REPORT # MR26-009

120V Battery-Equipped Induction Ranges

Field Study Report

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CalMTA is a program of the California Public Utilities Commission (CPUC) and is administered by Resource Innovations

Contents

List of Abbreviations

Abbreviation	Definition
AEA	Association for Energy Affordability
CalMTA	California Market Transformation Administrator
CPUC	California Public Utilities Commission
HOB	Highest output burner
LIFT	Low-Income Families and Tenants
LIWP	Low-Income Weatherization Program (LIWP
kWh	Kilowatt hour
MFES	Multifamily Energy Savings
MTI	Market Transformation Initiative
V	Volts
W	Watts

1 Introduction

This report presents findings from a field study conducted at an Eden Housing apartment complex, Emerson Arms, where the team installed Copper's "Charlie" model induction range to replace existing gas ranges. The study aimed to gather both quantitative and qualitative data to assess how users adapt to 120-volt (120V) battery-equipped induction cooking, how specific product features align with their cooking habits, and how the technology impacts their overall satisfaction and understanding of how to use the equipment.

CalMTA partnered with Eden Housing, the Association for Energy Affordability (AEA), and Copper to co-fund the induction install pilot project.[1] Shared costs included the purchase of the Copper ranges, the installation of a Wi-Fi network to collect data on the operation of the Copper ranges, and the purchase of incentive gift cards for the residents who signed a waiver to participate in the study and who completed the qualitative questionnaire.

The study site, Emerson Arms, is a 32-unit affordable housing complex in Martinez, California, managed by the nonprofit Eden Housing. Occupancy in this multifamily complex varies from one to five people per unit, with the majority being two people, representing variability in cooking behavior. This project was part of a larger full-electrification project funded by MCE that included the installation of ductless mini splits, a central heat pump water-heating system, and electric dryers. This site is also scoped to receive rooftop solar at a later date to offset the electrification costs for the residents.

1.1 Study objectives

The objectives of this study are as follows:

1) Collect data on resident cooking behavior
2) Document cooking behavior related to Copper's "Charlie" induction range product features
3) Analyze cooking behavior data to determine potential future induction cooking product development
4) Use qualitative survey data to gauge the impact of Copper's induction range technology on consumer understanding of the 120V induction product and their satisfaction

1.2 Study scope

The replacement of gas ranges with induction ranges builds off AEA's broader electrification work at the Emerson Arms site, which is funded through MCE's Multifamily Energy Savings (MFES) and

[1] Copper provided the induction ranges used at the Emerson Arms test site; however, Copper did not fund or sponsor this study. All findings and conclusions are independent.

Low-Income Families and Tenants (LIFT) programs, as well as the California Department of Community Services and Development Low-Income Weatherization Program (LIWP). 23 of the 32 households authorized the collection of data related to their usage of the 120V battery-equipped induction range.

Copper's "Charlie" model induction range is a plug-and-play 120V product with an integrated 5 kWh battery. The range provides up to 3,200 watts (W) of power output on a single inductive coil, with a peak battery power output of 10,000W. This product has the potential to provide similar cooking performance benefits as a conventional 240V appliance, despite being limited by the maximum power output of a typical 15 amp (A) 120V circuit.

The Emerson Arms site provided a unique opportunity to evaluate induction cooking where there are electrical infrastructure constraints and a need to mitigate bill impacts when transitioning appliances from gas to electric. There is a need to add electrical capacity due to all the electrification efforts at the site, but the capacity of the building has not yet been updated by the utility. As the kitchens do not have a 240V circuit or dedicated 120V circuit for appliances, the new ranges are installed on a shared 120V, 15A circuit.

The plug-and-play 120V battery-equipped range prevents the need for invasive and costly electrical service upgrades, and it allows the research team to evaluate cooking performance under reduced charging rates and scheduled charging during off-peak periods. The study leverages "Charlie's" automatic charge-limiting function that reduces or stops the charge rate when other appliances are operating on the circuit. To ensure the induction ranges didn't overload the circuits, Copper set them to charge at different times of day based on the building capacity and at a rate that was less than what the battery was capable of.

For this study, data was collected between November 1, 2024, and May 31, 2025. The study includes an analysis of the data to understand the relationship between resident cooking behavior and battery-equipped induction range capabilities. The team also engaged consenting occupants through qualitative surveys to understand how they perceived the product after using it. The study sought to:

- Determine peak power demand from both the cooktop and oven to inform battery size. This data was shared with manufacturers to help inform future product iterations and enhance consumer acceptance.
- Identify alternative ways to configure a range to reduce reliance on battery power.
- Determine how often occupants use the highest output burner simultaneously with the oven and/or other burners, and/or if simultaneous usage could be limited to reduce peak demand and wattage.
- Determine user satisfaction with the battery-equipped induction range units.

2 Methodology

This section highlights the methods of quantitative data collection from the battery-equipped induction ranges during the November 1, 2024, through May 31, 2025, time period and from the in-person qualitative survey. 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. Residents received ongoing access to technical support after the ranges were installed.

2.1 Quantitative data

2.1.1 Data collection

Usage data collected by each Copper range was sent to Copper, which was anonymized and shared with the CalMTA research team. Data was collected at three-minute intervals and includes the battery state of charge (0-100%), the power input into the battery (watts [W]), the power output of the battery (W), the power consumed by each heating zone (kilowatts [kW]), and the power consumed by the oven (kW). The power was averaged over the previous three-minute interval, so high instantaneous peaks were not captured.

2.1.2 Data parameters

Once the data was collected, it was analyzed to identify instances of "cooking events." 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 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 step. To account for this, there are a number of timestamps that can contain no power use while still considered the same cooking event. This number is adjustable and set to five (or 15 minutes, since the data is collected in three-minute intervals).

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.

2.2 Qualitative survey

CalMTA distributed surveys to all residents at the Eden Housing development six months after their Copper induction ranges were installed. Twenty residents agreed to complete the survey. Surveys were available to all residents who agreed to participate in the study, and all respondents received a $100 gift card. The survey was conducted in person using Qualtrics.

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 their highest-output burner (HOB) simultaneously with the oven and/or other heating zones
- Whether simultaneous usage of their HOB 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

3 Findings

3.1 Quantitative data findings

This study includes analysis of the data collected on 23 Copper 120V battery-equipped induction ranges to understand the relationship between resident cooking behavior and range capabilities. The findings below address key questions about the capabilities of the battery-equipped induction ranges compared to cooking performance of similar 240V appliances during a variety of cooking events.

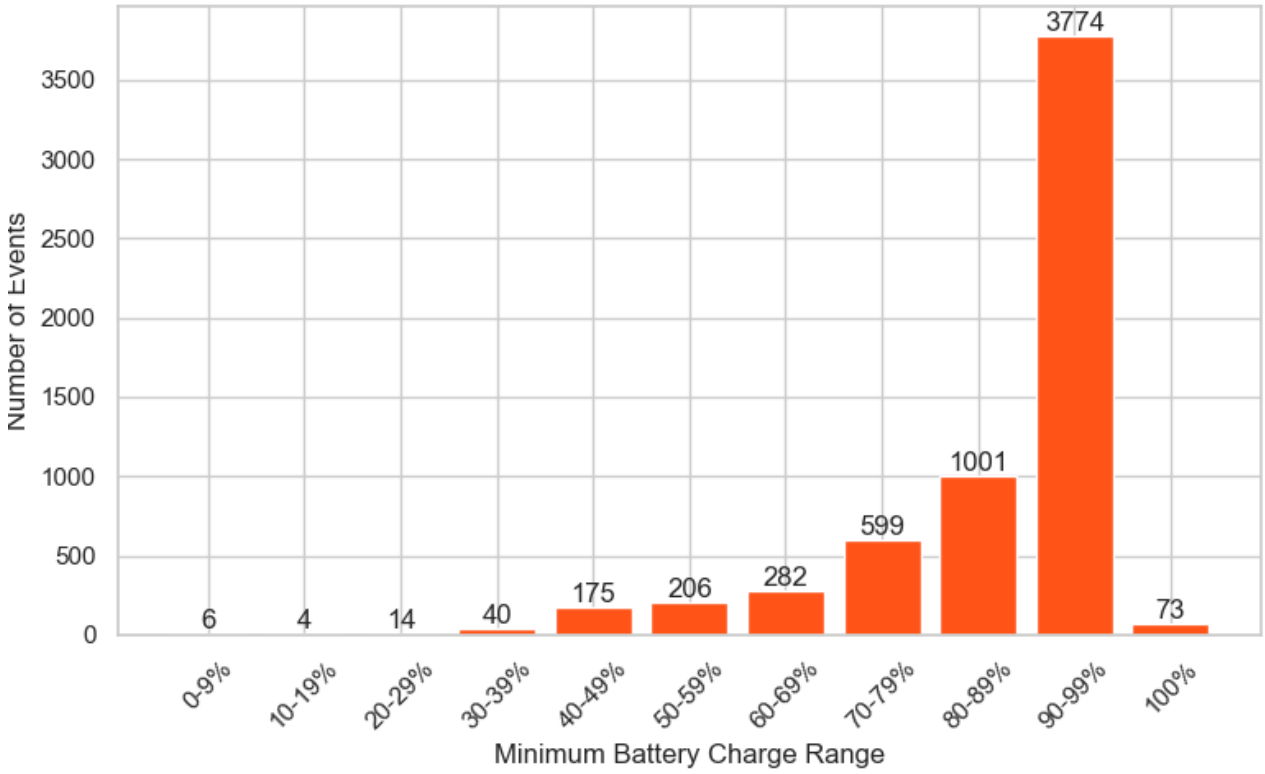
3.1.1 Adequate battery size

Copper's "Charlie" induction range provides adequate battery capacity to meet the cooking behavior of the study participants, assuming the appliance had access to a 120V charging circuit during the cooking event. Out of 6,175 cooking events in the dataset, only one event caused the battery to drop below 1% state of charge. This means that 99.98% of all cooking events during this study period were not limited by the battery size of the appliance. Six events, or 0.09% of all events, caused the battery to drop below a 10% state of charge, and 24 events, or 0.38% of all events, caused the battery to drop below a 30% state of charge. It should be noted, however, that the qualitative survey provides insights for potential changes to occupant behavior caused by "low power" alerts from the product. A low power alert, which is indicated by a battery icon on the range display, comes on when the battery is at a 30% state of charge and again at a 20% state of charge. The qualitative data must be taken into context with the information above.

Figure 1 below describes the minimum battery charge observed during a cooking event, but not the state of charge at the conclusion of the cooking event. If sufficient time has not passed between cooking events for the battery to recharge, the initial charge may be lower than 100%, so the figure does not represent the state of charge consumed. Overall, the chart shows the real-

world performance of the battery, taking into consideration limitations such as times when charging is available.

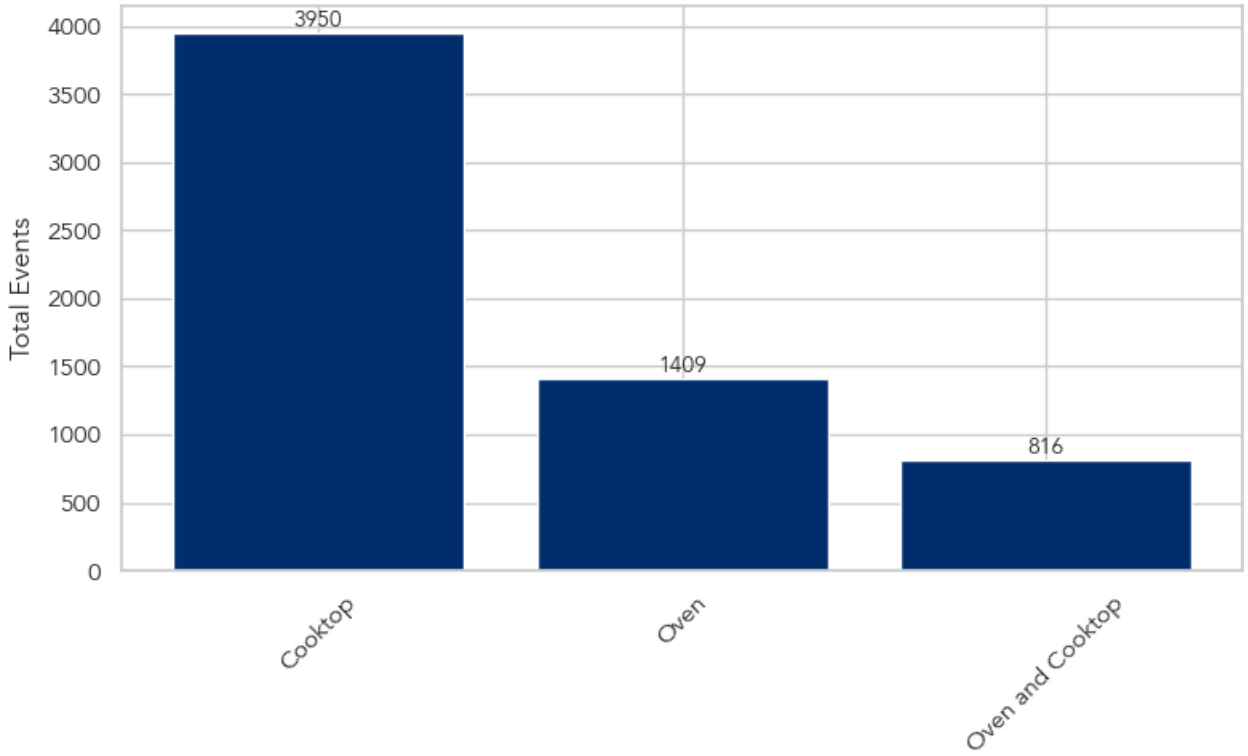
Figure 1. Total number of cooking events by minimum battery charge range



3.1.2 Adequate power output

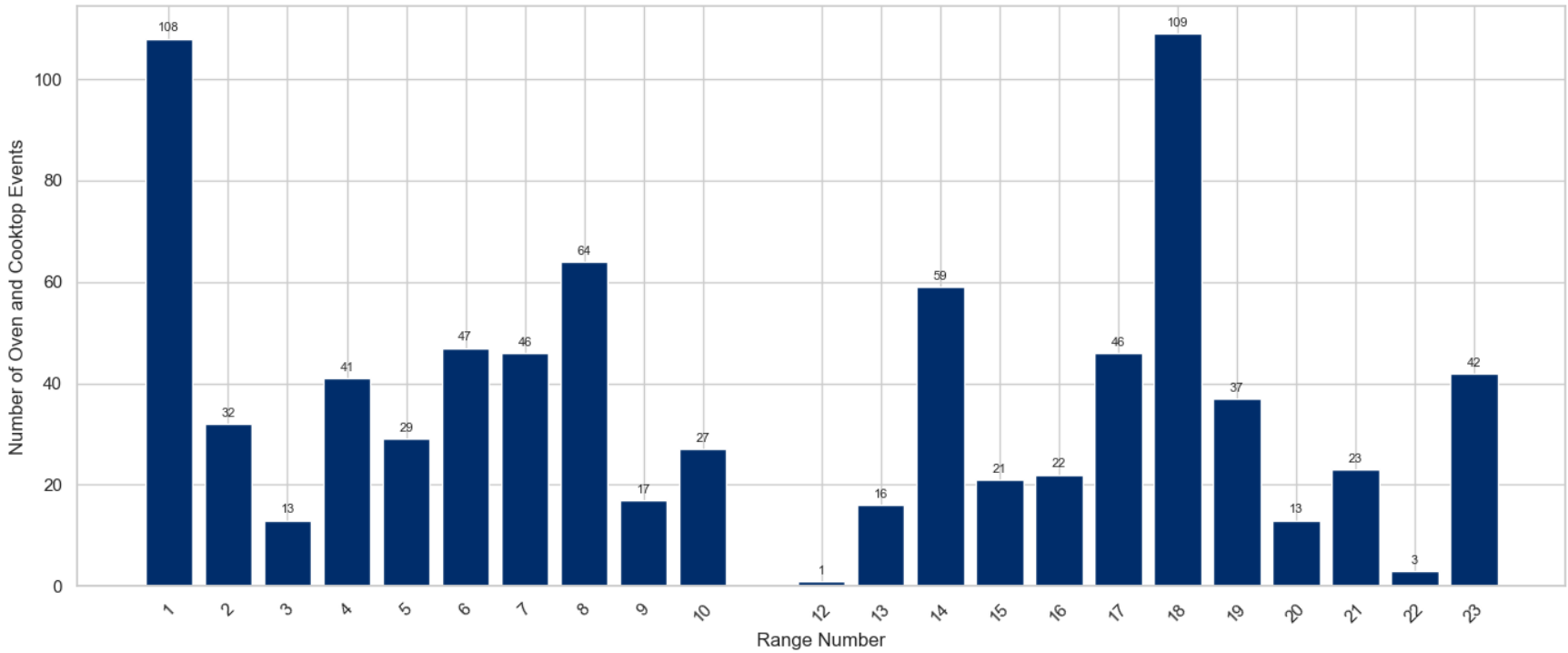
A second important finding is that out of 6,175 cooking events, 816 events combined the use of the oven and at least one cooktop heating zone simultaneously (Figure 2). This means that 13.2% of all cooking events required the power output necessary to operate both end-uses simultaneously. This number provides insight for manufacturers on the feasibility of potential configurations for 120V and battery-equipped product designs.

Figure 2. Total number of cooking events by cooking event type



Of the 816 oven-and-cooktop cooking events, 26.6% of them were from two of the 23 ranges (ranges 1 and 18), while three of the ranges (ranges 11, 12, and 22) had less than four events each (Figure 3).

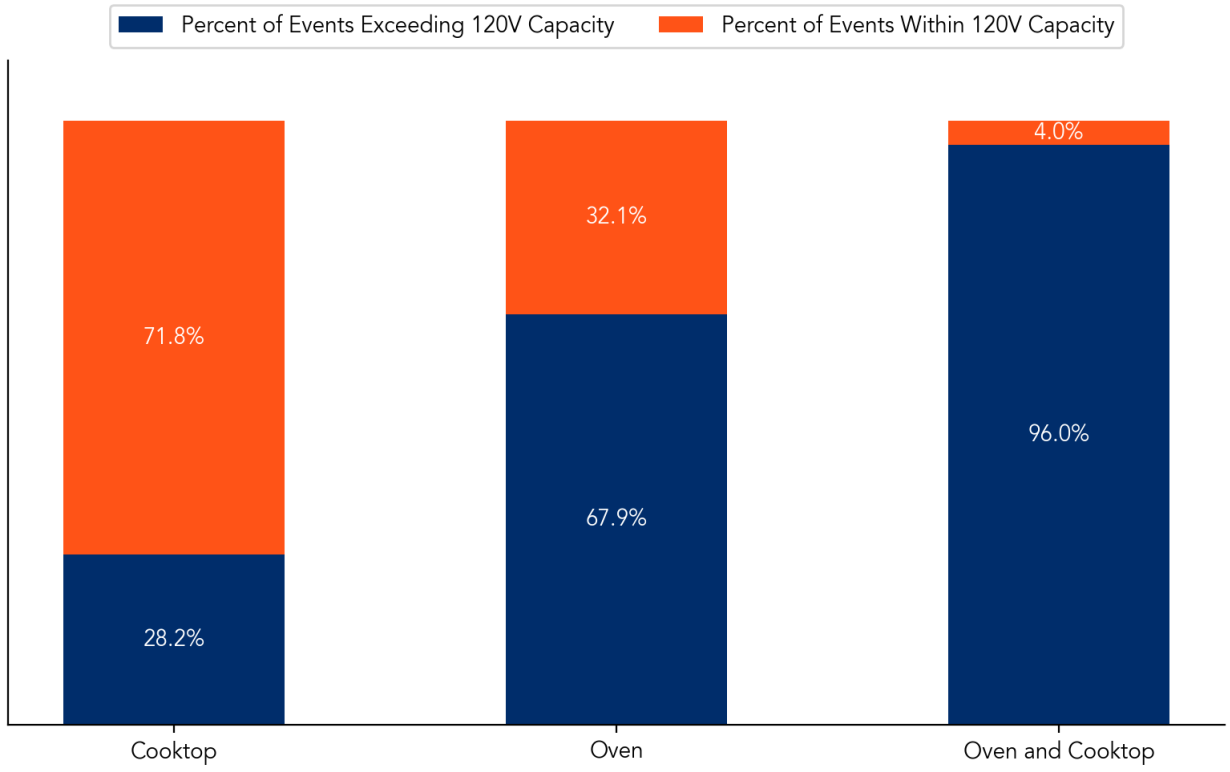
Figure 3. Total number of cooking events by range



3.1.3 120V (without a battery) product feasibility based on cooking event power draw

The study also gathered critical data that informs the viability of a 120V range without battery, as opposed to a conventional 240V range. A 1.44kW threshold is the power limit for 15A, 120V household circuits according to UL858. Figure 4 below displays the percentage of cooking event types that could not be met by a 120V induction range without battery power, assuming a similar level of outlet power and cooking time.

Figure 4. Percent of cooking event types that exceed 120V circuit capacity

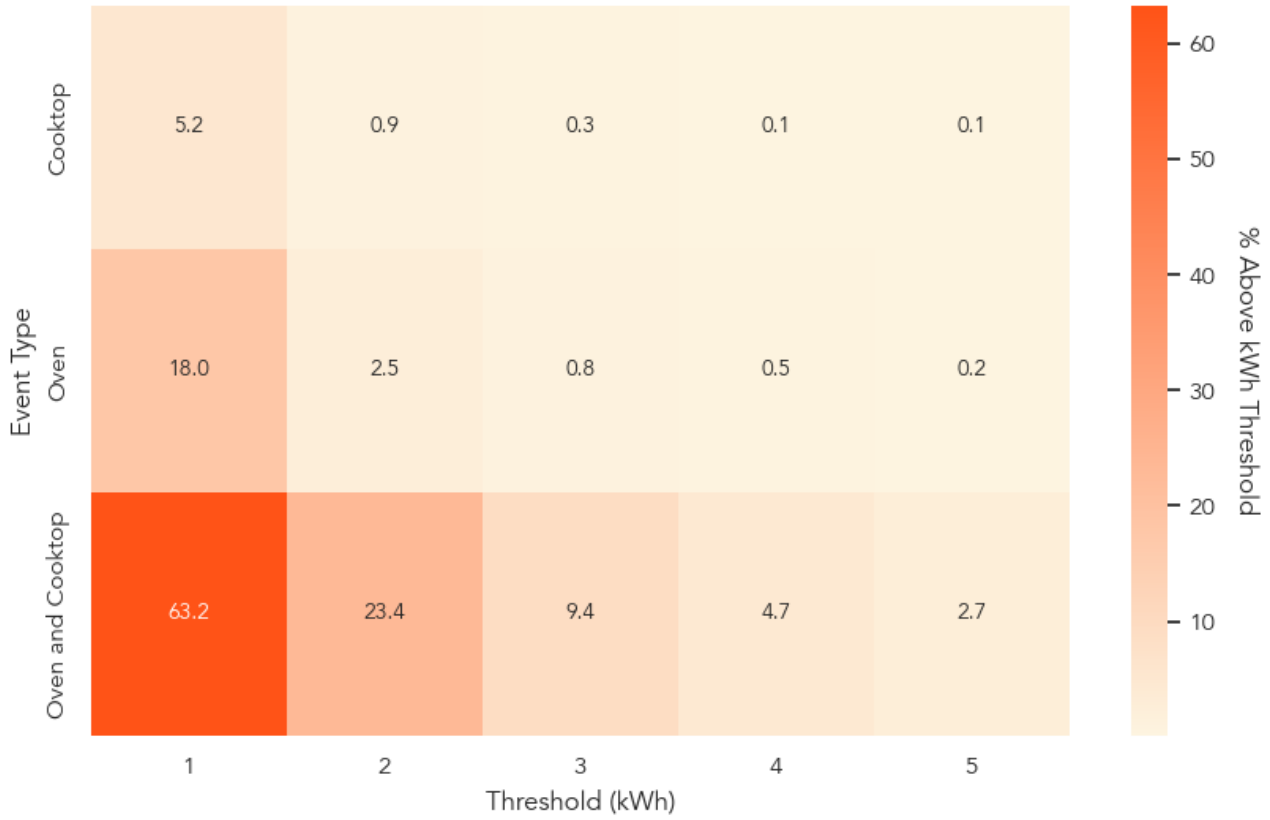


While 71.8% of cooktop-only events could be performed with no battery, only 4.0% of combination cooktop-and-oven events could (Figure 4). For oven-only cooking events, 67.9% exceeded the threshold, meaning only 33.6% of the time a household's 120V outlet could provide the power needs of the oven alone. Additional research and analysis is recommended to determine if 120V products with no battery or smaller batteries could satisfy the cooking events exceeding the capacity of a 120V circuit by spreading out the power over longer cooking periods without impacting user experience.

3.1.4 **Battery capacity thresholds**

The percentage of cooking events of each type that exceeds a threshold of total energy consumption is represented on Figure 6. Based on a fully charged battery, the induction range is capable of completing some percentage of the events exceeding the energy thresholds shown on the horizontal x-axis (1.0 kWh to 5.0 kWh). For example, the left-most column shows that 5.2% of cooktop-only events, 18.0% of oven-only events, and 63.2% of combination oven-and-cooktop events use more than 1.0 kWh. It should be noted that this analysis does not account for the incoming charge from the 120V circuit, which may be included to complete a cooking event, and is therefore a conservative analysis in every respect.

Figure 5. Percentage of cooking events of each event type that exceeds a threshold of total energy consumption during an event



The first key finding indicated that the 5 kWh battery was sized sufficiently to meet the typical needs of all cooking behaviors. Furthermore, 99.91% of cooking events could be sufficiently met with a battery 10% smaller than what is currently included in the 120V battery-equipped range. Figure 5 shows that only 3.0% of all cooking events (2.7%+0.2%+0.1%) exceeded 5 kWh of consumption, and 5.3% of all cooking events exceeded 4 kWh. Yet, it should also be noted that the cooking events not covered by the current battery size (.09%) could be significant days (such as holidays) and it would be an unfortunate outcome if the range was unable to perform at those critical times. This analysis is from a small sample, and a larger study should be conducted before developing any products with smaller battery capacity, which may limit cooking performance for special events or large gatherings.

3.1.5 Other analyses

Figure 6 represents the maximum number of concurrent cooktop heating zones being used during a cooking event. Most cooktop-only events are relatively simple, with 77% using only one cooktop heating zone. However, when the oven is involved, the distribution shifts with 43% of events using two or more concurrent cooktop heating zones, implying that when the oven and cooktop heating zones are used together, the cooking setup tends 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

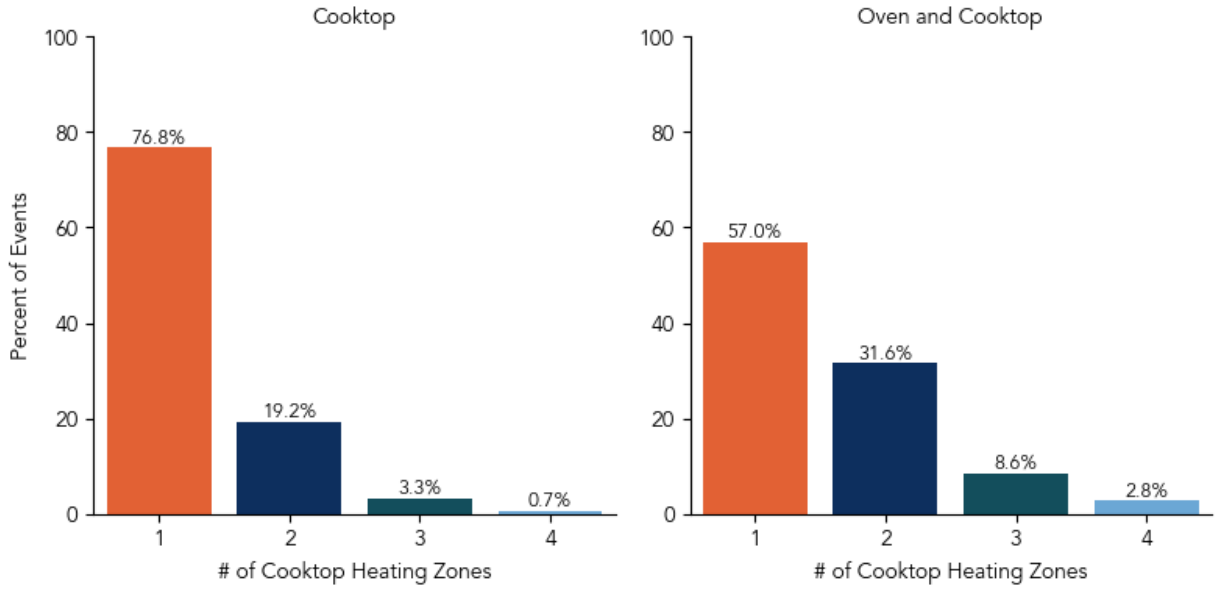
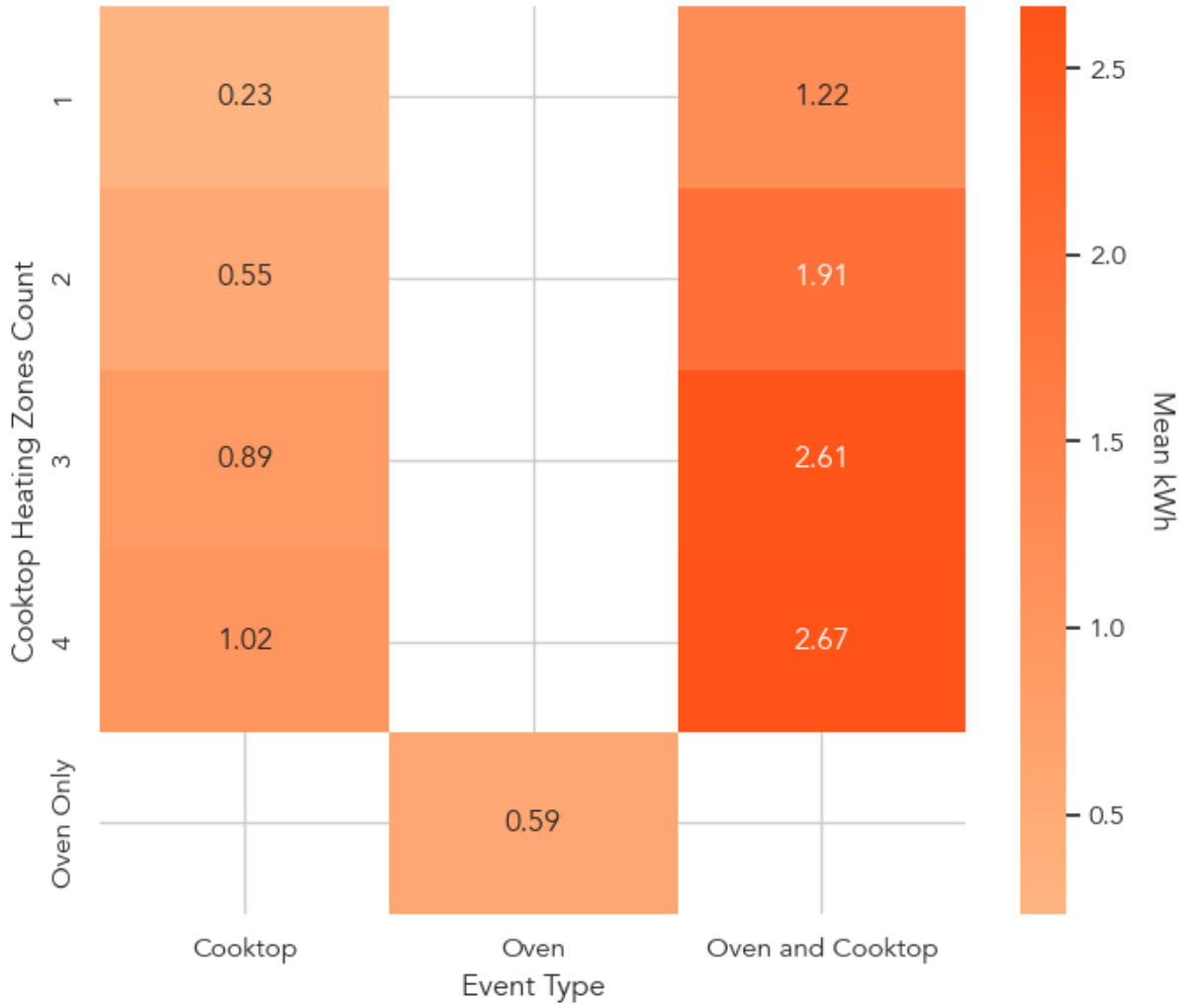


Figure 7 represents the average total energy consumption based on the type of cooking event. For cooktop-only events, mean energy consumption rises from 0.23 kWh for one cooktop heating zone to 1.02 kWh when using four cooktop heating zones. For oven-and-cooktop combination events, mean energy consumption rises from 1.22 kWh for one cooktop heating zone to 2.67 kWh for four cooktop heating zones. Oven-only events have a mean kWh consumption of 0.59 kWh. This data shows that combination cooking events with a single cooktop heating zone and use of the oven have a higher mean-energy consumption than cooktop-only cooking events with multiple cooktop heating zones.

Figure 7. Average total energy consumption per event based on the type of cooking event

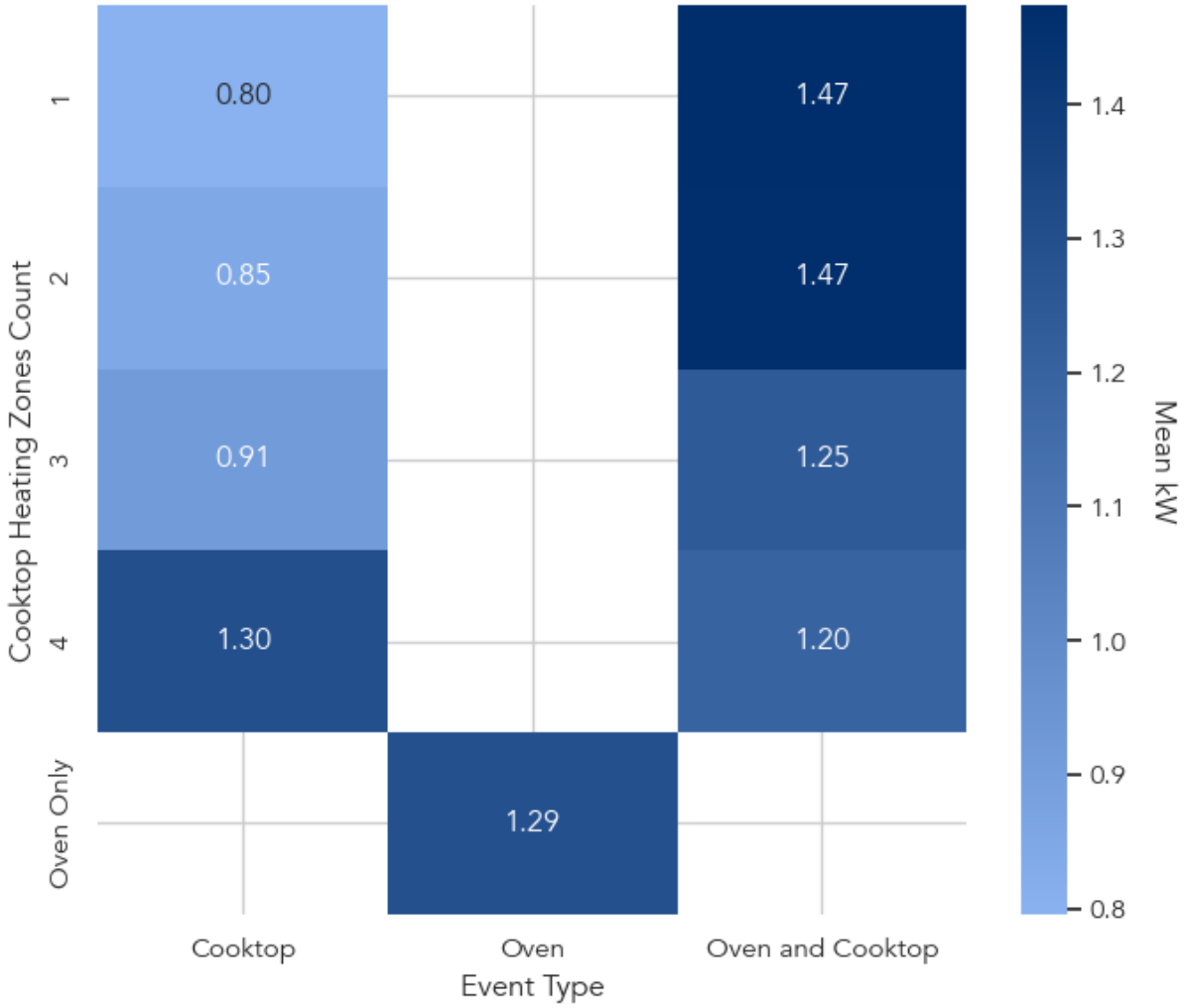


The trends are not identical for mean power consumption during events. Figure 8 displays the mean power input by cooking event type and cooktop heating zone count. Mean power increases from 0.80 kW when using one cooktop heating zone to 1.30 kW when using four cooktop heating zones but slightly decreases from 1.47 kW when using one cooktop heating zone and the oven to 1.20 kW when using four cooktop heating zones and the oven. This implies that more complicated cooking setups with the oven and all four cooktop heating zones might involve lower power cooking rates.

Combined with the above chart, four cooktop heating zones and the oven events use low power, but take more time. Additionally, because the cooktop count only counts maximum concurrent heating zones, not the average number of concurrent cooktop heating zones, many timestamps contain zero power use for the cooktops. When an event is counted, the cooktop heating zone count is recorded as the maximum concurrent heating zones. For example, if an event contains 14

timestamps with just one heating zone in use and only one timestamp with all four heating zones, it will count as an event with four heating zones. This means that an event that counts as four heating zones does not actually represent the average energy and power use of all four heating zones.

Figure 8. Mean power input by cooking event type and cooktop count



Figures 9 and 10 represent the average power draw in kW and average energy consumption in kWh for combination oven-and-cooktop cooking events. These illustrate similar observations as seen for the separate cooktop-only and oven-only cooking events, in that average cooktop power and energy both increase as more heating zones are used, but the average oven power decreases when more heating zones are used, indicating that the use of four cooktop heating zones might have longer and lower oven use. However, average oven energy use increases as more heating zones are involved, but at a much lower rate than average cooktop energy use.

Figure 9. Mean power (kW) output for combination oven-and-cooktop events, separated by oven and cooktop

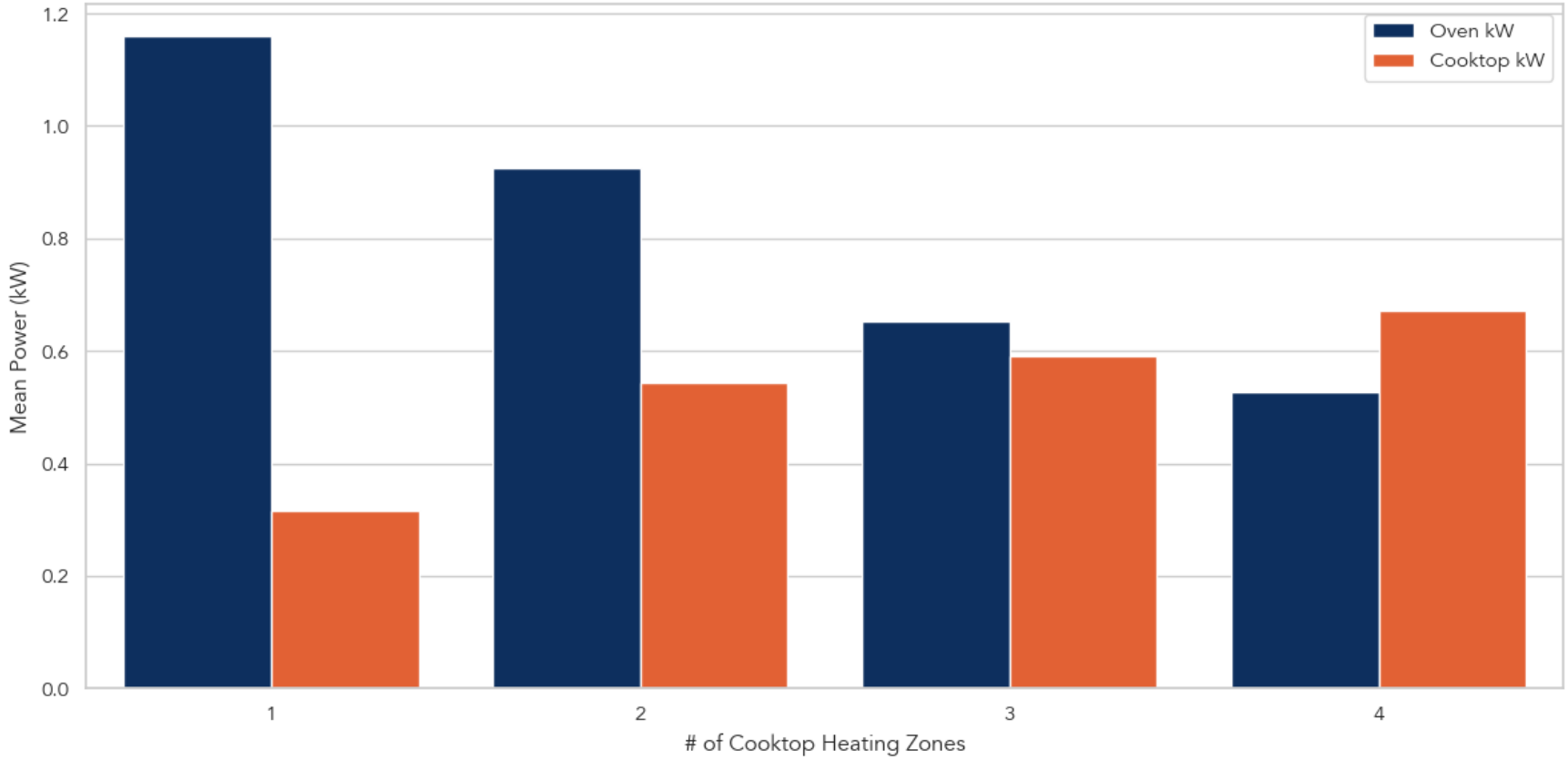


Figure 10. Mean energy (kWh) consumption for combination oven-and-cooktop events, separated by oven and cooktop

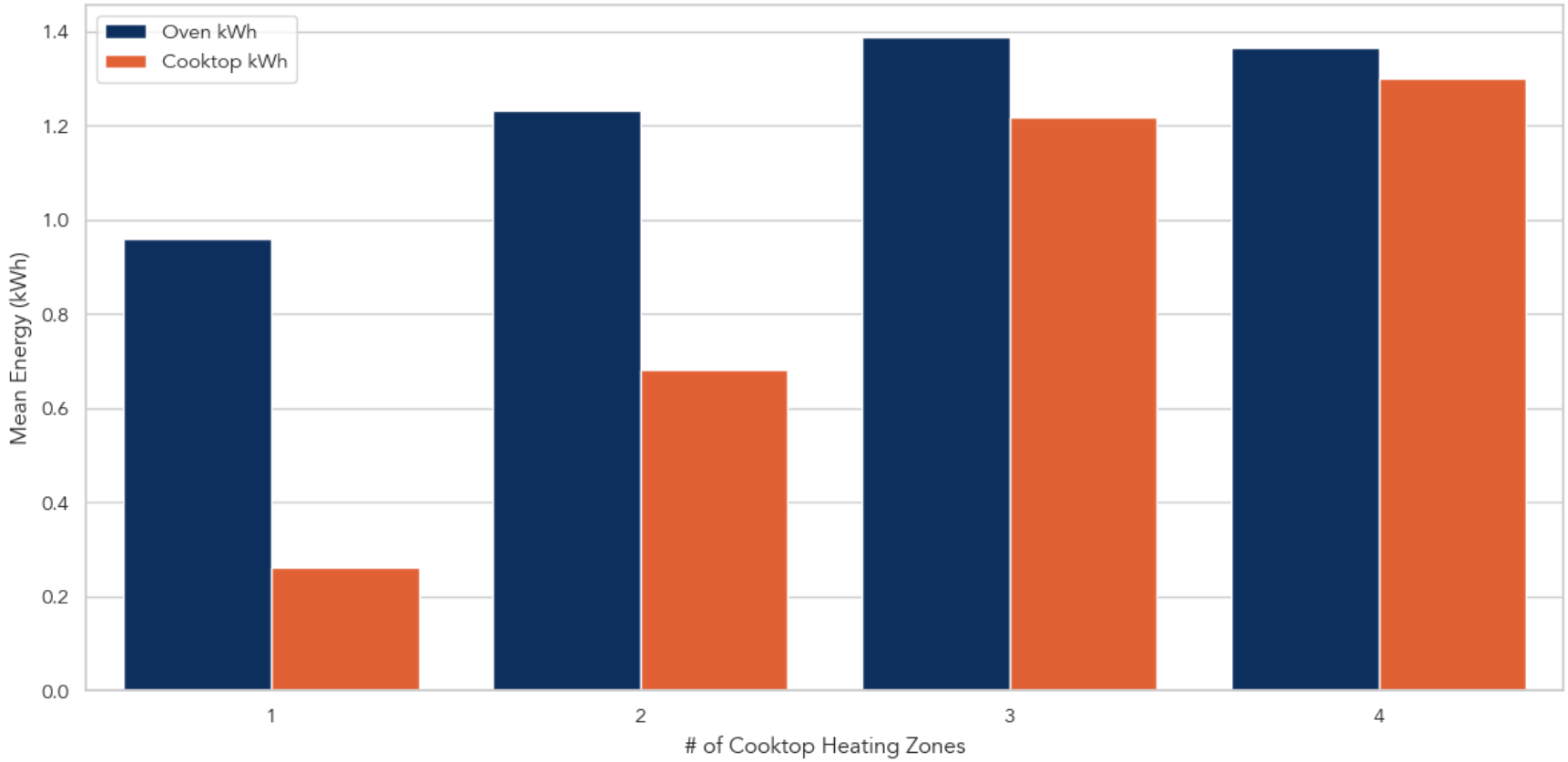


Figure 11 shows the total energy consumption of each of the 23 ranges per month, and Figure 12 displays the amount of time that each of those ranges was on. Total energy consumption is calculated by multiplying power and duration of each event. Time on is calculated by adding the duration of each event. Because events have a minimum duration of three minutes, there may be some inaccuracy in the "time on" statistic. However, each timestamp's power is the average of the preceding three minutes, so the energy consumption figures do not include that inaccuracy. Additionally, our team identified one outlier in the time-on chart: during December 2024, range 7 had a

time-on of 178.4 hours (more than 7 days), which is 1.98 times the next-highest time on of 90.1 hours (range 18 in February 2025). We suspect that this could represent the occupant's use of the range to heat their home, or forgetting to turn the unit off.

Figure 11. Total energy consumption of each range per month

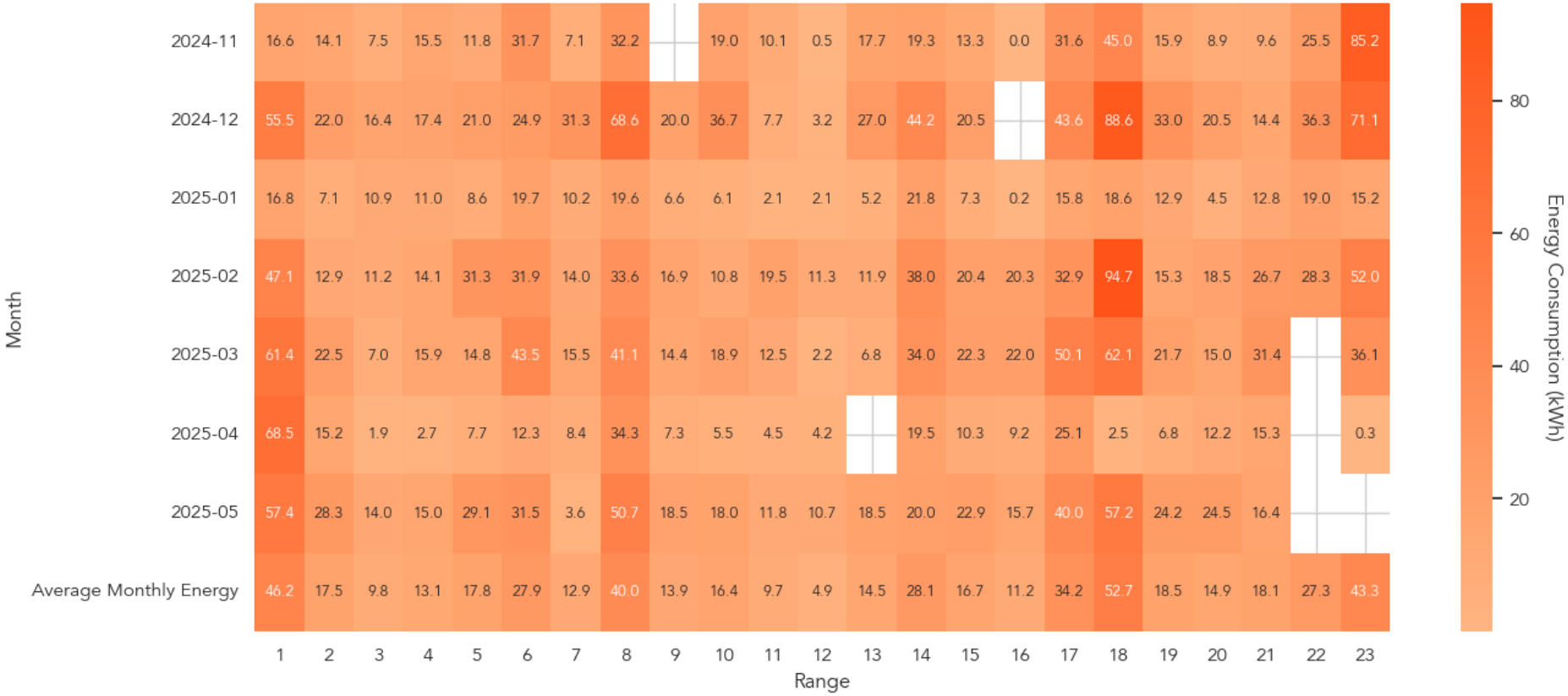
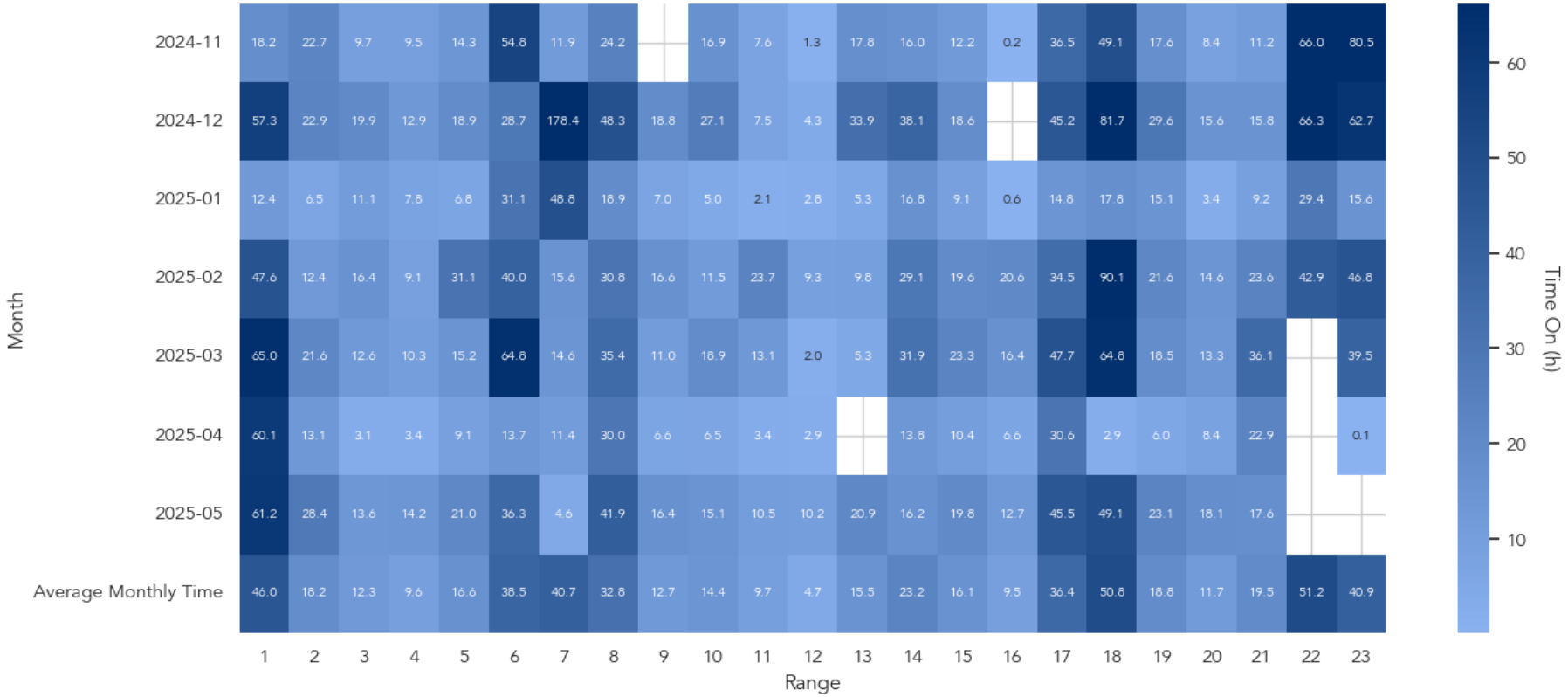


Figure 12. Time each range is on each month



Each range has one day in which the total energy use is highest. Figures 13, 14, and 15 display total daily energy use for the 23 ranges for the days surrounding the three major holidays during the data gathering period: Thanksgiving, Christmas, and New Years. Figure 16 is a bar graph displaying the maximum energy consumption per range, and the date at which it occurs. For 12 of the 23 ranges, the maximum energy consumption date does not coincide with a holiday period, nor is the energy use an outlier compared to the rest of the days.

Figure 13. Thanksgiving (11/28/2024) holiday period

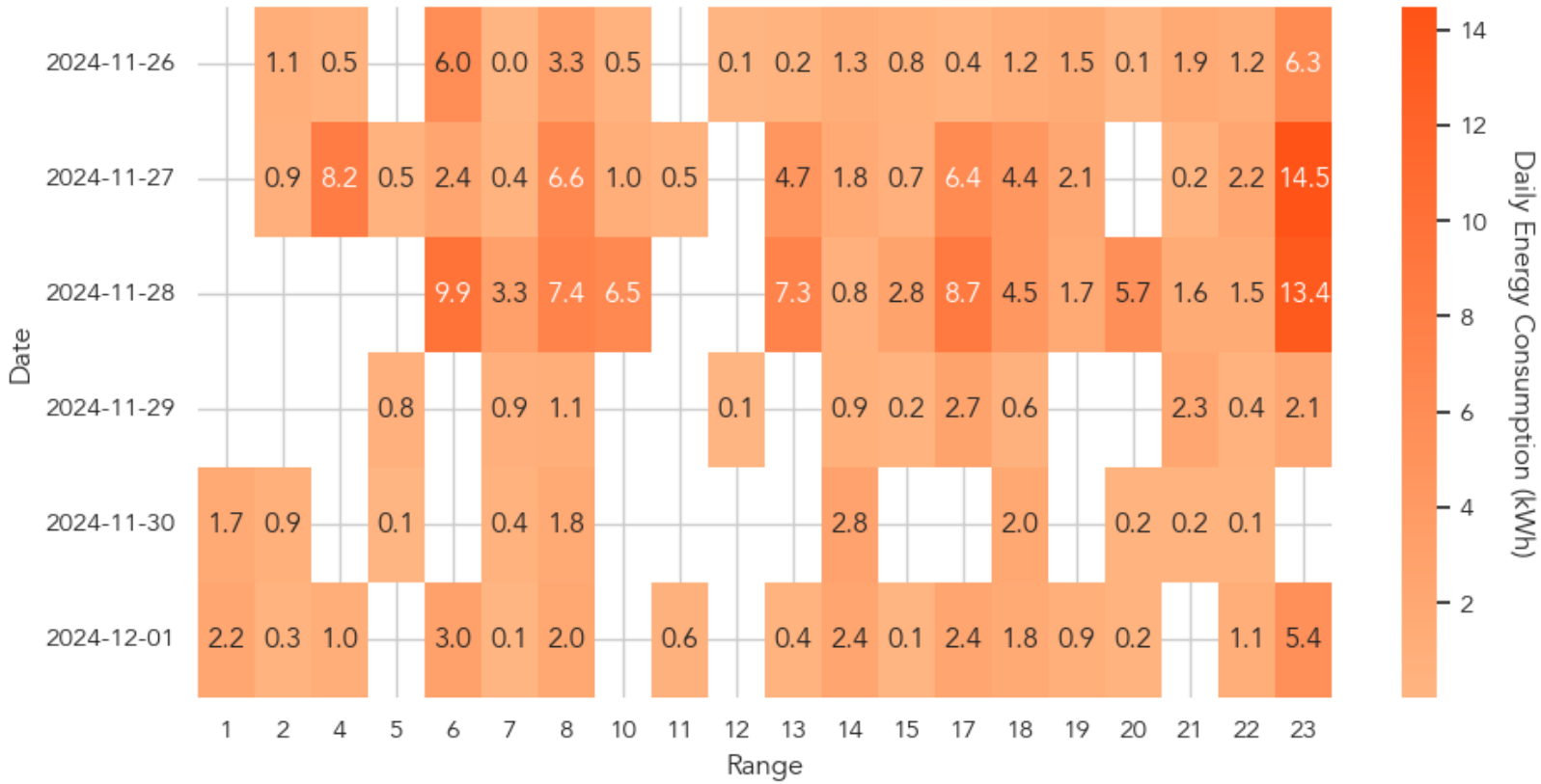


Figure 14. Christmas holiday period

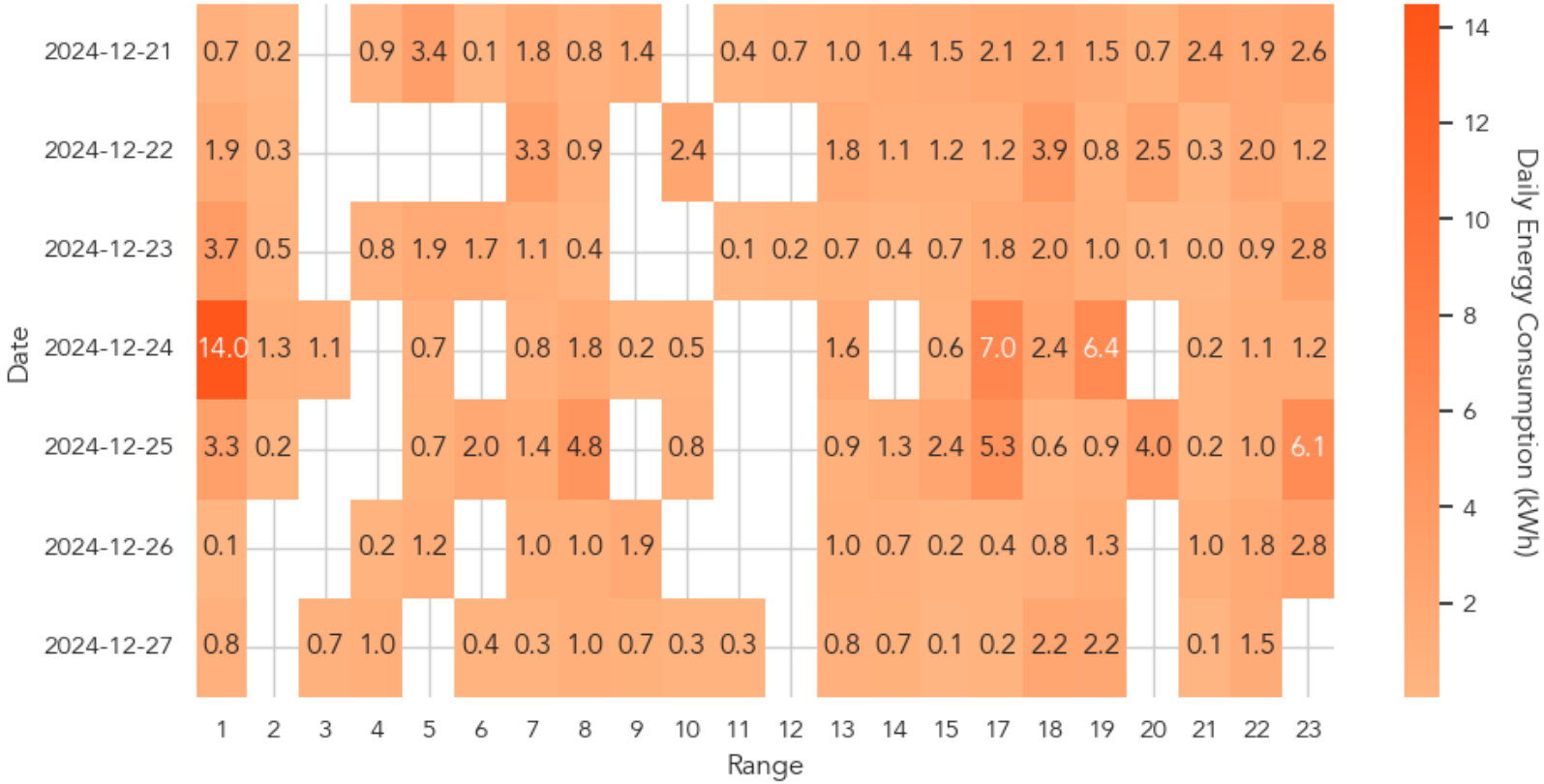


Figure 15. New Years holiday period

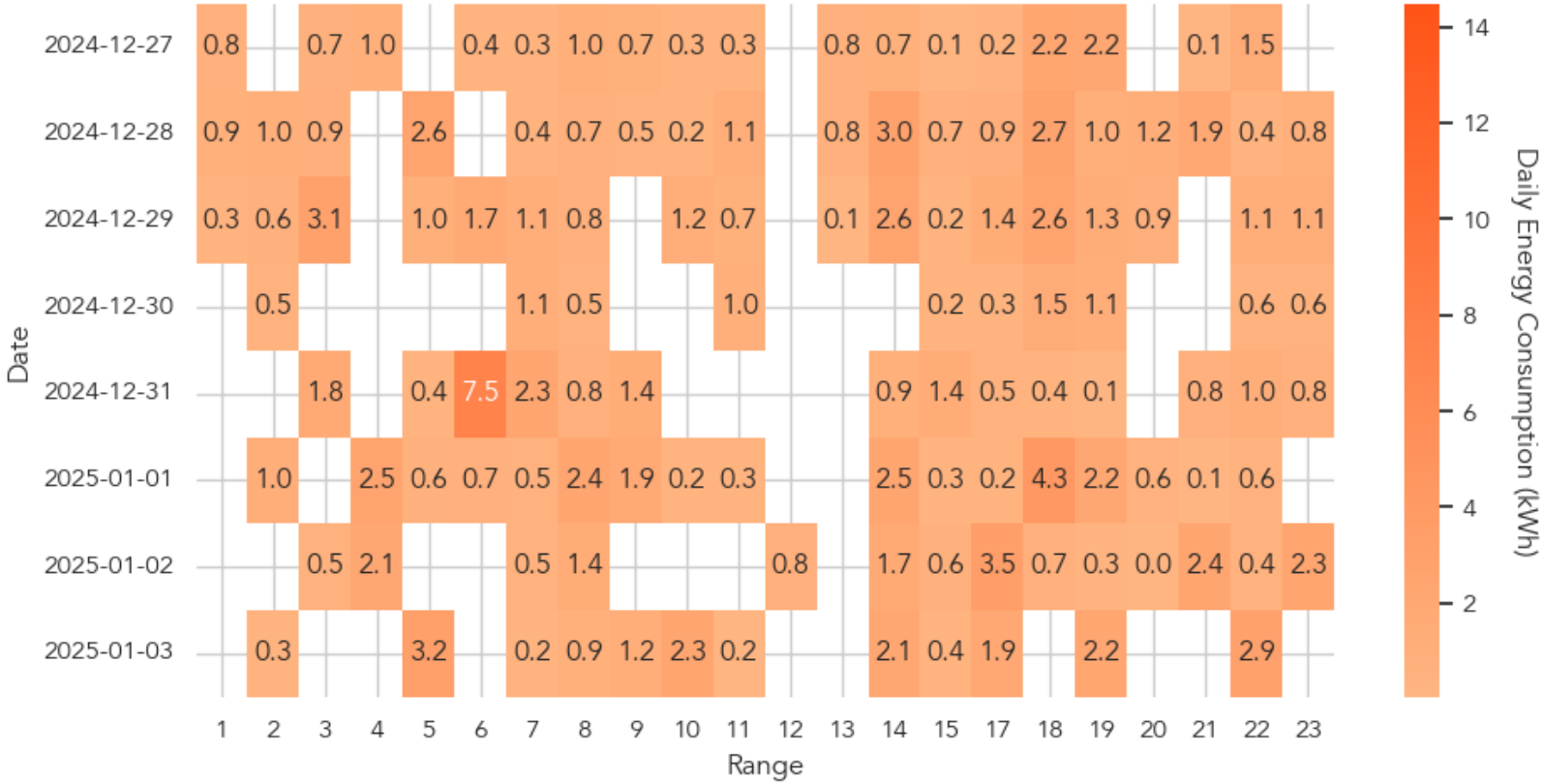
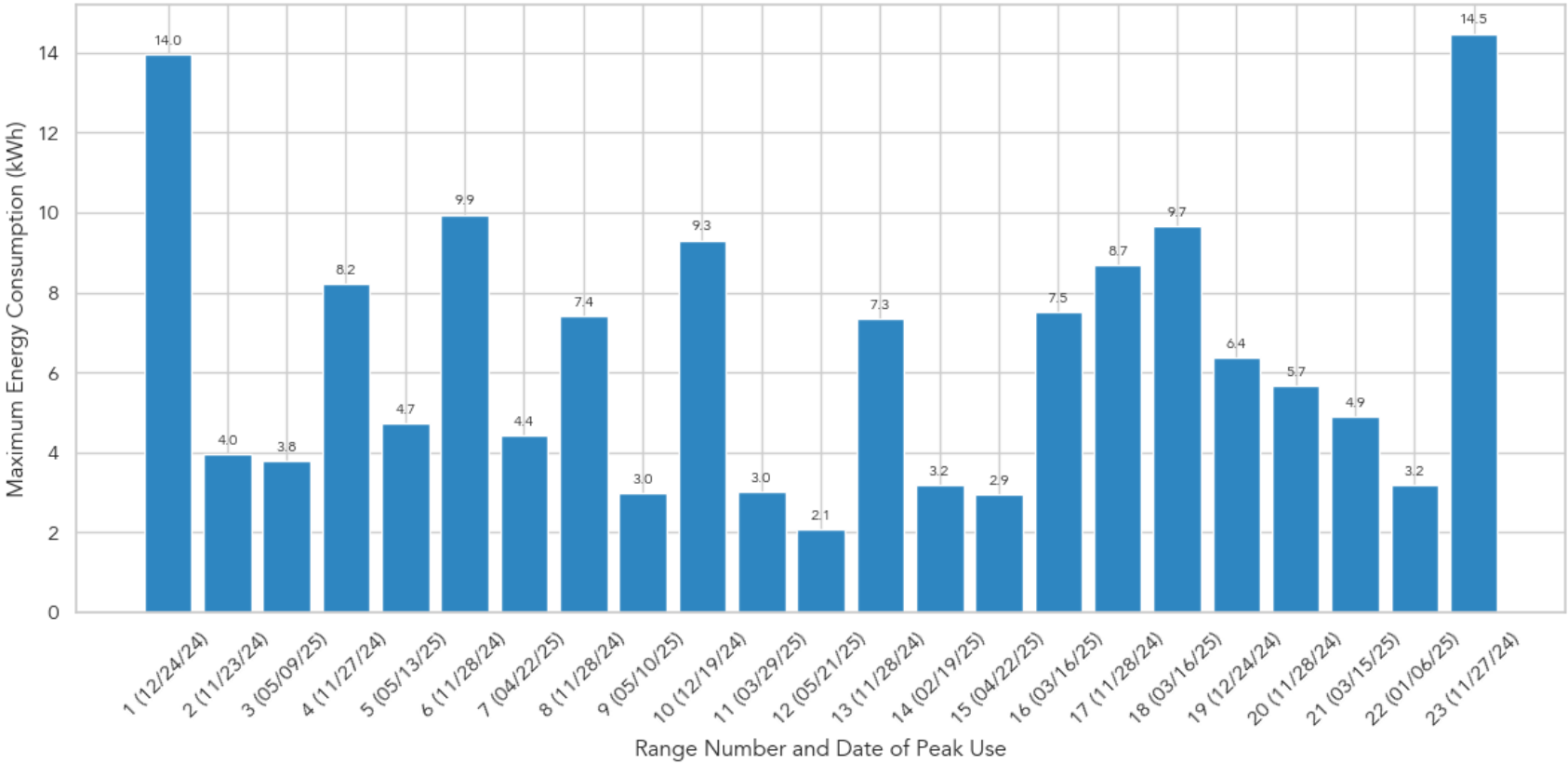


Figure 16. Maximum energy consumption per range



3.2 Qualitative survey findings

The following summarizes the survey responses of the 20 respondents.

3.2.1 User experience and satisfaction

Respondents most-often reported that two people occupied their unit and that they most-often regularly cook for two people (Figure 17).

Figure 17. Unit occupancy

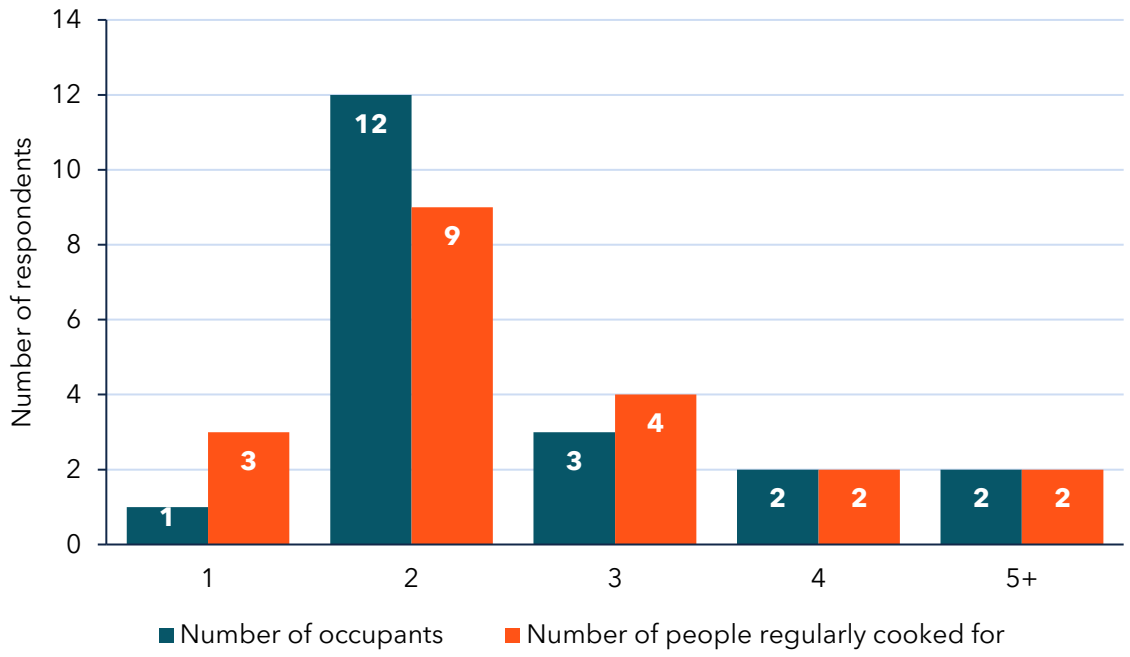


Figure 17: CalMTA Copper Eden Housing Qualitative Survey Question 2: "How many people occupy the unit?" (n=20) and Question 3: "How many people do you regularly cook for?" (n=20)

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 on Figure 18.

Figure 18. Familiarity with induction ranges

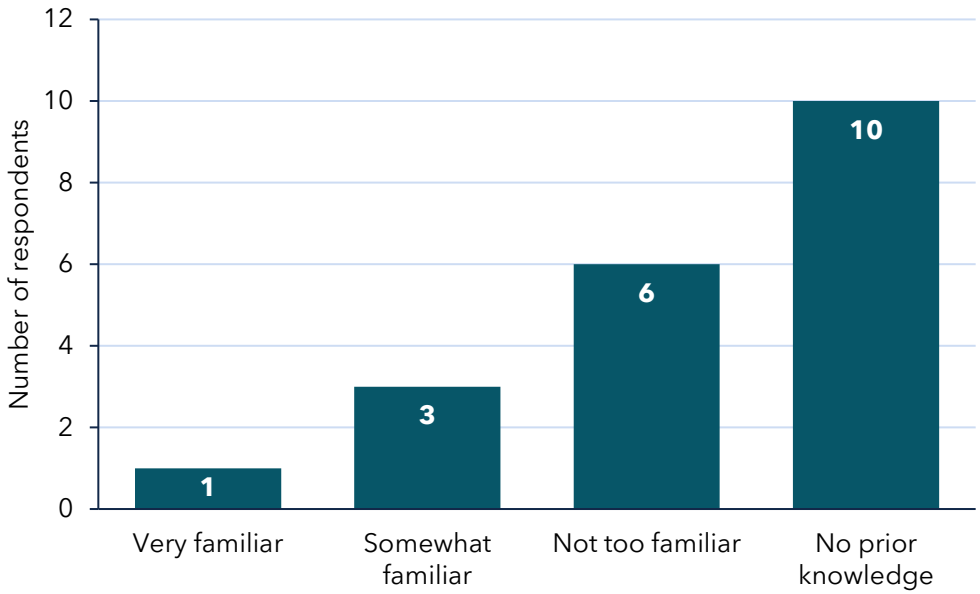


Figure 18: CalMTA Copper Eden Housing Qualitative Survey Question 4: "Before the new range was installed in your apartment, how familiar were you with induction cooking appliances?" (n=20)

Seven respondents noted having specific questions or concerns about their induction range after it was installed. Four of these responses were related to general operational questions, two related to their cooking experience, and one respondent noted having questions about what type of cookware can be used with the range. Participants were provided with stainless steel pots and pans that were compatible with the range at the time of installation.

Additionally, 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.

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 show below on Figure 1919.

Figure 19. What respondents liked most about the induction range

: CalMTA Copper Eden Housing Qualitative Survey Question 9: "What do you like most about the induction range?" (n=18)

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. The full breakdown of responses is shown below on Figure 20.

Figure 20. Challenges while using the induction range

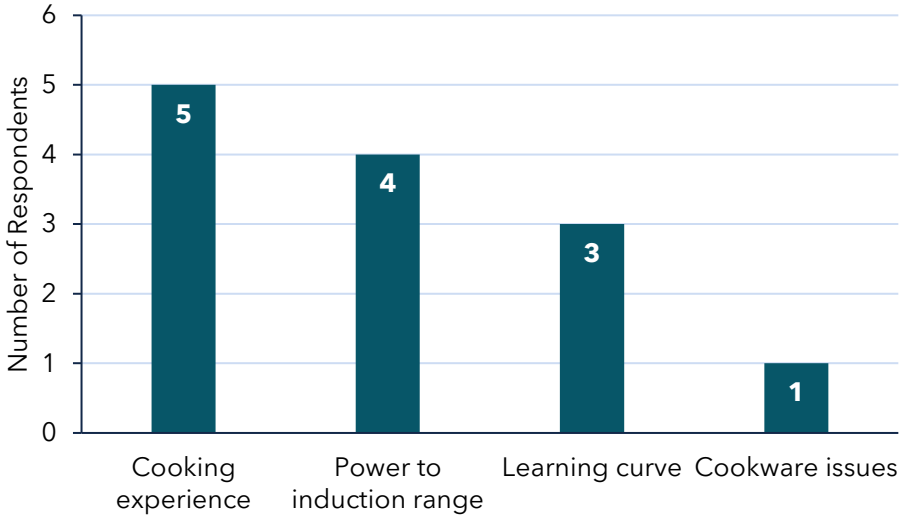


Figure 20: CalMTA Copper Eden Housing Qualitative Survey Question 10: "Have you experienced any challenges or frustrations while using the induction range?" (n=13)

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 customer service 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, two 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 on Figure 21.

Figure 21. Difficulty of learning to use the induction range

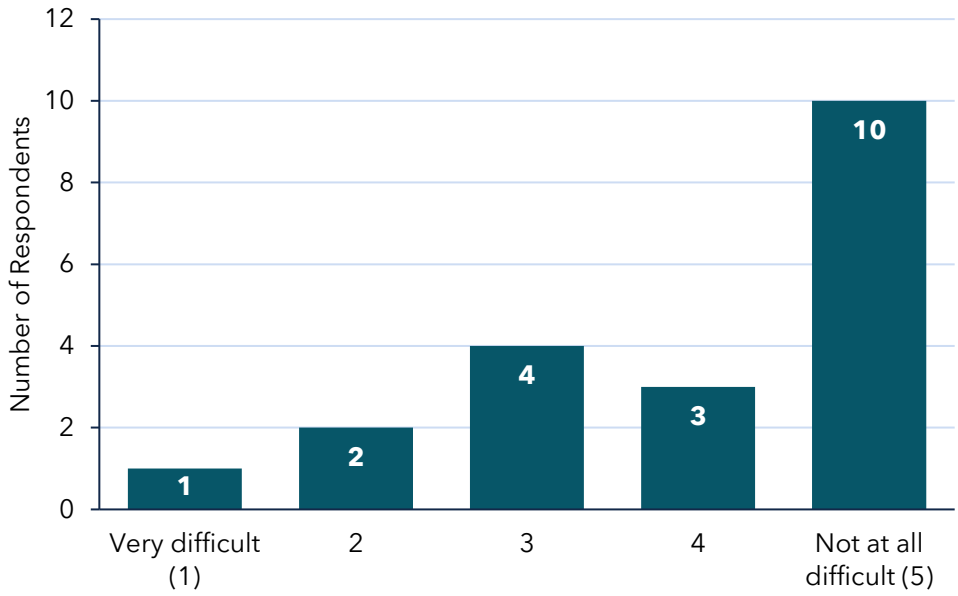


Figure 21: CalMTA Copper Eden Housing Qualitative Survey Question 14: "How easy or difficult was it to learn how to use the induction range? Please rate on a scale from 1 to 5, where 1 is 'very difficult' and 5 is 'not at all difficult'" (n=20)

When asked what they liked or disliked about the stainless-steel pots and pans they received, respondents provided explanations regarding both. Ten respondents expressed satisfaction with the cookware, providing reasons such as the ease of cleaning them, the cooking experience while using them, and other general positive sentiments. Seven respondents expressed dissatisfaction with the cookware, providing reasons such as the ineffectiveness of the non-stick functionality, and their cooking experience. Two respondents said they felt neutral about the cookware, and

one respondent provided reasons for both feelings saying they liked that the pans were chemical-free but also that it was difficult to clean the cookware.

3.2.2 Cooking habits and performance

Respondents varied in how often they use the HOB on their range. As shown on Figure 22, the most common selection was "several times a week," followed by "daily" or "rarely."

Figure 22. HOB usage

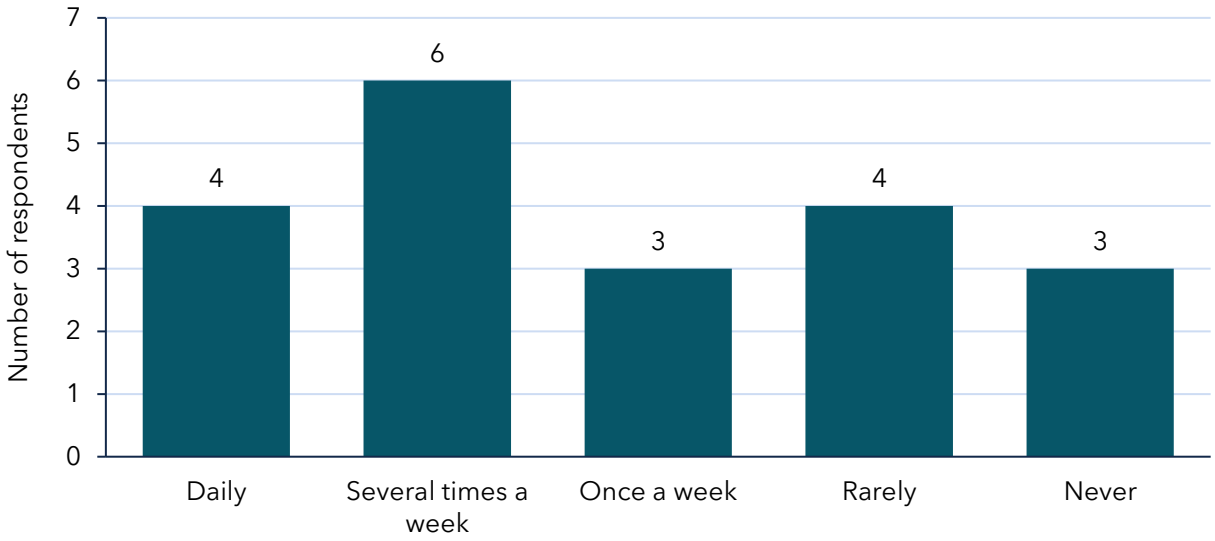


Figure 22: CalMTA Copper Eden Housing Qualitative Survey Question 16: "How often do you use the highest output burner?" (n=20).

Respondents who said they use their HOB at least once a week were also asked about using multiple heating zones. As shown on Figure 23, seven of these 12 respondents noted they use the HOB at the same time as the oven or other heating zones.

Figure 23. Usage of the HOB and multiple heating zones

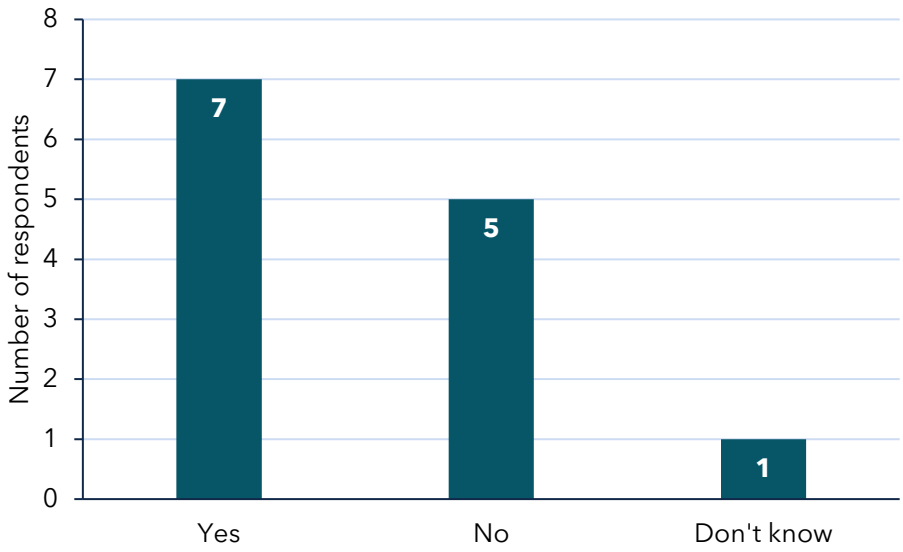


Figure 23: CalMTA Copper Eden Housing Qualitative Survey Question 17: "Do you ever use the highest output burner at the same time as the oven or other burners?" (n=13).

Of these seven respondents, three said they use these features simultaneously daily, while two said they do it several times a week, and two said they do it once a week.

When asked how the induction range has changed their cooking habits, nine respondents said there has been no significant change. The full breakdown of these responses is shown on Figure 24.

Figure 24. Change in habits

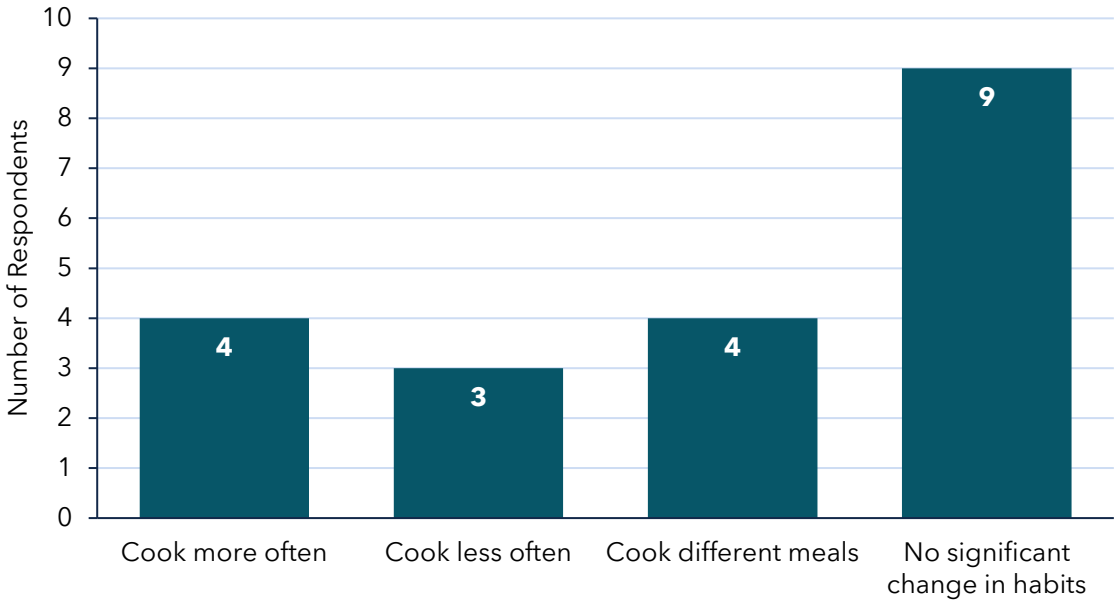


Figure 24: CalMTA Copper Eden Housing Qualitative Survey Question 19: "How has the induction range changed your cooking habits?" (n=20)

Of the four respondents who said they cook more often, two said it was because they enjoyed the cooking experience, one said it was because of the additional functionality, and one said they like the range more in general. Of the three respondents who said they cook less often, two said it was because they disliked the range more in general, and one said it was because of some functionality with the range that did not work properly. Of the four respondents who said they cook different meals as a result of using the range, two said the meals have changed generally with what works best with their range, one said they are able to cook faster meals, and one said the range helped cook their food more evenly.

The survey also asked respondents a series of questions related to specific functionality of the range. Thirteen respondents indicated the induction range was either "much faster" or "somewhat faster" than their previous gas range. The full breakdown of results is shown below on Figure 25.

Figure 25. Cooking speed of induction compared to gas

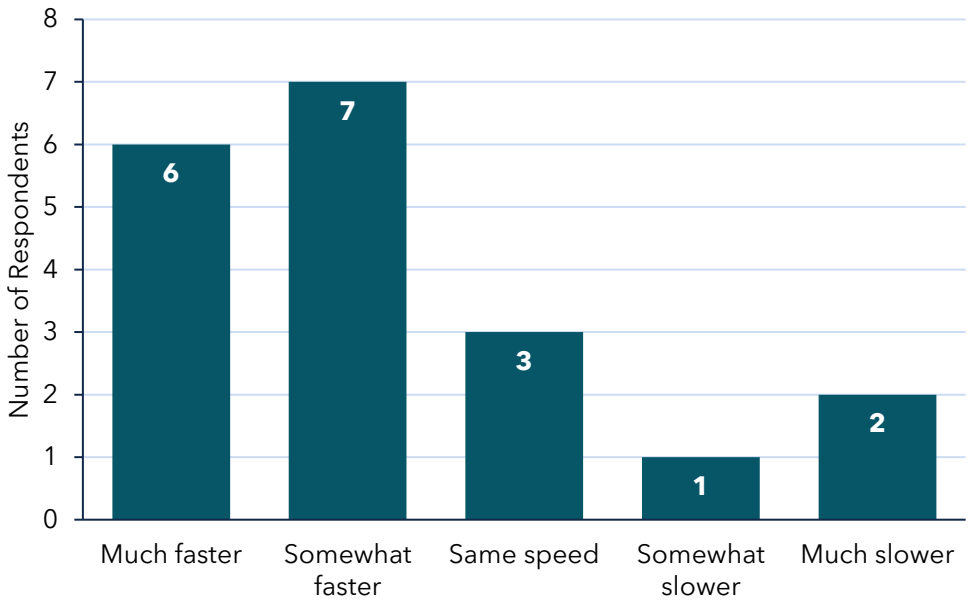


Figure 25: CalMTA Copper Eden Housing Qualitative Survey Question 22: "How does the cooking speed of the induction range compare to your previous range?" (n=19)

Notably, three respondents said the cooking speed was slower than their previous range. Two of these respondents specifically noted quicker cooking speeds as their top improvement recommendation. Despite this, two said they were much more satisfied with their induction range than their previous range, while one said they were less satisfied. The one respondent that said they were less satisfied also noted they were very familiar with induction ranges prior to receiving theirs, indicating they potentially compared their experience to other products with different features.

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 on Figure 26.

Figure 26. Most useful features

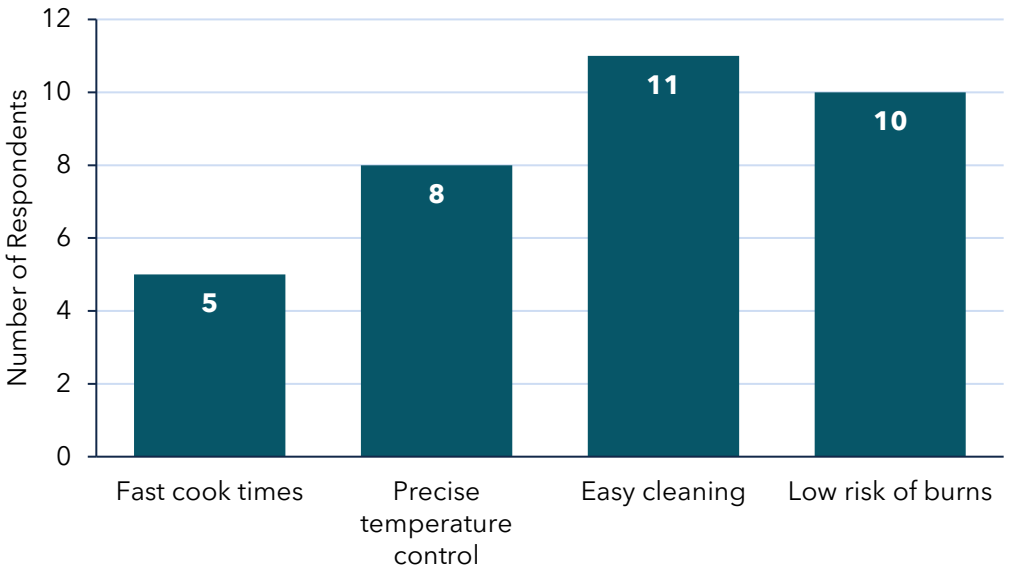


Figure 26: CalMTA Copper Eden Housing Qualitative Survey Question 23: "Are there any specific features of the induction range that you find particularly useful?" (n=20).

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.

The survey also asked questions about the power to their ranges. Fourteen respondents indicated they had not used their range during a power outage (n=19). Additionally, 12 respondents said they had never received a "low on power" alert from their range (n=18). Of the six respondents who said they had received the alert, three indicated they had adjusted the way they cooked as a result, and three indicated they had not.

Three respondents reported experiencing additional problems with their range including the knobs/handles coming loose after repeated usage (two) and general power functionality issues, which they were working with customer service to resolve. All of these respondents said the problems did not occur often or had been resolved.

In terms of safety, 17 respondents said they felt their induction range was safer to operate than their previous gas range, while another three 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 on Figure 27.27.

Figure 27. Satisfaction with induction compared to previous range

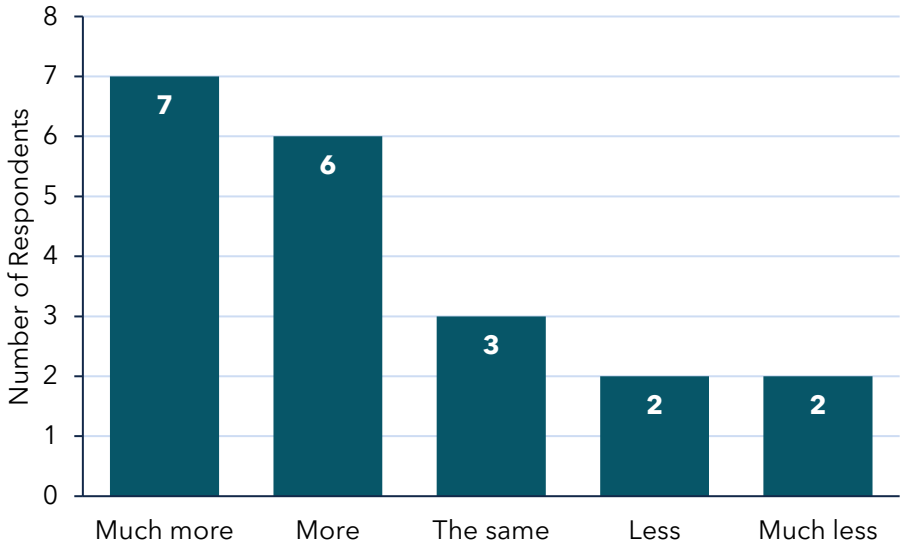


Figure 27: CalMTA Copper Eden Housing Qualitative Survey Question 33: "How satisfied are you with this range relative to your previous gas range?" (n=20)

3.2.3 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 on Figure 28. 12 respondents said they would recommend an induction range. When asked why they would recommend the range, five respondents said it was because of the safety of using induction compared to gas, three said it was due to ease of use, two provided general functionality reasons, and one respondent each said it was because of the cooking speed and power reliability.

Figure 28. Recommending an induction range

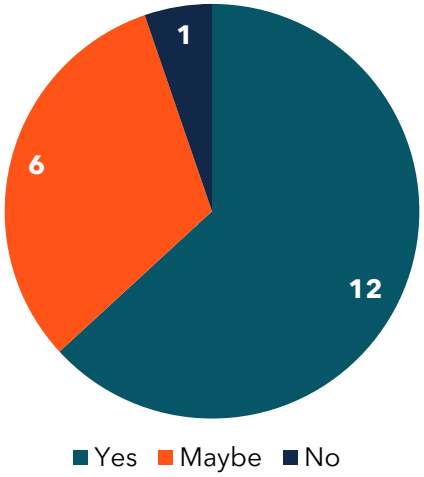


Figure 28. : CalMTA Copper Eden Housing Qualitative Survey Question 34: "Would you recommend an induction range to others?" (n=19)

Additionally, as shown on Figure 29. , 14 respondents said that if they had the option, they would choose an induction range again in the future.

Figure 29. Use of induction ranges in the future

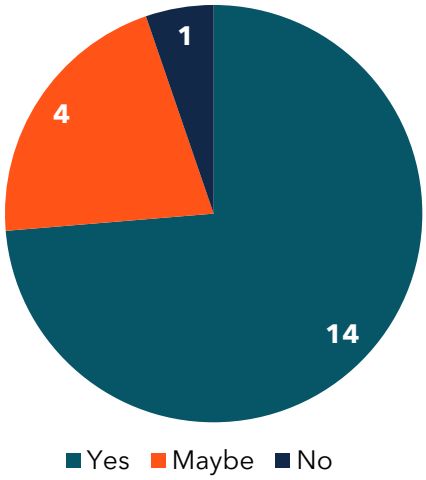


Figure 29. CalMTA Copper Eden Housing Qualitative Survey Question 36: "If you had the option, would you choose an induction range again in the future?" (n=19)

Finally, respondents were asked what improvements or changes they would like to see to the ranges. Five respondents said they would like to see additional functionality added to the ranges such as timing features and specialty cooking areas for foods like tortillas. Two respondents said they would like the handles improved to make them more secure, while another two said they would like increased speed of cooking times. Additionally, one respondent suggested improving

the compatible cookware while another said increasing the amount of information regarding how to use the ranges would be helpful.

4 Recommendations

The primary objective of this study was to analyze cooking event data as it relates to the performance and capacity of a 120V battery-equipped induction range. While key findings are specific to this product, much of the analysis can be extrapolated to provide valuable insight into recommendations for manufacturers, contractors, and programs.

4.1 Manufacturer recommendations

As demonstrated in Section 3.1.4, Battery capacity threshold, there is room to explore the size and cost of the battery in the 120V battery-equipped induction range product. A 4kWh battery, as compared to the 5kWh battery in this study, might achieve reductions to integrated battery costs while still meeting 94.9% of the observed occupants' cooking events, assuming that battery power output is the same. Yet, it should also be noted that the cooking events not covered by a smaller battery size could occur on significant days for consumers, such as birthdays, holidays, and family gatherings. Manufacturers should proceed with caution, as it would be an unfortunate outcome if the range was unable to perform at those critical times. This analysis is from a small sample, and a larger study should be conducted before developing any products with smaller battery capacity.

Additionally, Figure highlights that 99% of cooktop-only and 97% of oven-and-cooktop events can be met with three cooktop heating zones. Reducing one heating zone shows a limited impact on the observed cooking experience. However, special cooking events not covered by these reduced specifications may include birthdays, holidays, and family gatherings. Of note, 16 respondents in the qualitative survey said they had used their range on a holiday or for a special event. Twelve of these respondents said their experience using the range for these times was about the same compared to cooking for regular meals. Manufacturers will need to understand the overall impacts that both reduced battery size and reduced number of heating zones may have on the targeted consumer audience.

4.2 Contractor recommendations

A 120V battery-equipped induction range is a unique product class. This type of product is likely to be installed on a shared 120V, 15A circuit in the kitchen. Unlike conventional 240V electric cooking products with their own dedicated circuit, this product has the potential to overload the circuit when combining the charging of the battery-equipped induction range and the operation of another appliance.

The Copper "Charlie" used in this study does have an automatic charge-limiting function to detect other loads on the circuit and to stop or reduce the charge rate. This feature can support a plug-and-play approach for existing circuits; however, further analysis is recommended to understand

the impact of adding battery-equipped induction ranges to a shared circuit. The data from this field study shows that most cooking behavior on a 5kWh battery does not require charging to complete a cooking event, and so the bottleneck of circuit power draw becomes the governing factor for installation. Installers should take care if choosing a circuit with shared appliances and implement programmed charging rates well below the maximum allowed by the circuit.

4.3 Messaging and education recommendations

As noted in the qualitative survey results, most respondents did not report a significant change in their cooking habits or that they cooked more as a result of their new induction range. Most occupants were satisfied with the product and eventually grew accustomed to its operation. However, there were a few noted exceptions of occupants who never had their issues resolved.

Respondents did receive a quick-start guide for their range operation (with options in English and Spanish) but also expressed that more general information regarding the range operation, as well as information being provided in Spanish, could help alongside the in-person demonstration that was performed. Eleven of the 15 respondents who attended the in-person demonstration said it was very helpful for their understanding of the range. This reinforces the importance of these demonstrations for interest in and acceptance of the technology. Education and training materials for induction ranges and/or integrated battery cooking technologies (including versions in Spanish or other languages to increase accessibility) are an important component of gaining consumer acceptance.

Seven respondents expressed dissatisfaction with the cookware they used with their induction range. Reasons such as the cookware not having non-stick functionality had a negative effect on their overall cooking experience. This indicates the potential to provide customers with non-stick induction compatible cookware options, as well as additional informational materials to help educate customers on which types of cookware are compatible with induction ranges. Many common types of cookware such as cast iron and stainless steel are compatible, and customers may not need additional cookware to use their range.

5 About CalMTA

CalMTA is a program of the California Public Utilities Commission and is administered by Resource Innovations. We work to deliver cost-effective energy efficiency and decarbonization benefits to Californians through a unique approach called market transformation. Market transformation is the strategic process of intervening in a market to create lasting change by removing market barriers or exploiting opportunities, accelerating the adoption of identified technologies or practices. CalMTA-developed market transformation initiatives also aim to advance state goals on demand flexibility, workforce development, and equity. Learn more at www.calmta.org.