QUICK START GRANT FINAL REPORT

Sacramento Home Energy Equity Pilot

City of Sacramento

Quick Start Grant Final Report

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TECH CLEAN CALIFORNIA

Executive Summary

The Sacramento Home Energy Equity Pilot aimed to create a scalable model for electrifying and repairing homes to maximize household benefits and mitigate displacement risks for low-income residents. The project specifically focused on addressing barriers that prevent low-income households and residents in disadvantaged communities from adopting heat pumps, like lack of awareness and trust in the technology, high upfront costs, and difficult rebate processes. By collaborating with the Sacramento Municipal Utility District (SMUD) to install heat pumps and weatherization upgrades in income-qualified homes, the City of Sacramento aimed to demonstrate a scalable model that could be replicated to increase heat pump adoption across similar communities.

Electrification presents a critical opportunity for cost-effective investments that improve the efficiency, sustainability, and resilience of Sacramento's existing building stock. The city benefits from some of the lowest rates in California — about 47 percent lower than the neighboring electricity providers. With nearly 70 percent of the city's 181,000 households currently using gas for space and water heating and 90 percent having access to air conditioning,[1] the prospective benefit from electrification is vast. Nevertheless, electrification cannot happen overnight. Structural challenges must be addressed to ensure an equitable transition toward decarbonizing Sacramento's homes.

The Sacramento Home Energy Equity Pilot implemented a neighborhood-level approach to address the barriers to residential electrification, build trust in heat pump technology, and advance the City of Sacramento's climate action goals. The project aimed to create a holistic, scalable model for home electrification and repairs that maximizes household benefits from improving the residential building stock, while mitigating risks such as the displacement of low-income residents. The project also aimed to provide home repair assistance through leveraged funding from the City and University of California, Davis, to address code violations and ensure the health, safety, and habitability of homes.

The City's Climate Action and Adaptation Plan, adopted February 2024, established a goal of achieving carbon neutrality by 2045. Residential buildings account for approximately 18 percent of Sacramento's greenhouse gas (GHG) emissions, with natural gas-based emissions specifically contributing about half of that. The Sacramento Municipal Utility District (SMUD) has committed to provide zero-carbon electricity citywide by 2030 and supports building electrification as a way of doing so. It is a key strategy for addressing both emissions sectors and advancing the City's climate goals. Prior energy modeling conducted

1 2019 Residential Appliance Saturation Study (ca.gov)

TIMELINE:
January 2023 - August 2024

HOUSING TYPE:
Single Family Homes

EQUITY SEGMENT:
Income-Qualified Customers and Disadvantaged Communities

TECHNOLOGY:
Heat Pump Water Heaters, Heat Pump HVAC, and Home Weatherization

LOCATION:
Sacramento, California

before this Quick Start Grant project demonstrated that electrification would reduce utility bills for all homes in Sacramento, due to SMUD's low electric rates and the region's favorable climate. By lowering energy costs, home electrification not only supports climate goals but also acts as a safeguard against displacement, helping low-income households remain in their homes through more affordable energy solutions.

The project leveraged existing communication channels, community-investment programs, and partnerships to build interest and trust in residential electrification. The project team committed to installing heat pumps in at least 20 low-income, single-family homes within the project area, with two homes receiving full electrification. The final installations exceeded initial targets, delivering 22 heat pump HVAC systems and 11 heat pump water heaters. Additionally, the project provided complementary improvements, including three rooftop solar photovoltaic systems, two back-up battery systems, three electric stoves, five refrigerators, and weatherization improvements in ten homes.

This project informed and reinforced the importance of many strategies identified in the City's recently adopted Existing Building Electrification Strategy (Electrification Strategy), which outlines a pathway to transition Sacramento's existing buildings to carbon-free electricity by 2045. Importantly, the upfront costs and challenges of securing rebates and incentives for individual households highlight the need for a comprehensive, supportive approach to assist resource-constrained households throughout the electrification process. While this project, along with the leveraged incentive programs, exclusively served owner-occupied homes, a key challenge remains: extending these services to renter-occupied units in both single and multifamily homes. The split incentive between owners and renters, coupled with concerns of pass-through costs and potential renter displacement as a result of investments, poses an ongoing barrier to broader adoption.

Project Team

The City of Sacramento Office of Climate Action and Sustainability (OCAS) and Office of Innovation and Economic Development (OIED) led the grant application and management for the project. OCAS coordinates the City's response to climate change by guiding projects, programs, and policies to reduce GHG emissions and adapt to a changing climate. OIED's Housing unit supports and collaborates with various City departments, the local Housing Authority, the development community, and community-based organizations to increase housing production and stability, respond to homelessness, and preserve housing stock and affordability.

The Sacramento Municipal Utility District (SMUD) is a not-for-profit, community-owned utility company that serves most of Sacramento County and all of the City of Sacramento. SMUD has established a goal of providing 100 percent carbon-free electricity by 2030 and incorporates energy efficiency into much of their work. SMUD first introduced a heat pump water heater upgrade program several years ago. Over the years, SMUD has shifted the program implementation model—from a contractor and customer incentive model to a customer-only rebate model—and rebate amount—from $1,000 to $3,000, as funding has allowed—to increase program participation. SMUD's programming continues to evolve in alignment with their zero-carbon and electrification goals, with a new focus on opportunities to promote electrification, rather than energy efficiency-only measures.

Market Barrier

Limited awareness and confidence in heat pumps deters customers and contractors from exploring the technology as a viable option. High upfront costs further discourage interested homeowners from pursuing heat pump retrofits. Moreover, the significant costs related to major home upgrades, particularly in an aging housing stock, threaten the financial well-being of vulnerable households. Compounding these challenges is the process of securing multiple rebates, which often have complex eligibility requirements. Even though the region has a favorable climate, SMUD is working to promote electrification, and various beneficial services are being offered by the City and community partners. Limited collaboration between these groups hinders the development of partnerships that can effectively advance home electrification and heat pump adoption. Delivering the comprehensive benefits of whole-home electrification to low-income homeowners while simultaneously promoting neighborhood stabilization and maximizing community co-benefits remains a persistent challenge. It underscores the need for targeted strategies to address these interconnected issues.

Proposed Solution

The Stockton Boulevard corridor (zip codes 95817, 95820, 95824, 95828) was selected as a focus area for the project in response to the "Aggie Square" campus expansion that the University of California, Davis is implementing on Stockton Boulevard, in the Oak Park neighborhood. The City, University of California, Davis, and the developer of the Aggie Square project together negotiated a community benefits partnership agreement (CBPA)[2] to ensure that investments are brought to low-income or other vulnerable community members surrounding Aggie Square. These investments are intended to focus, in particular, on housing stabilization programs as a way of mitigating potential displacement. The project aimed to complement the CBPA-funded housing stabilization work with residential electrification investments that can have a high upfront cost, but may provide ongoing bill savings, in addition to other health, comfort, and safety benefits.

The Home Energy Equity Pilot funded heat pump installations in at least 20 low-income singlefamily homes, with two homes receiving full electrification. These installations were funded through the Urban Sustainability Directors Network through their Energy Innovation Fund, the Aggie Square CBPA, and additional leveraged funds from the Habitat for Humanity of Greater Sacramento (Habitat). Low-income households were identified through their eligibility or current participation in SMUD's Energy Assistance Program Rate (EAPR), which offers a range of monthly discounts on electricity bills for households starting at zero percent, up to 200 percent of the Federal Poverty Level. In addition to low-income verification, EAPR eligibility was considered a proxy indicator for potential housing vulnerability that this project could stabilize through investment in home upgrades. These upgrades may have a high upfront cost but are important for home comfort and safety and can provide ongoing utility bill savings.

Participating homes were recruited by either SMUD or Habitat. Each home received services from the recruiting entity before being referred to the other entity as eligible. For example, the two homes that received full electrification were recruited by Habitat, received all eligible

2 Community Benefits Partnership Agreement | Aggie Square (ucdavis.edu)

repairs from Habitat, and then were referred to SMUD for heat pump installation and other energy efficiency services.

Theory of Change and Scalability

By reducing energy bills for low-income homeowners through high-efficiency heat pump deployment, the project will increase awareness and trust of heat pump technology among households facing significant barriers to heat pump adoption. The project will leverage existing programs and processes to identify a model for municipalities, utilities, and community organizations to foster partnerships and administer holistic electrification services in tandem. Through these investments, the project will demonstrate how housing stabilization and building decarbonization efforts can go together. Lessons learned from implementing this Quick Start Grant will directly inform the City's building decarbonization strategy and refine approaches for SMUD to electrify customer homes. Securing a sustainable source of funding is crucial to effectively scaling the partnership model exemplified in this project. Simplifying processes and aligning eligibility requirements is key to reasonably layering programs supportive of administering holistic electrification services.

Program Changes and Evolution

The original scope proposed broad community outreach for identifying homes—including general outreach to EAPR lists via field visits, emails, and phone calls; outreach to customers who might be EAPR eligible; outreach through City "Community Ambassadors;" and outreach through local community partners. However, this outreach approach was scaled back to avoid over-recruiting for a limited program. The project team was concerned about having to turn away many participants, which may inadvertently reduce community trust and undermine a key program goal.

Instead, the project identified homes through SMUD's existing outreach pathways for EAPR customers and used non-committal language in materials (e.g., "upgrades may include," vs. "will include") to avoid setting up unrealistic expectations. Through this process, it built a pipeline of priority households that would be offered all eligible energy-efficiency and electrification upgrades that were available. Specific outreach pathways used in the project included engaging households that were already calling in for service (e.g., interest in cooling systems during hot summer months), neighborhood-specific outreach at neighborhood association meetings or SMUD events, and parallel housing stabilization efforts carried out by Habitat. SMUD periodically conducts ongoing recruitment targeted to homes that are older, have a high electricity bill burden, are in a priority zone, and are likely to have gas-powered heating and cooling equipment. All participating customers were EAPR qualified and already on the EAPR rate, making them eligible for the project.

Project Goals and Achievements

Summary of Project Goals and Achievements

This Quick Start Grant Project exceeded the original installation goal and successfully reached 22 homes for decarbonization improvements. For these homes, the project team facilitated the installation of 22 heat pump HVAC units and 11 heat pump water heaters. In addition, many homes received complementary energy-efficiency and electrification improvements that create cost savings and enable households to otherwise use these savings. The project team successfully coordinated services and funding for whole-home electrification in two homes, including solar installation and battery storage, at no cost to the owner.

Table 1. Summary of project goals and achievements

KPI/Goal	Metric	Project Total
Increase low-income household heat pump adoption	Number of units installed	• 22 heat pump HVAC units • 11 heat pump water heaters
Improve condition and maintenance of housing stock	Number of housing units assisted with both maintenance and energy efficiency installation	• 5 high-efficiency fridge upgrades • 3 electric stoves • 3 rooftop solar photovoltaic systems • 3 roof replacements • 2 energy storage (battery) systems • Weatherization improvements (e.g., screen frames, weather stripping, door shoe) at 10 homes
Increase low-income household awareness of building electrification technologies	Survey measurement	18 of 20 households (90%) said they would recommend a heat pump to their friends or family. See Goal 3.
Reduce greenhouse gas (GHG) emissions from household energy use	Estimated annual greenhouse gas emission reductions in metric tons of carbon dioxide equivalent (MTCO2e)	Households have an average estimated GHG emissions savings of 1.84 tons CO2 per year. This represented an average 56% reduction on households' total GHG emissions.

Goal 1: Increase low-income heat pump adoption

None of the homes served had heat pump water heaters or HVAC units before this project. This project installed 22 heat pump HVAC units and 11 heat pump water heaters. The number of heat pumps installed in homes surpassed the expectations of the project team. Nearly all heat pump installations were gas-to-electric conversions; only one HVAC installation was formerly an electric system, and all heat pump water heaters replaced gas equipment.

The survey responses reaffirmed that upfront installation cost, as initially identified, is a market barrier to heat pump adoption. Sixteen of the 20 households (80 percent) directly mentioned cost as the barrier to getting energy-efficient home appliances.

Table 2 breaks down the average cost of electrification measures supported through the Energy Equity Pilot. Labor costs are not accounted for in each measure but are reflected in the total cost. On average, the suite of electrification measures cost $21,366.96, with HVAC heat pump units accounting as the largest driver of costs. Notably, the electrical work was the second most expensive measure. Electrical upgrades and repairs appeared to be largely triggered by specific upgrades; 13 of the 18 (72 percent) homes needing this service required dedicated circuits to be run for an electric stove or EV charger. Moreover, the average cost of electrical work in the five homes that did not receive these measures ($1,658.20) was about half as much as those that did ($3,472.65). The remaining four participating homes did not require any electrical upgrades. Building codes determine the amperage for certain equipment, such as stoves and EV chargers, and require the panel to be oversized by 20 percent. These factors driving expenses are consequential for designing and planning incentive programs around but can vary significantly across municipalities.

Table 2. Average costs of each electrification measure

Measure	Estimated Average Cost[3]	Homes Receiving Measure
Service assessment	$209.05	22
T24 / HERS rater	$241.52	22
Permits	$420.69	22
General electrical / circuit work / breakers	$2,968.64	18
Heat pump water heater	$1,645.17	11
HVAC heat pump	$6,990.57	22
Thermostat	$241.15	20
Replace insulation	$1,108.64	8
Duct replacement and/or seal	$1,200.08	13
Crane service	$347.43	7
Other HVAC work	$1,298.88	5
Material cost and disposal	$1,242.45	21
EV circuit	$450.00	8
Average cost of electrification	**$21,366.96**	**22 (Total Homes)**

3 Costs are not divided into the exact same categories by all contractor invoices.

Another market barrier identified was the complexity of securing rebates to reduce the upfront costs of heat pumps. The project team aimed to address this market barrier by leveraging SMUD's direct install programs to deliver the heat pump installations. In these programs, SMUD assigns participating households to a contractor, and the contractor completes all rebate documentation. Fifteen of 20 households (75 percent) reported good to excellent experiences with receiving a heat pump through the program. Three households described the process as taking a long time, and only one household had a negative experience.

Goal 2: Increase housing stock condition and maintenance

The project team deployed surveys regarding quality of life and perceptions of heat pumps, which are important for understanding the success of this project. to complement the energy usage and energy cost data. All participating households were contacted for post-project interviews immediately after the project ended and again at the six-month post-project completion date. The project team aims to contact participating households at the 12-month post-project completion date.

Responses to select questions from the survey are shown in Figure 1. Of the households served by the project, 16 of the 20 survey respondents (80 percent) said cost was a barrier to making electrification upgrades and 14 (70 percent) said they had deferred maintenance on their homes, indicating a need to increase housing stock condition and maintenance among the project participants.

In the initial survey, 11 of the 15 households (73 percent) reported experiencing uncomfortably hot indoor temperatures for more than a day in the six months prior to engaging with the project. Most respondents attributed this to a lack of air conditioning, an undersized air conditioning unit, a broken air conditioning unit, or inadequate insulation. Comparatively, only two respondents cited high energy bills as the cause. Seven of the 15 households (47 percent) reported that they had been uncomfortably cold for more than a day in the six months prior. Most respondents indicated the underlying cause to be from an undersized heater, a broken heater, or inadequate insulation. Only one respondent referenced bill cost as the reason.

In the six-month post-project survey, all respondents reported that they had no longer experienced uncomfortable heat in their home. Only one participant reported experiencing discomfort from cold temperatures due to equipment malfunction. Though the surveys do not capture experiences across all seasons, the improvements in housing conditions from the heat pump HVAC installations are promising.

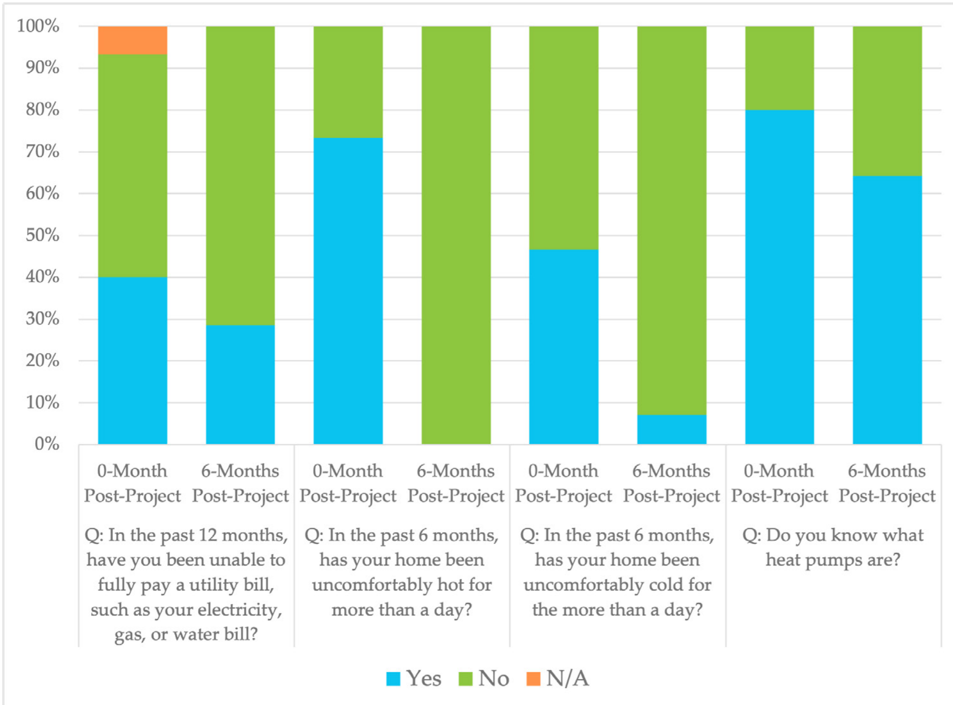

Figure 1. Select responses to survey questions administered immediately following installation and six months later.

Beyond the housing stock condition improvements from the heat pumps, the project included weatherization improvements at 10 homes, roof replacements at three homes, and complementary energy-efficiency and electrification improvements (e.g., high-efficiency fridges, electric stoves, solar panels, and back up battery systems) that support ongoing cost savings and enable households to redirect funds elsewhere.

Table 3. Average cost of each measure improving housing conditions

Measure	Estimated Average Cost	Homes Receiving Measure
Fridge replacement	$1,201.21	5
Electric stove	$1,277.69	3
Weatherization	$1,589.91	10
Solar, battery storage[4], roof replacements, and other repairs[5]	$66,404.01	3

4 Only two homes received battery storage.

5 Other repairs ranged widely across homes.

Goal 3: Increase low-income household awareness of building electrification technologies

The team struggled to receive consistent gas utility bill data from participants. As such, bill impacts could not be quantified to verify this as an approach to drive interest and trust around electrification from low-income households. However, the participants who received whole-home electrification services had promising bill saving results. For example, the retrofits reduced energy consumption in one home by 32 percent, saving over $500 in annual electricity costs (Figure 2). Accounting for rate increases, participant electricity bills increased on average by $43 during the heating season and by $66 during the cooling season. Notably, those who received weatherstripping only saw a cumulative average increase of $13. Once again, these bill impacts do not account for savings from gas. More participant electric bill data is presented in Appendix 1: Electricity Use Data and in the City's Existing Building Electrification Strategy.[6]

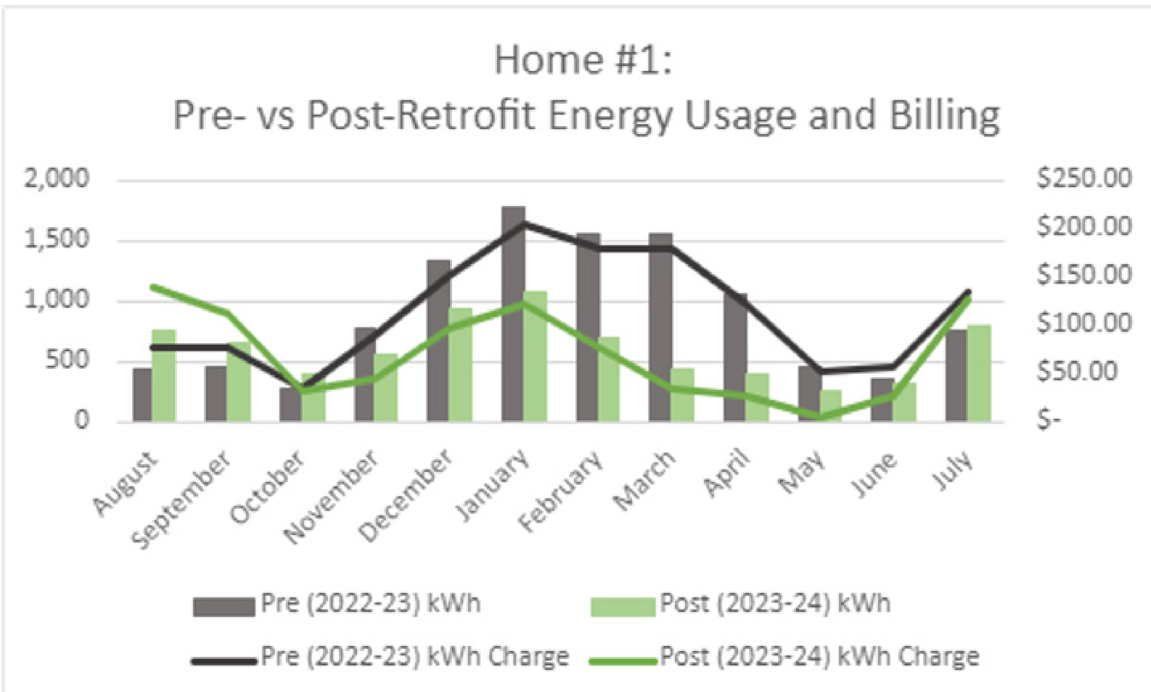

Figure 2. Electric consumption and expenses in the year before and after installations.

When households were asked if they would recommend a heat pump to their friends or family, 18 of 20 households (90 percent) answered affirmatively. The other two households were not prepared to recommend for or against a heat pump until they had more experience with their equipment.

Homeowner responses were very positive overall about the new heat pumps, as shared through responses to "How would you describe the process of getting a heat pump installed

6 City of Sacramento Existing Building Electrification Strategy

in your home?" and "How would you describe the health and comfort of your home?" (see "Customers' and partners' experiences" below).

During post-installation conversations with participating households, it became clear that some participants did not know that the specific equipment that they had was a heat pump. Of the 14 households who responded to the six-month post-installation survey:

- Five (36 percent) responded "No" to the question "Do you know what heat pumps are?"
- Four of those five would still recommend a heat pump to their friends or family.

As such, it is unclear how successful the project team was in addressing the low awareness and suggests that there is still a gap regarding the name recognition of heat pumps, even when homeowners like how the system functions. However, through leveraging SMUD's home energy assessment to direct install program approach, SMUD energy specialists were able to identify the opportunity for a heat pump retrofit without the household needing to self-identify a heat pump as a possible improvement.

Yet, for home upgrades that residents independently take on, the marketing of "heat pumps" may still be crucial to ensure that residents seek out heat pump technologies rather than like-for-like replacement, lowest-cost appliances, or the recommendations of contractors (which may not be for heat pumps).

Goal 4: Reduce GHG emissions from household energy use

As noted, the team did not collect complete gas utility bills from customers as part of project implementation. As a result, the project team is not able to calculate more detailed estimates of reduced GHG emissions from these electrification upgrades.

However, as part of the development of the City's Electrification Strategy, the City and SMUD worked with Vistar Energy to develop the XeroHome modeling tool to understand the estimated on-bill costs and GHG savings from electrification. XeroHome creates individual energy models for single-unit homes in Sacramento, including all but one of the homes served through this Pilot.

XeroHome estimates[7] that households will save an average of ~1.8 tons of CO_2 per year as a result of the upgrades, which represents an average 56-percent reduction in household GHG emissions. However, these averages may be slightly inflated through the emissions reductions from the homes that received solar photovoltaic panels.

- The three homes that received solar have the greatest estimated GHG reductions, with ~2.5 tons of CO_2 per year on average, a 75-percent reduction.
- For the remaining 19 homes, the estimated average GHG emissions reductions are ~1.7 tons of CO_2 per year, a 53-percent drop.

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7 Key assumptions include: 1) initial central HVAC system with room vents and a natural gas furnace (unless noted an electric-to-electric conversion, 2) initial natural gas water heater with storage tank, 3) if a homeowner reported past broken AC system, a central HVAC system was still selected as the initial system, 4) if a homeowner reported an undersized AC system, room AC units were selected as the initial system, 5) if SMUD reported attic insulation as a measure for a home, ceiling insulation was selected as the upgrade in XeroHome, 6) if SMUD reported any caulking or sealing as part of the measures for a home, air sealing was selected as the upgrade in XeroHome, and 7) lighting upgrades were not included.

The estimated GHG emissions reductions should increase over time as SMUD gets closer to its 2030 zero-carbon electricity goal.

Key Publications

The project team prepared a case study as part of the deliverables for the leveraged USDN funding. Habitat conducted some additional press to highlight the two homes that were fully electrified and promote their related services more broadly.

The City also incorporated a summary of the project directly into the City's Electrification Strategy and considered the broader lessons learned as part of the recommended actions. Key applied takeaways include:

- Validation of cost ranges for electrification upgrade work. The Electrification Strategy pulled TECH Clean California data for all of Sacramento County, but this pilot data informed what the likely upper-end cost may be for these upgrades, since many of these homes were facing additional upgrade challenges, e.g., circuit work.
- SMUD's programs are essential to help homeowners—particularly those who are lower-income or on a fixed-income—through the full process of upgrades. Pilots like these can start moving the needle.
- The exact role that the City should play in the electrification space continues to evolve. The City has a clear pathway to guide electrification through ordinances, building/energy reach codes, and building performance standards. The project implementation pathway is less clear. It may not always make sense to run funding through the City because of the complexity of contracting requirements, which canextend project timelines. However, there may still be need for City-led efforts to secure additional funding for low-income or other vulnerable households. The policy recommendations are flexible for the City to continue to support project upgrades in an evolving way.

Customers' and Partners' Experiences

SMUD's energy specialists and City staff conducted post-project surveys of participant experiences via written surveys or phone calls, immediately after the project ended and then again at the six-month post project date. Select participant testimonials from those interviews follow, edited for clarity.

> “*The process was so easy and fast! We are so grateful for this program! I don't know if we would have ever been able to afford these kinds of upgrades to the house. We feel extremely fortunate to have qualified for this program! Life-changing!”*

> “*Before the home repairs, we had no electricity and had to live like the 1800s… that's how we survived. Before the heat pump, we had to live without a heater. Our SMUD bill was skyrocketing because we had to use wall heaters. It's sad we had to go through all of that.”*

> “*When my AC went out, I didn't have the resources [to replace it] and I was blessed to qualify for this SMUD program. The work was so efficient and so timely. I am so grateful that I qualified. This program came at a crucial time because without the heat pump, I wouldn't have any heat” because of the high replacement costs.*

> “*I've been in the neighborhood for a long time; so super helpful to have this new roof. It's a beautiful thing for the program to exist and make it possible to have low-income families live in their homes for a long time.”*

Identifying Best Practices

The project team set out to learn more about the barriers to home electrification and how it can complement housing stabilization. This project exceeded its goal of installing heat pumps in at least 20 homes, with many homes receiving two units (i.e., heat pump HVAC and heat pump water heater), alongside supplemental electrification and efficiency upgrades. The results represent a significant accomplishment in providing comprehensive electrification services to low-income households. The project team also gained important insights, detailed here, that could inform future implementation strategies.

Set clear expectations with customers upfront to ensure smooth project implementation. Participants must be fully informed and acknowledge requirements for participation, including the need to be available for contractor and inspector appointments (which may require taking time off work) and be prepared to provide documentation or respond to surveys. The project team experienced some challenges with homeowners struggling to keep appointments or assuming the project was complete before final inspections, which delayed permitting close-out processes. Future pilot and program teams should not assume that homeowners will eagerly adapt to program requirements simply because there is no cost for the upgrades. Staggering contractor work is an important consideration for projects delivering holistic electrification upgrades and home repairs, despite the fact that it extends timelines, because it can keep homes livable for residents while the work takes place.

Emphasizing the importance of keeping scheduled appointments is particularly important for closing out permits. During this project, several participants believed the work was complete as soon as the equipment was installed, even though inspections had not yet been scheduled. Open permits are not simply an administrative inconvenience. In some municipalities, they may also result in fines, penalties, or issues when selling the home. Homeowners seemed generally unaware of these legal implications. Regular reminders and clear messaging about the significance of closing out permits can prevent these bottlenecks and avoid unintended financial burden arising from projects that are supposed to benefit low-income populations.

From an internal perspective, engaging the team responsible for invoicing and reporting early in the program design ensures that the necessary questions and formats are clearly identified in advance, minimizing confusion or delays in reporting once the project is underway.

Be transparent about potential bill impacts of heat pump upgrades, but also emphasize that there may also be quality of life improvements. It is crucial to set clear expectations regarding the potential for both increased and decreased energy usage, which may be highly influenced by the household's existing infrastructure. Energy modeling completed by the City supports the potential for heat pump conversions to reduce energy consumption in all homes, but rising costs may mask these savings on customer bills, particularly in homes introducing new cooling loads. By contrast, replacing inefficient air conditioning units with heat pumps can yield significant efficiency savings.

Complimentary energy-efficiency and weatherization upgrades are essential to minimize potential utility bill impacts from heat pump installations. Providing this holistic package of measures, as demonstrated in this Quick Start Grant, helps optimize heat pump performance, ensuring that residents experience the intended benefits without incurring additional costs. These investments also enhance reductions in GHG emissions.

Overall, between SMUD's relatively low electricity rates and widespread air conditioning usage, the Sacramento region is uniquely positioned for cost-effective home electrification. However, programs statewide should clearly articulate the potential for bill increases for customers without existing air conditioning. At the same time, highlighting the quality-of-life improvements these technologies provide, as evidenced by testimonials from participants of this project, creates a balanced narrative that may encourage customers hesitant to make the switch.

Map out the participant journey during the initial program design to streamline documentation and data collection. This process allows for the identification of opportunities for efficiency and can also highlight other services and partners to create a holistic home resiliency program. For example, this project's dual recruitment model through SMUD and Habitat provided households with multiple services and referrals through the partnership.

While the partnership did successfully link some households with more holistic services, there were a few drawbacks to this approach. Each partner needed to complete projects separately due to liability concerns, which extended project timelines. In particular, Habitat's home repairs were more extensive, with highly variable timelines, making coordination for customer hand-off with SMUD challenging. Motivation to participate also varied, depending on the recruitment path, and resident interests did not necessarily align with the services offered by the other partner. In addition, providing holistic home improvements requires a substantial amount of funding and reduces the number of homes that can be served. Programs must carefully approach balancing these elements to deliver meaningful results.

Design participant feedback mechanisms early in the planning phase to ensure seamless integration with project workflows and robust data collection. Due to staff capacity constraints, survey development for this project began alongside outreach efforts. As a result, nearly all participants had completed the initial intake process by the time the pre-project survey design was finalized. Rather than administer the survey to the few remaining homeowners at the pre-project stage, the project team prioritized refining the workflow for the post-project survey. SMUD led the distribution of the initial post-project survey and followed up with unresponsive participants up to three times, while City staff managed the six-month post-project survey, following up twice. However, given the complexity of projects involving multiple upgrades and inspections, it was difficult to determine the precise completion date. Because of this, some responses were collected beyond the six-month post-project window.

At the same time, collecting feedback requires a careful balance. While persistence is necessary to gather insights, it may also be the case when busy participants are pressed to respond, they highlight issues that cannot always be addressed directly. In the 6-month post-project survey, one homeowner expressed frustration over a late stove replacement, which was beyond the influence of the project team. Programs collecting input from participants should be prepared to receive critical feedback and, where possible, connect them to resources or information to address their concerns.

Similarly, key goals for qualitative research should be determined upfront. If garnering a larger sample size is a priority, incentives may be effective for increasing response rates, especially for data that is being collected well after participant engagement has concluded. Incentives may be less appropriate if the quality of responses is a priority, as they may distort participant feedback. This project received a meaningful response rate from participating households without incentives.

Future initiatives that rely more heavily on qualitative data collection should account for the timing and administration of research. Developing participant data collection tools early in the planning phase allows for alignment with project milestones and may enhance participant engagement. By embedding surveys and qualitative research methods into the pre- and post-project workflows from the outset, data collection is more synchronized with the project timeline, resulting in more accurate and timely insights.

Programs seeking to measure bill and GHG savings should require participants to submit utility data as part of the intake documentation. The project team struggled to receive utility data from participants. In the end, the team was only able to secure partial gas bills for the participants recruited by Habitat, which prevented documentation of conclusive bill and GHG savings from the work. While the project team was able to estimate savings, real-world data is essential for verifying impacts. Collecting gas bills may not be a challenge in locations where electricity and gas are provided by the same utility. Nevertheless, programs should consider the challenges with the participant data collection process and mitigate risks from non-compliance.

Leveraging existing outreach and communication channels from community partners is a way to streamline and appropriately scale participant recruitment built on pre-established trust. Using neighborhood-specific outreach at local meetings and events that were already taking place proved to be an effective way to allocate resources and engage potential participants. Leveraging existing community channels helped the team recruit households without the need for a broad-based outreach campaign or heavy upfront investment in outreach centered on trust-building. Instead, the efforts of community partners facilitated a warm reception from the community. This approach allowed targeted communication to reach those most likely to benefit.

Also, the team's refined marketing strategy prevented oversubscription of participants relative to the project's limited resources, which may have resulted from a broad outreach campaign. Instead, the team used flexible language, offering general "electrification upgrades" in the recruitment process to mitigate the risk of setting unrealistic expectations for potential participants. Interested households were recruited through partner services (SMUD's electrification services and Habtiat's home repair program) to match eligible homeowners with available programs, including this Quick Start Grant. As such, no residents were turned away due to funding limitations, and non-eligible participants still received other relevant services.

Multilingual engagement requires more than just translated flyers: Access to ongoing translation support - both for in-person visits, and for phone and email customer inquiries - is key. Language accessibility is essential for equitable program participation. In this Quick Start Grant Project, flyers and resource materials were developed in multiple languages and distributed through a network of community partners with the cultural competence needed to extend program reach. However, multilingual engagement requires more than static materials. It demands ongoing support throughout the project lifecycle, including in-person translation during site visits and remote support for phone and email inquiries.

Several households that participated in this Quick Start Grant project faced language barriers, and at least one household had no English-speaking members. One participant noted that the language barrier made progressing through the project difficult. The project team was eventually able to provide the necessary assistance, but this feedback underscores the importance of providing comprehensive, proactive support to eliminate linguistic barriers and ensure smooth participation for all households.

Providing eligible households with all potential electrification upgrades at once (e.g., heat pump water heaters, efficient appliances, electric stoves, EV plugs, etc.) maximizes the impact of the program touchpoint. The direct-install model - where households are assigned a contractor who handles the installation, rebate documentation, building permits, inspections, and approvals - is the best practice for simplifying customer upgrades. Leveraging SMUD's existing direct-install programs was essential to delivering a holistic suite of electrification and energy-efficiency upgrades. Moreover, the partnership with Habitat extended the impact of the project by addressing additional home health and safety concerns through their programs.

SMUD's programming has shifted toward this holistic approach to program delivery, in part due to the administrative efficiency savings that result from a single comprehensive touchpoint with customers. In the past, customers had been served one measure at a time, leading to frequent returns to provide upgrades in a piecemeal way. SMUD has instituted a 10-year waiting period between household participation in programs to balance holistic delivery and broad customer service.

Even with this holistic approach to electrification, not every upgrade or home repair can be provided through existing programs. Participants may request additional work that exceeds the scope of services available. For example, one customer indicated interest in window replacements. However, window replacements are not a service that SMUD provides and typically have long payback periods, especially when compared with heat pump upgrades.

Other upgrades or repairs may be triggered by building code compliance that mandates specific infrastructure improvements. This is especially important for heat pump water heaters that require more space than conventional systems. While addressing deferred maintenance and poor efficiency in buildings will help increase the benefits that residential electrification can provide, this will increase the cost of upgrades per home. Requirements around program cost effectiveness are a significant barrier to expanding a holistic electrification approach, especially to areas served by investor-owned utilities (IOUs) that are governed by stricter tests and calculators for ratepayer-funded energy-efficiency programs. In this Quick Start Grant, the stackable funding sources through SMUD, Habitat, and the CBPA were essential to addressing these costs, and they may not be easily replicable, presenting a challenge for program scaling.

Including inflation estimates in project budgets to account for cost increases between the initial grant application and project implementation is also an important factor. Even a one-year turnaround time between grant submission and project implementation may result in insufficient budgeted funding. Longer turnaround times for project implementation may be unavoidable, but they may exacerbate the funding gap.

Households need training and support for heat pump system configuration and efficient use. Participants often needed additional guidance to operate their systems effectively. Offering basic education on heat pump functionality, coupled with hands-on learning opportunities, can significantly boost user confidence, satisfaction, and system performance. Participant feedback highlighted this need for more interactive and accessible training:

> *"Need more training on how to use all the new appliances. I also am unable to connect my Wifi to my thermostat. I am a visual and [tactile] learner so I can't rely on manuals or emails to learn these things. I would love someone to come back and help me figure out how to use my appliances more efficiently."*

In response, SMUD arranged for a contractor to provide in-home support to resolve the customer's issue. The project team observed that customers retain educational content best when delivered at the point of installation, but often struggle to recall details later when temperatures change. To address this, building both immediate and future touchpoints for training — especially when seasons change — ensures that residents continue using their heat pumps effectively year-round. It is possible that inefficient use of new heat pump equipment may contribute to higher post-upgrade utility costs; however, this project did not include any evaluation of usage behaviors post-installation.

Next Steps

Continuation and scaling of this project is dependent on securing additional funding. While this pilot is currently not anticipated to continue, it has provided a learning opportunity to understand the bill impacts and quality-of-life changes that result from the building electrification upgrades. This project has also prompted conversations between the City and project partners regarding how renters or residents of multifamily buildings could benefit from residential electrification.

The City is pursuing additional funding to develop building and energy reach codes to advance heat pump deployment in Sacramento, as well as to develop a building energy benchmarking and building performance standard program in commercial and multifamily properties. The City will continue to pursue funding sources to implement electrification pilot projects.

SMUD has secured $3 million from the U.S. Department of Energy to fund a neighborhood-based approach to home electrification in the Meadowview neighborhood of Sacramento. This project will electrify up to 300 single-family homes — electrifying HVAC systems, water heating, cooking, adding EV chargers as appropriate, and weatherization measures as needed — using the same direct install approach as this pilot. The Meadowview electrification project will apply lessons from this Quick Start Grant project regarding the survey timing, questions, and deployment; recruitment through neighborhood partners; communication templates that describe how these upgrades will take place; and budget expectations for how many homes will receive multiple measures.

A key lesson learned from this pilot is that SMUD is a crucial partner for residential electrification work and their partnerships and programs should be scaled to further serve the Sacramento community. While the City of Sacramento can support outreach, reporting, and analysis, it can be challenging to fund electrification projects through the City because of required administrative components, e.g., contracts and invoicing. Habitat can provide additional holistic home improvement, however, the need for a substantial amount of flexible funding for supplemental home repair can limit the scale of Habitat's involvement.

The City can be a strong partner in advancing an electrification policy that complements and encourages home upgrades. The adoption of the City's Electrification Strategy established a policy direction to develop ordinances that advance existing residential and commercial electrification, as well as direction to pursue neighborhood-scale electrification pilots.

Recommendations for Scaling Statewide

Although this project was a small, neighborhood-scale pilot, the project team identified several elements that should be scaled to a state programmatic level:

Expand customer access to upfront rebates. One of the primary barriers identified by many homeowners in this Quick Start Grant project was the lack of upfront funds for electrification upgrades. Most incentive programs are reimbursement-based, placing the burden of covering initial costs on homeowners while the rebate is processed. Shifting programs from this model to one that offers upfront funding support for homeowners can significantly improve accessibility. TECH Clean California, for example, requires participating contractors to reduce customer invoices by the incentive amount upfront for claims to be approved. This adjustment is particularly important for low- and moderate-income households who face significant financial constraints that limit their participation in energy-efficiency programs.

Provide a "concierge" service to assist with navigating rebates and mitigating accessibility barriers. Homeowners frequently struggle with navigating the complex paperwork and documentation required to secure multiple rebates. Program implementers offering concierge-like support, where they handle the administrative processes on behalf of participants, can reduce the burden and improve program uptake. This should include guidance on understanding rebate timelines or participation agreements, such as SMUD's 10-year waiting period for households that have previously participated in an upgrade program. Simplifying the process can encourage broader engagement, especially among households with limited time or resources.

Increase collaboration and programmatic alignment between housing, energy, and sustainability programs. Expanding the collaboration between programs that offer mutual benefits is key to scaling decarbonization efforts. Building electrification should be treated as a part of broader housing stabilization strategies, with the goal of leveraging multiple funding sources and aligning policy objectives. Coordinating these efforts can amplify outreach and improve overall program efficiency.

Investing in comprehensive, whole-home electrification strategies can maximize the impact for each participant. By bundling multiple upgrades — such as heat pump water heaters, electric stoves, and EV charging infrastructure — into a single project, programs can make the most of homeowner engagement and reduce participants' time burden. This approach is especially important for time- and resource-constrained households, where every touchpoint matters just as much as costs do. A given homeowner may only connect with a building electrification program once, so maximizing the impact of that engagement is key. Whole-home upgrades also offer an opportunity to address underlying issues, such as outdated circuitry, within a single engagement, leading to greater long-term cost and energy savings.

Such integration can also introduce higher administrative and coordination costs, however, both for implementers and participants. Moreover, layering multiple programs can result in prohibitively complex requirements to maintain eligibility for funding. These challenges must be managed to avoid undermining the benefits of cross-sector partnerships. Utilities and community choice aggregators (CCAs) have the resources and infrastructure to scale electrification efforts beyond local jurisdictions. Their involvement can help streamline the integration of various programs under a whole-home electrification model, using their existing networks to broaden program access.

However, care must be taken to ensure that these efforts are inclusive and flexible enough for households that may not be ready for full electrification. While maximizing the impact of each homeowner touchpoint is important, scaling these efforts requires sensitivity to the readiness of individual households. Forcing a pace of change faster than participants are comfortable with — particularly in underserved or historically marginalized communities — could damage trust in the program and between government entities and the public. Often, low participation rates in these communities are products of complex intersectional issues. For example, one household in this pilot declined a gas stove replacement. While the project team did not specifically ask for a reason why, the participant self-reported that the gas stove was their only source of heat and they were unsure if they could give that up. Recognizing that the barriers faced by these communities are multifaceted is vital to ensure a transition toward electrification that is inclusive. Programs should prioritize building trust and offering adaptable solutions to meet varying levels of readiness for electrification.

Appendix 1: Electricity Use Data

SMUD Rate Increases:

- Effective 1/1/23: 2.00%
- Effective 1/1/24: 2.75%
- Effective 5/1/24: 2.75%

Pre (2022-23)	Low	High
Nov-Jan avg.	40	56
Feb-Apr avg.	42	61
Post (2023-24)		
Nov-Jan avg.	43	60
Feb-Apr avg.	45	63

Pre (2022)	Low	High
June-Aug avg.	61	92
Post (2024)		
June-Aug avg.	62	92

Key:

- WS: Weatherstripping
- WH: Water heater
- Split: Mini split
- G2E: Gas to electric
- E2E: Electric to electric

Table 4. Winter (mid-Nov, Dec, Jan, Feb) / Spring (Mar, mid-Apr) Evaluation (i.e., Home Heating)**

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Heating?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
1	• G2E Split • G2E WH • E2E Stove • WS • Solar	963	3,817	6,292	2,475	$407	$582	$175	$166	Broken heater (used space heaters)
2	• G2E Split • G2E WH • G2E Stove • WS • Solar	835	8,039	4,035	4,004	$843	$362	$481	$497	Broken heater
3	• G2E Split • E2E WH	1,117	1,553	4,071	2,518	$153	$437	$284	$281	In-adequate insulation

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Heating?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
4	• G2E Split • WS	1,591	3,794	4,515	721	$399	$476	$44	$69	Unknown
5	• G2E Split • WS	1,496	3,790	3,714	76	$383	$383	$1	$7	Unknown
6	• G2E Package • WS	2,331	2,042	3,654	1,612	$206	$400	$194	$190	None
7	• G2E Split • G2E WH	1,078	5,281	9,842	4,561	$533	$1023	$491	$480	None
8	• G2E Split	Unknown	10,431	7,701	2,730	$1,105	$837	$268	$290	Unknown
9	• G2E Split • WS	1,087	11,272	13,440	2,167	$1,179	$1,425	$246	$223	Unknown
10	• G2E Package • G2E WH • WS	1,710	13,114	9,031	4,083	$1,393	$965	$428	$465	None
11	• G2E Split • WS	809	2,271	3,435	1,164	$170	$264	$94	$91	Possible broken heater
12	• G2E Split • G2E WH • Solar	1258	1,642	3,624	1,982	$160	$357	$196	$193	Unknown
13	• G2E Package • WS	1,166	8,238	7,962	276	$822	$756	$66	$83	None
14	• G2E Package • G2E WH	1,200	3,577	2,766	811	$396	$293	$103	$111	Unknown
15	• G2E Package	837	1,569	2,695	1,126	$157	$284	$127	$124	Broken heater
16	• G2E Split	1,289	3,797	5,108	1,311	$366	$528	$162	$155	None

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Heating?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
17	• G2E Package • G2E WH	1,086	1,643	3,386	1,743	$160	$359	$199	$196	Unknown
18	• G2E Split • WS	1,152	8,143	4,634	3,509	$872	$299	$573	$290	Broken heater, in-adequate insulation, under-sized heater
19	• G2E Split • G2E WH • G2E Stove	876	1,710	4,474	2,764	$96	$405	$309	$307	Under-sized heater, in-adequate insulation
20	• G2E Split • G2E WH	1166	5,770	4,732	1,038	$578	$497	$81	$93	Broken heater
21	• G2E Split • G2E WH	1003	2,720	9,315	6,595	$268	$951	$682	$677	None
22	• G2E Split	1100	4,429	3,935	493	$455	$404	$51	$60	None

* Not including cost (which was the most common reason).

**Caveat: kWh data and temperature data are on a monthly cycle while the kWh cost data is on the bill cycle, which is different for each household.

Table 5. Summer (June, July, mid-Aug) Evaluation (i.e., Home Cooling)**

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Cooling?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
1	• G2E Split • G2E WH • E2E Stove • WS • Solar	963	410	537	127	$57	$27	$30	$34	No AC

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Cooling?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
2	• G2E Split • G2E WH • G2E Stove • WS • Solar	835	1218	1763	545	$195	$245	$50	$35	Broken AC
3	• G2E Split • E2E WH	1,117	2944	2452	491	$479	$429	$49	$86	Broken AC
4	• G2E Split • WS	1,591	1172	2206	1034	$187	$396	$209	$194	Unknown
5	• G2E Split • WS	1,496	2515	2852	310	$382	$480	$97	$68	Unknown
6	• G2E Package • WS	2,331	1108	3040	1931	$142	$466	$324	$313	None
7	• G2E Split • G2E WH	1,078	3626	5934	2308	$566	$4058	$491	$448	No AC
8	• G2E Split	Unknown	1931	3075	1144	$277	$519	$242	$220	Unknown
9	• G2E Split • WS	1,087	4498	4095	403	$745	$749	$5	$52	Unknown
10	• G2E Package • G2E WH • WS	1,710	3991	3837	155	$639	$660	$21	$29	Broken AC
11	• G2E Split • WS	809	833	880	48	$27	$62	$35	$33	Broken AC
12	• G2E Split • G2E WH • Solar	1258	843	1610	767	$131	$237	$107	$97	Unknown

#	Upgrades	Size Estimate (sq-ft)	Energy Usage (kWh)			kWh Charge ($)				Past Issues Cooling?*
			Pre-Project	Post-Project	Difference	Pre-Project	Post-Project	Difference	Difference w/ Rate Increase	
13	• G2E Package • WS	1,166	3647	4881	1234	$584	$818	$234	$189	Unknown
14	• G2E Package • G2E WH	1,200	1343	1103	241	$214	$192	$22	$39	Unknown
15	• G2E Package	837	1829	1944	115	$325	$356	$32	$7	Broken AC
16	• G2E Split	1,289	4259	3793	466	$718	$685	$33	$88	None
17	• G2E Package • G2E WH	1,086	1854	2346	492	$319	$440	$121	$97	Unknown
18	• G2E Split • WS	1,152	3321	1993	1328	$545	$126	$419	$461	Under-sized AC, in-adequate insulation
19	• G2E Split • G2E WH • G2E Stove	876	1886	2420	534	$276	$406	$130	$109	Under-sized AC
20	• G2E Split • G2E WH	1166	1896	1345	551	$326	$233	$93	$118	None
21	• G2E Split • G2E WH	1003	2390	5388	2998	$397	$925	$527	$496	None
22	• G2E Split	1100	1094	1304	210	$173	$231	$58	$44	Cost only

* Not including cost (which was the most common reason).

**Caveat: kWh data and temperature data are on a monthly cycle while the kWh cost data is on the bill cycle, which is different for each household.

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This program is part of the TECH Clean California Quick Start Grants (QSG) program, designed to fund targeted, innovative projects that test approaches to overcoming market barriers to heat pump space and water heating adoption.

If you have questions about this report's findings or seek additional support assessing learnings for scaling project concepts, please contact the TECH Clean California Team at tech.info@energy-solutions.com.