Successful Practice Guidelines

For Community Choice Energy Programs

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Electric Vehicle Incentive Program

Introduction

The transportation sector currently accounts for 37 percent of California's total greenhouse gas (GHG) emissions (California Air Resources Board, 2017). Switching from internal combustion to electric vehicles (EVs) can lead to community benefits including GHG emission reductions and air quality improvement. Because CCE-procured electricity tends to have higher renewable energy content than IOU-procured electricity, these potential benefits are greater when CCE customers switch to EVs. California has seen faster uptake of EVs than much of the US, but there is still room for growth, with EVs making up about 5% of new vehicle sales across the state (Lutsey, 2017). One method for increasing uptake of electric vehicles is to offer financial incentives to customers (Sierzchula et al, 2014, Tanaka et al, 2014). Here we present recommended practices for designing EV incentive programs, based on literature review and case studies of past programs.

EV market in California

California has the largest EV market share in the United States, and the EV market is growing quickly. The cities of Palo Alto, Los Altos, and Saratoga have the highest EV market shares, each greater than 20% in 2016 (Lutsey, 2017). EV sales in Rancho Santa Margarita, Los Angeles, and San Rafael showed rapid EV sales growth in 2016, with sales increasing by more than 100% compared to 2015 (Lutsey, 2017). Some of the main drivers of these high EV sales are high gasoline prices, availability of charging infrastructure, EV rebates and access to carpool lanes (Tanaka et al, 2014; Narassimham & Johnson, 2014). California's large and growing EV market make it a prime location for implementing EV programs.

Recommendations for Rebate Design

- **Offer upfront incentives**: People tend to value future savings less than immediate savings (Dreyfus et al., 1995; Gallagher et al., 2011). Because of this, incentives that lower the upfront costs of a vehicle purchase, such as waived excise or sales tax, are more effective than incentives that accrue later, like tax credits, registration fee waivers, and delayed rebates (Diamond, 2009; Narassimham and Johnson, 2014).
- **Clear and easy application process**: People are discouraged by complex rebate program processes and ambiguous information. Eligibility and application requirements should be very clear to incentive applicants (DeShazo et al., 2017). In a survey conducted for Connecticut's CHEAPR program, respondents highly preferred rebates offered at the point of sale by the dealer to rebates applied for by the consumer and received after the sale (Johnson et al., 2017).
- **Income-based incentives and vehicle price caps:** DeShazo et al. (2017) used an empirical model to show that offering rebate levels based on income, with low-income consumers eligible for larger rebates, improved the cost-effectiveness of a rebate policy,

in terms of amount spent per rebate-caused vehicle purchase. This is because income-based rebate levels reduce the amount spent on consumers who would have purchased an EV regardless of being offered an incentive. Similarly, DeShazo et al. found that a $60,000 vehicle price cap improved cost-effectiveness of a rebate program. At the state level, an income cap on the California Vehicle Rebate Program (CVRP) has had little impact on overall growth of EV sales in California (Lutsey, 2018). A regression analysis conducted by NREL shows that there is a smaller EV sale impact per rebate for luxury EVs (e.g. Tesla) than for other EVs (Clinton et al., 2015).

- **Dealer education**: Dealers generally prefer selling ICEVs to EVs because of their familiarity with ICEVs (Cahill et al., 2015). Helping dealers understand existing EV incentive programs and providing relevant information about the vehicles can lead to increased EV sales. The Center for Sustainable Energy found that offering dealers incentives to sell EVs boosts EV sales as well (Johnson et al., 2017).

Drive EverGreen Case Study: Lessons Learned

Sonoma Clean Power (SCP) ran a three-month pilot program called Drive EverGreen in 2016, in which the agency offered $2,500 rebates to customers who purchased or leased a qualifying EV. A $5,000 rebate was offered to qualifying low-income customers. SCP also negotiated additional discounts of $10,000 on qualifying purchases from participating EV dealers, which did not add to SCP costs. The program supplied 206 incentives for leased and purchased vehicles. Drive EverGreen was quite successful in reducing GHG emissions at a low cost to the agency, and SCP repeated it with even better results in 2017 (Center for Sustainable Energy, 2017 and 2018).

We believe the basic design elements of these pilot programs will likely become a standard model for EV incentive programs, although there are other program designs, e.g. Peninsula Clean Energy (2018). SCP and the Center for Sustainable Energy (2017) published an evaluation of the 2016 Drive EverGreen program that includes lessons learned and recommendations for running similar programs. These include:

- **Clearly communicate program features:** Survey respondents who participated in the incentive program reported confusion regarding the amount and types of incentives for which they were eligible.
- **Include a variety of options:** Survey respondents who did not redeem a Drive EverGreen incentive reported being dissatisfied with the eligible vehicle choices. For the 2017 program, SCP increased the number of eligible vehicles from 2 to 9.
- **Invest in program marketing and outreach:** Survey respondents reported a high degree of satisfaction with the incentive amount offered. When incentive programs offer a clear benefit to customers, it can be more cost-effective to increase spending in marketing and outreach than to increase the amount of the incentive. The state incentive program, CVRP allocated 50% of its program administrative funds to outreach (Stern, 1999).

- **Plan for long-term programs:** Some survey respondents applied for the incentive program, but were unable to redeem their incentive and purchase a vehicle during the three-month program.

Additional Considerations

- **Investing in charging infrastructure:** More charging infrastructure tends to increase willingness to drive/purchase EVs (Sierzchula et al, 2014). Across California, cities with the highest density of public charging stations have higher EV market shares (Lutsey, 2017). Investing in public charging infrastructure is a cost-effective incentive for spurring EV purchases (Jin et al., 2014).
- **Marketing strategies:** Effective marketing of incentive programs is crucial to program success, and investing in it can be more cost-effective than offering a higher incentive to customers. Consumers also tend to undervalue the cost savings associated with driving an EV (Hagman et al., 2016). Effective marketing can be used to inform customers of all available incentives and improve understanding of the true cost of EV ownership.
- **Lease option availability**: Leasing is attractive for electric vehicles because it allows consumers to embrace the latest technology available while removing the risk of unknown or unpredictable vehicle and battery depreciation, maintenance costs, and technology changes (Loveday, 2013). As such, the electric vehicle leasing rate in the United States is significantly higher than the overall vehicle leasing rate: 86% of new Nissan Leaf drivers and 44% of Chevrolet Volt drivers, for example, compared to 22% of conventional vehicle drivers leased based on a 2013-2014 survey (NRC, 2015). In addition, there has been a general shift from buying to leasing vehicles from 16% in 2009 up to 27% in 2014 in the United States (Kessler, 2015). Therefore, offering incentives for leased EVs will likely increase the uptake of an incentive program.
- **PHEV option availability**: The benefits of offering incentives for PHEVs depends on the battery capacity and electric range of the vehicles, as well as the energy mix used for charging. Plötz et al. (2017) estimates that a PHEV with an electric range of 20 km will on run on electricity for 15-35% of its miles driven, on average. This increases to 40-50% for an electric range of 40 km and 75% with an electric range of 60 km. A greater electric range and cleaner electricity mix will result in greater benefits associated with incentivizing PHEV purchases.

Solar Financing

Introduction

Residential solar demand in the United States has grown significantly over the past decade, and with a declining cost of solar panels, more and more people are choosing to purchase rather than lease the panels (Litvak, 2017; SEIA, 2017). Given that the average cost of a residential solar photovoltaic (PV) system ranges between $15,000 and $35,000, many people choose to cover the cost of solar through financing rather than purchasing up front (Hausman, 2015). There are number of financing options currently available for residents in California, including PACE programs, home improvement loans, and solar-specific financing (Go Solar, n.d.). However, financing institutions typically provide loans only to people with a minimum FICO credit score of about 650 to 700, thus excluding homeowners with subprime credit scores from owning a solar PV system and benefiting from government incentives for purchasing one (DiGangi, 2015).

Providing loans to people with lower credit scores may help to accelerate the adoption of solar in California, as has been shown to occur in certain locations with credit-blind PACE financing (Ameli et al., 2017). Some additional attributes of financing from CCE agencies that can accelerate adoption are:

- The additional marketing that occurs with the launch of a program, as well as the fact that the financing is from or associated with CCE agencies, prompts people to think about solar anew and lends the credibility of the agency (Kirkpatrick & Bennear, 2014).
- If on-bill financing is chosen for repayment, it can lower some customers' resistance to having yet another separate expenditure to pay (de la Rue du Can et al., 2011).
- CCE agencies uniquely have the ability to make solar PV more financially feasible for some customers by bundling it with related products and services, such as EV incentives, heat pump incentives, or smart thermostats and demand response.
- Finally, agencies could even work out bulk purchase deals with solar contractors or manufacturers, which they have done with EV incentives as described above.

CCE agencies can enter solar PV financing by creating new in-house financing products, as was done with the Sonoma County Energy Independence Program, or by endorsing and coordinating with existing financing companies (Kirkpatrick & Bennear, 2014). The latter can range from simply co-marketing an existing program to providing a loan loss reserve that protects the external lending institution in case of customer default (Menten and McNeil, 2016). Another, untested option would be to subsidize external financing to lower the effective interest rate for customers. Depending upon a program's design and interest rate, it can be an inexpensive or even value-generating option.

Financing Program Design Considerations

- **Interest rates**: Currently available solar financing interest rates can range widely from less than 3% to nearly 10% (DiGangi, 2015). These rates are determined by a number of factors, a major one being customer credit scores.
- **Market size:** The solar market in California is shrinking as the percentage of homeowners with solar grows (Litvak, 2017). The growth rate of solar uptake in California seems to be declining, indicating that demand for solar financing could decrease. This may be attributable to market saturation and/or reduced customer acquisition effort by the biggest national installers, which are seeking to protect themselves with a more sustainable business model. Another possibility is that California is simply entering a period of slower, more sustainable growth in residential solar uptake whose market will rebound if there is sufficient demand among the early majority consumers in the population (Perea, 2017).
- **Uncertain market trends**: The recent development in California state policy requiring all new homes to have solar panels beginning in 2020 may alter the need for solar financing in unpredictable ways (California Energy Commission, 2018). Agencies should consider potential effects when designing a financing program after that time. With changes such as this, users of our PV model after 2020 should update its assumptions and be aware of any way in which it may not reflect current market trends with the new policy.
- **Solar size and price trends:** As solar panel and soft costs decrease, consumers are responding by covering more of their energy needs with their solar systems, and may be more likely in the future to invest in higher quality components and energy storage. The imposition of Time of Use rates by utilities and CCE agencies may also drive storage demand (EnergySage, 2018). These trends create implications for agency revenue as well as program design, especially if agencies consider add-ons like bundling storage, EV and EV charger incentives, or bulk purchasing of solar components or services.
- **Rebates**: Solar financing can complement local and federal rebates and tax credits to make solar more affordable. It is important to communicate all of these benefits to potential solar customers, particularly to those of lower income and/or lower credit scores so that they are maximally incentivized to purchase a PV system for their home.

Solarize Case Study: Building Community and Consumer Trust

The state of Massachusetts launched Solarize, a campaign meant to get local communities to install more rooftop solar PV. While this was not a financing program and the communities interviewed are smaller (population <50,000) than many CCE jurisdictions, CCE agencies can use some of its design and marketing principles in their own programs. We interviewed two communities that participated: Northampton and Amherst.

Program Design Elements

- **Local volunteer engagement.** Communities would recruit local volunteers to help market the program and coordinate with city staff. One volunteer was designated as the liaison between the city staff and other volunteers.

- **Vetted solar contractors.** Massachusetts first vetted a set of contractors that could participate in the program. Communities could then review the list of approved contractors, interview some, and decide on one to handle all installs in the community during the program. This was an important aspect of the program because it helped build trust in residents, who knew the contractor had the cities' support.
- **Tiered pricing.** The first installations would pay an initial rate per kW on their system. As the city reached certain thresholds on the number of installations, the following installations would be discounted. At the end of the program, a rebate would be given to the first installations to equalize the cost among all participants. The rebates would be provided by the solar contractors as they received bulk pricing on materials as they installed more solar panels. The solar contractors would pass their savings along to the residents as rebates and discounts. This would encourage the community to come together to get the lowest possible rates.

Marketing Strategies

Both communities deployed a wide variety of marketing strategies and materials to increase solar PV installations. The marketing efforts were done completely by volunteers.

- Volunteers were present at public events like farmers markets, city council meetings, churches, and neighborhood associations.
- Doorknob hangers and lawn signs were spread throughout the cities.
- Early solar purchasers held open houses where they shared their experiences.
- Our interviewees believed that solar panels can be self-marketing: if someone sees them on multiple homes on a street, they may be more inclined to get solar themselves.

Other Takeaways and Program Results

Northampton surveyed the community before joining Solarize to make sure that it fit community needs. The survey found significant interest because solar is a fairly well known technology that many people want; they just need to know that the finances are favorable.

Both towns reached the highest participation threshold, so residents reached the maximum discount. Northampton installed approximately 100 systems and Amherst installed approximately 200 systems. When deciding between contractors, picking a local contractor was an important factor, followed by price. Even after the program ended, Northampton appeared to have a spillover effect where installs occured at a higher rate after the program compared to before the program.

Having a deadline for the program created a sense of urgency for people to install PV now to take advantage of the discount. In both communities there was a spike in installations towards the end of the program.

Fuel Switching

Introduction

For a community to minimize its carbon impact, it must generate electricity from renewable, GHG-free sources and electrify as many services as possible. Several agencies are working to electrify the transportation sector by offering EV incentives and rates. A few are starting to encourage the adoption of electric appliances, as well. One promising venue for CCE agencies to achieve GHG emission reductions is the electrification of residential heating systems.

In 2016, 64.6% of California housing units relied on natural gas for heating (U.S. Census Bureau, 2017). In 2009, the average California household used 22,000 cubic feet of natural gas per year for space heating and 16,000 cubic feet of natural gas for water heating, resulting in 2 metric tons of GHG emissions per home per year (2009 RECS, 2013). An alternative to natural gas, heat pumps use electricity to heat or cool air or water using a system of compressors, pumps, and refrigerants, similarly to refrigerators. Heat pumps are highly efficient and typically have Coefficients of Performance (COP) between three and four depending on the climate, meaning they move up to four units of heat for every unit of electricity they use.

Common Barriers to Heat Pumps

Several areas within the United States and across the world have seen the great potential heat pumps have to reduce overall energy usage and greenhouse gas emissions, but efforts to increase adoption of this technology have been met with mixed success. Below is a summary of common barriers governments have faced when trying to promote heat pumps.

Price

MCE representative revealed that homeowners usually replace major appliances when the old one fails, resulting in a short time frame to educate potential buyers on heat pumps (B. Menten, personal communication, November Heat pumps typically cost more up front than competing heating technologies such as natural gas furnaces, oil furnaces, and resistance heaters. It costs an average of $6,000 to purchase and install a heat pump in California, but the cost may be as high as $10,000 depending on brand, home size, and other factors (Home Advisor, 2018). Natural gas furnaces, however, only cost $4,500 on average in California (Home Advisor, 2018). Higher initial prices can normally be offset over time by lower operating costs, though annual savings will vary depending on the local prices of electricity and replaced fuel. If these savings are small, consumers may not be willing to wait multiple years to see a return on their investment (Caird and Roy 2010).

Heating oil in the Northeast and natural gas in Europe are relatively expensive, making heat pumps viable options for reducing residential energy costs. But natural gas is relatively cheap in the United States and electricity is relatively expensive, particularly in California. Depending on

the exact prices of natural gas and electricity in an area, it may be more expensive to operate a heat pump compared to a natural gas furnace. This makes it difficult to sell consumers on heat pumps based on the finances alone.

Awareness and Understanding of Technology

Heat pumps have been available on the market since the 1940s, but several studies have shown that consumers are unfamiliar with how the technology works and are unsure if it will be reliable in their climate (Seyboth et.al, 2008 and NYSERDA, 2017). Customers are more likely to decide on a more familiar heating technology and one that has a faster perceived payback period (Caird and Roy, 2010). Some users indicated that heat pumps were difficult to use and adjust to their prefered temperature settings, which could deter customers from buying heat pumps (Boait et al, 2011). Reliability concerns in regions with cold winters are valid, though California's relatively mild winters minimize this concern.

Potential Solutions

Incentives

Local governments can offer financial incentives to reduce the price barrier to heat pump adoption. Some have tried offering incentives for heat pumps but the information regarding them was difficult to find or the incentives were too small to cause many people to switch over (Caird and Roy 2010). Incentives offered by CCE agencies could be provided in addition to other state and federal incentives. In California, incentives for retrofitting HVAC systems are typically offered as part of larger home retrofits, reducing the likelihood that a homeowner will be able to take advantage of a heat pump incentive. As recommended elsewhere in this document, incentives should be provided up front and be easy to obtain to maximize adoption.

Education Campaigns

The lack of customer awareness on the benefits of heat pumps can be addressed through education campaigns. Agencies should communicate that heat pumps are ideal in California's climate, are easy to use, and can meet both heating and cooling needs. Agencies can use a variety of media outlets such as mailers, social media, and including education information with customer bills. Agencies can utilize on-the-ground marketing methods like tabling at public events to get directly in front of customers.

Agencies can partner with HVAC contractors and educate them so they can recommend and communicate the benefits of heat pumps to potential customers. Customers trust contractors backed by local governments, as was shown in the Amherst and Northampton case studies. HVAC contractors will have access to customers that are actively looking to retrofit their homes and can influence customers' ultimate purchasing decisions. One of our discussions with an 3, 2017). HVAC contractors are uniquely positioned to educate buyers on the benefits of heat pumps when they need new HVAC equipment.

Targeted Marketing

Given the potential challenges in switching customers over on financial benefits alone, agencies can target customers who value environmental benefits, such as those who upgraded to 100% renewable energy or have solar panels. Customers who opt up to the 100% renewable option have shown they are willing to pay more to reduce their environmental footprint and may be good leads when starting a heat pump program. Customers who already have solar panels face a lower average electricity cost than grid electricity users and also probably value environmental benefits. Given that the current California natural gas and grid electricity prices are not favorable for heat pumps, homeowners with solar PV are more likely to realize cost savings from installing heat pumps. These early adopters can later be champions in future heat pump programs or educational campaigns.

Building Code Mandates

California's Zero Net Energy (ZNE) standards provide an opportunity to increase heat pump adoption. California requires that new residential buildings be ZNE by 2020, meaning that these buildings must consume less energy on an annual basis than the quantity of renewable energy generated on-site. The renewable energy source for ZNE homes will likely be solar PV. Heat pumps consume a fraction of the energy that natural gas furnaces consume to serve the same heating load, reducing the quantity of energy that a ZNE home would need to generate. This lower home energy demand will require fewer solar panels and may be able to offset the purchase price between heat pumps and natural gas furnaces. The solar panels will also keep heat pump operating costs low.

Northampton Case Study: A Community Education Campaign

Following its Solarize campaign, Northampton pursued a similar program to increase heat pump adoption. The city first educated three grassroots organizations about heat pumps. Once they understood the benefits, they were very excited about getting more Northampton residences to install heat pumps. It should be noted that a significant proportion of Massachusetts homes use fuel oil to meet their heating needs, which is more expensive than natural gas. As a result, the economics of switching from fuel oil to heat pumps to are more favorable as compared to switching over from natural gas (NEEP 2014).

Northampton used the same marketing strategies it used in its Solarize campaign (described in the solar section above). The city relied on these grassroots organizations to help educate other community members on the benefits of heat pumps. There were some significant differences, however, between Northampton's Solarize and heat pump campaigns.

- **Heat pumps required more education.** Most people generally understood how solar panels worked, but not heat pumps. More effort had to be put into education on how the technology worked and would be beneficial. Then the volunteers could explain the potential financial benefits.
- **No tiered pricing discounts**. The program did not offer additional incentives or discounts beyond those of the state and utilities. The lack of tiered pricing discounts

prevented the incentive seen in the solar program to help one's neighbors get a discount.

- **Heat pumps do not self-promote like solar panels.** Heat pumps may be behind the house and not visible to people passing by. Even if visible, it is difficult to tell the difference between a heat pump and an outdoor AC unit. This makes it more difficult for someone to get a sense that the community is supportive of this technology.

At the time this was written, the heat pump program was still ongoing. The city has a goal of 60 heat pump installations and reached about half of that thus far. Northampton expects a spike at the end of the program, like there was in its Solarize campaign.

General Marketing Strategies

Introduction

Effective marketing and program awareness-raising are critically important to the success of clean energy programs (Maibach et al., 2008; Stern, 1999). Insufficient or ineffective marketing can doom a program; for example, MCE once partnered with a community bank to provide on-bill energy efficiency financing, and conducted broad-based marketing efforts. However, MCE did not partner with contractors in this instance, and the bank did not help market the program even on its own website, resulting in unexpectedly low program uptake. Eventually, the bank ended the program (B. Menten, personal communication, November 3, 2017).

Depending on their implementation, informational campaigns can have a wide range of effectiveness in spurring environmental behavior change, from no significant effect to multiplying the uptake of clean energy programs up to five times the uptake without an information campaign (Miller & Ford, 1985). The following suggestions for effective marketing strategies were compiled from existing literature and case studies of clean energy programs.

- **Referrals are very valuable** to increase the adoption of new technologies. They can be directly from a neighbor or building professional, or from trusted government agencies. They help reduce transaction time for residents trying to find their own installer or financing program (Bogart, 2018, Kirkpatrick & Bennear, 2014).
- **Get community feedback** before launching a program. Northampton, discussed in the above case studies, asked its community before launching its Solarize and heat pump programs to see if there was interest in those specific programs.
- **Analyze specific customer needs** and target programs to them. Agencies have the detailed customer data needed to determine what products and services specific customer types most need and will be most interested in. Using these data to tailor program designs and target marketing can improve the overall effectiveness of CCE programs compared to offering broad incentives or financing programs (P. Fenn, personal communication, November 2, 2017). For example, an agency can contact individual businesses or businesses in areas with high peak loads, and target solar program-related marketing in high priority grid areas for deployment. The agency can then include this analysis and targeting to meet customer needs as part of the CCE agency service.
- **Understand barriers to participation** in a clean energy program. These might include knowledge, convenience, trust, and cost. Conducting surveys and involving residents in decision making can help reveal and overcome these barriers (Gardner & Stern, 1996). Different informational interventions can be used to overcome different barriers to action. As a general rule, use simple, clear messaging repeated often and through a variety of trusted sources (Maibach, 2008).

- **Utilize and strengthen public trust** in the agency to increase uptake of agency programs. Customers start out trusting the agency as a not-for-profit, unbiased, governmental body, and building this trust is important for future engagement (P. Fenn, personal communication, November 2, 2017).
- **Bundling multiple clean energy technologies** rather than selling them in isolation can increase their overall impact (P. Fenn, personal communication, November 2, 2017). For example, bundling an EV and solar PV program will decrease both the total lifetime cost of the technologies to the customer and the GHG emissions associated with charging EVs. Solar PV and indoor heat pumps are similarly complementary, especially with the addition of a smart thermostat that the agency can control for demand response.
- **Leverage the agency billing relationship with customers** in order to provide blanket and/or targeted marketing about energy programs on electricity bills, and possibly to provide on-bill financing services. Marketing through mail also has high viewership (P. Fenn, personal communication, November 2, 2017).

Environmental Justice and Energy Democracy

CCE can foster environmental justice and energy democracy by transferring decision-making about energy sources, rates, local energy projects, employment, and other matters from distant, private utility boardrooms to public local government meetings. Doing so can help ensure a just transition from fossil-based to clean renewable energy. Here, we present recommendations for implementing programs that promote energy equity. Except where otherwise noted, these recommendations were taken from *Energy Democracy: Advancing Equity in Clean Energy Solutions* (Fairchild and Weinrub, 2017).

- **Establish a clear definition of impacted communities:** It is important to set clear criteria for selecting communities for clean energy programs. California's CalEnviroScreen Tool (https://oehha.ca.gov/calenviroscreen) uses cumulative impacts to identify the state's most vulnerable and disadvantaged environmental justice communities. Agencies can use this tool to identify and prioritize communities for clean energy programs.
- **Prioritize local energy:** Where practical, agencies should advance projects that install renewable energy directly in overburdened communities. This ensures that the job creating benefits of new renewable energy reach communities that are most in need. As a case study, Energy Democracy examines AB 693, California's Multifamily Affordable Housing Solar Roofs Program. This program installed small-scale solar projects directly in disadvantaged communities identified with CalEnviroScreen, and included a local-hire mandate to ensure economic benefits from the program reached the target community.
- **Establish community governance and decision making:** Community participation in decision making is crucial for ensuring that community needs are being met. An example can be found in the early actions of the CCE agency East Bay Community Energy, which invested in an intensive public process to create a Local Development Business Plan determining how many of its activities will involve the community (East Bay, 2018).
- **Outreach directly to target communities:** Outreach should be conducted by actors that community members trust, in the language of the local community. In low-income communities, many residents may not have internet access, making face-to-face outreach critical to reaching all community members.
- **Address financial needs of target communities:** Historically disadvantaged communities lack the financial resources of more affluent communities to invest in clean energy. Agency programs should address this resource gap by designing programs specifically for low-income residents. This could be done, for example, by offering income-dependent rebates on EV purchases (DeShazo et al., 2017) or low-cost solar or energy efficiency financing for a wider range of customers than can usually access such financing. Financing types should be chosen with resident needs in mind, e.g. PACE financing to serve low-credit individuals or on-bill financing for renters. Low and moderate income individuals are more likely to rent, live in inefficient housing, and spend a higher percentage of their incomes on energy than affluent individuals (Leventis et al., 2017).

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