federal, and state incentives along with SMUD EV incentives and programs.

Figure 2 presents a summary of the relative importance that customers placed on that array of SMUD and federal programs. Customers indicated that when considering all EV-related programs and incentives aimed at encouraging EV adoption, their decision to adopt EVs was in large part driven by: federal incentives (37%), state incentives (25%), SMUD’s EV TOD rate (15%), SMUD’s \$599 charging rebate (11%), and manufacturer incentives (6%). The upfront purchase cost of EVs remains a significant barrier for customers, and financial incentives help overcome this barrier. While battery prices have steadily fallen, EV prices have not achieved purchase price parity with gasoline vehicles. The manufacturer’s suggested retail pricing (MSRP) for EVs in the United States remains significantly higher than that for similar gasoline-powered vehicles, despite an 89 percent drop in battery costs over the past decade (BloombergNEF, 2021).

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<sup>1</sup> Customers had a choice between \$599 cash, or a free Level 2 EVSE unit, both of which had a value roughly equivalent to the average SMUD customer’s home charging at SMUD’s EV TOD discount rate for two years.

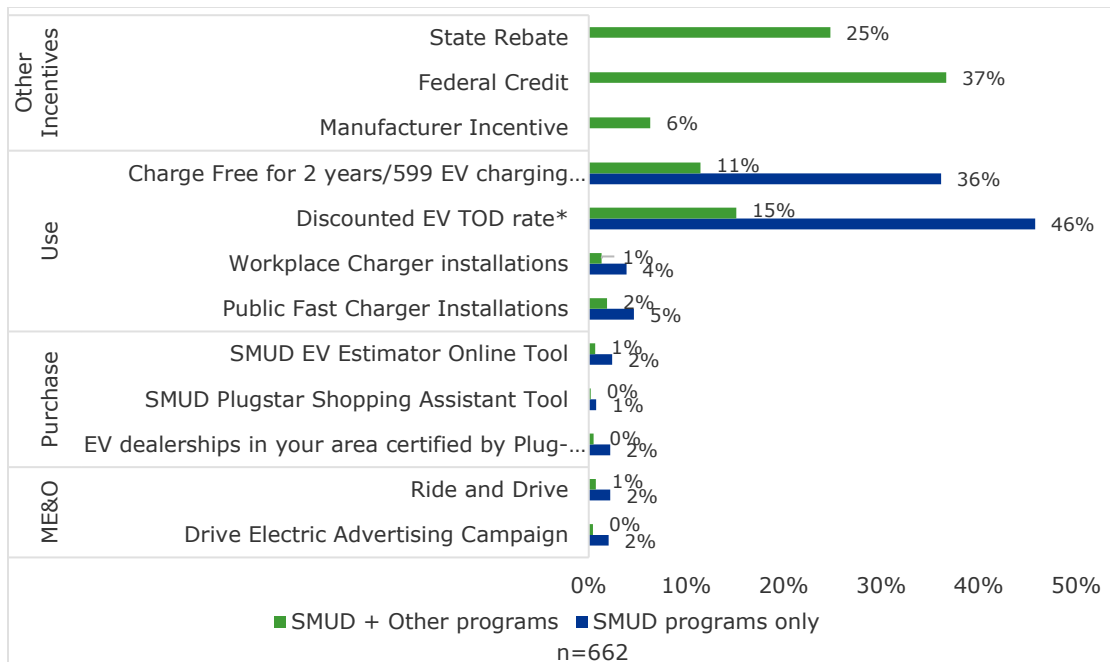


Figure 2. Relative importance of various SMUD, state, and national EV programs in decision to adopt EVs

The importance of financial interventions in EV adoption is further underscored when considering just the SMUD EV programs. Customers indicated that 82% of the decision drivers to adopt EVs (i.e., over four-fifths of their 100 points) were concentrated on the two financial incentives from SMUD – the discounted EV TOD rate and the \$599 EV charging rebate.

**Marketing Education and Outreach Results: Refined customer segmentation and dealer perspectives reveal the importance of Ride and Drive events**

SMUD’s Drive Electric outreach and education campaign includes Ride and Drive EV events. A Ride and Drive event is a gathering that SMUD hosts for private or public groups, where SMUD’s customers can test drive EVs and speak with experts who can answer customers’ questions. While Figure 2 indicates that Ride and Drive events were a relatively low contributor to the customer decision to adopt EVs (2% when just considering SMUD programs), further analysis uncovered that this program did have significant impact, but lower awareness and engagement. Among the subset of customers who are aware of SMUD’s Ride and Drive events, customers allocated 10% of relative importance to Ride and Drive events; among those who participated in an event, it gathered 18% of relative importance (Figure 3).

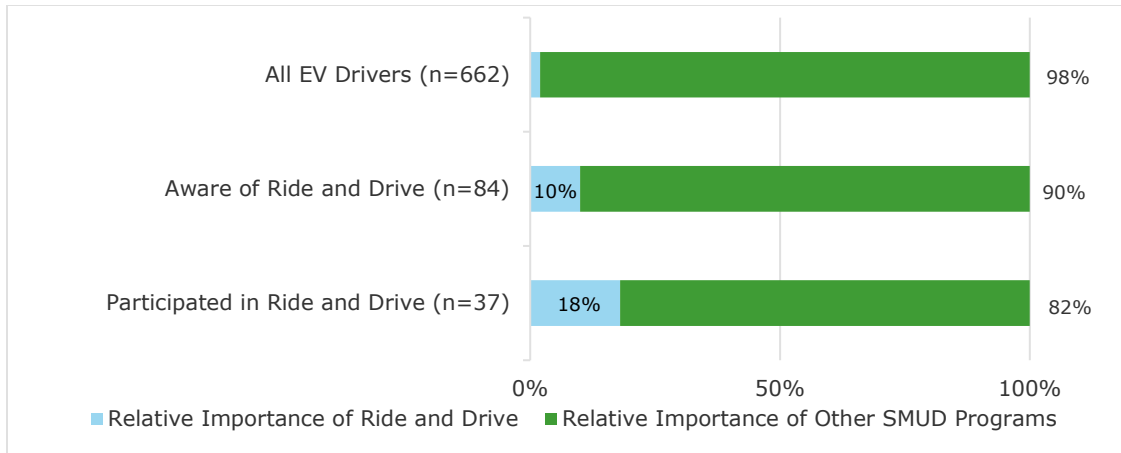


Figure 3. Relative Importance of Ride and Drive increases with exposure to program

While the size of the customer segments that are aware of and participated in the Ride and Drive events is small, these events were a driver of the customer decision to adopt EVs for these customers. Among customers who attended the events, the key motivators of attending Ride and Drive events were to learn more about the EV brands and models available (78%) and have the experience of driving an EV (70%). Customers attest to a high level of satisfaction with Ride and Drive events and, while these events are not the sole driver of adoption, they are a significant contributor to the conversion funnel from awareness to consideration and finally to purchase of EVs for a segment of customers, with 73% of customers stating that they acquired an EV after attending a Ride and Drive event (Figure 4). Taken together, this suggests that while Ride and Drive events had 2% of relative purchase importance on average across all customers, only 13% of respondents were aware of the events, 73% of those who did attend them ultimately purchased an EV after attendance, and Ride and Drive participants allocated an average 18% of their decision to purchase an EV to the event itself.

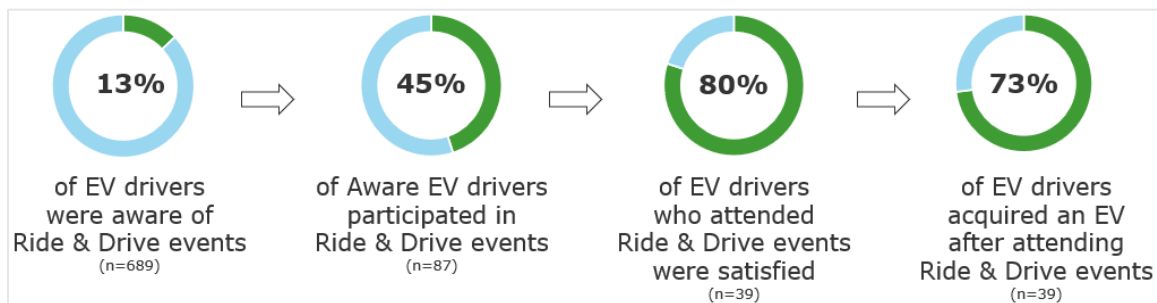


Figure 4. SMUD Ride and Drive Program Profile

Dealer perspectives gathered from interviews with them indicate a positive response to Ride and Drive events as well. Dealers stated that SMUD events have helped to promote and get customers interested in EVs. Dealers also shared that event participation and training have helped shape how their salespeople talk about EVs to customers.

**EV Adoption Results: Dealer engagement program refinements offer opportunity for an improved EV customer experience**

SMUD’s dealer engagement program implemented by Plug-in America has provided training to more than 230 sales staff and includes 20 certified trained dealerships in, and close to, its service territory.

Once a dealership has engaged in the training, SMUD considers them to be “PlugStar certified.” To the extent possible, our research looked for impacts that PlugStar certifications had on customers’ experiences. Over half (55%) of all current SMUD EV drivers who responded to the survey indicated that they purchased their vehicle in-person at an auto dealership<sup>2</sup> and around one-quarter (24%) began their purchase process online but finalized their EV purchase in-person at a dealership. In sum, nearly 80% of all EV purchases were finalized in-person at a dealership. Of those who purchased their EV in-person at a dealership, over three-fourths (77%) purchased their EV from an auto dealership in the Sacramento area. The research underscores the importance of auto dealers as an influential market actor in customers’ EV adoption journey.

While less than one-fourth (22%)<sup>3</sup> of all current SMUD EV drivers who purchased their vehicle in-person at an auto dealership stated that their dealer was influential in their decision to acquire an EV, 90% of these customers stated that they were very confident that they wanted to buy an EV when they started their vehicle purchase journey. Furthermore, while 57% characterized their dealer’s attitude towards EVs as positive and proactive about explaining the benefits and sharing helpful information, 41% indicated that their dealer was neutral and did not encourage or discourage customer decisions related to EVs, and 2% indicated that their dealer was negative and actively discouraged EVs. Results from a national study conducted in 2019 revealed that 74% of American auto dealerships still weren’t selling any EVs and that of the 26% of dealerships that did have an EV to sell, “66% of them did not display them prominently, with vehicles sometimes buried far in the back and hard to spot” (Sierra Club, 2019). Report findings revealed a more positive in California for EVs with 75% of dealerships with EVs displaying them prominently on the lot.

Respondents were asked to indicate the type of guidance, if any, their dealer may have provided them regarding EVs. Respondents were shown a list of possible items and instructed to select all the information or guidance they received from their dealer. Responses reveal that the auto dealers serve as a conduit of information for a significant proportion of EV drivers. Almost half indicated that their dealer told them about federal and state incentives for EVs (Figure 5). These findings are in line with results from the aforementioned Sierra Club report which revealed that dealers in CA were forthcoming with EV related information with 60% providing information to customers up front on state/federal rebates and tax incentives that would save customers money (Sierra Club, 2019).

Between 33% and 42% variously stated that their dealer told them about how EV charging worked, EV charging equipment, and how long it took to charge and EV. The crucial role of dealers in educating customers and boosting EV adoption is echoed in the finding from a national study that 31% of all respondents indicate a dealership salesperson would be among their primary sources of information (Businesswire, 2021).

Only 27% of all customers stated that their dealer provided them with information about SMUD’s EV incentives and 23% stated that their dealer provided them with information about total cost of ownership for EVs.<sup>4</sup> These represent opportunities for SMUD’s EV dealer engagement programs. SMUD and its EV program implementation partners can provide dealers in its territory a checklist of essential EV information to be communicated to customers, both related to SMUD programs and to EVs themselves, so that the dealers can ensure customers are well-informed when making a vehicle purchase or lease decision.

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<sup>2</sup> Dealership purchases include Tesla purchases, which are technically not purchased from a “dealership”, but rather a “showroom” selling Teslas directly from the manufacturer to the consumer.

<sup>3</sup> Percent of respondents with a 7-10 response on a 1-10 strength of influence scale

<sup>4</sup> Approximately two-thirds of local dealerships participate in SMUD’s Dealer Engagement program. Results presented here are based on customer engagement across participating or non-participating dealerships.

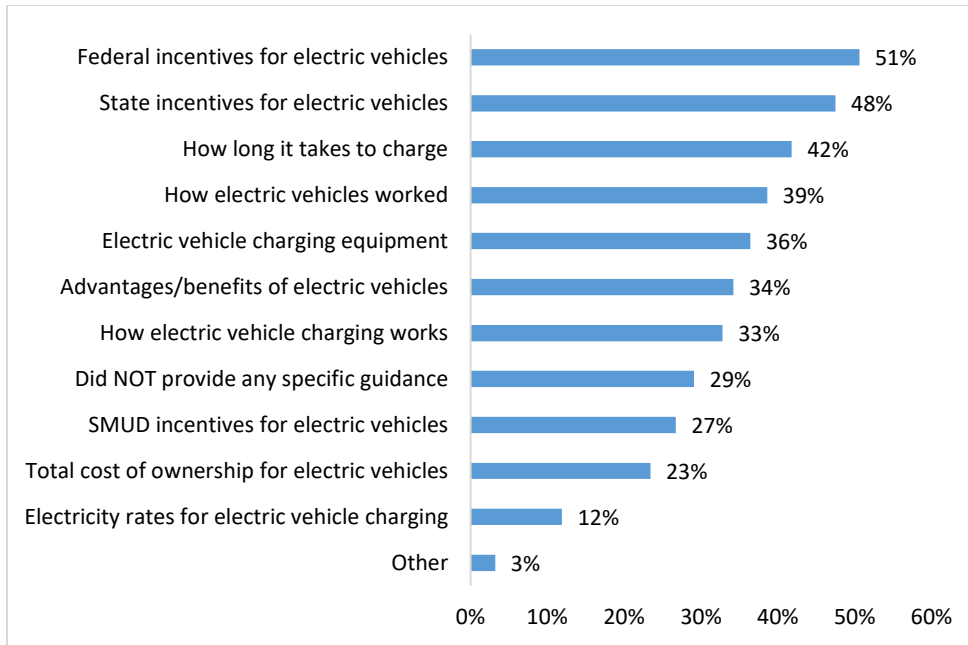


Figure 5. Information provided to customers by auto dealers on EVs (n=632)

Viewed collectively, customer and dealer responses indicate that there is room for improvement with respect to dealer engagement. Dealer engagement programs aim to serve EV drivers better by equipping them with the information they need.

As shown in Figure 6, EV drivers revealed a series of insights that demonstrated there is still opportunity to strengthen dealer knowledge and support of EVs. Sixty-three percent of respondents indicated that dealers were knowledgeable, and only 27% say dealers provided guidance on SMUD’s local incentive options. Overall, EV drivers expressed a desire for dealership salespeople who specialize in EVs who could guide them through the EV purchase and use the process knowledgeably. Program refinements that could improve the customer experience include the following:

- Continued dealer staff education as incentives and programs evolve
- Developing marketing collateral on EVs to support EV dealers
- Developing checklists of essential EV information for salespeople
- Developing window inserts for EVs on SMUD’s EV TOD rate discount

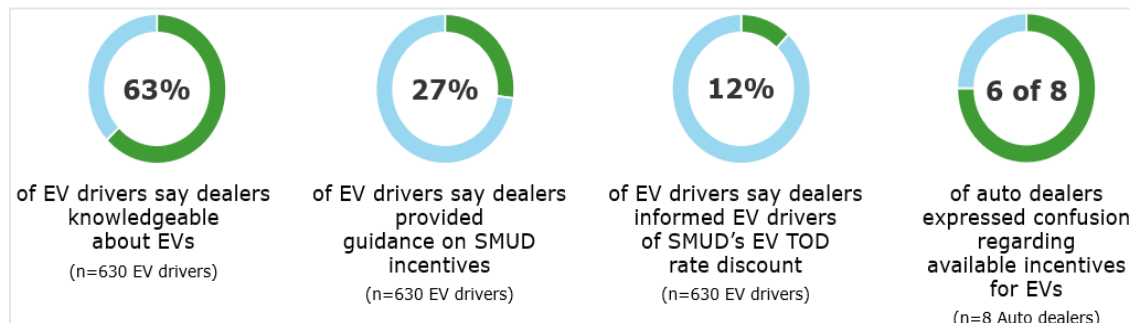


Figure 6. Dealer engagement profile

## EV Charging Result 1: Opportunities exist to optimize EV charging environment

SMUD provides a \$1500 incentive to encourage EV charging installations<sup>5</sup> at workplaces and multifamily properties. Over one-fourth (27%) of all EV drivers indicated that they were aware that SMUD sponsored charging installations at workplaces. Of those who were aware of SMUD sponsored workplace charging installations, over one-third (35%) indicated that the availability of workplace fast charger installations was influential in moving them further towards their decision to acquire an EV.

One-third (33%) of all EV drivers indicated that they were aware that SMUD sponsored charging installations at commercial public sites. Approximately two-fifths (41%) of those who were aware of SMUD sponsored public charging installations indicated that the availability of public fast charging was influential in moving them further towards their decision to acquire an EV.

Respondents were asked about their current charging behavior and the share of EV charging that occurred at home versus at work and other public locations. They were also asked about what their desired share of charging was across these options. Residential customers indicated that they would like to be able to do more of their EV charging at workplace and public charging installations (35%) compared to current levels (23%; Figure 7).

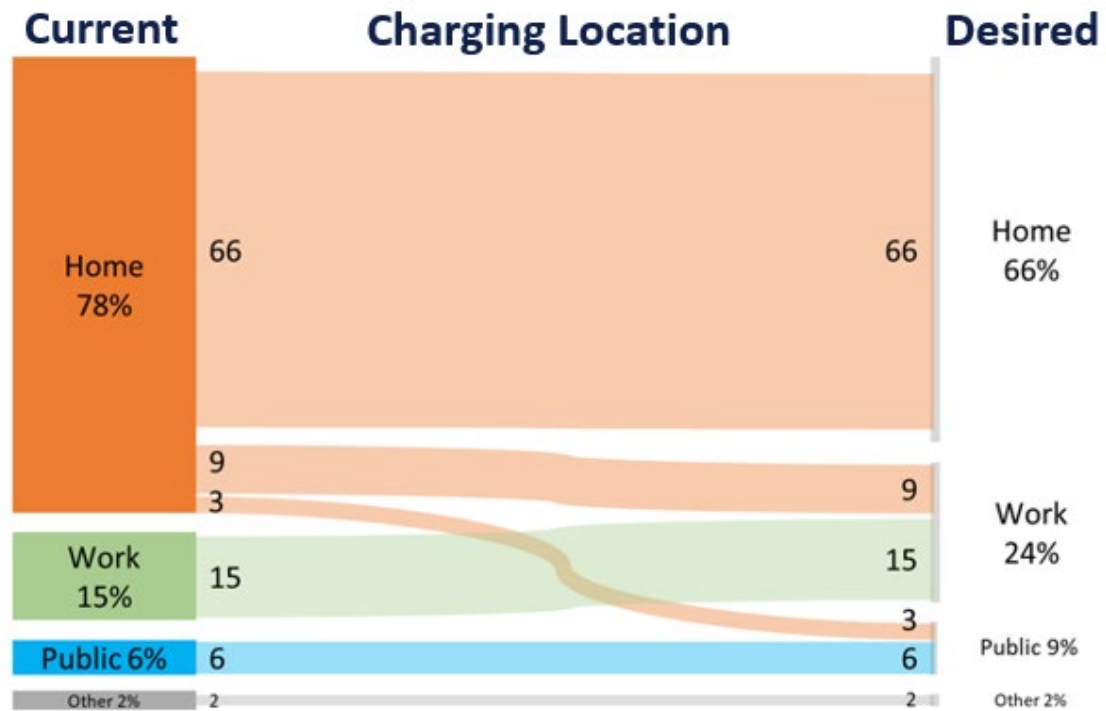


Figure 7. Customer charging location preferences (n=632)

While the majority of EV drivers indicated that the charging options available to them have not been a barrier to EV use and that the coverage provided by current EV charging installations was sufficient for their daily needs, around one-fourth of all EV drivers, on average, indicated that there is some room to optimize the EV charging environment to suit their EV use needs (Figure 8).

<sup>5</sup>

SMUD provides \$1500 per qualified Level Two (208/240 volt) EV charger. <https://www.smud.org/-/media/Documents/Going-Green/Workplace-MultiFamily-Charger-Incentive.ashx?la=en&hash=5D4AAAF5899F75C4AE73564C2CAC8444E199D898>



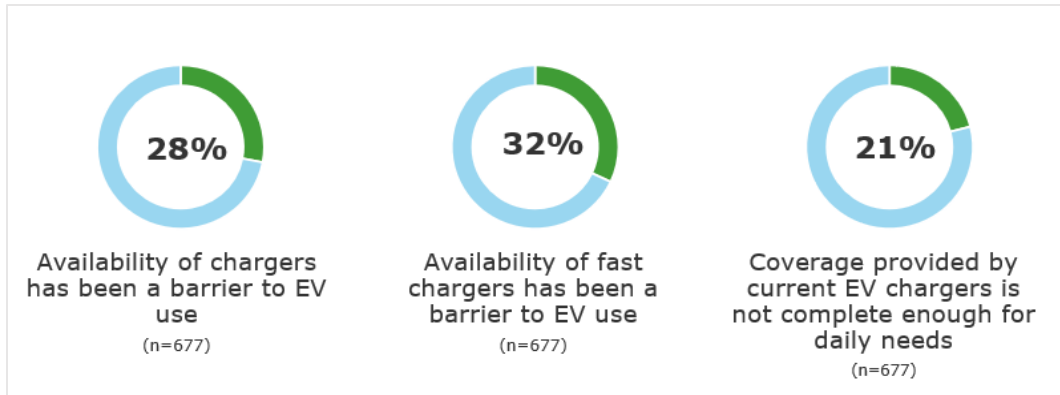


Figure 8. Customer perception of sufficiency of current EV charging environments

Corroborating evidence confirms that Sacramento County has an opportunity to expand public charging infrastructure and further meet customer expectations. An analysis of county population and public EV charger count for the counties in California is summarized in the chart below (Hsu and Fingerman, 2021, Figure 9). The blue line represents the regression best-fit line ( $r$ -square = 0.95). Los Angeles county, with a more than 10 million population, is not shown on the figure and lies close to the best-fit line. Counties with the five most positive and five most negative residuals are labeled. Sacramento County has significantly lower public charging installations per capita than other Northern California counties such as San Mateo and Santa Clara. Especially as programs seek to widen their reach beyond affluent early adopters of EVs, strengthening EV charging environment options for multifamily residents who may not have access to residential charging facilities will be important to alleviate range anxiety.

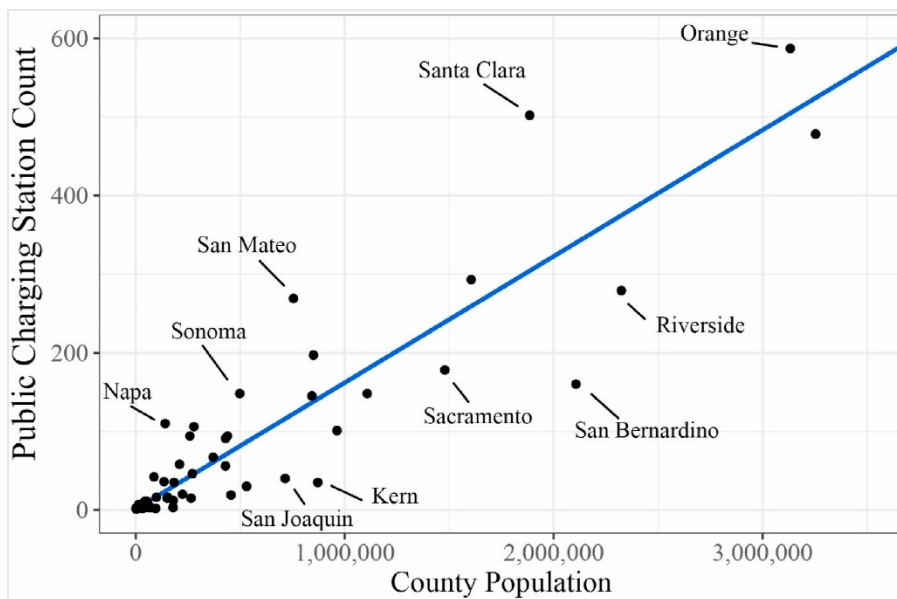


Figure 9. Public charging installations by county population in CA

## EV Charging Result 2: SMUD initiatives to build out EV charging receiving positive feedback

Interviews with workplace charging participants (hosts) revealed that the majority of respondents (70%) contacted SMUD directly to engage in the program. Around one-third (30%) indicated that they were motivated to participate in the program due to demand from their employees and tenants and 20%

stated that they were motivated by the potential for additional revenue collected via charger usage fees. Participants indicated a few challenges with program participation including permitting, interconnection, charger setup and operation.

Workplace charging program participants said that charger use was higher than expected and that their participation in the program drove up curiosity about EVs as an option among employees and tenants. Given that an employee with access to workplace charging is estimated to be six times more likely than the average worker to drive electric (DOE, 2017), increasing the reach of these programs will yield positive outcomes.

While program attribution for SMUD’s workplace charging program is low with two-thirds of the participants stating they would have installed the same number of chargers at the same time without SMUD program support, workplace charging participants (hosts) indicated value in SMUD’s assistance with the technical aspects related to charger installation and roll-out.

Approximately one-quarter (27%) of EV drivers who responded to the survey indicated that they were aware that SMUD sponsored charging installations at workplaces. Of those who were aware, approximately one-third (35%<sup>6</sup>) indicated that the availability of workplace fast charger installations was influential in moving them further towards their decision to acquire an EV. Collectively, these findings underscore the importance of the availability of sufficient EV charging options in boosting customer adoption of EVs.

### EV Charging Result 3: Residential EV charging program and TOD rate discount influence customers and behaviors

Respondents were presented with various charging incentive configurations based on the level of monthly savings expected from their EV TOD rate, availability of weekend EV TOD rate discounts, and incentives for EV charging equipment. The various incentive charging features and levels explored in the research are summarized below (Figure 10).



Figure 10. EV charging incentives explored in conjoint experiment

Respondents were asked to consider configurations based on varying levels of features in order to determine key drivers of choice related to EV charging incentives. Analysis of these responses indicates that the incentive for EV charging equipment was the most important determinant of customer choice (51%) when considering various charging incentive offer configurations (Figure 11).

<sup>6</sup> Percent with a 7-10 response on a 10-point influence scale

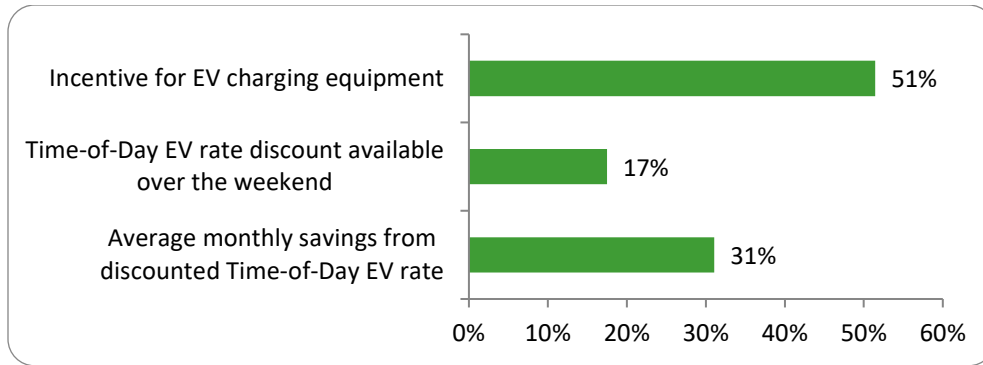


Figure 11. Residential charging program preferences (n=677)

Respondents who were on the EV TOD rate were also asked how likely they would have been to charge their EVs off-peak overnight (between midnight and 6 a.m.) if they did not have a discounted rate for off-peak overnight charging (between midnight and 6 a.m.).<sup>7</sup> Over half (53%) indicated that they would not have been likely to shift their charging to this off-peak overnight period between midnight and 6 a.m. in the absence of the discounted EV TOD rate. Viewed collectively, these findings indicate SMUD’s charging incentives are moving the needle on EV adoption and charging behavior.

## Conclusions and Recommendations

Study findings provide useful customer and program insights that lead to the following conclusions and recommendations. For customers exposed to Ride and Drives, these events were significantly influential in contributing to their decision to adopt EVs. Customers indicated that dealers were an important conduit of information about various EV incentives and charging related information. SMUD programs should continue tackling the entire EV customer journey with a focus on marketing, education, and outreach and EV charging support. Increasing marketing for educational initiatives such as Ride and Drive events and increasing dealership clarity on incentives with supporting material and training is recommended.

About one-fourth of EV drivers expressed insufficiency in the EV charging environment. Expanding access to public charging and continuing partnerships with site hosts as a trusted advisor will improve the customer experience by offering EV drivers more flexibility in charging options. Access to workplace, multifamily, and public EV charging options will be especially important when looking ahead to increased penetration of EVs and bringing in customers from less affluent demographic segments who may lack access to dedicated residential EV charging options.

Recommendations for future research include studies to support the development of additional residential EV charging rate offerings to leverage the EV TOD rate’s success in influencing charging behavior and achieving customer satisfaction, investigating customer perceptions on differences in dealer knowledge, guidance, SMUD EV offerings, and incentives based on experiences at PlugStar certified and non-PlugStar certified dealers.

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<sup>7</sup> How likely would you have been to charge your electric vehicle(s) off-peak (between midnight and 6 a.m.) if you did not have a discounted rate for overnight charging (between midnight and 6 a.m.)?

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