Scaling Electric Cooking through Equity-Centered Market Transformation - Lessons from a 120V Battery-Equipped Induction Pilot in California

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ABSTRACT

Market transformation frequently overlooks legacy multifamily (MF) housing—particularly affordable housing in environmental and social justice (ESJ) communities—expecting these buildings to be impacted later in the market adoption cycle. Barriers to this market segment are especially challenging for efforts seeking to electrify cooking due to electrical service constraints, panel upgrade costs, and limited consumer familiarity with induction cooking technologies. This paper documents findings from a multifamily (MF) building pilot deployment of 120-volt (V) battery-equipped induction ranges at Emerson Arms, a 32-unit affordable housing complex in Martinez, California (CalMTA 2026a).

Using a mixed-methods approach combining quantitative cooking event data and qualitative resident feedback, the paper assesses technical performance and user adoption for 120V battery-equipped induction ranges. Findings demonstrate observed cooking behaviors can be met with limited electrical capacity, and that battery-equipped induction ranges can safely operate. The results can inform the design of future induction products and provide information for scaling equitable electrification in MF housing in the future.

Introduction

Cooking is one of the most visible and personal uses of energy in households, and efficient induction cooking serves as a linchpin to bring about the full home electrification needed to meet California's decarbonization goals. Induction cooktops and ranges provide a high-performance cooking experience while significantly improving safety and indoor air quality (IAQ) (CalMTA 2026b). These benefits are particularly important in the MF affordable housing context as IAQ contaminant concentrations are typically higher in smaller-volume spaces and in MF buildings due to shared walls with neighboring occupied units. Older buildings are also less likely to be equipped with functional ventilation. Adoption, however, has been uneven across California's housing types. Existing MF buildings—especially affordable housing serving ESJ communities—remain among the most difficult segments to electrify due to electrical infrastructure limitations, cost constraints, and tenant disruption risks (CalMTA 2026b).

One of the most persistent barriers is the prevalence of gas ranges connected to 120V outlets used to power electronic ignition, displays, and oven lights, rather than kitchens with a dedicated 240V circuit- to deliver the higher power needed for conventional electric or induction ranges (CalMTA 2026). Conventional electric and induction ranges, which use 240V electricity, typically require costly panel upgrades, rewiring, and tenant displacement, making them

impractical for many existing multifamily properties. As a result, cooking electrification has lagged behind other MF electrification efforts (CalNEXT 2023).

NYSERDA (New York State Energy Research and Development Authority) has played a significant role in encouraging the development of 120V induction cooking products, primarily by creating market demand and funding product innovation. NYSERDA's strategy has been to stimulate innovation through funding, public procurement, and market coordination. They have driven the conditions for manufacturers to develop full-size 120V induction ranges that can replace gas stoves without major electrical upgrades, making building electrification more practical for older housing stock. Building on their efforts, CalMTA[1] has recently launched a statewide Market Transformation Initiative (MTI) that focuses on building additional product availability and demand aggregation in California MF building market. This MTI will invest in additional product development, building awareness and demand, to further the adoption of induction cooking with a focus on 120V solutions.

This paper focuses on the new class of 120V battery-equipped induction ranges and how they can address this challenge in California. By integrating onboard energy storage and charge-limiting controls, these appliances are designed to deliver high-performance electric cooking while operating within existing electrical constraints. A pilot project at the Emerson Arms apartments provides a real-world test case for evaluating the technical feasibility, user experience, and equity implications of this approach. Research questions this study sought to answer include:

- Can battery-equipped induction ranges reliably meet real-world cooking demands in multifamily housing?
- What design insights emerge for manufacturers seeking to optimize cost and performance?

Emerson Arms is a 32-unit affordable housing complex located in Martinez, California. It was built in 1973 and is operated by Eden Housing. Eden Housing is an affordable housing provider with more than 12,600 homes across California serving a diverse population of 65,000 low-income residents from many cultures and backgrounds. Household sizes at Emerson Arms range from one to five occupants, with most units housing two residents. The site is representative of aging MF housing stock in California with limited electrical capacity and shared 120V kitchen circuits (CalMTA 2026a).

The 120V battery-equipped induction range pilot was implemented as part of a broader electrification effort that included heat pump space conditioning, central heat pump water heating, and electric dryers. This electrification work was implemented by the Association for Energy Affordability (AEA) with support from MCE. At the time of the study, the building had not yet received an electrical service upgrade from the utility, making it an ideal test case for evaluating plug-and-play electric cooking solutions. In all instances, the 120V ranges replaced an existing gas range.

[1] CalMTA is California's statewide market transformation administrator and is a program of the California Public Utilities Commission. The program is administered by Resource Innovations.

Technology Overview

The pilot deployed Copper's "Charlie" 120V battery-equipped induction range in all units. Key features include:

- Operation on a standard 120V, 15-amp (A) circuit
- Integrated 5 kilowatt-hour (kWh) battery
- Power output up to 3,200 watts (W) on a single inductive coil
- Peak power output of 10,000 W sufficient to support induction cooking and oven use
- Automatic charge-limiting functionality to prevent circuit overload on shared circuits.

This configuration is intended to eliminate the need for electrical upgrades while maintaining user experience comparable to conventional electric or gas ranges (Copper 2026).

Methodology

Study Design

The study employed a mixed-methods evaluation framework combining device-level quantitative range usage data with qualitative feedback from resident surveys. The evaluation was designed collaboratively by CalMTA, the AEA, and West Monroe (formerly 2050 Partners), with data provided by Copper.

Residents received a free set of compatible cookware when the ranges were installed, a quick start guide for their range operation (with options in English and Spanish), as well as ongoing access to technical support after the ranges were installed. Many residents had not previously used an induction range, so Eden Housing and Copper provided an in-person cooking demonstration prior to the installation, overviewing the capabilities of the range and the use of compatible cookware.

Quantitative Data Collection and Analysis

This study aimed to determine if battery-equipped induction ranges can reliably meet real-world cooking demands in MF housing. Cooking event data was collected from 23 participating ranges at three-minute intervals and included battery state of charge (0-100%), power input and output (W), cooktop heating zone power (kW), and oven [2]. Data were anonymized and analyzed to identify discrete cooking events and characterize power demand and energy consumption patterns. This data was collected from November 1, 2024 to December 31, 2025. In June 2025, there was a firmware update which prohibited the data from being collected from the ranges. This month's data has been excluded from the cooking event counts and analysis.

The team processed data to identify instances of "cooking events" to characterize cooking behavior and identify demand and energy consumption patterns. A cooking event contains all timestamps when at least one heating zone or the oven requests more than a specified threshold level of power. For each cooktop heating zone, that threshold is set to 1W; for the oven, that

[2] Twenty-three of the 32 households authorized the collection of data related to their usage of the 120V battery-equipped induction ranges.

threshold is set to 30W because of some other attributed electronics in the background (such as the clock). In some cases, the user turns off all zones and the oven while still cooking, such as when letting a pot cool before beginning the next cooking step, which should still be counted as the same cooking event. To account for this behavior, the calibrated amount of time can contain no power. This window is set to 15 minutes for the purposes of this analysis. There is no defined window in industry standards or test procedures, so this 15-minute window was selected to balance capturing cooking sessions as events and not grouping separate cooking sessions into a single event.

Each event is classified as one of three options: cooktop only, oven only, or both. From here, the events are manipulated for key findings, such as how much power is used by events with one cooktop heating zone compared to four cooktop heating zones and the oven, or the viability of reducing the battery size included in the range. This analysis is performed using Python code.

Qualitative Data Collection

Resident surveys were conducted approximately six months after the range demonstration event and after range installation to assess user experience, satisfaction, learning curves, and perceived benefits or challenges. Twenty residents agreed to complete the in-person survey that was conducted door-to-door. Surveys were available to all residents who agreed to participate in the pilot, and all respondents received a $100 gift card. The survey was conducted using the Qualtrics platform to record answers.

The survey gathered qualitative data related to the study objectives, including:

- Demographic data regarding occupants of each unit
- Standard cooking behavior of occupants
- Satisfaction with the induction range compared to their pre-retrofit gas range
- How often occupants use Power Boost to increase power on one burner while simultaneously using the oven and/or other heating zones
- Whether simultaneous usage of Power Boost and oven could be limited to reduce peak demand and wattage
- Correlation of peak power and other usage patterns to the number of bedrooms and/or number of occupants in each apartment

Findings

Technical Performance and Cooking Behavior

This study demonstrated that battery-equipped induction ranges can reliably meet real-world cooking demands for this multifamily housing site and that range performance for most cooking events required modest power and energy levels, supporting operation on constrained electrical infrastructure. There were 12,224 cooking events categorized. Of those, there were 8,538 (69.8%) cooktop-only events, which represented the majority of usage. There were 2,210 (18.1%) oven-only events, while simultaneous oven and cooktop operation occurred the least, at 1,476 (12.1%) events. Figure 1 shows the total number of cooking events per range, demonstrating that not every household utilized the range equally.

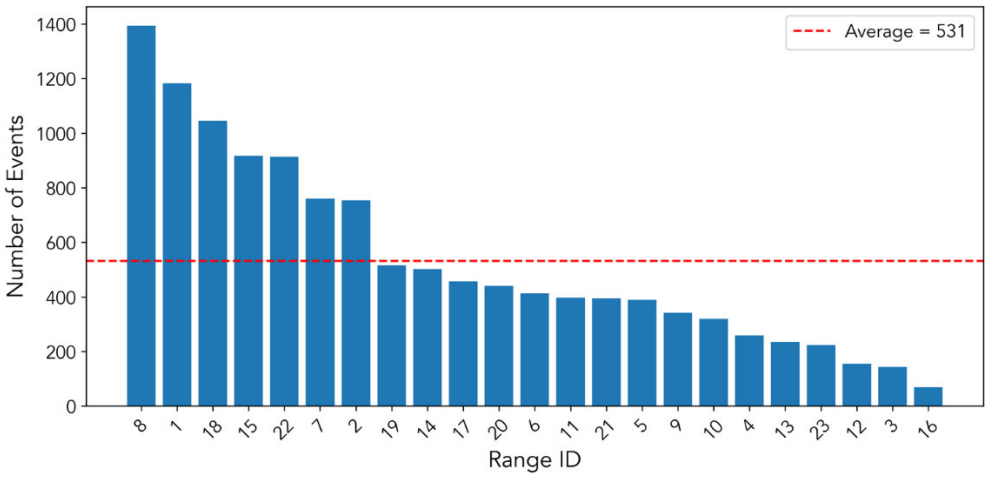

Figure 1. Total number of cooking events per range

Figure 2 summarizes the annual electricity consumption per Copper "Charlie" range, showing an average annual usage of approximately 255 kWh per unit across the study sample. CalMTA's Induction Cooking MTI research used an estimated annual energy consumption of 528 kWh for electric induction ranges and 543 kWh for electric resistance ranges in its modeling scenarios (CalMTA 2026b). The distribution in Figure 2 highlights substantial variability in cooking energy use between households, but overall consumption remains relatively modest, reinforcing that cooking loads are a small portion of total residential electricity use. These measured annual energy values provide useful inputs for energy efficiency program savings estimates and avoided cost calculations, while also enabling comparison with other studies evaluating standard 240V induction ranges and electric cooking technologies. As previously noted, data for the month of June could not be retrieved so the research team averaged consumption for the months of May and July to provide an adjusted value for June 2025 to include in the total annual electricity consumption.

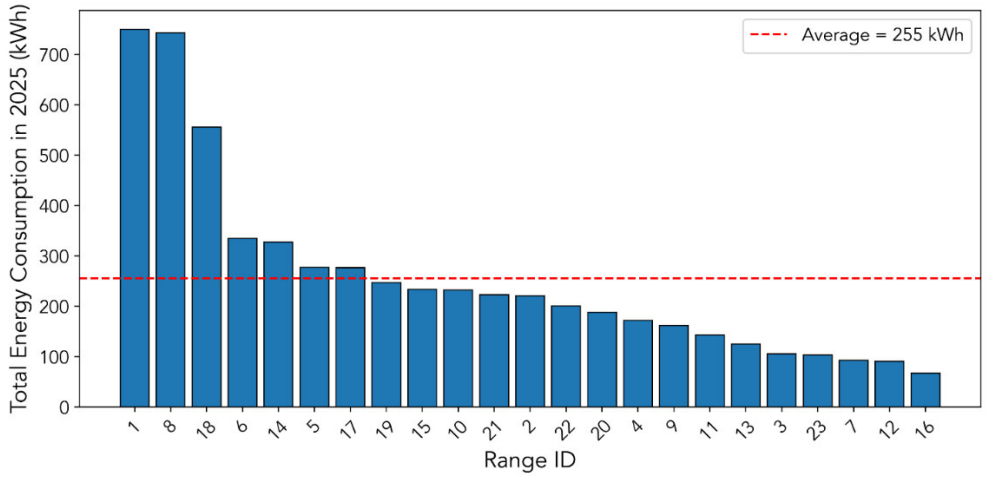

Figure 2. Total energy consumed during 2025 per range

Most cooking events used one or two cooktop heating zones, while concurrent high-output burner and oven use was limited. Battery performance data indicate that integrated battery capacity supported nearly all cooking events without significant depletion, suggesting alignment between the kWh battery capacity and typical cooking demand. As seen in Figure 3 below, only 0.6% of events dropped below 30% capacity. This chart represents the minimum battery charge at the end of a cooking event, bucketed in intervals of 10%. It should be noted that this chart does not represent the state of charge at the conclusion of the cooking event, but the minimum charge at any time during the event. For example, if the battery starts at 85%, drops to 78%, but then recharges to 83% during the event, the minimum battery charge recorded for the event would be 78%. The initial state of charge may be lower than 100% if sufficient time has not passed for the battery to recharge. This provides an assessment of the effectiveness of the battery capacity to serve real-world cooking needs when considering limitations of when charging is available.

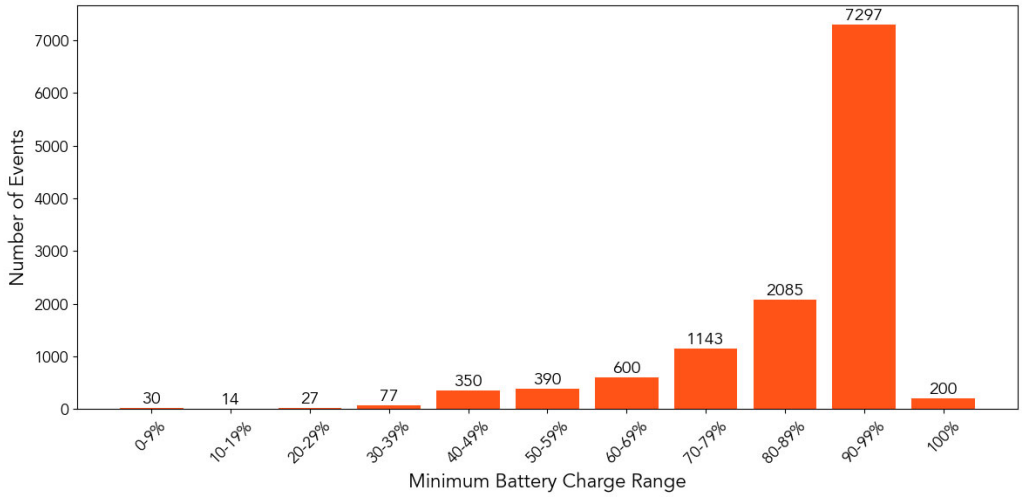

Figure 3. Total number of cooking events by minimum battery charge at end of cooking event

Findings from this study indicate opportunities to optimize battery capacities while maintaining performance. Figure 4 represents the percentage of cooking events that exceed a threshold of total energy consumption. For example, the left-most column shows that 5.2% of cooktop-only events, 19.8% of oven-only events, and 62.2% of combination oven-and-cooktop events use more than 1.0 kWh. While battery size can be decreased to reduce cost and weight, there are technical tradeoffs involved. A battery's C rate, which represents its charging and discharge rate, constrains the minimum size of the battery. While a battery smaller than the 5 kWh one in the "Charlie" range may be able to meet many of the events seen in the above chart, the C rate will also decrease, leading to less available instantaneous power for use during high-power events. It should be noted that this analysis did not account for incoming power from the 120V circuit, which may be included during a cooking event.

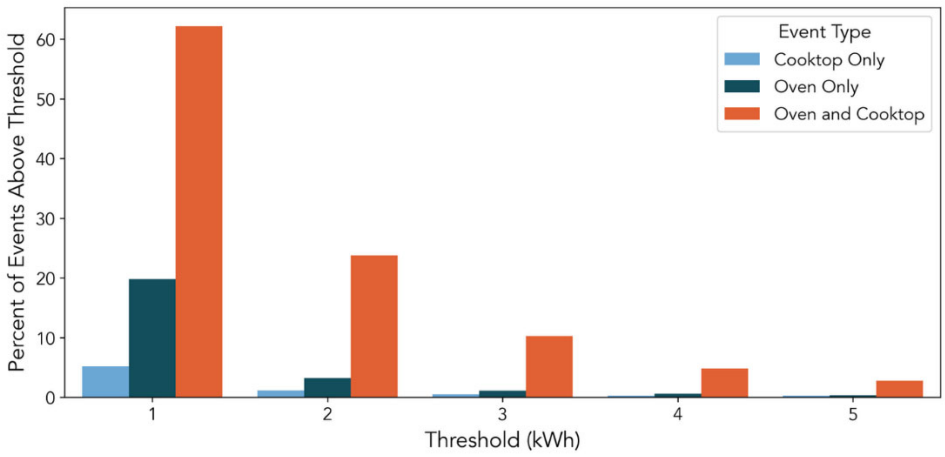

Figure 4. Percentage of cooking events of each event type that exceeds a threshold of total energy consumption during an event

Results in Figure 5 demonstrate that battery-equipped induction ranges can provide effective cooking performance on standard 120V circuits, reducing the need for costly electrical upgrades. To assess the limitation of a standard 120V induction range without a battery, this study evaluated the percentage of cooking events that would exceed the available circuit capacity. The kitchen receptacles are served by a 120V, 15A circuit, providing 1.8 kW of power. However, UL858 requires that electric ranges use a maximum of 80% of the available power, resulting in an effective power threshold of 1.44 kW for the analysis seen in Figure 5. When only the cooktop was in use, 35.5% of events exceed this threshold. When both the oven and the cooktop were used, nearly all cooking events included one 3-minute interval during which power demand exceeded the 1.44 kW limit.

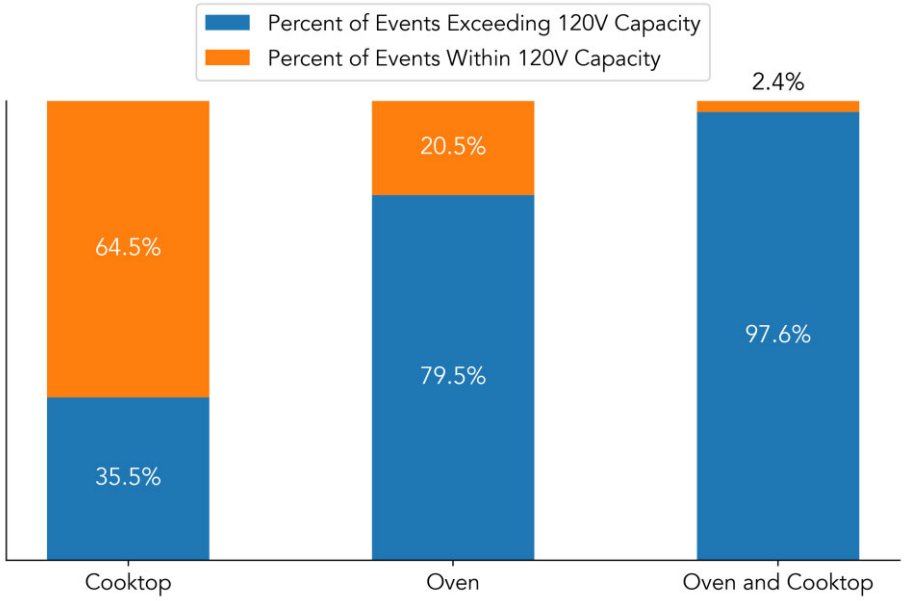

Figure 5. Percentage of cooking event types that exceed 120V circuit capacity of 1.44 kW

Additional analysis focused on cooking event configurations. Figure 6 represents a breakdown of cooking events by the maximum number of concurrent cooktop heating zones used during cooktop-only and oven-plus-cooktop events. Most cooktop-only events are relatively simple, with over 76% using only one cooktop heating zone. However, when the oven is used in combination with the cooktop, the distribution shifts, with over 40% of events using two or more concurrent cooktop heating zones. This suggests that cooking events involving both the oven and cooktop tend to be more elaborate.

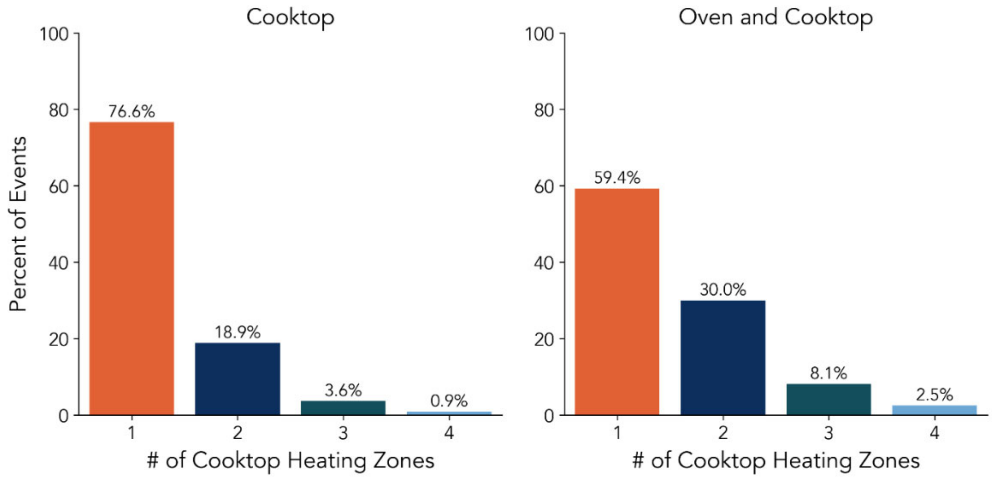

Figure 6. Percentage of cooking events by type according to the maximum number of cooktop heating zones active during the event

Figure 7 below is a histogram of all times in which any parts of the range draw power. 23.4% of timestamps where the range is being used exceed 1.44 kW, the standard allowable power draw from a 120V kitchen outlet, indicating that the battery is necessary for the cooking being done during that time. The spikes at 2 kW and 3 kW correlate to the max output of cooktop heating zones.

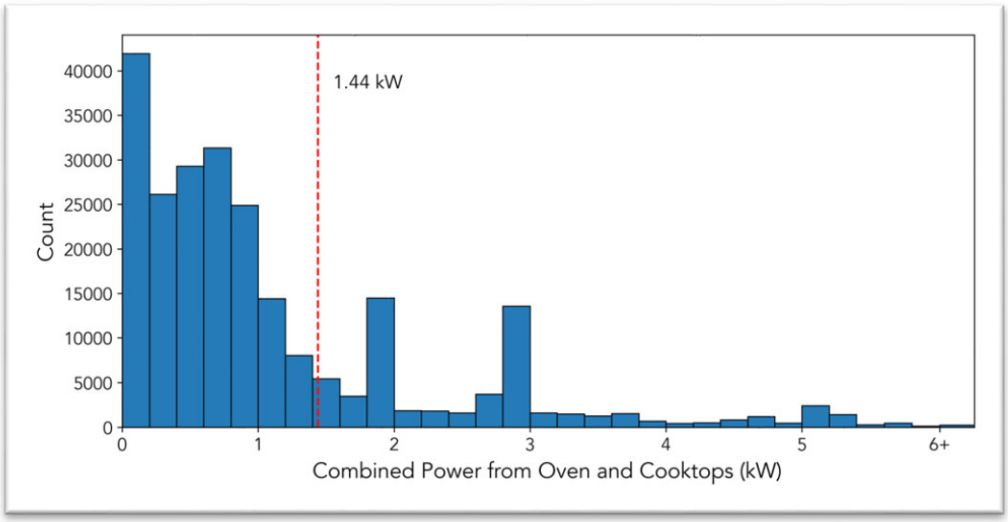

Figure 7. Indicates the number of timestamps where the range use exceeds 1.44 kW

Installation Viability in Legacy Multifamily Buildings

The pilot demonstrated that battery-equipped induction ranges can operate successfully on shared 120V, 15A circuits common in legacy multifamily buildings when automatic charge-limiting controls are properly configured to detect other loads on the circuit and stop or reduce the battery charge rate. No persistent circuit overload issues were observed during the study. This finding is significant for affordable housing properties where the cost of panel or service upgrades are often infeasible.

Currently, battery-equipped induction ranges are roughly two times more expensive than a 240V induction range due to the integrated battery and associated power electronics, but for homes requiring an electrical upgrade, the battery-equipped product could be cost neutral or offer savings in up-front cost depending upon the complexity of the electrical work required. In many retrofit contexts—particularly older MF buildings—the avoided costs of electrical panel upgrades, rewiring, and service capacity improvements can offset this price premium. Plug-and-play 120V battery-equipped ranges enable electrification on existing kitchen circuits, avoiding infrastructure upgrades that can range from several thousand dollars in single-family homes to tens or even hundreds of thousands of dollars in multifamily properties. The median avoided cost benefit was roughly four times higher for battery-equipped 120V compared to 240V induction when switching from gas due to the ability to shift electricity consumption to off-peak hours (CalMTA 2026).

Successful deployment required coordination with concurrent electrification upgrades and careful circuit management during installation. Results suggest that these products are particularly viable when incorporated into broader building electrification strategies.

Qualitative Survey Findings

User Experience, Adoption, and Equity Considerations

Six months after the ranges were installed, a qualitative survey was conducted. The survey was optional, and respondents received $100 to complete the survey. Twenty of the 32 units completed the survey. The following summarizes the survey responses of the 20 pilot participants:

Respondents most often reported that two people occupied their unit and that they most often regularly cook for two people. Half of respondents noted that before their induction range was installed, they had no prior knowledge about induction appliances. A full breakdown of respondents' awareness levels is shown in Figure 8. Seven respondents noted having specific questions or concerns about their induction range after it was installed. When the induction ranges were installed, a demonstration was performed by a chef to show residents how to operate the range. Fifteen of the 20 respondents said they attended this demonstration. Eleven of these rated the demonstration a 5 in terms of helpfulness (on a scale of 1 to 5 where 1 was "not at all helpful" and 5 was "very helpful"). When asked if there was any additional information that could have been provided for range operation, responses included: more general information regarding the range operation, cleaning of the cookware, and information available in Spanish.

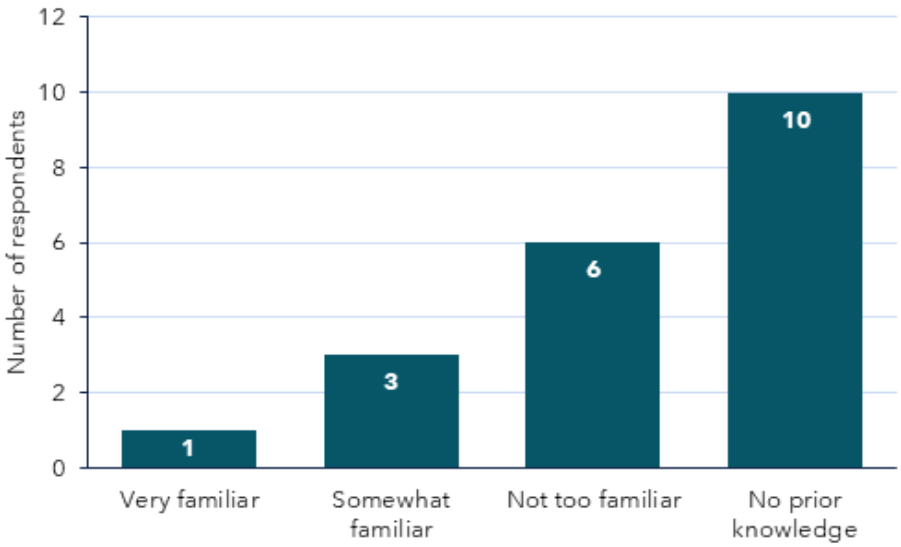

Figure 8. Familiarity with induction ranges

When asked what they liked most about the induction ranges, respondents provided a variety of answers including: the various functionalities of the range, the cooking experience of using the range, the ease of cleaning the range, and the range's safety features compared to their previous gas range. The full breakdown of responses is shown below on Figure 9.

Figure 9. What respondents liked most about the induction range

Thirteen respondents noted experiencing challenges or frustrations while using their induction range. These included needing to make adjustments to their typical cooking experience when learning to use induction, issues with the range shutting off unexpectedly, taking time to fully understand the functionality of their range, and issues with their cookware not working as intended. Of the 13 respondents that noted experiencing challenges with their range, 10 said they were able to resolve them. Six of these respondents said they were able to resolve them on their own by learning more about their range's functionality, three said they contacted management or a Copper customer service representative to resolve the issue, and one said they received

assistance from a neighbor. Of the three respondents who said they have not been able to resolve their challenges, 2 said they have not taken any steps to try to resolve them, and the other noted talking to a manager who tried to help them, but the problem was not resolved. Of note, the challenges described by respondents were a mix of hardware-related issues with the range as well as challenges related to the experience of using an induction range for the first time. As a result, many of the challenges were resolved with more usage, whereas others took assistance to resolve.

In terms of the ease of learning how to use their range, half of the respondents also rated the induction range a 5 (on a scale of 1 to 5 where 1 was “very difficult” and 5 was “not at all difficult”). The full breakdown of results is shown below in Figure 10. Most residents reported limited familiarity with induction cooking prior to installation, but satisfaction increased after an initial adjustment period. In-person demonstrations and ongoing support were key factors supporting adoption.

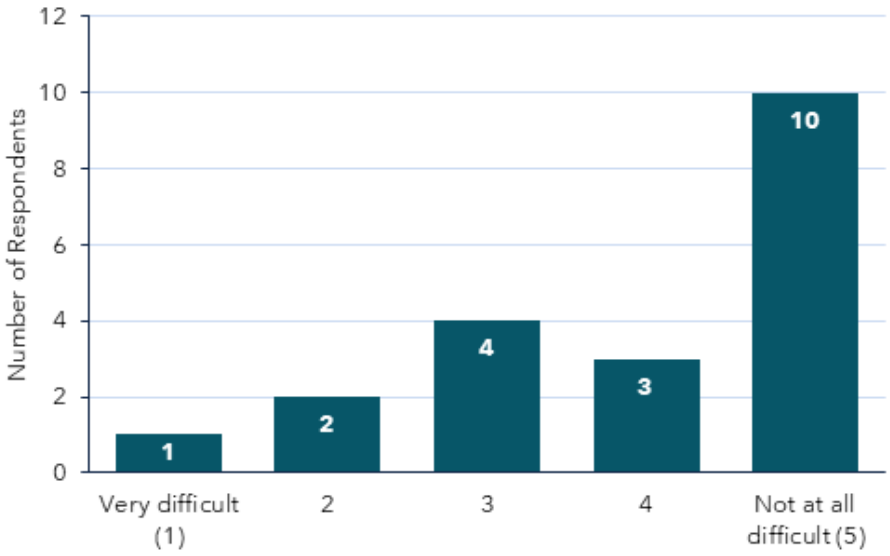

Figure 10. Difficulty of learning to use the induction range

Cooking Habits and Performance

Respondents varied in how often they use Power Boost on their range. As shown on Figure 11, the most common selection was “several times a week,” followed by “daily” or “rarely.”

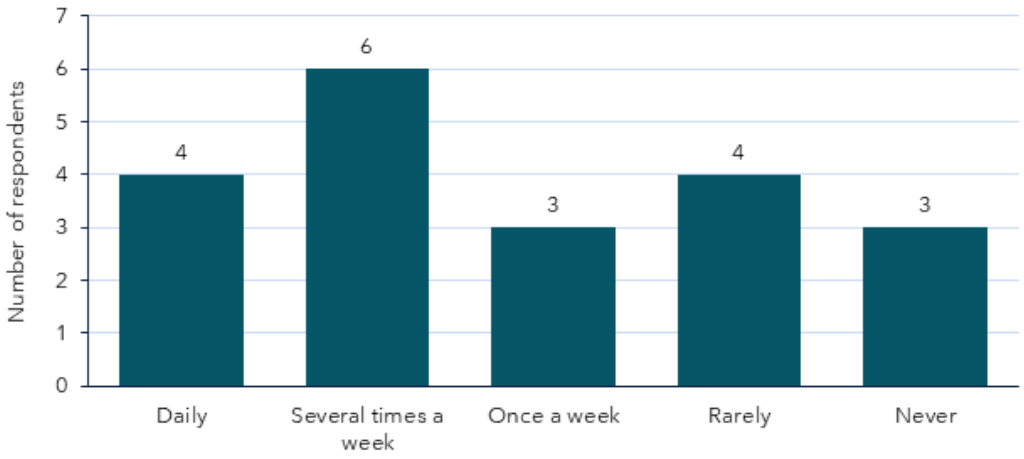

Figure 11. Power Boost usage

Respondents who said they used Power Boost at least once a week were also asked about using multiple heating zones. As shown in Figure 12, seven of these 12 respondents noted they use the Power Boost at the same time as the oven or other heating zones.

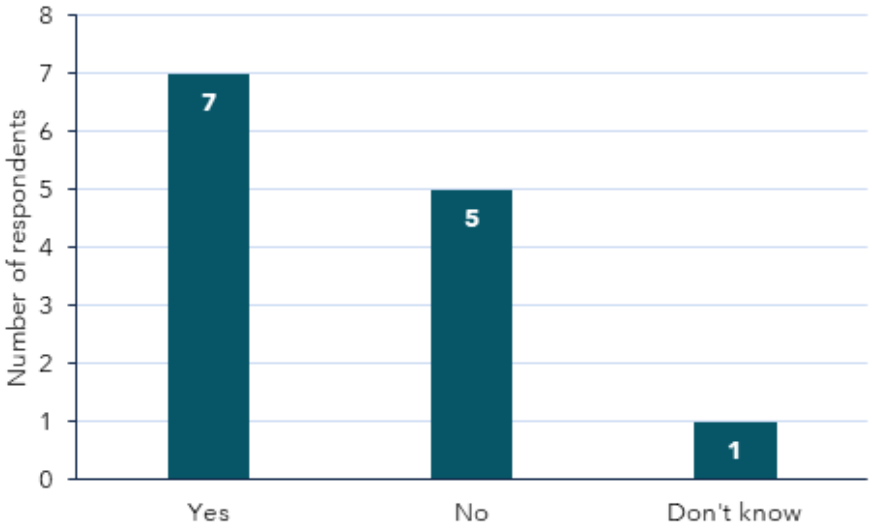

Figure 12. Usage of the Power Boost and multiple heating zones

The most mentioned features of the induction range that respondents found most useful were the ease of cleaning and the low risk of burns. A full breakdown of these results is shown below in Figure 13.

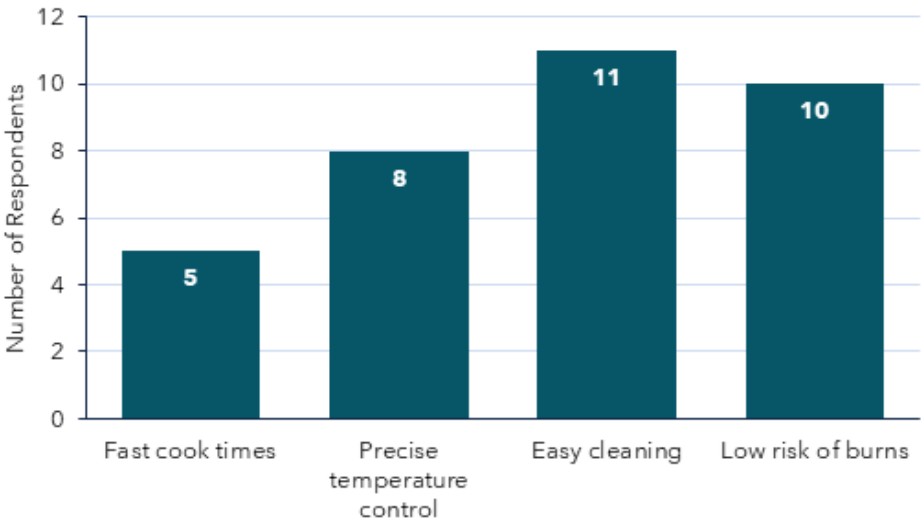

Figure 13. Most useful features

Only one respondent noted a feature they found unnecessary, which was the heat indicator. In terms of additional functionality, 16 respondents said they had used their range on a holiday or for a special event (n=18). When asked to compare the ability of the range to cook larger meals for these occasions compared to regular meals, 12 respondents said the experience was about the same, three said it was easier, and one said it was more difficult.

Findings highlight the importance of multilingual materials and hands-on education to support adoption, particularly in affordable housing since over 40% of California residents (Axios 2023) primarily speak a language other than English at home. Successful electrification deployments depend not only on appliance performance but also on accessible education and resident support.

In terms of safety, 17 respondents said they felt their induction range was safer to operate than their previous gas range, while another 3 felt it was just as safe to operate (n=20). Overall, 13 respondents said they were either “much more” or “more” satisfied with their induction range than their previous gas range. A full breakdown of these responses is shown below in Figure 14.

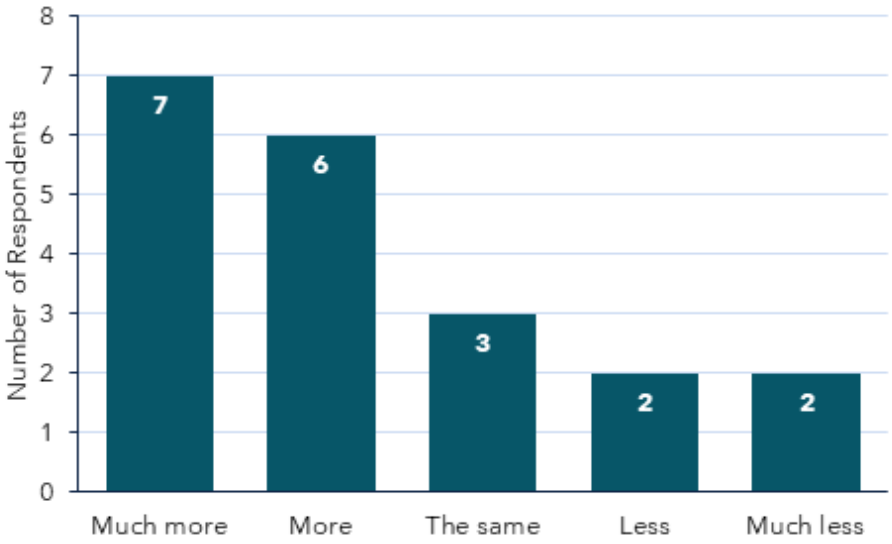

Figure 14. Satisfaction with induction compared to previous range

Adoption and Willingness to Recommend

At the end of the survey, respondents were asked if they would recommend an induction range to others. As shown in Figure 15 below, respondents said they would recommend an induction range. When asked why they would recommend the range, 5 respondents said it was because of the safety of using induction compared to gas, 3 said it was due to ease of use, 2 provided general functionality reasons, and 1 respondent each said it was because of the cooking speed and power reliability.

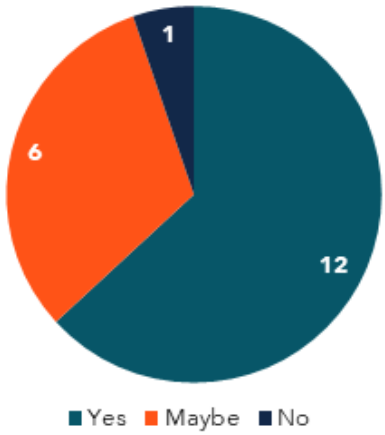

Figure 15. Recommending an induction range

Implications for Transforming the Cooking Market

Results from this pilot at the Emerson Arms indicate that battery-equipped induction ranges can serve as a scalable solution for cooking electrification in multifamily housing, particularly in buildings where electrical upgrades are costly or infeasible. By enabling

installation on existing 120V circuits, this technology reduces retrofit costs and minimizes tenant disruption—two persistent barriers in affordable housing electrification efforts.

Findings suggest several implications for market actors and program design. For manufacturers, observed cooking patterns indicate opportunities to optimize battery capacity and heating zone configurations while maintaining performance for typical household cooking needs. For program implementers, results highlight the importance of pairing technology deployment with resident education and support to ensure successful adoption. Providing the right pots and pans will facilitate building resident buy-in, help guide how best to operate this new technology and mitigate future consumer challenges as they transition to induction cooking.

More broadly, the pilot demonstrates a replicable pathway for advancing electrification in legacy MF housing stock while centering equity and minimizing infrastructure constraints. Study findings are informing the development of a statewide market transformation initiative at CalMTA aimed at accelerating 120V induction adoption in MF buildings across California. Continued research and deployment will help refine product design and program approaches needed to scale this solution across constrained multifamily housing markets.

Further Research

While results represent a limited sample size at a single property, findings are directionally robust and provide actionable insights for near-term program design, product development, and deployment strategies. Future analyses will refine understanding of performance under longer-term and broader deployment conditions.

CalMTA is working with AEA, Los Angeles Cleantech Incubator (LACI), Standford Labs, Copper, and Esperanza Housing on consumer usage data collection from the installation of 33 Copper ranges in another low-income MF building in Los Angeles. This full electrification project includes replacing gas stoves with Copper 120V battery-equipped ranges as well as placing IAQ monitors in 10 units before and after the removal of gas ranges. This project is similar to this pilot with Eden Housing and will enable the project team to compare user experiences with the 120V products but in a different location and different set of tenants. The team should have data to report in the latter part of 2026.

Acknowledgements

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References

Axios. 2023. “The Californians Who Speak a Non-English Language at Home.” September 7. https://www.axios.com/local/san-francisco/2023/09/07/california-foreign-language-speakers

CalMTA (California Market Transformation Administrator). 2026a. *120V Battery-Equipped Induction Ranges Field Study Report*. San Francisco, CA: CalMTA. https://calmta.org/wp-content/uploads/2025/09/120V-Battery-Equipped-Induction-Ranges-Field-Study.pdf

CalMTA (California Market Transformation Administrator). 2026b. Induction Cooking Market Transformation Initiative Plan. San Francisco, CA: CalMTA. https://calmta.org/wp-content/uploads/2025/09/Induction-Cooking-MTI-Plan-052626.pdf

CalNEXT. 2023. Low-Income Multifamily Housing Characteristics Study Final Report ET22SWE0033. https://calnext.com/wp-content/uploads/2023/11/ET22SWE0033_Low-Income-Multifamily-Housing-Characteristics-Study_Final-Report.pdf

Copper. 2026. "Charlie – Battery-Equipped Induction Range." Accessed June 9, 2026. https://copperhome.com/products/charlie

AI Disclosure

AI-assisted tools used: ChatGPT.
Used for: Creating paper outline, editing, assisting citation formatting.
Human review: The authors reviewed and verified all content, calculations, and citations.