

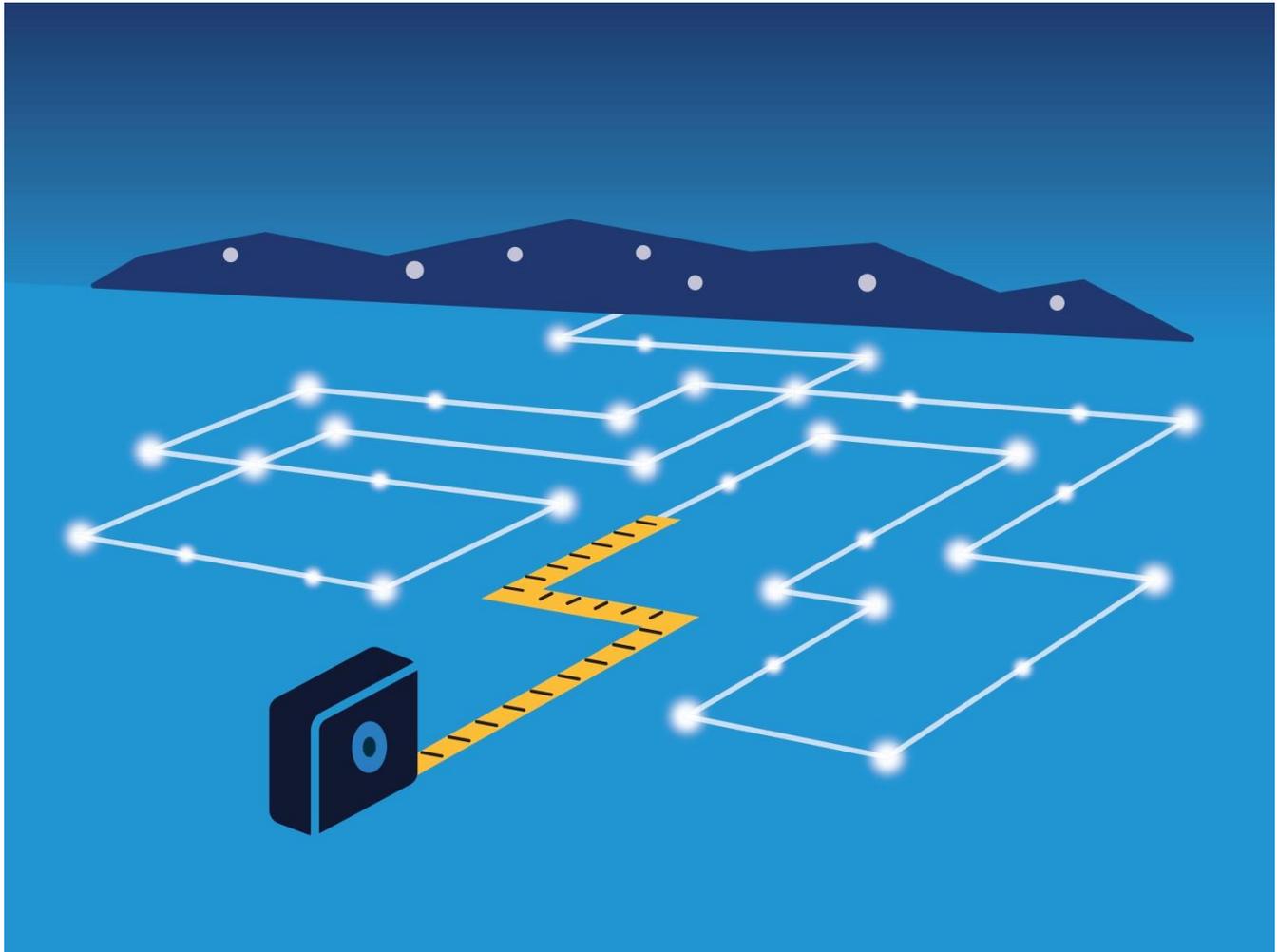


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# 2019 California Low-Income Needs Assessment

Final Report: Volume 1 of 3: Summary of Key Findings

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## Glossary

**Alternative-fuels (alt-fuels) customers:** Low-income customers who do not have natural gas service and who use propane, kerosene/oil/diesel, and/or wood/pellets as their primary fuel(s) for space heating, water heating, and/or cooking.

**California Alternate Rates for Energy (CARE) program:** A rate assistance program offered by the IOUs that provides income qualified customers who earn 200% or less of federal poverty guidelines (FPG) a discount of up to 35% on their monthly electricity bills and up to 20% on their monthly natural gas bills.

**CARE capitation agencies:** Community-based organizations that provide services to local residents, including assistance with CARE enrollment, recertification, income verification, and/or high-usage processes.

**CARE categorical participation:** Participants who enrolled in or recertified for CARE by selecting in their CARE application the public assistance programs they participate in or that they are on fixed income instead of providing an annual income amount.

**CARE-eligible nonparticipants:** Low-income customers earning 200% or less of federal poverty guidelines (FPG), who have never participated in CARE as of July 2018, and who live in high poverty areas in California.

**CARE enrollment:** Process through which low-income customers enroll in the CARE program by providing their household size and annual income or selecting public assistance programs they participate in or that they are on fixed income in the CARE application and submitting the application to their IOU.

**CARE enrollment channel:** Means through which customers can enroll in (and recertify for) CARE and include CARE capitation agencies, IOU website, IOU customer call center, direct mail, data sharing between IOUs, and others.

**CARE high-usage verification:** Process through which CARE high-users either reduce their usage to below 400% of their baseline allowance, through ESA participation and usage monitoring, or appeal their high-usage to their IOU; participants who do not reduce their usage or whose appeal is declined are removed from CARE for up to two years.

**CARE high-users:** CARE participants who monthly usage exceeds 400% (high-low user) or 600% (high-high user) of their baseline allowance and are selected for high-usage verification.

**CARE income verification:** Process through which CARE participants who are likely not income-eligible are identified via the IOU's monthly propensity modeling and are selected to verify their income (e.g., with tax forms, check stubs, etc.) or public assistance participation (e.g., with award letters, receipts, etc.) with their IOU; participants who do not provide the proper documentation or are no longer eligible are removed from CARE for up to two years.

**CARE recertification:** Process through which all CARE participants must recertify, or renew, their participation in CARE by completing and submitting the CARE application to their IOU; occurs every two years for most participants and those who do not provide their information or are no longer eligible are removed from CARE.

**Current CARE participant:** Low-income customers currently participating in CARE as of July 2018.

**Energy Burden Metrics:** Energy burden is the percentage of customers' annual income that is spent on their energy bills; modified energy burden includes the monetary value of public assistance programs in the income

of customers participating in such programs; alternative energy burden includes the annual cost of alt-fuels in the annual energy costs of customers who use alt-fuels.

**Energy Savings Assistance (ESA) program:** An energy assistance program offered by the IOUs that provides income-qualified customers who earn 200% or less of federal poverty guidelines a free home energy assessment, energy saving equipment repair, replacements, or upgrades, and an energy education.

**ESA supervisors/lead contractors:** Contractors working for firms qualified by IOUs to provide ESA services and who manage or lead teams that do ESA enrollments and assessments and/or installation of ESA heating, cooling, or enclosure measures.

**ESA participants:** Low-income customers who participated in ESA between January 1, 2016 and June 30, 2018 (recent participants), received ESA energy education, and received at least one of the targeted ESA measures.

**Family Electric Rate Assistance (FERA) program:** A rate assistance program offered by the IOUs that provides income qualified customers who earn 250% or less of federal poverty guidelines (FPG) and who have three or more household members a discount of up to 12% on their monthly electricity bills.

**High poverty areas:** Census tracts in California where 20% or more households earn 100% or less of federal poverty guidelines (FGP).

**High service reliability customers:** Customers living in areas with high electricity service reliability, measured as less than one standard deviation above the SAIDI or SAIFI mean values for each IOU.

**Investor-owned utilities (IOUs):** The four utilities that are subject to the 2017-19 LINA and who provide energy services to most California residents; they include Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas & Electric (SDG&E).

**Low service reliability customers:** Customers living in areas with low electricity service reliability, measured as one standard deviation or more above the SAIDI or SAIFI mean values for each IOU.

**Past CARE participants:** Low-income customers who formerly participated in CARE any time between January 1, 2015 and June 30, 2018 but were removed from CARE as of July 2018.

**System Average Interruption Duration Index (SAIDI):** Measure of an IOU's annual average duration of electricity outages, where larger numbers mean longer outages.

**System Average Interruption Frequency Index (SAIFI):** Measure of an IOU's annual average frequency of electricity outages, where larger numbers mean more frequent outages.

**Targeted ESA measures:** The heating, cooling, and enclosure measures that are the focus of the 2017-19 LINA and identified as higher-cost and/or labor intensive: furnace repair or replacement; central air conditioning (AC) tune-up, repair, or replacement; room/window AC replacement; evaporative cooler replacement; attic insulation; weatherization; and, windows and doors.

# 1. Executive Summary

## 1.1 Background

The California investor owned utilities (IOUs) provide two energy assistance programs to income-qualified customers with annual incomes 200% or less of Federal Poverty Guidelines (FPG). The California Alternate Rates for Energy (CARE) program provides discounted energy rates of up to 35% on their monthly electric bills and up to 20% on their monthly natural gas bills. The Energy Savings Assistance (ESA) program provides participants no-cost energy efficiency services, including an energy assessment, education, and equipment upgrades. These programs seek to alleviate low-income customers' energy burden and improve their health, comfort, and safety.

As per Assembly bill 327 (AB 327) enacted in 2013, the California Public Utilities Code Section 382(d) requires the California Public Utilities Commission (CPUC) to conduct a Low-Income Needs Assessment (LINA) every three years with the assistance of the Low-Income Oversight Board (LIOB). After conferring with LIOB members and other stakeholders, and in response to statutory mandates and directives set forth in Commission Decision (D.) 16-11-022, the CPUC's Energy Division staff determined the 2019 LINA needed to address the following overall topics:

- CARE program eligibility and participation barriers, including the enrollment process and the post-enrollment (PE) processes of recertification, income verification, and high-usage verification.<sup>1</sup>
- Impacts of select ESA heating, cooling, and enclosure measures (targeted measures) on customers' health, comfort, and safety (HCS).<sup>2</sup>
- Energy burden and hardships of customers who rely on alternative fuels (propane, wood, etc.) for their primary energy source (alt-fuels customers).
- Energy burden and hardships experienced by customers living in areas that have less reliable electricity service (low service reliability customers) as indicated by each IOU's System Average Interruption Duration Index and System Average Interruption Frequency Index (SAIDI/SAIFI).<sup>3</sup>

The 2019 LINA is the fourth conducted on behalf of the CPUC and IOUs, which includes Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), Southern California Gas Company (SCG), and San Diego Gas and Electric (SDG&E). The 2019 LINA addresses four overarching research objectives (ROs) and the findings and recommendations are intended to provide information that may be useful for planning and/or implementing the next cycle of the CARE and ESA programs.

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<sup>1</sup> Participants self-certify eligibility by reporting the 200% or less FPG annual income requirements or selecting other qualified public assistance programs they participate in (categorical participation). They are required to recertify their eligibility every two years or, for those on fixed income, every four years. A small percentage of participants are subject to post-enrollment verification (PEV) of income or categorical participation and are selected monthly via the IOUs' probability models and random sampling. Participants whose monthly usage exceeds 400% of their baseline usage are "high-users" who must go through the PEV process, participate in ESA, and agree to monthly usage monitoring, or make an appeal to their IOU in an attempt to justify their high usage.

<sup>2</sup> Targeted heating measures: furnace replacement, repair, or tune-up. Targeted cooling measures: central AC (CAC), room AC, and evaporative cooler replacement, and CAC repair or tune-up. Targeted enclosure measures: attic insulation, caulking, glazing, weather-stripping, wall repairs, and door and window replacements and repairs.

<sup>3</sup> SAIDI is a measure of the average duration of electrical outages and SAIFI is a measure of the average frequency of electrical outages in an IOU's service territory.

## 1.2 Data Collection Methods and Sources

We used numerous sources and data collection methods to conduct the 2019 LINA and address the research objectives, including existing IOU customer and program data, customer survey data, ESA contractor in-depth interviews (IDIs), CARE capitation agency staff IDIs, and a brief literature review.

- The IOUs' customer, billing, service reliability, and program data were used to develop survey samples and in-depth interview (IDI) lists, calculate energy burden, and conduct select analyses.
- An omnibus customer survey designed to address multiple research objectives was conducted via web and phone survey modes in English and Spanish in March 2019 with 1,505 customers.
  - The survey averaged about 20 minutes to complete and included some common questions asked of all sampled customers about their characteristics and some customized questions asked only to customers in one of the sampled groups listed below.
  - The survey sample was stratified to include a sufficient number of low-income customers who:
    - Currently participate in CARE (current participants)
    - Previously participated in CARE but were removed or discontinued their participation (past participants)
    - Never participated in CARE but are income eligible (CARE-eligible nonparticipants) <sup>4</sup>
    - Participated in ESA and received one or more heating, cooling, and/or enclosure measures (ESA participants)
    - Use alternative fuels such as propane or wood/pellets for space heating, water heating, and/or cooking (alt-fuels customers) <sup>5</sup>
    - Live in areas with lower electric service reliability where more frequent and/or longer outages occur (low service reliability customers) <sup>5</sup>
- Individual IDIs with 12 ESA program supervisors and lead technicians (at least two in each IOU territory) were conducted in March 2019, averaged about 50 minutes, and included questions about the impacts of ESA measures on participants' health, comfort, and safety (HCS).
- Individual IDIs with staff at seven CARE capitation agencies (at least one in each IOU territory) were conducted in February 2018, averaged about 30 minutes, and included questions about CARE enrollment trends and barriers among their immigrant and non-English speaking customers.

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<sup>4</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. The results reflect the experiences of eligible nonparticipants in areas with high concentrations of eligible customers and others like them in the state and may potentially be found among the entire California population.

<sup>5</sup> Alt-fuels customers were identified from survey responses and low service reliability customers were identified with IOUs' electrical reliability (SAIDI/SAIFI) data, and both groups are a subset of the four surveyed CARE and ESA customer groups. Alt-fuels customers do not use natural gas and low service reliability is based on electrical usage so neither group includes SCG customers. Due to the sample design for these groups, those who responded to the survey may not represent all low-income alt-fuels customers and low service reliability customers in California but the results do reflect the experiences of those surveyed and others like them in the state. In addition, the sample sizes of both groups are large enough for high statistical confidence/precision at the state level, but the sizes of the subgroups by IOU territory or CARE/ESA participation are too small for conclusive statistical results.

- The qualitative review of 11 recent studies focused on trends in and barriers to immigrants' use of public assistance programs like CARE.

## 1.3 Research Objectives, Questions, Conclusions, and Recommendations

The 2019 LINA includes four primary areas of inquiry that were developed into four overarching research objectives. The first objective (RO.1), about the effectiveness of the CARE program, is divided into two sub-objectives: RO.1a focuses on CARE PE processes and RO.1b focuses on CARE marketing, education, and outreach (ME&O), particularly among immigrants. The second objective (RO.2) is about the effectiveness of ESA program heating, cooling, and enclosure measures at improving participants' health, comfort, and safety (HCS). The third and fourth research objectives (RO.3 and RO.4) focus on the energy burden and unique hardships of low-income alt-fuels customers and low service reliability customers, respectively.

### 1.3.1 RO.1a: Informing CARE Program Post-Enrollment (PE) Processes

For the first subobjective of RO1, we compared current (retained) and past (removed) CARE participants at each PE process – recertification, income verification, and high-user verification – using data from the customer survey and the IOUs to inform the effectiveness of CARE PE processes. See Chapter 3 for summary results and Appendix C in Volume 2 for detailed results.

#### RO.1a Research Questions and Answers

##### What are the differences in characteristics between current (retained) and past (removed) CARE participants?

Surveyed current CARE participants are reportedly more likely than surveyed past participants to have higher energy burdens and greater economic hardship, among other associated characteristics indicative greater need for CARE, suggesting the overall appropriateness of the PE processes.

##### To what extent do CARE PE processes remove ineligible participants and retain eligible participants?

CARE PE processes appear to be removing most of the participants who are ineligible for CARE:

- Among the surveyed current CARE participants, 13% were income-ineligible based on the household information they reported in the survey.
- The ineligible current participants are very similar to ineligible past participants in that both demonstrate lower burden/hardship and less need for CARE.

The PE processes do not appear to be retaining as many eligible participants as possible:

- Over half (54%) of the surveyed past participants removed from CARE were reportedly still income-eligible and possibly could have been retained.
- The eligible past participants are very similar to the eligible current participants in that both demonstrate higher burden/hardship and a greater need for CARE.

The eligible past participants most commonly reported being removed from CARE because it was inconvenient to (42%) or they didn't know how to (23%) complete the PE process.

About 20% or less also reported not knowing why they were removed (21%), experiencing issues with the PE process (8%), not knowing they were removed (8%), moving residences frequently (8%), having privacy concerns (4%), and not needing CARE any longer (3%).

Only about 2% of the past participants were flagged by their IOU as participating in the Family Electric Rate Assistance (FERA) program.

### What are the key differences in eligibility and characteristics between current and past CARE participants at the different PE processes?

Among the surveyed current CARE participants, each of the PE processes are removing most of the ineligible participants:

- About 18% of those recently enrolled reported ineligible household information but this is reduced to about 10% among those who recently recertified. <sup>6</sup>
- About 10% of those who recently income verified and 6% of those who recently high-usage verified are reportedly income-ineligible. <sup>7</sup>

In contrast, among surveyed past participants, the PE process appear to be removing many who are eligible for CARE:

- About 70% of those removed at income verification, 55% removed at high-usage verification, and 44% removed at recertification are reportedly eligible for CARE and removed for reasons other than ineligibility (e.g. inconvenience, didn't know what to do, etc.).

Trends in current and past participants' characteristics support these findings.

- Those removed at recertification demonstrated burden and hardship lower than those retained and were more likely to report not knowing that they were removed or no longer needing CARE.
- In contrast, those removed at income verification demonstrated burden and hardship that is more similar to those who were retained and were more likely to report not knowing how to continue on CARE or having privacy concerns.

## RO.1a Conclusions and Recommendations

CARE PE processes are removing most ineligible participants and are retaining most eligible participants overall. However, the PE processes are also removing many eligible participants, particularly the income verification and, to a lesser extent, the high-usage and recertification processes. The eligible past participants removed from CARE also demonstrate higher levels of burden and hardship similar to those who were retained and also reported being removed from CARE because it is an inconvenience or they don't know how to continue on CARE. Many of the past participants likely qualify for FERA but very few appear to be participating.

- **Recommendation 1a.1:** Consider updating the probability model used for selecting participants for income verification to reduce the number of potentially eligible participants who are selected (and then

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<sup>6</sup> Recertification is required of all CARE participants every two years for most participants and every four years for participants on fixed income.

<sup>7</sup> Income verification is required of participants either randomly selected or selected via an IOU's probability model as likely to be income ineligible, which ranged from 2% to 5% of participants annually in 2018, and high usage verification is required of participants whose monthly electrical usage is greater than 400% of their baseline allowance, which ranged from 4% to 6% of participants annually in 2018.

removed). This could involve updating the inputs to the model and/or the algorithm(s) it uses with the inputs to identify likely ineligibles.

- **Recommendation 1a.2:** Consider revising or updating the advanced ME&O notifications informing CARE participants of an upcoming PE process to more effectively reach participants and address concerns reported by the past CARE participants recently removed due to a reason other than ineligibility (e.g., inconvenience, don't know what to do, don't know why removed, etc.), including informing them about reduced rates available via FERA as an alternative to CARE.

### 1.3.2 RO.1b: Informing CARE Marketing, Education, & Outreach (ME&O)

For the second subobjective of RO.1, we compared CARE-eligible nonparticipants with current CARE participants, including subgroups of immigrants and non-English speakers, using data from the customer survey and the IOUs to inform the effectiveness of CARE ME&O. <sup>8</sup> According to the IOUs' 2018 annual CARE reports, CARE penetration is about 90% of the CARE-eligible population in California, leaving about 10% who are eligible nonparticipants. The eligible nonparticipants living in the high poverty areas of the state comprise about 36% of the total eligible nonparticipant population (or about 3.6% of the total eligible population). See Chapter 4 for summary results and Appendix D in Volume 2 for detailed results.

#### RO.1b Research Questions and Answers

##### What are the differences in characteristics between current CARE participants and CARE-eligible nonparticipants?

Surveyed CARE-eligible nonparticipants reported greater energy burdens but fewer other associated hardships than corresponding surveyed current CARE participants, suggesting that the nonparticipants may have less need for CARE overall even though they are reportedly income-eligible.

##### What are barriers to CARE enrollments among CARE-eligible nonparticipants that can inform how ME&O can be more effective?

Surveyed CARE-eligible nonparticipants reported lack of awareness of CARE (62%) as the most common barrier to enrolling in CARE.

Among the eligible nonparticipants who reported awareness of CARE, the most common barriers to enrolling include an uncertainty over eligibility (38%), a perception that enrolling is an inconvenience (30%), a lack of knowledge about how to enroll (25%), and a lack of need for CARE (11%).

Not knowing how to apply for CARE was cited more by those eligible nonparticipants with lower annual incomes (vs. those with higher incomes).

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<sup>8</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. The results reflect the experiences of eligible nonparticipants in areas with high concentrations of eligible customers and others like them in the state and may potentially be found among the entire California population. In addition, for purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

### How much does CARE maximize enrollments of low-income immigrant and non-English speaking customers?

About one-third of surveyed CARE-eligible nonparticipants reported a foreign-born household member (immigrant) or speaking a non-English language in the home, suggesting that CARE enrollments are not maximized among these subgroups.<sup>9</sup>

However, about one-third of current CARE participants also reported immigrant household members or speaking a non-English language, indicating that these subgroups are not underrepresented in CARE.<sup>10</sup>

In addition, comparisons between the nonparticipants and participants show that participants reported greater energy burdens, economic hardship, and other characteristics associated with higher burden and greater need for CARE, suggesting that immigrant and non-English speaking customers who likely most need CARE are participating.

### What are barriers to CARE enrollments among CARE-eligible nonparticipant immigrants and non-English speaking customers that can inform how ME&O can be more effective?

Lack of awareness of CARE is also the greatest enrollment barrier reported by immigrant (70%) and non-English speaking (66%) CARE-eligible nonparticipants, even more than for nonparticipants without these subgroups (59%).

Among those who reported awareness of CARE, the most common barriers to enrolling include a perception that enrolling is an inconvenience (38%-39%), an uncertainty over eligibility (28%-38%), a lack of knowledge about how to enroll (23%-27%), and a lack of need for CARE (11%-17%).<sup>11</sup>

Interviewed CARE capitation agency staff also reported that the immigrants they serve faced few barriers to enrolling in CARE but acknowledged they don't see all the immigrants in their communities who may face enrollment barriers and that awareness of CARE and their services could be improved.

In addition, a review of studies about trends in immigrants' enrollments in public assistance programs indicate that the CARE program already includes many the practices that help facilitate enrollments, like providing materials in multiple languages, allowing categorical participation, and leveraging community organizations, but it is too soon for definitive evidence about whether immigrants' use of public assistance like CARE is on a long-term decline and what may be causing the decline (e.g., no trust vs. no need).

## RO.1b Conclusions and Recommendations

CARE-eligible nonparticipants, including immigrants and non-English speakers, reported characteristics indicating less need for CARE as those currently participating but are reportedly income-eligible, and either are not aware of CARE or perceive that they are ineligible, enrolling is an inconvenience, or don't know how to enroll. CARE has not maximized enrollments among immigrants and non-English speakers, but these

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<sup>9</sup> Based on survey responses, the CARE-eligible immigrant and non-English speaking nonparticipants are estimated to comprise about one-third of all the CARE-eligible nonparticipant customers in areas with high concentrations of eligible customers, about 11% of all CARE-eligible nonparticipants throughout the state, and about 1% of all CARE-eligible customers (participants and nonparticipants) in California.

<sup>10</sup> If immigrants and non-English speakers were underrepresented in CARE, the percentage of CARE participants who are immigrants would be much lower than the percentage of nonparticipants who are immigrants. We find very similar percentages between the groups, suggesting equal representation.

<sup>11</sup> The surveyed low-income immigrant and non-English speaking nonparticipants who reported being aware of and interested in CARE are too small for conclusive statistical results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the subgroups.

subgroups also do not appear to be underrepresented in CARE, and those who appear to need CARE most are currently participating. CARE capitation agencies also reported success in enrolling immigrant and non-English speaking subgroups in CARE but acknowledged that lack of awareness of the agencies and of CARE is a barrier.

If IOUs' prioritize increasing the CARE penetration rate above 90% through enrolling more nonparticipants, the following recommendations should be considered:

- **Recommendation 1b.1:** Consider revising and/or broadening existing ME&O strategies designed to increase awareness of CARE by, for example, using ME&O channels that have been underutilized or not utilized previously (e.g., text messaging, social media, media advertisements, etc.), including non-English languages spoken among different subgroups of customers that are not currently included in ME&O (if any), and/or expanding into areas where CARE has not previously been advertised (e.g., less in areas with concentrations of those on public assistance or fixed income and more in areas high concentrations of service, agricultural, and other low-wage employment; more in cooler climate zones, in the Desert/Mountain regions, and in areas with high concentrations of multifamily residences).
- **Recommendation 1b.2:** Consider revising ME&O to more effectively address the CARE-aware nonparticipants' reasons for not applying, like their uncertainty about their eligibility, lack of knowledge of how to apply for enrollment, and perception that applying is an inconvenience or too much trouble.
- **Recommendation 1b.3:** Consider expanding coordination with CARE capitation and similar agencies that provide services primarily to immigrant and non-English-speaking customers in an effort maximize enrollments and/or prevent attrition among CARE-eligible members of these subgroups.

### 1.3.3 RO.2: Examining ESA Program Health, Comfort, and Safety (HCS) Impacts

For the second research objective, we examined changes in HCS in the homes of recent ESA participants who received heating, cooling, and/or enclosure measures (targeted measures) using data from the customer survey, interviewed ESA contractor supervisors and lead installers, and the IOUs. See Chapter 5 for summary results and Appendix E in Volume 2 for detailed results.

#### What are ESA participants' perceptions of the non-energy HCS impacts of heating, cooling, and enclosure ESA measures and the conditions under which the measures provide more or less HCS impacts?

Surveyed ESA participants who received heating, cooling, and/or enclosure measure(s) reported improvements in the comfort of their home and, to lesser extent, in making their home a healthier and safer place to live.

- HCS improvements included reducing uncomfortably hot and cold temperatures, drafts, pests, and mold/mildew/fungus/moisture.

The greatest HCS impacts were reported by participants who received a cooling or heating measure in combination with enclosure measures.

- The greatest HCS impacts from single measures were reported by participants who received central ACs and evaporative coolers, followed by enclosure measures, then furnaces and room/window ACs.
- ESA participants also rated their home's overall HCS as better (or higher) than nonparticipants' ratings of their homes' HCS.

Surveyed participants who recalled receiving HCS advice from their ESA contractors reported the greatest HCS improvements, suggesting the importance of the ESA energy education.

- In addition, other conditions that reportedly lead to more or less HCS impacts varied across the HCS issues but include climate zone, housing type, household composition, and retirement status.

### What are ESA contractors' perceptions of the non-energy HCS impacts of heating, cooling, and enclosure ESA measures and the conditions under which the measures provide more or less HCS impacts?

Interviewed ESA contractors' perceptions of HCS impacts were largely consistent with surveyed participants' perceptions.

- They reported HCS improvements in many of the participants' homes they serviced with the targeted measures, mentioned that cooling measures likely had the greatest impacts, followed by enclosure measures, and then the heating measures, and conveyed that the comfort of participants' homes was often the most improved, followed by safety and health.

Interviewed ESA contractors reported HCS impacts are often greatest in homes with elderly, disabled, or very young household members, and can vary by measure type, climate zone, and housing characteristics.

The ESA contractors also mentioned that rental homes, particularly multifamily units, where landlords will not sign installation waivers and homes without heating or cooling equipment or that are otherwise infeasible to service are not very common but often need HCS improvements that they are unable to receive.

The contractors could not identify any measures that could be cost-effective substitutes of the targeted measures and still deliver similar HCS impacts.

## RO.2 Conclusions and Recommendations

The ESA heating, cooling, and enclosure measures appear to be delivering HCS improvements in participants' homes. The greatest HCS impacts are perceived by participants who received a combination of measures, followed by central ACs and evaporative coolers, then by enclosure measures, then furnaces and, lastly, room/window ACs. The targeted measures deliver the greatest improvements for participants who recalled receiving the energy education as part of their participation and who have household members who tend to be home more often (retirees) and/or who tend to have the greatest need for HCS benefits, like the elderly, disabled, and young children. Challenges to making HCS improvements are greatest in rental units where landlords will not permit installation of equipment and in other infeasible homes.

- **Recommendation 2.1:** Continue offering all the ESA heating, cooling, and enclosure measures in eligible homes and consider changing measure eligibility if there are restrictions by climate zone, housing type, or other characteristics not related to equipment safety or cost effectiveness requirements to ensure that customers who would greatly benefit from the targeted measures, and potential HCS improvements, are eligible to receive them.
- **Recommendation 2.2:** Consider implementing ME&O that will provide a follow-up energy education to participants a few weeks after they receive heating, cooling, or enclosure measures to increase awareness and persistence of HCS and other benefits. Examples include a direct mailer, an email, an onsite check-up from the ESA contractor, and/or a dedicated website or toll-free number.
- **Recommendation 2.3:** Consider increasing coordination efforts with landlords of rental units, particularly but not exclusively in multifamily buildings, to address their concerns about installing

equipment in their units. This could involve in-person consultations, ME&O addressing their concerns about split incentives and other issues related to upgrading equipment, and/or connecting nonparticipant landlords with participant landlords in their area.

### 1.3.4 Research Objective 3: Assessing Alternative Fuels Customers' Hardships

For the third objective, we assessed the burdens and unique hardships of low-income PG&E, SCE, and SDG&E alt-fuels customers, in comparison to non-alt-fuels customers, using data from the customer survey and IOUs.<sup>12</sup> See Chapter 6 for summary results and Appendix F in Volume 2 for detailed results.

#### What are the energy burdens, unique hardships, and key characteristics of alt-fuel customers compared to non-alt-fuels customers and how do alt-fuel customers' energy burdens and hardships vary by key characteristics and drivers?

Energy burden is higher for surveyed alt-fuels customers (8.7%) than for non-alt-fuels customers (5.5%) when it accounts for alt-fuels customers' self-reported annual alt-fuels costs.

Alt-fuels customers appear uniquely burdened by the costs of alt-fuels because their energy burden that accounts for only electricity costs (5.1%) is slightly lower than that of non-alt-fuels customers (5.5%).

Alt-fuels customers also reported greater economic and health hardships and other associated characteristics than non-alt-fuels customers.

#### How do alt-fuel customers' energy burdens and hardships vary by key characteristics and drivers?

The primary, unique drivers of alt-fuels customers' higher burden and hardships are living in the Central Valley region (vs. other regions), lower education, renting (vs. owning), and/or living in a manufactured/mobile home (vs. other housing types).

- Other drivers of burden and hardship, like being on fixed-income or public assistance, are similar between alt-fuels and non-alt-fuels customers.

In addition, the type of alt-fuel also has an impact:

- propane using alt-fuel customers reported greater burden and hardships than wood/pellets users and appear to be uniquely burdened by not having access to natural gas or electricity-using equipment since most reported this as the reason for why they use propane.

#### To what extent do CARE and ESA programs mitigate alt-fuel customers' energy burden and hardships?

Available evidence suggests that, among surveyed alt-fuels customers, those who have the greatest burdens and hardships have been participating in CARE, ESA, and/or IOUs' other energy assistance or efficiency programs compared to those with lower burden and hardships.

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<sup>12</sup> Due to the sample design for this study, the surveyed low-income alt-fuels customers may not be representative of all such customers in the state and the sample sizes for the surveyed alt-fuels subgroups of CARE and ESA participants are too small for conclusive statistical results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the groups.

In addition, trends in CARE and ESA program impacts among alt-fuels participants are similar to those for non-alt-fuels participants, suggesting that both groups receive benefits from participation.

- The benefits of CARE and ESA participation are slightly less than for non-alt-fuels customers because alt-fuels ESA participants' equipment that use alt-fuels is not eligible for ESA upgrades and alt-fuels CARE participants do not receive discounts on the costs of alt-fuels.

### RO.3 Conclusions and Recommendations

The following conclusions and recommendations apply to the surveyed alt-fuels customers and others in California who are similar to those surveyed.

The surveyed alt-fuels customers have greater energy burden and other hardships than the surveyed non-alt-fuels customers, in part due to the higher costs of alt-fuels and lack of availability or uptake of less expensive options like natural gas service or possibly electricity-using equipment. Surveyed alt-fuels customers who reported the greatest need for CARE and ESA appear to be participating or have participated in the programs and the programs' benefits seem slightly less for alt-fuels than non-alt-fuels participants because alt-fuels are not discounted by CARE and alt-fuels-using equipment is ineligible for ESA upgrades.

- **Recommendation 3.1:** Consider providing unique ME&O to alt-fuels customers, particularly propane users, to inform them of options to switch to natural gas, electricity-using equipment, or other possible alternatives to help reduce their reliance on alt-fuels. This could be done through the CARE and ESA programs and through targeting ME&O in areas in California with high concentrations of alt-fuels customers (available via the American Community Survey).
- **Recommendation 3.2:** Continue monitoring alt-fuels customers' characteristics via ongoing research efforts, such as the Residential Appliance Saturation Study and other planned IOU and CPUC studies that provide opportunities to include alt-fuels customers, as well as monitoring their program participation in ESA and, to the extent possible, in CARE for whether there is differential participation based on alt-fuel usage.

### 1.3.5 RO.4: Assessing Low Service Reliability Customers' Hardships

For the fourth and final objective, we assessed the burdens and unique hardships of low-income PG&E, SCE, and SDG&E customers who live low electrical service reliability areas in California, in comparison to those who live in higher service reliability areas, using data from the customer survey and IOUs.<sup>13</sup> See Chapter 7 for summary results and Appendix G in Volume 2 for detailed results.

#### What are the energy burdens, unique hardships, and key characteristics of low service reliability customers compared to high service reliability customers?

Energy burden is higher for surveyed low service reliability customers (6.6%) than for high service reliability customers (5.3%).

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<sup>13</sup> Due to the sample design for this study, the surveyed low-income customers who live in low service reliability areas may not be representative of all such customers in the state and the sample sizes for the surveyed low service reliability subgroups of CARE and ESA participants are too small for conclusive statistical results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the groups.

Low service reliability customers reported few other hardships or associated characteristics compared to high service reliability customers, indicating that the groups are mostly similar on average.

### How do low service reliability customers' energy burdens and hardships vary by key characteristics and drivers?

The primary, unique drivers of low service reliability customers' higher burden are non-white race/ethnicity, senior household members, smaller household sizes, and living in a manufactured/mobile home (vs. other housing types).

- Other drivers of burden and hardship, like being on fixed-income or public assistance, are similar between low and high service reliability customers.

In addition, low service reliability customers reported experiencing more outages but of shorter duration, on average, compared to high service reliability customers, and also reported that outages they experienced tend to cause more difficulty for their households compared to high service reliability customers.

### To what extent do CARE and ESA programs mitigate low service reliability customers' energy burden and hardships?

Available evidence suggests that, among surveyed low service reliability customers, those who have the greatest burdens and hardships have been participating in CARE and/or ESA compared to those with lower burden and hardships.

In addition, trends in CARE and ESA program impacts among low service reliability participants are similar to those for high service reliability participants, suggesting that both groups receive similar benefits from participation.

## RO.4 Conclusions and Recommendations

The following key findings and recommendations apply to the surveyed low service reliability customers and others in California who are similar to those surveyed.

Surveyed low service reliability customers have greater energy burden and electrical outages cause them more difficulty compared to high service reliability customers. However, there are few other differences between surveyed low and high service reliability customers, suggesting that low service reliability has little to no effect on customers' burdens and hardships. Available evidence also suggests that surveyed low service reliability customers who reported the greatest need for CARE and ESA are participating or have participated in the programs and that trends in the programs' impacts are similar for low and high service reliability customers

- **Recommendation 4.1:** Consider using SAIDI/SAIFI data to monitor CARE and ESA penetration rates in low and high service reliability areas for whether there is differential participation based on service reliability and to monitor energy usage patterns and bill amounts of low service reliability program participants relative to high service reliability participants to measure potential program impacts.

## 2. Introduction

The California investor owned utilities (IOUs) provide two energy assistance programs to income-qualified customers with annual incomes 200% or less of Federal Poverty Guidelines (FPG).<sup>14</sup> The California Alternate Rates for Energy (CARE) program provides discounted energy rates of up to 35% on their monthly electric bills and up to 20% on their monthly natural gas bills. The Energy Savings Assistance (ESA) program provides participants no-cost energy efficiency services, including an energy assessment, education, and equipment upgrades. These programs seek to alleviate low-income customers' energy burden and improve their health, comfort, and safety.

California Public Utilities Code Section 382(d) requires the California Public Utilities Commission (CPUC) to conduct a Low-Income Needs Assessment (LINA) every three years with the assistance of the Low-Income Oversight Board (LIOB), as per Assembly Bill 327 (AB 327) enacted in 2013. According to AB 327, "the assessment shall evaluate low-income program implementation and the effectiveness of weatherization services and energy efficiency measures in low-income customers' homes. The assessment shall also consider whether existing programs adequately address low-income electricity and gas customers' energy expenditures, hardships, language needs, and economic burdens."

To commence the project, the CPUC's Energy Division staff conferred with members of the LIOB in February 2017. In addition, the IOUs and Energy Division conducted an initial public topic solicitation workshop May 19, 2017 to get additional input from stakeholders. As a result of this activity and in response to statutory mandates and directives set forth in Commission Decision (D.) 16-11-022, the 2019 LINA addresses the following overall topics:

- CARE program eligibility and participation barriers, potentially including enrollment, recertification and income and high-usage verification processes.
- Impacts of select ESA heating, cooling, and enclosure measures on customers' health, comfort, and safety (HCS).
- Energy burden and hardships of customers who rely on alternative fuels (propane, wood, etc.) for their primary energy source (alt-fuels customers).
- Energy burden and hardships experienced by customers living in areas that have less reliable electricity service (low service reliability customers) as indicated by each IOU's System Average Interruption Duration Index and System Average Interruption Frequency Index (SAIDI/SAIFI).<sup>15</sup>

The 2019 LINA is for the years 2017 to 2019 and is the fourth LINA conducted on behalf of the CPUC, Pacific Gas & Electric (PG&E), Southern California Edison (SCE), Southern California Gas (SCG), and San Diego Gas & Electric (SDG&E). It addresses four overarching research objectives (ROs) and the findings and recommendations are intended to provide information that may be useful for planning and/or implementing the next cycle of the CARE and ESA programs.

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<sup>14</sup> The IOUs are Pacific Gas & Electric Company (PG&E), Southern California Edison Company (SCE), Southern California Gas Company (SCG), and San Diego Gas & Electric Company (SDG&E).

<sup>15</sup> SAIDI is a measure of the average duration of electrical outages and SAIFI is a measure of the average frequency of electrical outages in an IOU's service territory.

## 2.1 Report Organization

The 2019 LINA report includes three volumes. The main report with summaries of key findings and conclusions (this document) is Volume 1. The detailed methods and results from all analyses, including findings by IOU and other subgroups, are in Volume 2. The supporting documents like the research plan and data collection instruments are in Volume 3.

## 2.2 CARE and ESA Program Overviews

### 2.2.1 CARE Program

Through the CARE program, each of the four IOUs gives a discount of up to 35% on income-qualified customers' monthly electricity bills and up to 20% on their monthly gas bills. The 2017 income-eligibility requirements are shown in Table 1 and are used instead of the 2018 or 2019 requirements because we conducted the customer survey in March 2019, before some customers knew their actual 2018 income amount, and thus asked customer for their 2017 income and we used 2017 customer billing data from the IOUs to calculate surveyed customers' energy burden.

Table 1. 2017 CARE Income-Eligibility Requirements

Number in Household	Income Eligibility Upper Limit	Number in Household	Income Eligibility Upper Limit
One or Two	\$32,920	Six	\$67,480
Three	\$41,560	Seven	\$76,120
Four	\$50,200	Eight	\$84,760
Five	\$58,840	Each additional person	\$8,640

According to the most recent CARE and ESA annual reports filed by the IOUs in December 2018, more than four and half million IOU customer households participated in CARE by the end of 2018, representing 90% of the estimated CARE-eligible population (Table 2). The CPUC authorized a budget of about \$3.9 billion in ratepayer funds for 2017-19 CARE administration and discounts (Table 2).

Table 2. CARE Program Participation and Budget <sup>a</sup>

IOU	2018 CARE Participation (millions)			2017-19 CARE Budget (millions)		
	Estimated CARE-Eligible Population	Customers Served	Penetration Rate	2017 (per expenditures)	2018 (per expenditures)	2019 (per authorization)
PG&E	1.54	1.38	90%	\$656.7	\$622.5	\$611.9
SCE	1.42	1.21	85%	\$381.8	\$383.7	\$494.0
SCG	1.79	1.62	90%	\$116.5	\$119.5	\$142.4
SDG&E	0.32	0.30	92%	\$114.0	\$132.0	\$81.1
Total	5.07	4.51 <sup>b</sup>	90%	\$1,269.0	\$1,257.7	\$1,329.4

<sup>a</sup> IOUs' 2017 & 2018 CARE and ESA Annual Reports (the latest available).

<sup>b</sup> Double-counts customers who get their electricity and gas services from different IOUs (e.g., SCE and SCG).

The CARE program has four main processes:

- **Enrollment:** Customers can apply to enroll in CARE through multiple channels, providing household information and a declaration that the information is correct. <sup>16</sup>
- **Recertification:** CARE enrollment covers a two-year period for most participants and a four-year period for a few participants; to continue in the program participants must recertify, or re-apply, for CARE.
- **Income Verification:** IOUs select 2% to 5% of participants annually who are identified via a probability model as potentially ineligible and via a smaller random sample, and request them to submit supporting documentation to prove their eligibility. <sup>17</sup>
- **High-Usage Verification:** IOUs require CARE participants to limit their monthly electricity usage to 400% (termed “high-low users”) or 600% (termed “high-high users”) of their monthly baseline allowance, depending on their circumstances. Participants exceeding their limits are required to have high-user verification, which ranges from 4% to 6% of participants annually and includes income verification, participation in the ESA program, and usage monitoring, or an appeal process.

The three latter processes comprise the post-enrollment (PE) processes. Participants who do not complete or meet the eligibility criteria of the PE processes are removed from CARE for up to two years.

## 2.2.2 ESA Program

The IOUs offer the ESA program at no cost to income-qualified renters and homeowners in all single family, multifamily, and manufactured/mobile homes (Table 3). Participants receive a home energy audit with energy education, as well as the installation of qualifying measures. ESA measures include energy-efficient appliances, water heaters, and space conditioning equipment; weatherization, insulation, and window repair or replacement; and direct install measures.<sup>18</sup>

More than four million IOU customer households participated in ESA from 2002 to 2018, representing 84% of the estimated ESA-eligible population (Table 3). The CPUC authorized a budget of nearly \$1 billion in ratepayer funds for 2017-19 ESA administration and measures (Table 3).

Table 3. ESA Program Participation and Budget <sup>a</sup>

IOU	ESA Participation (millions)			2017-19 ESA Budget (millions)		
	Estimated ESA-Eligible Population	Customers Served 2002-2018	Penetration Rate	2017 (per expenditures)	2018 (per expenditures)	2019 (per authorization)
PG&E	1.57	1.38	88%	\$122.8	\$122.1	\$184.5
SCE	1.21	0.99	82%	\$61.0	\$64.8	\$63.6
SCG	1.65	1.35	82%	\$79.4	\$93.2	\$131.8
SDG&E	0.32	0.29	91%	\$17.8	\$22.8	\$29.9
Total	4.75	4.01	84%	\$281.0	\$302.9	\$409.8

<sup>a</sup> IOUs' 2017 & 2018 CARE and ESA Annual Reports and 2019 April Monthly Reports (the latest available).

<sup>16</sup> Enrollment channels include their IOU's website, customer call center representative or interactive voice response (IVR) phone system, or paper application mailed to or printed by the customer, data sharing with another IOU, or a capitation agency

<sup>17</sup> Documentation of their income can include check stubs, tax forms, financial statements, etc. and documentation of participation in public assistance programs can include award letters, stubs/receipts, etc.

<sup>18</sup> The IOUs vary their offerings appropriate to the fuels and climates they serve. They coordinate to provide all eligible ESA services to customers who have accounts with multiple IOUs or utilities.

## 2.3 Research Objectives

The 2019 LINA includes four overarching research objectives (ROs), but the first RO about the CARE program is divided into two sub-objectives for data collection and analysis purposes since each sub-objective focuses on different aspects of the CARE program and includes different comparison groups.

The first CARE program research sub-objective (RO.1a *Informing the CARE PE processes*) compares current (retained) CARE participants with customers recently removed from CARE (past participants). In summary, sub-objective seeks to understand the effect of the PE processes on participant composition, so that the IOUs might better understand the implications of their program processes and be able to refine them as warranted. See Chapter 3 for RO.1a results.

The second CARE program research sub-objective (RO.1b *Informing CARE ME&O*) compares CARE participants with CARE-eligible nonparticipants who have never participated in CARE. In summary, this sub-objective seeks to better understand who in the eligible population is being reached and, of those, who completes enrollment so that the IOUs might better understand the implications of their ME&O activities and be able to refine them as warranted. The research objective also looks specifically at immigrant and non-English speaker subgroups of nonparticipants. See Chapter 4 for RO.1b results.

The ESA research objective (RO.2 *Examining the HCS impacts of ESA Program heating, cooling, and enclosure measures*) explores perceptions of the HCS impacts of ESA heating, cooling, and enclosure measures, with a focus on the experience of recent participants who received one or more of the measures and of ESA installation contractors. The IOUs and CPUC identified the ESA measures of interest (targeted measures) as those that are high-cost and/or time- and labor-intensive and are most likely to impact participants' HCS.<sup>19</sup> In summary, the research objective seeks to gauge the magnitude of the perceived HCS impacts and how they vary across customers, so that the IOUs might better understand these important ESA non-energy benefits and be able to refine program measures and policies as warranted. See Chapter 5 for RO.2 results.

The two remaining research objectives explore the hardships of two subgroups of low-income customers who may have unique energy needs and burdens. Findings on these two research objectives will enable IOUs to better understand the subpopulations of low-income customers and be able to refine the CARE and ESA programs as warranted to better serve them.

- The three-part RO.3 (*Assess hardships of alt-fuels customers*) focuses on PG&E, SCE, and SDG&E low-income customers who do not have natural gas service and rely on alternative fuels (alt-fuels) – propane, kerosene/oil/diesel, and/or wood/pellets – as the primary fuel for their space heating, water heating, and/or cooking. See chapter 6 for RO.3 results
- The three-part RO.4 (*Assess hardships of customers with less reliable energy services*) focuses on PG&E, SCE, and SDG&E low-income customers who live in low electrical service reliability areas, as defined by IOUs' System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI) data, which measure the duration and frequency of outages, respectively. See Chapter 7 for RO.4 results.

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<sup>19</sup> Targeted heating measures: furnace replacement, repair, or tune-up. Targeted cooling measures: central AC (CAC), room AC, and evaporative cooler replacement, and CAC repair or tune-up. Targeted enclosure measures: attic insulation, caulking, glazing, weather-stripping, wall repairs, and door and window replacements and repairs.

In summary, RO.1a, RO.1b and RO.2 examine CARE and ESA processes associated with customer needs and RO.3 and RO.4 explore the energy burdens and unique hardships of two subpopulations of low-income customers and the extent to which the CARE and ESA programs mitigate these burdens and hardships.

## 2.4 Customer Groups and Omnibus Survey

We designed an omnibus customer survey to provide our primary data for the multiple research objectives. The survey was fielded by Washington State University's Social and Economic Science Research Center in March 2019 via web and phone modes, included 75 questions of which customers were asked no more than 50, and took an average of about 20 minutes to complete. A total of 1,505 customers responded to the survey, mostly via the web, out of a sample of 21,590 customers for a total response rate of 7%. All respondents were provided a \$25 gift card for their participation and time.

Overall and IOU-specific survey disposition results are in Volume 2, Appendix B.

To obtain the data relevant to each of the research objectives, we stratified the survey sample to achieve a sufficient number of responses (for 90/10 confidence/precision at statewide, IOU, and strata levels) from four primary customer groups:

- **424 Current CARE participants** who were participating as of July 1, 2018.
  - We developed a random statewide sample divided into four strata based on which CARE processes they most recently experienced: 1) enrolled, 2) recertified, 3) income verified, and 4) high-user verified.
  - The group achieved an 11% survey response rate and 90/10 confidence/precision (C/P) at statewide, IOU, and strata levels (except the high-user stratum with 85/10 C/P), and
  - The group represents the approximate 14% of all CARE participants who are retained by a PE process each year and the approximate 20% of all CARE participants who newly enroll each year.
- **345 Past CARE participants** who participated any time between January 1, 2015 and June 30, 2018 but were removed as of July 1, 2018.
  - We developed a random statewide sample divided into three strata based on the PE process removing them from CARE: 1) recertification, 2) income verification, and 3) high-usage verification.
  - The group achieved a 9% survey response rate and 90/10 C/P at statewide, IOU, and strata levels.
  - The group represents the approximate 14% of all CARE participants who are removed at a PE process each year.
- **267 CARE-eligible nonparticipants** who never participated before July 1, 2018, live in high-poverty areas of California, and determined to be income-eligible based on survey responses about 2017 income and household size.<sup>20</sup>
  - We developed a random sample in high-poverty areas divided into three subgroups based on survey responses: 1) a foreign-born household member (32%), 2) a non-English language spoken

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<sup>20</sup> Nonparticipants are eligible for CARE if they reported annual incomes of 200% or less of FPG for 2017. We limited the sample of potential nonparticipants to those who live in high poverty areas of the state, which are the Census tracts where 20% or more households earn annual incomes of 100% or less of FPG, in order to improve the incidence of CARE-eligible nonparticipants for the customer survey to achieve a sufficient number of respondents within the project budget and timeline. However, the results do reflect the experiences eligible nonparticipants living in areas with high concentrations of eligible customers and others like them in the state and may potentially be found among the entire California population.

in the home (35%; includes households with foreign-born members), and 3) English spoken in the home and no foreign-born members (60%).

- The group achieved a 3% survey response rate, 1% survey incidence rate, and 90/10 C/P at the statewide, IOU, and subgroup levels (except the PG&E sample at 85/10 C/P).
- The group represents the approximately 4% of CARE-eligible customers in California who have never participated and who live in areas of the state with high concentrations of CARE-eligible customers.
- **396 ESA participants** who participated any time between January 1, 2016 and June 30, 2018 (recent participants), and who received ESA energy education and at least one of the targeted measures.
  - We developed a random statewide sample divided into six strata based on the targeted measure(s) received and frequency in program databases: 1) weatherization (most common), 2) evaporative cooler replacement, 3) attic insulation, 4) furnace replacement/repair, 5) CAC replacement/repair, and 6) room AC replacement (least common).
  - The group achieved an 11% survey response rate and 90/10 C/P at statewide and strata levels, and represents the ESA participants who received targeted measures between 2016 and 2018.
  - We created a comparison group of **907 ESA nonparticipants** using survey responses from the surveyed customers in the three CARE groups who had not participated in ESA between January 2016 and July 2018, as indicated by IOU program data.
    - The comparison group achieved a 70% incidence rate and 90/10 C/P at statewide and IOU levels.

The survey design enabled us to create two subgroups – alt-fuels customers and low service reliability customers (and their comparisons groups) – using the survey responses and IOU data for the surveyed CARE and ESA customer groups, as follows:

- **138 alt-fuels customers** in PG&E, SCE, and SDG&E territories who reported depending on alternative fuels – propane, kerosene/oil/diesel, and/or wood/pellets –for space heating, water heating, and/or cooking.<sup>21</sup>
  - We developed a stratified oversample of customers in the CARE and ESA customer group sample frames using IOU data about customers’ space and water heating fuel and 2017 American Community Survey data about where alt-fuel users are concentrated (e.g., Census tracts where 50% or more households use alt-fuels) in California.
  - The group achieved a 4% response rate, 1% incidence rate, and 90/10 C/P at the statewide level.
  - We created a comparison group of **1,077 non-alt-fuel customers** using responses from the PG&E, SCE, and SDG&E surveyed respondents who did not report depending on alternative fuels.
    - The comparison group achieved a 7% incidence rate and 90/10 CP at statewide and IOU levels.

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<sup>21</sup> SCG customers have natural gas service and are less likely to depend on alt-fuels, and thus were excluded from analyses. In addition, due to the sample design for this study, the surveyed low-income alt-fuels customers may not be representative of all such customers in the state and the sample sizes for the surveyed alt-fuels subgroups of CARE and ESA participants are too small for conclusive statistical results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the groups.

- **153 low service reliability customers** in PG&E, SCE, and SDG&E territories who live in low service reliability areas with a SAIDI and/or SAIFI value equal to or exceeding one standard deviation above the mean value for the entire IOU service territory.<sup>22</sup>
  - The group achieved a 13% incidence rate and 90/10 C/P at the statewide level.
  - We created a comparison group of **1,062 high service reliability customers** from among the surveyed PG&E, SCE, and SDG&E customers who do not live in the low service reliability areas.
    - The comparison group achieved an 87% incidence rate and 90/10 C/P at the statewide level.

## 2.5 In-depth Interviews and Literature Review

We also conducted qualitative interviews and a literature review. More details about these data collection activities are in Volume 2, Appendix B.

- We augmented the CARE survey data by conducting in-depth interviews with staff at a sample of **seven CARE capitation agencies**, out of a list of 202 total agencies, that provide CARE referrals to the IOUs and offer services and support in communities with immigrant (undocumented and documented) and non-English speaking customers. Interviews lasted about 30 minutes and included up to 30 questions about trends in and barriers to CARE enrollments among the immigrant and non-English speaking population, and we provided all interviewees with a \$50 gift card for their participation and time.
- Following the staff interviews, we conducted a **literature review** of 11 studies and reports on trends in immigrants' use of and barriers to using public assistance programs like CARE.
- We augmented our ESA survey data by conducting in-depth interviews with **supervisors and lead installers at 12 certified ESA contractor firms**, out of a list of 62 firms. We interviewed two to five ESA contractors per IOU, including at least one contact involved in enrollments and assessments, and in installation of each measure type in each IOU service territory. The interviews lasted about 50 minutes and included up to 41 questions about the HCS impacts of the targeted ESA measures, and we provided all interviewees with a \$50 gift card for their participation and time.

## 2.6 Analysis Methods and Metrics

### 2.6.1 Overview of Data Analyses Methods

We calculated and applied post-stratification weights to the surveyed customer groups and subgroups that included a stratified sample. We used the following tests of comparison: for means – two-tailed t-tests; for proportions – two-tailed z-tests; for bivariate distributions – chi-square tests. We identified statistically significant factors that influence an outcome (such as ESA HCS impacts) using linear regression with

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<sup>22</sup> We determined whether surveyed customers lived in an area with low or high service reliability by matching their premise address to the SAIDI/SAIFI values associated with electrical circuit area, census tract, or zip-code in which they reside, where high values are associated with lower reliability. SCG customers were excluded since SCG does not have electrical SAIDI/SAIFI data. In addition, due to the sample design for this study, the surveyed low-income customers who live in low service reliability areas may not be representative of all such customers in the state and the sample sizes for the surveyed low service reliability subgroups of CARE and ESA participants are too small for conclusive statistical results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the groups.

continuous dependent variables and logistic regression with binomial dependent variables. Below, we discuss several metrics and characteristics we used for all the 2019 LINA customer groups.

Additional methodological details about these and other data sources and metrics used in the analyses are found Volume 2, Appendix B.

## 2.6.2 Data from IOUs

We received from the IOUs comprehensive lists of customers in each of the customer groups. The lists included customer contact info, CARE program history, and billing data. We used the data to develop the stratified samples for the customer survey, to inform or conduct select CARE analyses, and to calculate energy burden metrics for the customer groups. We also received lists of ESA contractor firms and CARE capitation agencies operating in each IOU territory that we used to develop a sample for conducting the in-depth interviews. Finally, we received the SAIDI/SAIFI data from PG&E, SCE, and SDG&E for identifying low and high service reliability areas and customers who live in them. The specific data fields we received from IOUs' CARE databases did vary by IOU, as described in more detail in Volume 2, Appendices B and C.

## 2.6.3 Burden and Hardship Metrics and Other Customer Characteristics

We developed two energy-specific hardship metrics (energy burden and modified energy burden) used in past LINAs and many other studies, as well as economic and health hardship indices used in the California Time-Of-Use Opt-In Pilot study.

### Energy Burden and Modified Energy Burden

We calculated the 2017 “customer energy burden,” or the proportion of customers’ annual income that was used to pay energy bills, for all surveyed customers using IOU billing data and customers’ responses to a survey question about their annual income.<sup>23</sup> Larger values mean that energy costs are a greater burden for customers.

$$\text{Customer Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bills}}{\text{Annual Household Income}}$$

The average energy burden for all surveyed customers is 5.5%, indicating overall moderate burden, but results vary by customer group and subgroup as described in the results chapters 3 to 7 in this volume and in Appendices C to G in Volume 2 of the report.

A potential shortcoming of the energy burden metric is that it doesn’t account for the value of public assistance benefits that qualified customers receive. For the modified customer energy burden, the value of public benefits is added to annual household income in the denominator of the metric.<sup>24</sup>

$$\text{Modified Customer Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bills}}{\text{Annual Household Income} + \text{Value of Public Benefits Received}}$$

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<sup>23</sup> The same method for calculating customer energy burden was used in the 2013 and 2016 LINAs by Evergreen Economics, although comparisons of energy burden results between the studies are limited due to other methodological differences, as described in detail in Volume 2, Appendix B.

<sup>24</sup> We used the same method to calculate modified energy burden as Evergreen Economics in the 2016 LINA, as described in more detail in Volume 2, Appendix B.

The average modified energy burden for all surveyed customers is 4.9%, indicating overall moderate modified burden, but results vary by customer group and subgroup as described in the results chapters 3 to 7 in this volume and in Appendices C to G in Volume 2 of the report.

### Alternative Fuels Energy Burden and Modified Energy Burden

We also created energy burden indices for customers self-reporting dependence on alt-fuels and their alternative fuel annual costs.

$$\text{Alternative Customer Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bills} + \text{Alt-Fuel Expenses}}{\text{Annual Household Income}}$$

$$\text{Alternative Modified Customer Energy Burden} = \frac{\text{Annual Sum of Monthly IOU Bills} + \text{Alt-Fuel Expenses}}{\text{Annual Household Income} + \text{Value of Public Benefits Received}}$$

For each of these metrics, we summed for all customers in the analysis group their energy burden results and divided by the total number of customers in the group to calculate the average energy burden metrics. See chapter 6 in this volume and Appendix F in Volume 2 for results.

### Economic Hardship

We created an economic hardship index using customers' responses to five survey questions about their overall financial well-being, the amount of difficulty they had paying for their basic needs (such as energy, food, and housing), their sources of income, and how they paid their bills (see Volume 2 for details.) We used confirmatory factor analysis (CFA) to load the questions into a single measure, or index, which had moderate reliability (as measured by Cronbach's alpha of 0.53).

The resulting economic hardship index is on a 0 to 10 scale, where 0 means very low economic hardship, or the equivalent of high financial well-being and little to no difficulty affording basic needs with earned income, and a 10 means very high economic hardship, or the equivalent of low financial well-being and great difficulty affording basic needs with non-income sources like fixed income or public assistance, assistance from family/friends, loans or credit cards, etc. A 5 on the scale is the equivalent of moderate financial well-being and difficulty affording basic needs with a mixture of earned income and non-income sources.

The average economic hardship score for all surveyed customers is 3.2, indicating overall moderately low economic hardship, but results vary by customer group and subgroup as described in the results chapters 3 to 7 in this volume and in Appendices C to G in Volume 2 of the report.

### Health Hardship

We created a health hardship index using customers' responses to two survey questions about how often their health and the health of household members was not good during the past year and how often their poor health prevented them and other household members from doing their usual activities. We used CFA to load the questions into a single index, which had high reliability (as measured by Cronbach's alpha of 0.90)

The index is measured on a 0 to 10 scale, where 0 means the absence of poor health and a 10 means the household experienced members with consistently poor health that prevented them from performing usual activities. A 5 on the scale could mean that household members were in poor health often, but it rarely limited their usual activities, or they rarely had poor health, but it limited the usual activities often when it occurred.

The average health hardship score for all surveyed customers is 4.0, indicating overall moderate health hardship, but results vary by customer group and subgroups as described in the results chapters 3 to 7 in this volume and Appendices C to G of Volume 2 of the report.

### Other Customer Characteristics Used in Analyses

We also analyzed findings with respect to other key customer characteristics (Table 4). As relevant, we followed the methodologies used in past LINAs and California Time-Of-Use Opt-In and Default Pilot studies. Data for these characteristics were obtained from survey responses and IOU databases (see Volume 2, Appendix B.)

Table 4. Customer Characteristics Used in Analyses

Geographic & Energy	Economic and Health	Demographic	Housing
Climate zone	Difficulty paying bills and basic needs	Respondent education	Housing tenure
Fuel type(s)	Annual 2017 household income	Respondent race/ethnicity	Housing type
Annual energy costs	Sources of income	Respondent marital status	Housing size
Heating equipment and percent of rooms heated	Employment status of household members	Household size and age-group composition	
Cooling equipment and percent of rooms cooled	Disabled household members	Language(s) spoken in the home	

### 3. Informing CARE Program Post-Enrollment (PE) Processes

We present the summary results for the research objective (RO1a) of informing CARE PE processes. The primary approach involved comparing 1) customers currently on CARE (current participants) vs. those formerly on CARE (past participants), 2) the current and past participants eligible for CARE vs. those ineligible for CARE, and 3) the current and past participants retained/removed at each PE process. This was done using results from the survey with 424 current CARE participants and 345 past CARE participants, and their IOU customer, program, and billing data. The sections below address the key research questions for this objective.

See Appendix C in Volume 2 for more detailed results, overall and by IOU and CARE-eligibility.

According to the IOUs' 2018 annual CARE Annual Reports, about 28% of participants in 2018 were selected for a PE process.<sup>25</sup>

- 21% were selected for recertification, and 39% of them were removed and 61% were retained.<sup>26</sup>
- 4% were selected for income verification, and 69% of them were removed and 31% were retained.
- 3% were selected for high usage verification, and 96% of them were removed and 4% were retained.

Overall, about half of the participants selected for a PE process (49%, or 14% of all participants) were removed, and the former participants removed between January 2016 and June 2018 are represented by the stratified sample of surveyed past CARE participants. In addition, about half the participants selected for a PE process (51%, or 14% of all participants) were retained, and an additional 20% of participants were added as new enrollees, and the retained and new participants between January 2016 and June 2018 are all represented by the stratified sample of surveyed current CARE participants.

#### 3.1 What are the differences between customers currently on CARE and former CARE participants no longer on CARE?

Findings indicate that current CARE participants on average are more burdened and disadvantaged than past participants removed during PE processes (Table 5). The findings also suggest that PE processes are effective overall at retaining participants more likely to be eligible and removing participants more likely to be ineligible.

Surveyed current CARE participants are *more* likely than past participants to have:

- Higher average energy burdens and modified energy burdens, and corresponding lower annual incomes and higher annual energy costs.<sup>27</sup>
- Greater general economic hardship, with a lower frequency receiving earned income from employed household members and a higher frequency receiving fixed income and/or public assistance and having retired, disabled, or children household members.
- Lower levels of education.

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<sup>25</sup> Percentages of CARE participants selected for a post-enrollment process ranged from 21% to 35% across the IOUs (see Table 20 in Volume 2).

<sup>26</sup> Percentages of CARE participants selected for recertification ranged from 12% to 26% across the IOUs (see Table 20 in Volume 2).

<sup>27</sup> Current participants' energy burdens would be up to 35% larger if the CARE discount was not included in their energy bills and thus in the energy burden calculation.

- A multifamily rental unit (and not a single-family home they own).
- Non-centralized heating and cooling equipment in the home.

Table 5. Surveyed Current and Past CARE Participants' Key Characteristic Differences, by Process Status <sup>a, b</sup>

Characteristics	Current CARE Participants	Past CARE Participants
N	405 - 424	315 - 345
Average energy burden <sup>c</sup>	5.4%*	4.4%*
Average modified energy burden <sup>c</sup>	4.7%*	4.1%*
Average economic hardship index score <sup>d</sup>	4.0*	3.0*
Average annual energy costs	\$1,267*	\$1,406*
Average annual household income (\$1,000s)	\$33.2*	\$46.3*
Receives earned income	62%*	72%*
Receives fixed income	41%*	30%*
Receives public assistance	23%*	14%*
Employed household member(s)	64%*	73%*
Retired household member(s)	29%*	25%*
Disabled household member(s)	30%*	21%*
Children under 18 household member(s)	53%*	45%*
Has high school diploma or less	31%*	25%*
Has 4-year degree or higher	25%*	32%*
Owns home	40%*	48%*
Lives in single-family home	52%*	58%*
Lives in multifamily building	32%*	25%*
Has central furnace in home	63%*	72%*
Has central AC in home	51%*	61%*

<sup>a</sup> \* = statistically significant difference at  $p \leq .05$  between current and past participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered the survey questions.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>d</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

### 3.2 To what extent do CARE PE processes remove ineligible participants and retain eligible participants?

CARE PE processes appear to be removing most of the participants who are reportedly income-ineligible for CARE (Table 6).<sup>28, 29</sup> Among the surveyed current CARE participants, 87% reported eligible and 13% reported ineligible 2017 income and household sizes per the 2017 CARE-eligibility criteria.

However, CARE PE processes appear to exclude many participants who are reportedly eligible for CARE (Table 6). Among surveyed past participants, 54% reported eligible 2017 income and household sizes and reported being removed from CARE for reasons other than ineligibility (Figure 1).<sup>30, 31</sup>

Table 6. Surveyed Current and Past CARE Participants' Eligibility Status, by IOU and Process Status<sup>a, b</sup>

IOU and Process Status	Current CARE Participants		Past CARE Participants	
	Income-Eligible	Income-Ineligible	Eligible	Ineligible
N	351	54	136	114
Total	87%	13%	54%	46%
PG&E	87%	13%	54%	46%
SCE	88%	12%	52%	48%
SCG	84%	16%	52%	48%
SDG&E	87%	13%	64%	36%

<sup>a</sup> CARE participants' eligibility status was determined by participants' survey responses about 2017 annual income and household size, and for past CARE participants their reasons for removal from CARE.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

The reasons for removal from CARE the surveyed eligible past CARE participants most commonly reported was that going through the PE process was inconvenient (they forgot, were too busy, or thought it was too much trouble), followed by not knowing how to continue on CARE or why they were removed (Figure 1). A few mentioned that they experienced issues with the CARE process and gave up, didn't yet know they were removed from CARE, move residences frequently, had privacy concerns with sharing their household information, and/or no longer needed CARE.<sup>32</sup>

<sup>28</sup> We surveyed CARE participants in early 2019 and asked them to report 2017 income and household size to determine their income-eligibility. Note that customers' responses are subject to recall bias, yet this bias would affect all customer groups equally (that is, would not introduce bias in the relative findings of group comparisons).

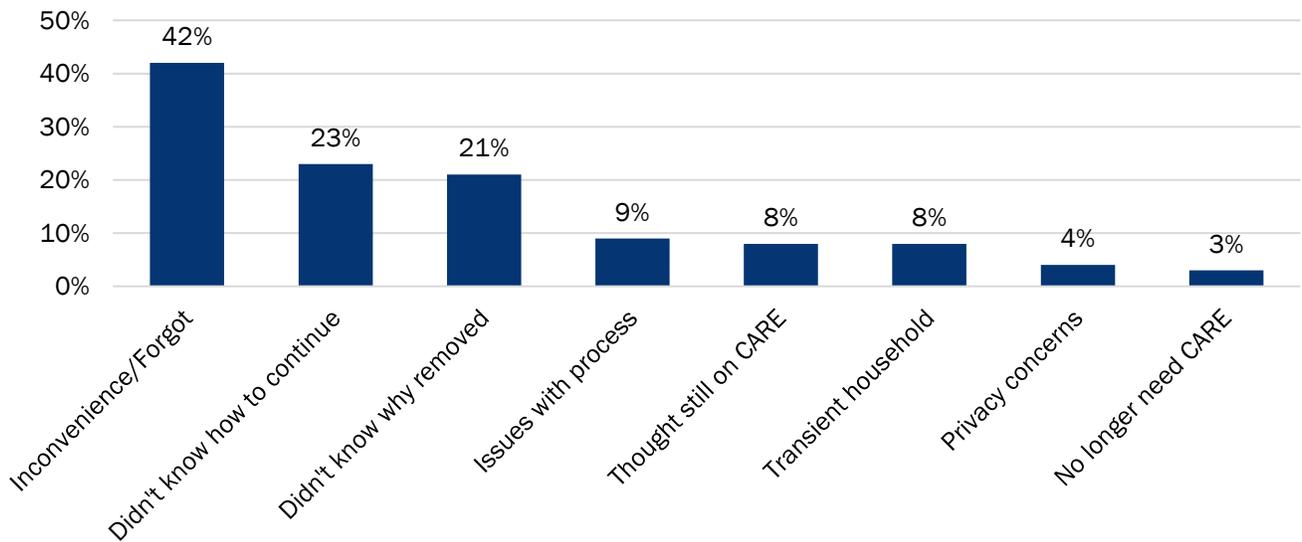
<sup>29</sup> It is important to note that the surveyed income-ineligible current CARE participants who enrolled or completed a PE process before 2018 could have been income-eligible at that time.

<sup>30</sup> We used surveyed past CARE participants' reported 2017 income/household size and reasons for removal to determine their eligibility. Using both self-reported measures likely improves the accuracy of the results since surveyed past participants could have mistaken their 2017 income and/or the reasons they were removed from CARE. Those who reported both income-ineligibility and being removed due to ineligibility (or failure to reduce high-usage) are coded as ineligible and those who reported both income-eligibility and being removed for a reason other than ineligibility are coded as eligible. Those who reported inconsistencies are excluded from analyses.

<sup>31</sup> Even though the surveyed eligible past CARE participants reported being removed from CARE for a reason other than being ineligible, it is important to note that those removed before 2018 may have been ineligible at the time of their removal.

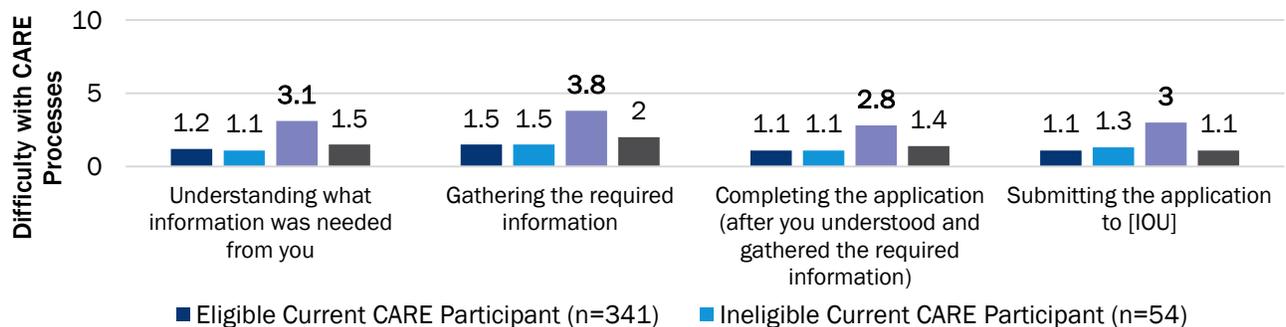
<sup>32</sup> Ineligible past CARE participants reported being ineligible (95%) or not reducing their electricity usage (5%, high-users) as reasons for their removal from CARE.

Figure 1. Reasons Surveyed Eligible Past CARE Participants Reported They Were Removed from CARE (n=146)



Surveyed eligible past participants' reasons for removal from CARE are reflected in their assessment of the difficulty of four different aspects of CARE PE processes (Figure 2). Overall, current and past participants reported little difficulty with CARE processes. However, the past CARE participants reported significantly greater difficulty with understanding what information was required, gathering the information, and completing and submitting the CARE application compared to the eligible current participants and ineligible current and past participants.

Figure 2. Surveyed Current and Past CARE Participants' Average Ratings of the Difficulty of CARE Processes They Most Recently Experienced, by CARE Eligibility Status <sup>a, b, c</sup>



<sup>a</sup> Difficulty was measured on an 11=point scale where 0 means not at all difficult and 10 means extremely difficult.  
<sup>b</sup> Bold values indicates statistically significant difference at  $p \leq .05$  in comparisons to eligible past CARE participants (gray bars vs. all others) using two-tailed t-tests.  
<sup>c</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

In addition, all surveyed current and past CARE participants reported similar positive economic impacts from receiving the reduced rate through CARE, regardless of their eligibility status. On average, they mostly agreed, using an 11-point scale, that CARE helped improve their overall financial situation (8.3), afford their basic needs (8.1), stay out of (deeper) debt (7.7), and pay their energy bills on time (7.9); reduced the amount they

worried about affording their energy bills (8.1); and, was worth the effort to go through the enrollment (9.2), recertification (8.7), income verification (8.7), or high-usage verification (8.4) processes.<sup>33</sup>

### 3.3 What are the key differences in characteristics between current and past participants by their eligibility?

Eligible past CARE participants who were removed and likely should have been retained are more similar to the eligible current CARE participants who were retained (Table 7). Similarly, ineligible current CARE participants who were retained but likely should have been removed more closely resemble the ineligible past CARE participants who were removed (Table 7).

Both the eligible current and past participants are *more* likely than the ineligible current and/or past participants to have:

- Much higher average energy burdens and modified energy burdens, and corresponding lower annual incomes.
- Greater general economic hardship, with a lower frequency receiving earned income from more employed household members and a higher frequency receiving fixed income and/or public assistance for more retired, disabled, and/or senior household members.
  - Greater difficulty energy paying bills and other basic needs.
- Greater general health hardship.
- Lower levels of education.
- A single, divorced, separated, or widowed marital status.
- A smaller, non-single-family home that they're more likely to rent.
- Non-centralized heating and cooling equipment in the home.

The surveyed eligible past CARE participants are different from the eligible current participants in a few ways that make them more likely to meet CARE eligibility requirements. The past participants are more burdened with higher average annual energy costs and greater health hardship, and are more likely to not be married, have foreign-born household members, and speak non-English language in the home than the current eligible participants. However, the past participants also are different in a few ways that make them less likely to be CARE-eligible: they are more likely to own their home and have lower general economic hardship, with a lower frequency of receiving fixed income or public assistance and having retired and children household member(s), compared to the eligible current participants.

The ineligible current CARE participants who likely should be removed are similar to the ineligible past CARE participants in all but a few aspects that do make them more likely to meet the requirements for CARE eligibility. The ineligible current participants are more burdened with lower annual incomes and greater economic hardship, including a lower frequency receiving earned income from employed household members and a higher frequency who receive fixed income, and are more likely to have a disabled household member(s) and to not be married than ineligible past participants.

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<sup>33</sup> Agreement with CARE's impacts was measured on an 11-point scale from 0, for do not agree at all, to 10, for completely agree.

Table 7. Surveyed Current and Past CARE Participants' Key Characteristic Differences, by CARE-Eligibility Status <sup>a, b, c</sup>

Characteristics	Eligible Current CARE Participants	Eligible Past CARE Participants	Ineligible Current CARE Participants	Ineligible Past CARE Participants
N	351	146	54	104
Average energy burden <sup>d</sup>	5.9%	6.1%	2.2%*	2.5%*
Average modified energy burden <sup>d</sup>	5.1%	5.7%	2.1%*	2.3%*
Average annual energy costs	\$1,258	\$1,370*	\$1,274	\$1,433*
Average economic hardship index score <sup>e</sup>	4.1	3.1*	3.9	2.6*
Average health hardship index score <sup>e</sup>	4.1	4.6*	3.8	3.5*
Average months during past year had difficulty paying... <sup>f</sup>				
Energy bills	2.5	3.1*	1.6*	1.7*
Other basic needs	2.1	2.5	1.3*	1.6*
Average annual household income (\$1,000s)	\$28.7	\$28.7	\$63.0*	\$72.1*
Receives earned income	60%	63%	80%*	85%*
Receives fixed income	40%	29%*	44%	25%*
Receives public assistance	27%	18%*	6%*	8%*
Has employed household member(s)	65%	68%	80%*	88%*
Has retired household member(s)	31%	26%*	26%*	25%*
Has disabled household member(s)	31%	29%	30%	12%*
Has senior over 64 household member(s)	31%	31%	24%*	25%*
Has children under 18 household member(s)	54%	47%*	44%*	44%*
Has foreign-born household member(s)	32%	44%*	33%	28%
Speaks only English in home	60%	55%*	69%*	72%*
Has high school diploma or lower	34%	37%	17%*	13%*
Has 4-year degree or higher	21%	26%	48%*	37%*
In married/domestic partnership	48%	43%*	56%*	62%*
Owns home	40%	48%*	52%*	53%*
Lives in single-family home	51%	51%	61%*	62%*
Average number of rooms in home	5.0	4.6	5.9*	5.9*
Has central furnace in home	61%	68%	80%*	76%*
Has central AC in home	48%	56%*	69%*	62%*

<sup>a</sup> CARE participants' eligibility status was determined by participants' survey responses about 2017 annual income and household size, and for past CARE participants their reasons for removal from CARE.

<sup>b</sup> \* = statistically significant difference at  $p \leq .05$  between eligible current CARE participants and other groups; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered the survey questions.

<sup>c</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

<sup>d</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>e</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

<sup>f</sup> Respondents could choose never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

### 3.4 What are the key differences between current and past participants at the different PE processes?

Evidence from surveyed current and past CARE participants’ eligibility status suggests that the PE processes have been successful at removing many potentially ineligible customers that were retained by the enrollment process (Table 8). About one-fifth of the current enrolled participants were income-ineligible, which nearly halves to about one-tenth among recertified and income-verified participants and nearly halves again to about one-twentieth of high-user verified participants.

However, the PE processes, and especially the income verification process, have not been as successful at retaining potentially eligible past participants. Seven out of ten who were removed at income-verification, over half (55%) removed at high-user verification, and less than half (44%) removed at recertification reported being eligible for CARE. In addition, only about 2% of the eligible past CARE participants were flagged by their IOU as participating in the federal Family Electric Rate Assistance (FERA) program after they were removed from CARE (but we don’t know if they were actually enrolled in FERA at the time of the survey).

Table 8. Surveyed Current and Past CARE Participants’ Eligibility Status, by IOU and Process Status <sup>a, b</sup>

IOU and Process Status	Current CARE Participants		Past CARE Participants	
	Income-Eligible	Income-Ineligible	Eligible	Ineligible
N	351	54	136	114
Enrolled	82%	18%	N/A	N/A
Recertified/Removed after recertify request	89%	11%	44%	56%
Income verified/Removed after income verification request	90%	10%	70%	30%
High-user verified/Removed after high-user verification request	95%	5%	55%	45%

<sup>a</sup> CARE participants’ eligibility status was determined by participants’ survey responses about 2017 annual income and household size, and for past CARE participants their reasons for removal from CARE.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

The trends in the CARE PE processes’ more successful removal of reportedly ineligible participants and less successful retention of reportedly eligible participants are further supported by results from comparisons of the characteristics between current and past participants retained and removed at each PE process (Table 9). Overall, current CARE participants who successfully completed each PE process and were retained are more disadvantaged and burdened, on average, than past participants who were removed at each process.

However, there are differences by each PE process that provide further support that income verification is removing more eligible participants than recertification and, to a lesser extent, high-usage verification (Table 9). Current and past participants retained/removed at recertification are very different from each other, those retained/removed at income verification are slightly different from each other, and those retained/removed at high-usage verification are somewhat different to each other, as indicated by the number of statistically significant differences and the magnitude of the differences in comparisons between current and past participants at each PE process. For example, nearly all the comparisons between current and past participants retained/removed at recertification are significant while just eight comparisons between those retained/removed at income verification are significant.

Table 9. Surveyed Current and Past CARE Participants' Key Characteristic Differences, by Process Status <sup>a, b</sup>

Characteristics	Recertification		Income Verification		High-user Verification	
	Current CARE Participant Retained	Past CARE Participant Removed	Current CARE Participant Retained	Past CARE Participant Removed	Current CARE Participant Retained	Past CARE Participant Removed
N	112	108	151	145	52	64
Average energy burden <sup>c</sup>	5.0%*	3.3%*	5.1%*	4.5%*	7.2%*	5.9%*
Average modified energy burden <sup>c</sup>	4.3%*	3.2%*	4.6%	4.3%	6.4%*	5.2%*
Average economic hardship index score <sup>d</sup>	4.0*	2.7*	4.1*	3.1*	4.4*	3.4*
Average annual costs	\$1,053*	\$1,267*	\$1,227	\$1,280	\$2,053*	\$1,953*
Average annual household income (\$1,000s)	\$31.0*	\$51.7*	\$34.4*	\$40.9*	\$33.9*	\$50.2*
Receives earned income	59%*	79%*	60%*	67%*	62%*	72%*
Receives fixed income	42%*	23%*	43%*	33%*	51%*	33%*
Receives public assistance	25%*	8%*	24%*	15%*	25%*	19%*
Employed household member(s)	62%*	82%*	63%	66%	58%*	76%*
Retired household member(s)	27%*	18%*	32%	31%	40%*	21%*
Disabled household member(s)	33%*	14%*	27%	27%	32%*	19%*
Has high school diploma or lower	38%*	25%*	27%	23%	38%*	25%*
Has 4-year degree or higher	21%*	31%*	33%	37%	15%*	22%*
Children under 18 in home	56%*	41%*	49%*	42%*	54%	59%
Owns home	43%	46%	42%*	49%*	43%*	49%*
Lives in single-family home	50%*	55%*	54%	53%	65%*	77%*
Lives in multifamily building	31%*	26%*	29%	27%	17%	17%
Has central furnace in home	55%*	68%*	71%	72%	75%*	82%*
Has central AC in home	43%*	60%*	59%	61%	62%	61%

<sup>a</sup> \* = statistically significant difference at p≤.05 between corresponding current and past CARE participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered the survey questions.

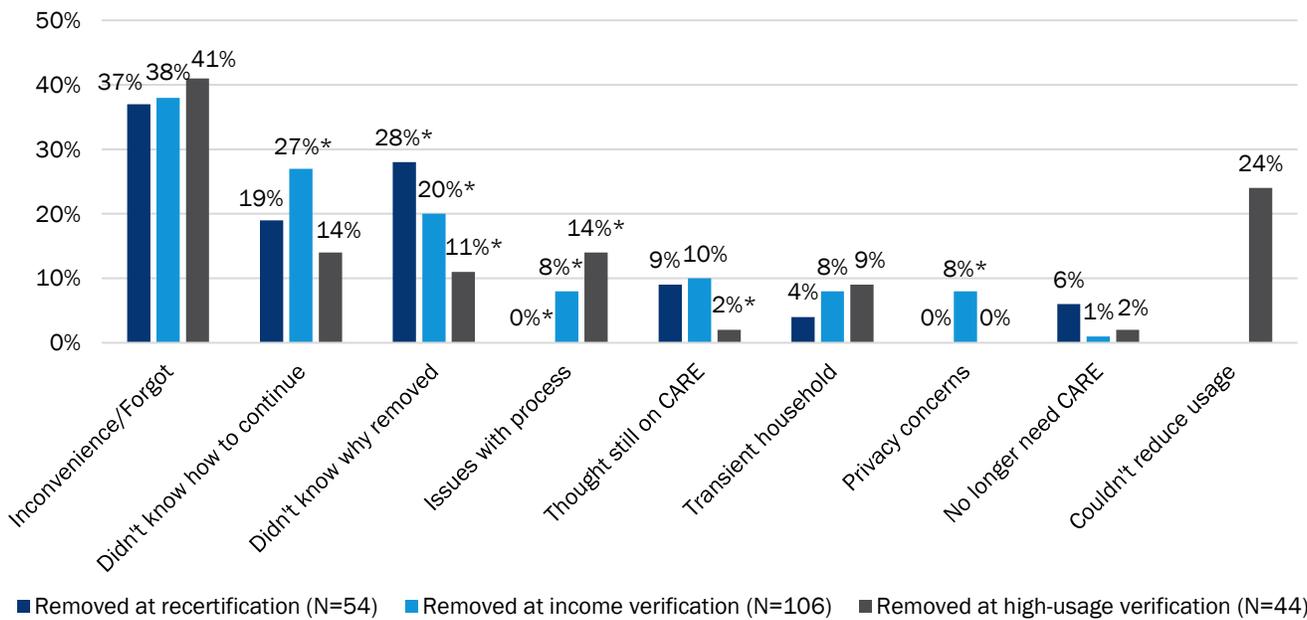
<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>d</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

In addition, surveyed eligible past participants' reported reasons for removal from CARE varied somewhat by the PE process (Figure 3). Those removed at income verification are more likely to not know how to continue on CARE or to have privacy concerns than those removed at recertification or high-usage verification. Those removed at recertification are more likely to not know why they were removed and to no longer need CARE. Those removed at high-usage verification are more likely to have experienced issues with the process.

Figure 3. Reasons Surveyed Eligible Past CARE Participants Reported They Were Removed from CARE by PE Process <sup>a, b</sup>



<sup>a</sup> \* = statistically significant difference at  $p \leq .05$  between corresponding current and past CARE participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered survey questions.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

### 3.5 Can CARE enrollment data be used to determine how long participants stay in CARE, reasons for participants' removal, or whether a participant is likely to be a high-user who will be retained or removed?

We did not find consistent or statistically significant evidence for how long customers are on the rate and/or reasons for removal based on the CARE enrollment data available. We analyzed the available fields within the CARE enrollment data including participants' enrollment channel, annual income reported in the CARE application, categorical participation, climate zone, ESA participation, and preferred language.

*Length of time on CARE:* We did not find consistent or strong evidence that CARE enrollment data can be used to predict how long participants stay in CARE. Results were not statistically significant, were inconsistent between the IOUs, or were significant only for a single IOU. For example, evidence from SCE suggests that participants who enroll in CARE via the website or customer service interactive voice response system remain on CARE much less time than those who enroll via other channels. See Volume 2 for our analysis of past participants' length of time on CARE by fields available in the IOUs' enrollment data.

*Reasons for removal:* The CARE enrollment data we received did not include the specific reasons that customers were removed from CARE (only the PE process at which they were removed) and thus we could not assess the relationship between enrollment data and reasons for removal. It seems unlikely that the fields we received in the IOUs' CARE enrollment data (above) would be strong predictors of the reasons that participants are removed from CARE, but we are unable to confirm this. See Volume 2 for our analysis of the factors that lead to the retainment and removal of surveyed participants for the PE processes.

*High-user retainment and removal:* We did not find any consistent statistical relationships between the IOUs' CARE enrollment data and the high-users who were retained and removed. We did find that surveyed current and past participants who live in warmer climate regions are more likely to become high-users than those who live in other climate zones but the climate zone (or any other CARE enrollment data field) does not predict whether the high-user will be retained or removed. See Volume 2 for our analysis of the factors that lead to a surveyed participant becoming a high-user and to being retained/removed.

### 3.6 To what extent does CARE enrollment or recertification result in ESA participation?

About 17% of the current CARE participants who recently enrolled or recertified participated in ESA after enrolling/recertifying (Table 10). According to program data, about 6% of current CARE customers participated in ESA after enrolling in CARE and an additional 11% participated in ESA after recertifying for CARE, indicating that longer tenure in CARE leads to higher participation rates in ESA. Results vary substantially by IOU and assume that each IOU's CARE program data includes up-to-date ESA participation dates and flags.

Table 10. Percentage of Current CARE Participants who Participated in ESA <sup>a</sup>

CARE Process	PG&E		SCE		SCG		SDG&E		Total	
	CARE Participants N	ESA %								
Enrolled	273,533	3%	388,241	7%	415,201	1%	63,101	46%	1,140,076	6%
Recertified	486,616	2%	763,778	16%	899,101	3%	128,299	67%	2,277,794	11%

<sup>a</sup> Estimates from IOU CARE and ESA program data as of July 1, 2018.

## 4. Informing CARE Program Marketing, Education, & Outreach (ME&O)

In the sections below, we present the summary results for the research objective (RO1b) of informing CARE ME&O. Results are from the survey with 267 CARE-eligible participants who live in areas of California with higher concentrations of eligible customers and with the 155 of the 424 surveyed current CARE participants who live in the same areas as the surveyed nonparticipants, as well as their IOU customer and billing data.<sup>34</sup> The sections below address the key research questions for this objective.

See Appendix D in Volume 2 for more detailed methods and results, overall and by IOU.

The nonparticipants we surveyed reported never participating in CARE and annual incomes of 200% or less of FPG. We sampled nonparticipants who live in Census tracts where 20% or more households earn 100% or less of FPG, where more eligible customers reside, which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. However, due to this sample design, the surveyed CARE-eligible nonparticipants represent those in areas with higher concentrations of eligible customers and others like them as opposed to all eligible nonparticipants in the state.<sup>35</sup>

According to the IOUs' 2018 annual CARE Annual Reports, there are about 5.1 million CARE-eligible customers in California, 90% of whom are on CARE, leaving 10%, or about 560,000, who are CARE-eligible nonparticipants (Table 11). The CARE-eligible nonparticipants in the areas with large concentrations of eligible customers are estimated to comprise about 36% of all the CARE-eligible nonparticipants in the state, which is about 202,000 customers and about 3.6% of all CARE-eligible customers in California.<sup>36</sup>

Table 11. CARE Program Participation <sup>a</sup>

IOU	2018 CARE Participation Estimates (millions)			
	CARE-Eligible Population	Customers Served	Penetration Rate	Eligible Nonparticipants
PG&E	1.54	1.38	90%	0.16
SCE	1.42	1.21	85%	0.21
SCG	1.79	1.62	90%	0.17
SDG&E	0.32	0.30	92%	0.02
Total	5.07	4.51 <sup>b</sup>	90%	0.56

<sup>a</sup> IOUs' 2017 & 2018 CARE and ESA Annual Reports (the latest available).

<sup>b</sup> Double-counts customers who get their electricity and gas services from different IOUs (e.g., SCE and SCG).

<sup>34</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For comparison purposes, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

<sup>35</sup> The incidence of CARE-eligible nonparticipants in the IOUs' entire service territories is too low to conduct a survey with 90/10 confidence/precision within the budget and timeline of the study. However, it is also important to note that the results from the surveyed CARE-eligible nonparticipants are potentially found among those living in other areas of the state but the actual percentages, means, and other statistics may be different.

<sup>36</sup> The 36% estimate is based on the percentage of the surveyed statewide current CARE participants, past CARE participants, and ESA participants (who received targeted measures) who live in the same areas as the surveyed CARE-eligible nonparticipants, which ranged from 34% to 38%.

## 4.1 What are key differences between customers currently on CARE and customers who are eligible but have never been on CARE?

The surveyed CARE-eligible nonparticipants appear to be disadvantaged and burdened based on their reported characteristics, but less so than the corresponding current CARE participants (Table 12; see Volume 2, Appendix D for results by IOU). On average, the nonparticipants are *more* likely than current participants to have:

- Higher energy burdens and modified energy burdens, with corresponding high annual energy costs and lower annual incomes.<sup>37</sup>
- Lower general economic hardship, with corresponding lower frequencies receiving fixed income or public assistance and lower frequencies of unemployed, retired, homemaker, disabled, senior, and children household members.
  - Less difficulty paying energy bills, rent/mortgage, and other basic needs.
  - Higher frequencies receiving other financial assistance from unemployment compensation, child support or alimony, family or friends, and/or banks or other financial lenders.
- Higher levels of education.
- Smaller households and a higher likelihood of not being married.
- A higher likelihood of being white and lower likelihood of being Hispanic/Latinx/Spanish.

Table 12. Key Characteristic of Surveyed CARE-Eligible Nonparticipants and Current CARE Participants<sup>a, b</sup>

Characteristics	CARE-Eligible Nonparticipants	Current CARE Participants
N	257 – 267	152 – 155
Average energy burden <sup>c</sup>	6.3%*	5.2%*
Average modified energy burden <sup>c</sup>	5.9%*	4.1%*
Average economic hardship index score <sup>d</sup>	2.5*	3.9*
Average annual energy costs	\$1,268*	\$1,146*
Average annual household income (\$1,000s)	\$28.2*	\$32.3*
Average months during past year had difficulty paying... <sup>e</sup>		
Energy bills	1.6*	2.5*
Rent/mortgage	1.3*	1.8*
Other basic needs	1.4*	2.1*
Receives fixed income	22%*	33%*
Receives public assistance	9%*	26%*
Receives other financial assistance <sup>f</sup>	32%*	22%*
Unemployed household member(s)	17%*	23%*
Retired household member(s)	16%*	24%*
Homemaker household member(s)	17%*	29%*
Disabled household member(s)	17%*	34%*

<sup>37</sup> Current participants' energy burdens would be up to 35% larger if the CARE discount was not included in their energy bills and thus in the energy burden calculation.

Characteristics	CARE-Eligible Nonparticipants	Current CARE Participants
Seniors over 64 household member(s)	15%*	22%*
Children under 18 household member(s)	34%*	53%*
Has high school diploma or less	27%*	41%*
Has 4-year degree or higher	32%*	18%*
Married/domestic partnership	41%*	49%*
Average household size	3.0*	3.6*
White race/ethnicity	47%*	30%*
Hispanic/Latinx/ Spanish race/ethnicity	30%*	48%*

<sup>a</sup> \* = statistically significant difference at  $p \leq .05$  between CARE-eligible nonparticipants and current CARE participants; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = number who answered the survey questions.

<sup>b</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>d</sup> Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

<sup>e</sup> Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

<sup>f</sup> Other types of income/assistance include unemployment compensation, child support or alimony, financial assistance from family or friends, and loans from banks or other financial lenders.

## 4.2 What are barriers to CARE enrollments among CARE-eligible nonparticipants that can inform how ME&O can be more effective?

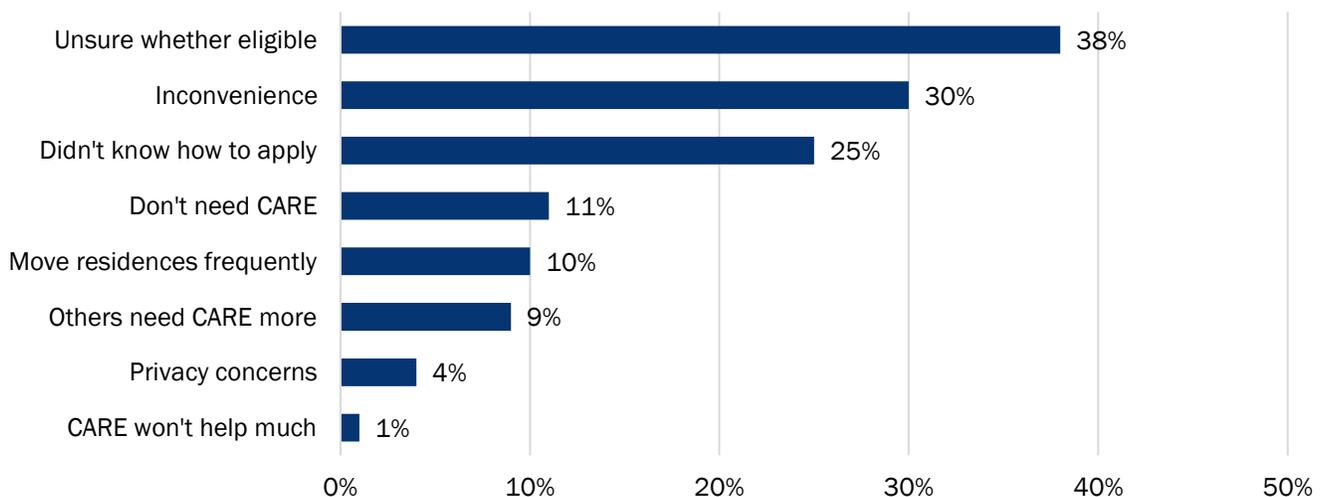
Awareness is the greatest barrier to program participation among surveyed CARE-eligible nonparticipants. Nearly two-thirds (62%) reported they were not aware of CARE and most (83%) reported they were interested in participating in CARE when they became aware of it (either before or during the LINX customer survey). Nonparticipants' awareness of and interest in CARE are significantly associated with several characteristics of eligible nonparticipants in high poverty areas:

- Awareness of CARE is lower for nonparticipants who:
  - Live in cooler climate zones (vs. warmer zones).
  - Live in the South Coast region and not in the Desert/Mountain region.
  - Have lower annual energy costs.
  - Live in a multifamily unit (vs. other housing types).
  - Have foreign-born household members.
- Interest in CARE is lower for nonparticipants who have:
  - Both electricity and natural gas service (vs. electricity only and/or alt-fuels).
  - Lower energy burdens and general economic hardship.

Many of the surveyed eligible nonparticipants who were aware of and interested in CARE reported that they have not applied for CARE because they didn't know whether they would be eligible, thought it might be too much of an inconvenience or didn't know how to apply (Figure 4; see Volume 2, Appendix D for results by IOU). About 10% reported a lack of need for CARE, that they move frequently, or that others need CARE more, and less than 5% reported privacy concerns or thought CARE would not help them much as reasons for not applying for CARE. In addition, those with lower annual household incomes were significantly more likely to report that they didn't know how to apply compared to those with higher annual incomes.

When asked what they need from their IOU to help better control their energy usage and/or afford their energy bills, nearly half (44%) reported they didn't need anything, nearly one-fourth (23%) reported needing lower rates or bill discounts like CARE, and 10% reported needing energy efficient products or rebates (not shown in figure; see Volume 2, Appendix D for detailed results). The remainder (5% or less) reported wanting more information about how to save energy and/or about their current usage and rate, usage alerts or monitoring, a time-of-use or time-varying rate, and/or options for bill extensions and payment plans.

Figure 4. Reasons Surveyed Aware of and Interested CARE-Eligible Nonparticipants Have Not Applied for CARE (n=80) <sup>a, b</sup>



<sup>a</sup> Respondents aware of CARE could select more than one reason for not applying.

<sup>b</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision.

The 45 surveyed CARE-eligible nonparticipants who reported a lack of interest in CARE mentioned that they were not interested because they have ineligibility concerns (40%), do not need CARE (27%), move residences frequently (18%), have privacy concerns (16%), think it is an inconvenience (13%), or don't know how to apply (7%) (not shown in figure; see Volume 2, Appendix D for detailed results). <sup>38</sup>

When asked what they need from their IOU to help better control their energy usage and/or afford their energy bills, over two-thirds reported they didn't need anything (69%) and less than 10% reported lower rates or

<sup>38</sup> The group analyzed is too small to offer conclusive statistical results and the findings apply only to the sample of surveyed uninterested CARE-eligible nonparticipants and others like them in the state but are potentially found among the entire California population of the subgroups.

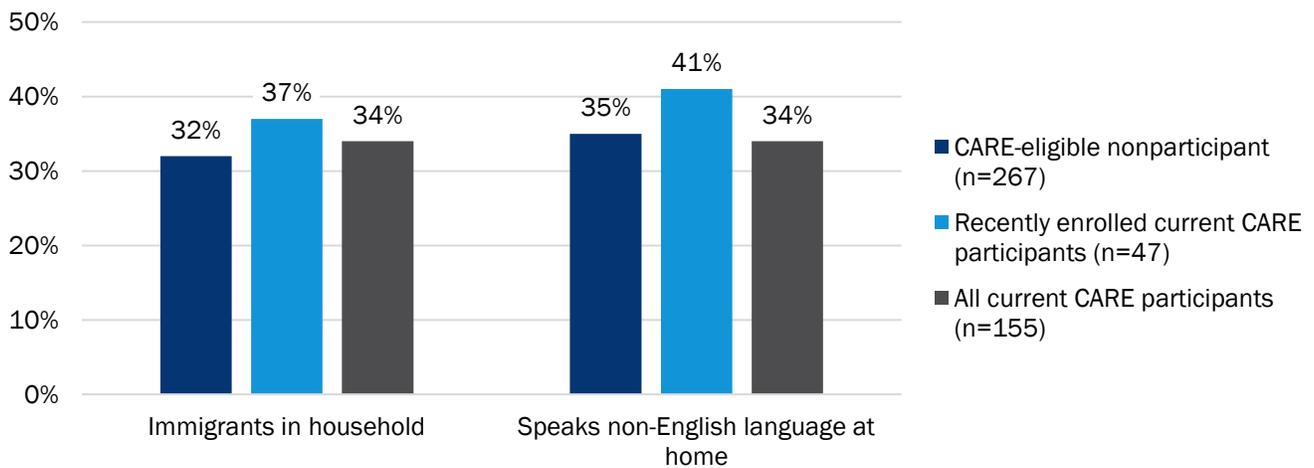
discounts, energy efficient products/rebates, or more information about how to save energy and/or about their current usage and rate (not shown in figure; see Volume 2, Appendix D for detailed results).

### 4.3 How much does CARE maximize enrollment of immigrant and non-English speaking customers?

Results from the survey of CARE-eligible nonparticipants and current participants, and from analysis of IOU customer data, indicate that customers with foreign-born household members (immigrants) and who speak a non-English language in their home (non-English speakers) are likely not underrepresented in CARE but are also not maximized (Figure 5; see Volume 2, Appendix D for results by IOU).<sup>39</sup>

About one-third of the nonparticipants reported an immigrant household member(s) compared to 37% of recently enrolled participants and 32% of all current participants. Similarly, over one-third of the nonparticipants reported speaking a non-English language in their home compared to 41% of recently enrolled participants and 37% of all current participants.<sup>40</sup> Thus, there are some immigrant and non-English speaking customers who are eligible for but have not participated in CARE. However, it is important to note that the CARE-eligible immigrant and non-English-speaking nonparticipants living in areas of the state with high concentrations of eligible customers represent about 1% of the total CARE-eligible population in the state.

Figure 5. Surveyed CARE-Eligible Nonparticipants and Current Participants Reporting a Foreign-Born Household Member(s) and Speaking a Non-English Language at Home <sup>a, b</sup>



<sup>a</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

<sup>39</sup> We used survey results to identify immigrants and non-English speakers and IOU customer data to identify CARE nonparticipants and current participants (recently enrolled and all). It is important to note that sampled customers with privacy concerns may not have responded to the survey or reported immigrant household members, and these customers may represent a higher proportion of nonparticipants (vs. participants).

<sup>40</sup> If immigrants and non-English speakers were underrepresented in CARE, the percentages of these groups among the nonparticipants would be much higher than the percentages of these groups among participants, particularly recent enrollees.

In addition, results from comparisons of surveyed CARE-eligible nonparticipants and current CARE participants with immigrant household members and who speak a non-English language in their home indicate that the nonparticipants are less disadvantaged and burdened, on average, than the current participants (Table 13). Compared to the current participants, the nonparticipants are more likely to have:

- Higher energy burdens, with corresponding lower annual incomes, but lower general economic hardship, with corresponding much lower frequencies receiving fixed income or public assistance and a lower likelihood of having retired, disabled, children, or senior household members. <sup>41</sup>
- Lower general health hardship.
- Smaller household sizes and housing units.
- Higher levels of education.
- Lower likelihood of speaking non-English language (among immigrants) and of having immigrant household members (among non-English speakers).
- Lower likelihood of owning their home and higher likelihood of living renting a multifamily unit.

Table 13. Key Characteristics of Surveyed CARE-Eligible Nonparticipants and Current CARE Participants with Immigrant Household Members and Who Speak Non-English Language <sup>a, b, c</sup>

Key Characteristics	CARE-Eligible Nonparticipant with Foreign-Born in Household	Current CARE Participant with Foreign-Born in Household	CARE-Eligible Nonparticipant and Speaks Non-English in Household	Current CARE Participant and Speaks Non-English in Household
N	80	47	94	61
Average Energy Burden <sup>d</sup>	6.5%*	5.0%*	5.8%*	4.1%*
Average Modified Energy Burden <sup>d</sup>	6.3%*	4.2%*	5.5%*	3.3%*
Average Economic Hardship Index Score <sup>e</sup>	2.4*	3.8*	2.4*	3.8*
Average Health Hardship Index Score <sup>e</sup>	3.5*	3.9*	3.1*	3.5*
Average Annual Household Income (\$1,000s)	\$31.2*	\$34.8*	\$30.3*	\$31.9
Receives earned income	78%	77%	75%*	67%*
Receives fixed income	8%*	19%*	5%*	25%*
Receives public assistance	6%*	30%*	7%*	28%*
Has employed household member(s)	83%	81%	88%*	82%*
Has retired household member(s)	6%*	28%*	5%*	20%*
Has disabled household member(s)	8%*	28%*	6%*	26%*
Has children household member(s)	42%*	70%*	39%*	67%*
Has senior household member(s)	10%*	21%*	9%*	18%*
Average household size	3.3*	4.1*	3.4*	4.0*
Has high school diploma or less	29%*	38%*	35%*	52%*
Speaks Non-English Language in Home	71%*	77%*	N/A	N/A
Has foreign-born household member(s)	N/A	N/A	63%	65%
Owns home	31%*	36%*	22%*	30%*

<sup>41</sup> Current participants' energy burdens would be up to 35% larger if the CARE discount was not included in their energy bills and thus in the energy burden calculation.

Key Characteristics	CARE-Eligible Nonparticipant with Foreign-Born in Household	Current CARE Participant with Foreign-Born in Household	CARE-Eligible Nonparticipant and Speaks Non-English in Household	Current CARE Participant and Speaks Non-English in Household
Lives in multifamily home	54%*	45%*	56%*	48%*
Average number of rooms in home	3.8*	4.6*	3.5*	4.2*

<sup>a</sup> \* = statistically significant difference at  $p \leq .05$  between the CARE eligible nonparticipant and current CARE participant subgroups; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered the survey questions.

<sup>b</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision. For purposes of comparisons, we also limited the surveyed current participants to those only living in the same Census tracts as the surveyed nonparticipants.

<sup>c</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

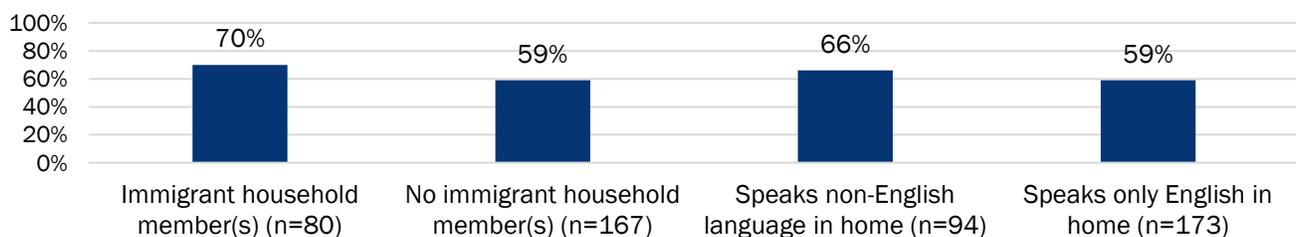
<sup>d</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants' energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>e</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

## 4.4 What are barriers to CARE enrollments among CARE-eligible nonparticipant immigrants and non-English speaking customers that can inform how ME&O can be more effective?

Overall, lack of awareness of CARE is reportedly the greatest barrier to applying for CARE among surveyed CARE-eligible nonparticipant immigrants and non-English speakers (Figure 6). These groups are significantly more likely to report not being aware of CARE than nonparticipants without immigrant household members and who speak only English in their home. Surveyed CARE-eligible nonparticipants' reported interest in CARE, on the other hand, did not vary by immigrant or language status (ranging from 82% to 85%; not shown in figure).

Figure 6. Percentage of Surveyed CARE-Eligible Nonparticipants Reporting Lack of Awareness of CARE, by Immigrant and Language Status <sup>a</sup>

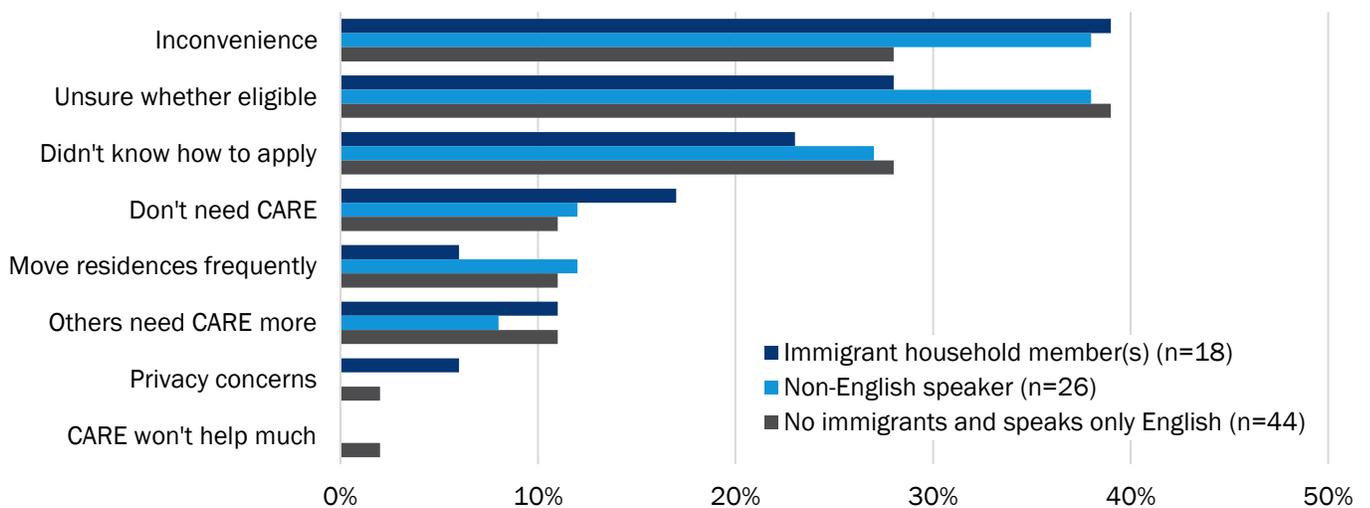


<sup>a</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG), which enabled us to obtain a sufficient number of survey respondents for high statistical confidence/precision.

The surveyed aware and interested CARE-eligible nonparticipants with immigrant household members and/or who speak non-English language in their home reported similar reasons for not applying to CARE as nonparticipants without immigrants and who speak only English in their home (Figure 7).<sup>42</sup> Those with immigrants and/or who speak a non-English language are more likely to report that applying for CARE is an inconvenience compared to English-only speakers without immigrants.

In addition, when asked what they need from their IOU to help better control their energy usage and/or afford their energy bills, over half of immigrant nonparticipants (53%) and non-English speaking nonparticipants (52%) reported they didn't need anything compared to under half of nonparticipants without these characteristics (44%) (not shown in figure). There were no differences between the subgroups regarding other services they reported needing from their IOU (e.g., lower or discounted rates [17%], energy efficient products or rebates [10%], info about saving energy and their usage [8%], etc.).

Figure 7. Reasons Surveyed Aware of and Interested CARE-Eligible Nonparticipants Have Not Applied for CARE, by Immigrant and Language Status<sup>a, b, c</sup>



<sup>a</sup> Respondents aware of CARE could select more than one reason for not applying.

<sup>b</sup> The surveyed CARE-eligible nonparticipants reported never previously participating in CARE and annual incomes of 200% or less of 2017 FPG. We limited the sample to nonparticipants living in areas of California with higher concentrations of eligible customers (Census tracts where 20% or more households earn 100% or less of FPG).

<sup>c</sup> Sample sizes are too small for conclusive statistical results and findings apply only to sampled subgroups and others like them in the state but may potentially be found among the entire California population of the subgroups.

Results from the in-depth interviews with staff at seven CARE capitation agencies that provide support and services to immigrants and non-English speakers are consistent with findings from the customer survey. According to agency staff, the immigrants and non-English speakers they serve currently face very few barriers to participating in CARE and are not especially concerned about sharing information with their utility to get the CARE discount. The interviewed staff did acknowledge, however, that they don't serve all immigrants and non-English speakers in their communities who may face barriers to enrolling in CARE or even visiting the local capitation agency.

<sup>42</sup> These subgroups are too small for conclusive statistical results and the findings apply only to the surveyed sample and others like them in the state but are also potentially found among the entire California population of the subgroups.

In addition, based on a brief review of the literature, the IOUs have implemented some of the best practices for encouraging participation in CARE among immigrants. Such practices include providing materials in multiple languages, allowing categorical participation via other public assistance programs, and leveraging community organizations that assist immigrants to enroll in multiple programs at once.

Some preliminary research from think tanks suggest that immigrants' use of public assistance programs has been declining and some anecdotal evidence from news reports suggests that declines in participation could be due to immigrants' increased fear or distrust that their information will be used against them. However, the declining trends may not be consistent or widespread, and could be due to improving economic conditions or other causes.

Overall, it appears to be too soon for definitive evidence about whether immigrants' use of public assistance is declining and what may be causing the decline. As staff at the interviewed CARE capitation agencies put it, the immigrant clients they work with are not yet concerned with sharing their info with their utility, even if they are reluctant to share it with a government agency. It is difficult to make any other conclusions until more data and studies become available.

## 5. Examining ESA Program Health, Comfort, Safety (HCS) Impacts

We present the summary results for the research objective (RO2) of examining the ESA HCS impacts of heating, cooling, and enclosure measures (targeted measures).<sup>43</sup> Results are from the survey with 396 ESA participants and 907 low-income ESA nonparticipants, and their IOU customer, program, and billing data, as well as from interviews with ESA supervisors and lead installers at 12 certified contractor firms (ESA contractors). The sections below address the key research questions for this objective.

See Appendix E in Volume 2 for more detailed methods and results, overall and by IOU.

### 5.1 What are ESA participants' perceptions of the HCS impacts of ESA heating, cooling, and enclosure measures and the conditions under which the measures provide more or less HCS impacts?

Overall, surveyed ESA participants who received heating, cooling, and/or enclosure measure(s) reported moderate to high satisfaction with the measures, good overall HCS in their home, and improvements in the comfort of their home and, to lesser extent, in making their home a healthier and safer place to live.

The greatest HCS impacts were reported by participants who received a combination of cooling and/or heating measures with enclosure measures. The greatest HCS impacts from single measures were reported by participants who received central ACs and evaporative coolers, followed by enclosure measures, then furnaces and room/window ACs.

The ESA participants who recalled receiving HCS advice from their ESA contractor, as part of their energy education, reported the greatest HCS improvements.

#### 5.1.1 ESA Participants' Perceptions of HCS Impacts

##### Satisfaction and Overall HCS

Surveyed ESA participants reported moderate to high satisfaction with the heating, cooling, and enclosure measures they received using an 11-point scale where 0 mean not at all satisfied and 10 means completely satisfied. On average, participants were most satisfied with central ACs (8.9), evaporative coolers (7.8), and enclosure measures (7.8), followed by furnaces (6.9), and then room/window ACs (5.9).

ESA participants reported that the overall HCS of their home is good, on average, ranging between +2.7 and +3.1 on a -5 to +5 scale, where -5 means extremely poor, 0 means not good but not poor, and +5 means extremely good. In addition, the ESA participants rated their home's overall HCS as significantly better (or higher) than nonparticipants' ratings of their home's HCS (ranging from +1.7 to +2.0), which is unlikely if the targeted measures did not improve participants' HCS.<sup>44</sup>

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<sup>43</sup> Targeted heating measures: furnace replacement, repair, or tune-up. Targeted cooling measures: central AC (CAC), room AC, and evaporative cooler replacement, and CAC repair or tune-up. Targeted enclosure measures: attic insulation, caulking, glazing, weather-stripping, wall repairs, and door and window replacements and repairs.

<sup>44</sup> Surveyed participants and nonparticipants rated the different HCS components of their homes, which are, in order of highest to lowest rated: overall safety, their home as a healthy place to live, and overall comfort.

## Comfort Improvements

Surveyed ESA participants reported, on average, a decline (or improvement) in the frequency of HCS issues occurring in their homes (Table 14) <sup>45</sup> and an increase in the comfort of their homes (In addition, ESA participants' reported frequencies of HCS issues after measure installation are, on average, significantly less than or (for one item – pests) statistically similar to the frequencies reported by nonparticipants about how often the HCS issues occurred in their homes during the past year (**Error! Not a valid bookmark self-reference.**).

Figure 8) after they participated in ESA and received the targeted measures.

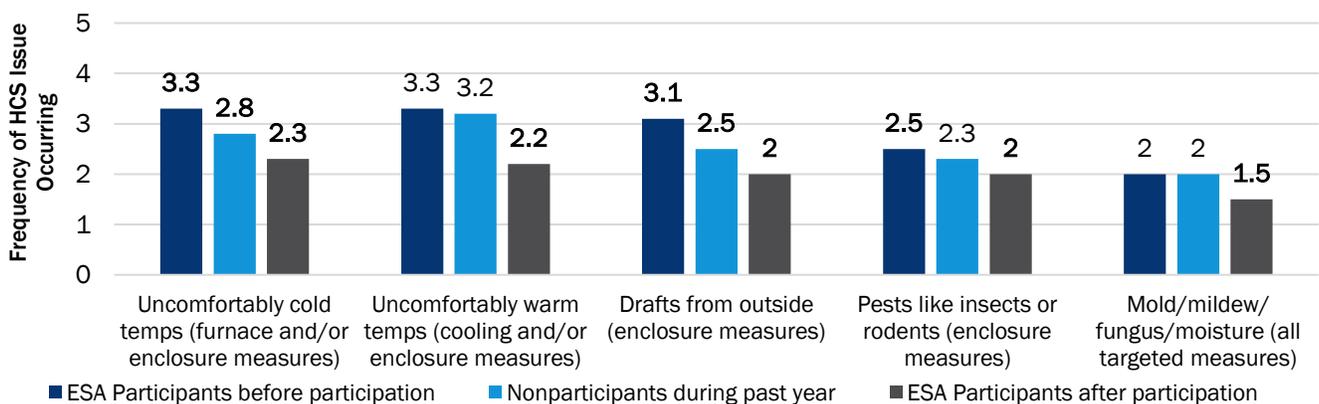
Table 14. Improvements in the Frequency of HCS Issues Occurring in Participants' Homes After Installation of ESA Targeted Measures

Issue Occurring in the Home	Percent for Which Issue Improved	Average Improvement on a 5-point Scale <sup>a</sup>	Label Associated with Improved Rating
Uncomfortably hot temperatures	66%	1.1	From “sometimes” to “rarely”
Drafts from outside	66%	1.1	From “sometimes” to “rarely”
Uncomfortably cold temperatures	58%	1.0	From “sometimes” to “rarely”
Mold/mildew/fungus/moisture	55%	0.5	From “sometimes/rarely” to “rarely”
Pests like insects or rodents	48%	0.5	From “rarely,” to between “never” and “rarely”

<sup>a</sup> Frequency of HCS issues occurring in participants' homes was measured on a 5-point scale where 1 means never, 2 means rarely, 3 means sometimes, 4 means often, and 5 means most or all of the time. All improvements are statistically significant at  $p \leq .10$ .

In addition, ESA participants' reported frequencies of HCS issues after measure installation are, on average, significantly less than or (for one item – pests) statistically similar to the frequencies reported by nonparticipants about how often the HCS issues occurred in their homes during the past year (**Error! Not a valid bookmark self-reference.**). <sup>46</sup>

Figure 8. Average Frequency of HCS Issues Occurring in ESA Participants' Homes Before and After They Participated and in Nonparticipants' Homes During the Past Year <sup>a, b, c</sup>



<sup>45</sup> Between 6% and 9% of participants reported for each HCS issue an increase in issue frequency.

<sup>46</sup> ESA nonparticipants were asked about how frequent HCS issues occurred in their homes during the past year to enable comparisons with the participants' post-participation perspectives.

<sup>a</sup> Frequency of HCS issues occurring in participants' and nonparticipants' homes is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

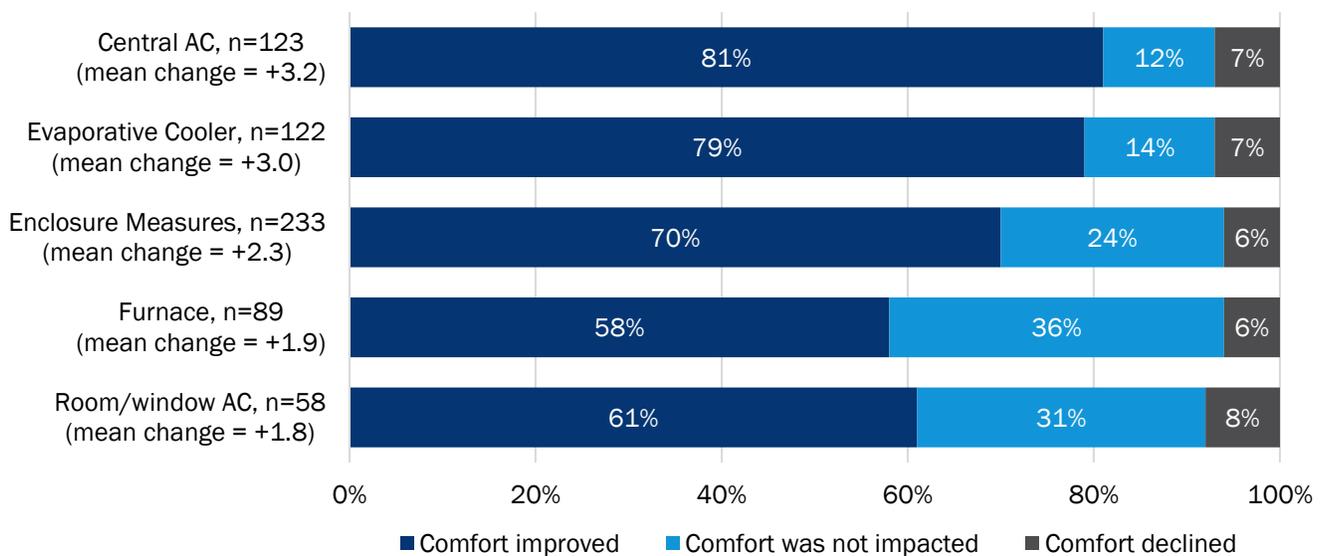
<sup>b</sup> The targeted measures that are applicable to improving the HCS issue are in parentheses and analyses were limited to customers who received the applicable measures.

<sup>c</sup> Comparisons are between ESA participants before and after participation (dark blue vs. gray bars) and between ESA nonparticipants during the past year and ESA participants after participation (light blue vs. gray bars). Bold numbers indicate the difference between the values is statistically significant at  $p \leq .10$ .

The greatest comfort improvements were reported by surveyed participants who received central ACs and evaporative coolers, followed by enclosure measures, then furnaces and room/window ACs (Figure 9). Overall, between 58% and 81% of surveyed ESA participants reported that the targeted ESA measure(s) they received improved the comfort of their home.

The average change in the comfort of ESA participants' home reported by surveyed participants ranged between +1.8 to +3.2 on a -5 to +5 scale, where -5 means "made a lot worse," 0 means "did not cause any change," and +5 means "made a lot better."

Figure 9. Percentage of ESA Participants Reporting an Improvement, No Change, or a Decline in the Comfort of their Home, by Targeted Measures They Received <sup>a, b</sup>



<sup>a</sup> Change in comfort from the ESA measures is measured on 10-point scale where -5 means "made a lot worse," 0 means "did not cause any change," and +5 means "made a lot better."

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

## Health Improvements

Surveyed ESA participants reported, on average, a decline in the frequency of HCS issues causing harm to the health of their household members (Table 15) and an increase in the overall health of their household members (Figure 10) after they participated in ESA and received the targeted measures.

In addition, ESA participants' reported frequencies of HCS issues causing harm to household members' health after measure installation are, on average, statistically similar to the frequencies reported by nonparticipants

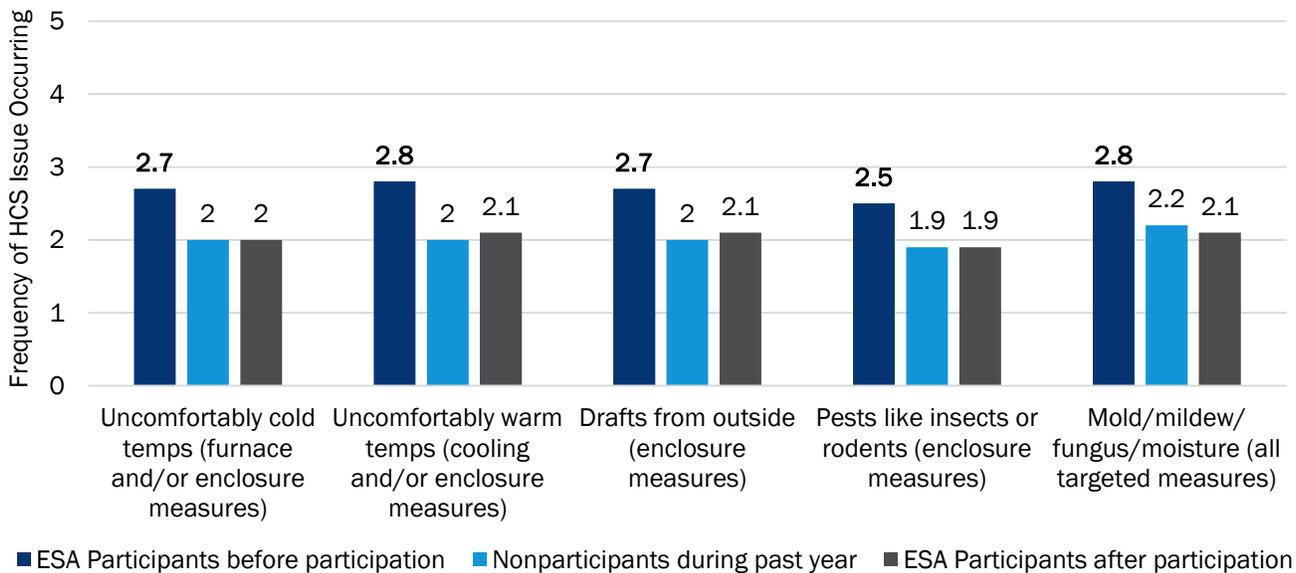
about how often the HCS issues caused harm to their household members' health their homes during the past year (Figure 10).<sup>47</sup>

**Table 15. Improvements in the Frequency of HCS Issues Causing Harm to ESA Participant Household Members' Health After Installation of ESA Targeted Measures**

Issue Causing Harm to Household Members' Health	Percent for Which HCS Issue Improved	Average Improvement on a 5-point Scale <sup>a</sup>	Label Associated with Improved Rating
Pests like insects or rodents	58%	0.6	From between "sometimes" and "rarely" to "rarely" and approaching "never"
Uncomfortably hot temperatures	57%	0.7	From slightly less than "sometimes" to "rarely"
Uncomfortably cold temperatures	56%	0.7	From slightly less than "sometimes" to "rarely"
Mold/mildew/fungus/moisture	54%	0.7	From slightly less than "sometimes" to "rarely"
Drafts from outside	53%	0.6	From slightly less than "sometimes" to "rarely"

<sup>a</sup> The frequency of HCS issues causing harm to household members' health was measured on a 5-point scale where 1 means never, 2 means rarely, 3 means sometimes, 4 means often, and 5 means most or all of the time. All improvements are statistically significant at  $p \leq .10$ .

**Figure 10. Average Frequency of HCS Issues Causing Harm to ESA Participant Household Members' Health Before and After They Participated and in Nonparticipants' Homes During the Past Year <sup>a, b, c</sup>**



<sup>a</sup> Frequency of HCS issues occurring in participants' and nonparticipants' homes is measured on 5-point scale where 1 means "never," 2 means "a few times," 3 means "sometimes," 4 means "many times," and 5 means "most or all the time."

<sup>b</sup> The targeted measures that are applicable to improving the HCS issue are in parentheses and analyses were limited to customers who received the applicable measures.

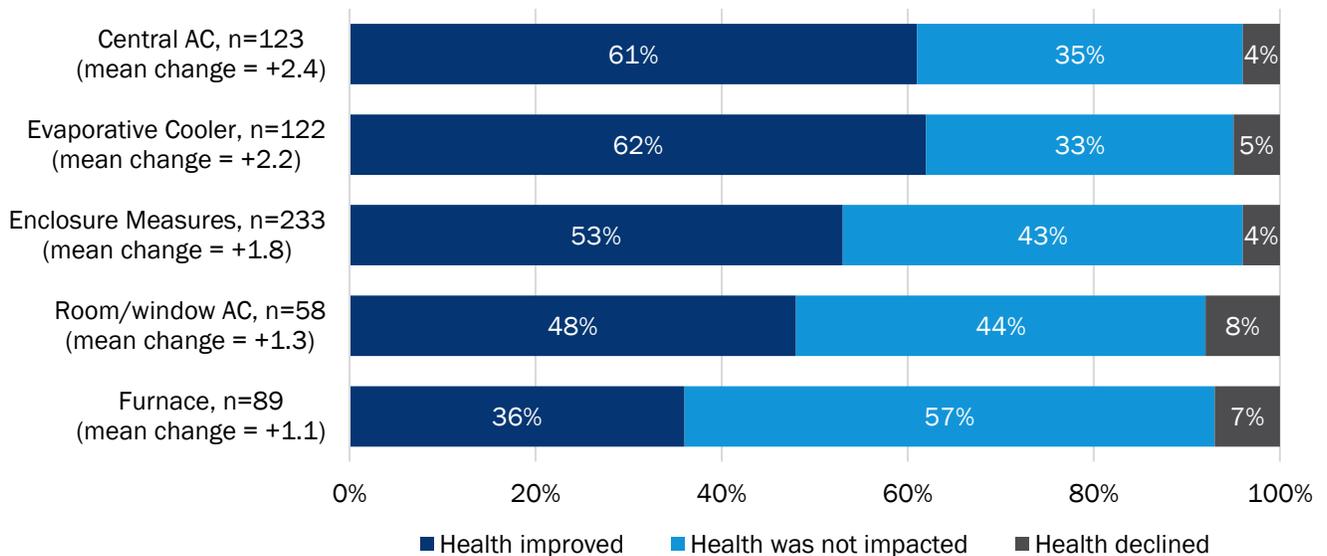
<sup>47</sup> ESA nonparticipants were asked about how frequent HCS issues caused harm to their household members' health during the past year to enable comparisons with the participants' post-participation perspectives.

◦ Comparisons are between ESA participants before and after participation (dark blue vs. gray bars) and between ESA nonparticipants during the past year and ESA participants after participation (light blue vs. gray bars). Bold numbers indicate the difference between the values is statistically significant at  $p \leq .10$ .

The greatest health improvements were reported by surveyed participants who received central ACs and evaporative coolers, followed by enclosure measures, then room/window ACs and furnaces (Figure 11). Overall, between 36% and 62% of surveyed ESA participants reported that the targeted ESA measure(s) they received led to improvements in household members’ health.

The average change in the health of ESA participants’ household members reported by surveyed participants ranged between +1.1 to +2.4 on a -5 to +5 scale, where -5 means “made a lot worse,” 0 means “did not cause any change,” and +5 means “made a lot better.”

Figure 11. Percentage of ESA Participants Reporting an Improvement, No Change, or a Decline in Household Members’ Health, by the Targeted Measures They Received <sup>a</sup>



<sup>a</sup> Change in household members’ health from the ESA measures is measured on 10-point scale where -5 means “made a lot worse,” 0 means “did not cause any change,” and +5 means “made a lot better.”

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision.

### 5.1.2 Conditions Under Which ESA Targeted Measures Resulted in Greater HCS Improvements Reported by Participants

Overall, surveyed ESA participants who reported the greatest HCS improvements were those who recalled receiving advice from their ESA contractor, as part of the program’s energy education, about how to use the measures, save energy, and improve HCS. About 80% of ESA participants recalled receiving ESA contractor advice and their reported HCS improvements were significantly greater than those reported by the 20% who did not recall receiving advice.

In addition, other conditions under which surveyed ESA participants reported greater HCS improvements varied by the HCS issue and measure type. A few of the most commonly reported conditions include:

- Uncomfortably cold temps, treated with heating and enclosure measures, improved most for participants who live in cooler climate zones, are retired (and likely home more often), participate in CARE, own their home, and live in manufactured/mobile homes.
- Uncomfortably hot temps, treated with cooling and enclosure measures, improved most for participants who received a central AC (vs. room/window AC) and enclosure measure(s) (vs. central AC alone), live in warmer climate zones, are retired (and likely home more often), participate in CARE, and who do not live in a multifamily dwelling.
- Drafts from outside, treated with enclosure measures, improved most for participants who received both attic insulation and weatherization enclosure measures (vs. either alone), are retired (and likely home more often), own their home, live in in manufactured/mobile homes.
- Pests in the home, treated with enclosure measures, improved most for participants who have larger household sizes (presumably, the combination of enclosure measures and more residents in the home keep pests away).
- Mold/mildew/fungus/moisture in the home, treated with heating, cooling, and/or enclosure measures, improved most for participants who received both attic insulation and weatherization measures (vs. either alone), have larger household sizes, and who live in homes that have a greater area cooled and/or heated (and temperature controlled and ventilated).

## 5.2 What are ESA contractors' perceptions of the HCS impacts of ESA heating, cooling, and enclosure measures and the conditions under which the measures provide more or less HCS impacts?

The interviewed ESA lead installers and supervising contractors reported that the program's heating, cooling, and enclosure measures resulted in HCS improvements in many of the participants' homes they serviced. They mentioned that cooling measures likely had the greatest impacts, followed by enclosure measures, and then the heating measures, and that the comfort of participants' homes was often the most improved, followed by safety and health. ESA contractors also mentioned several notable housing and weather conditions under which the targeted ESA measures result in greater HCS improvements and reported a few key barriers to making HCS improvements with the targeted measures.

### 5.2.1 ESA Contractors' Perceptions of HCS Impacts

Interviewed ESA contractors reported that HCS impacts tend to vary somewhat by the targeted measure type (Table 16).

- **Cooling:** Most contractors agreed that central ACs deliver the greatest benefits, particularly for improving thermal comfort throughout the home and the health of household members with heat-sensitive medical conditions. Evaporative coolers are also reportedly effective at improving thermal comfort and mitigating some heat-related health issues whereas room/window ACs tend to primarily improve thermal comfort; both measures are often limited to one or two rooms in a home, however.
- **Heating:** Furnaces can reportedly deliver the most HCS benefits – comfort, safety, and health – but mainly in homes that use gas, rely on space heating, and have residents with cold-sensitive medical conditions, which are reportedly less common than homes in need of cooling improvements.
- **Enclosure:** Attic insulation and weatherization measures reportedly enhance heating/cooling thermal improvements and can lead to higher indoor air quality, fewer pests, and greater feelings of security.

Table 16. Measures' Non-Energy Benefits Reported by Customers to ESA Contractors (n=11)

ESA Measure	Health	Comfort	Safety	Notes
Central AC	✓	✓		Improved thermal comfort and ventilation; no longer limit activity to one room; fewer problems for participants with heat sensitive medical conditions
Evaporative cooler	✓	✓		Improved thermal comfort; fewer headaches and dizziness
Room/Window AC		✓		Improved thermal comfort
Furnace	✓	✓	✓	Improved thermal comfort and ventilation; no longer limit activity to one room; improved safety that gas is working properly or from not having to use gas appliances for heating; fewer problems for participants with cold sensitive medical conditions
Doors/windows		✓	✓	Improved thermal comfort and fewer drafts; enhanced feelings of security; greater protection from infestations
Weatherization/insulation/duct sealing	✓	✓		Heating/cooling systems work more effectively; improved thermal comfort and air quality, and fewer drafts.

### 5.2.2 Conditions Under Which ESA Targeted Measures Resulted in More and Less HCS Improvements Reported by Contractors

Interviewed ESA contractors reported servicing many homes that were uncomfortably hot and/or cold but noted that it is uncommon for a home to be so dangerously hot or cold to cause or worsen residents' health problems. They estimated that such dangerously hot conditions are more common than cold conditions, but both occurred in about 10% or fewer homes they serviced. ESA contractors thought that very hot indoor temperatures more often result from customers not using their existing cooling equipment, particularly central ACs, to avoid a potentially high energy bill rather than because of broken cooling equipment, whereas very cold temperatures were the result of customers' having broken or very old, under-performing furnaces or other heating equipment.

The ESA contractors reported the cooling and heating measures are reportedly effective at improving thermal comfort in most participants' homes with uncomfortably cold or hot temps and in improving participants' health and safety in most homes with dangerously cold or hot temps, particularly if they have elderly, disabled, or very young household members. However, the heating and cooling measures' impacts reportedly can vary depending on housing and weather conditions outlined in Table 17.

All interviewed ESA contractors agreed that enclosure measures were needed in most homes they serviced and in nearly all of the homes that also receive a heating and/or cooling upgrade(s). Very few homes the contractors serviced were well weatherized and/or insulated before participating in ESA; many were quite drafty and a few had infestations from pests coming in through leaky areas of the home's enclosure. In addition, contractors reported that many of the homes with working heating and/or cooling only need enclosure measures to enhance the thermal comfort and reduce drafts.

The ESA program's doors/windows, attic insulation, and/or other weatherization measures are reportedly effective at improving these issues and also had greater impacts in homes with elderly, disabled, or very young residents. However, contractors reported that enclosure measures' effectiveness can vary depending housing conditions outlined in Table 17.

Table 17. ESA Contractors Input on the Relative HCS Benefits of Various ESA Measures

Measure	Delivers More HCS Benefits	Delivers Fewer HCS Benefits
Central Air Conditioner	Larger and multi-level homes. Humid and hot environments. Multiple residents using many parts of home. Homes with residents with heat-sensitive medical conditions. Homes without attic insulation.	Smaller single-family homes. Manufactured or mobile homes. Smaller multifamily homes. Homes with one resident. Homes in cooler environments. Homes with high summer cooling bills.
Evaporative Cooler	Smaller, one-story, single-family homes. Smaller multifamily homes. Drier and milder environments. Homes with residents with mild heat-sensitive medical conditions. Homes with high summer energy bills.	Homes with household members with asthma. Manufactured/mobile homes. Larger and multi-level homes. Humid and hot environments. Homes with residents with major heat-sensitive medical conditions.
Room Air Conditioner	Manufactured or mobile homes. Smaller multifamily homes. Smaller homes with one resident. Homes with high summer energy bills.	Larger and multi-level homes. Homes with residents with heat-sensitive medical conditions.
Furnace Repair or Replacement	Homes using heating equipment that carry a fire or carbon monoxide risks. Homes with residents with cold-sensitive medical conditions. Homes in colder environments. Homes that use electricity/gas for heating.	Homes with operable (but under-performing) furnaces or other safe heating equipment. Homes in warmer environments. Homes that use alt-fuels for heating.
Enclosure Measures	Homes with drafts, pests (older and/or manufactured homes). Homes that have reasonable ventilation or do not require much ventilation.	Homes without ventilation that require it (have fireplace, natural gas, high humidity, etc.). Homes with knob/tube electrical wiring (for attic insulation).

In addition, interviewed ESA contractors could not identify any substitute measures that would be more cost-effective and still deliver similar HCS benefits as the targeted heating, cooling, and enclosure measures. For example, for the cooling measures, interviewed contractors reported that room/window ACs provide some thermal comfort but few if any health or safety benefits and that evaporative coolers can reportedly be effective at improving heat-related comfort and mild health issues but primarily in smaller homes in drier climates. Central ACs, on the other hand, reportedly are most effective at improving heat-related comfort and health issues in most conditions.

### 5.2.3 Barriers to Making HCS Improvements with the Targeted ESA Measures

ESA contractors mentioned a few barriers to getting customers the measure they need for HCS reasons.

- One barrier is when a landlord will not sign the form to allow their renter to receive qualified targeted measure. For example, an ESA contractor from SCE territory estimated that one out of five customers with medical conditions were not receiving any cooling measure and attributed it solely to landlords not authorizing the program to serve their tenant, leaving tenants to rely on inefficient equipment or portable units they have to purchase. This occurred primarily but not exclusively in multifamily buildings.
- Another barrier occurs when the customer had no existing cooling or heating measures in place, or the existing equipment uses alt-fuels (e.g., propane, wood, etc.), and therefore could not qualify for a repair

or a new replacement measure through the program. This reportedly occurs in about 10% or fewer homes that need heating measures and in about 30% or fewer homes that need cooling measures.

- A third barrier are the infeasible homes that contactors are unable to service through the program. These homes likely need ESA measures but, due to aggressive pets, hoarding or excessive clutter, hostile residents, or criminal activity, contractors are unable to assess the home and/or install measures. Interviewed contractors estimated that these issues occur in fewer than 5% of the homes they visit.
- A fourth barrier is the ESA program policies that limit which targeted measures are eligible for homes based on climate zone or housing type. For example, homes in cooler climate zones are not eligible for cooling measures even though they could benefit during the shorter summers, manufactured homes in warmer climate zones in SCG and SCE territory and rental homes/units in all IOU territories are not eligible for furnace measures (even if the home has an existing furnace), evaporative coolers are ineligible in multifamily homes with 5 or more units, and some enclosure measures are not available to homes without natural gas.
- The last key barrier reported by ESA contractors is communication gaps between contractors and residents. Contractors reported providing an “energy education” to all participants but for some projects some or all the residents are unavailable, are not very engaged or interested, and/or have a language barrier.

## 6. Assessing Alternative Fuels Customer Hardships

We present the summary results for the research objective (RO3) of assessing the hardships of low-income alt-fuel customers. We defined alt-fuel customers as PG&E, SCE, and SDG&E customers who do not have natural gas service and reported using propane, kerosene/oil/diesel, and/or wood/pellets as their primary fuel for space heating, water heating, and/or cooking.<sup>48</sup>

Results are from the survey with 138 low-income alt-fuels customers and 1,077 low-income non-alt-fuels customers, and their IOU customer, program, and billing data. The sections below are based on the key research questions for this objective.

See Appendix F in Volume 2 for more detailed results, overall and by alt-fuel type. We did not report most results by IOU since sample sizes are too small for conclusive results at the IOU-level.

Due to the sampling design for alt-fuels customers, the surveyed respondents may not be representative of the statewide population of low-income alt-fuels customers but instead comprise a snapshot of a sample of these customers in California and others like them. Although the following results may not be representative, the sample size is large enough for 90/10 confidence/precision and the results do reflect the experiences of the surveyed sample of low-income alt-fuels customers that are potentially found among the statewide population.

### 6.1 What are the energy burden, hardships, and characteristics of alt-fuel customers compared to non-alt-fuels customers?

Alt-fuel customers' average energy burden (and modified energy burden) is similar to that of non-alt-fuel customers (5.1% vs. 5.5%), when the annual cost of alt-fuels is not considered (Table 18). However, alt-fuels customers have a significantly higher energy burden (and modified energy burden) when it accounts for alt-fuel costs, compared to non-alt-fuels customers (8.7% vs. 5.5%). This is also reflected in alt-fuels customers' reported greater difficulty paying their energy bills than non-alt-fuels customers.

Surveyed alt-fuels customers also reported higher overall economic and health hardship than non-alt-fuels customers (Table 18). Alt-fuels customers are also more likely to receive fixed income and have retired and disabled household members, and are less likely to have employed household members, compared to non-alt-fuels customers.

Demographically, surveyed alt-fuels customers are more likely to be white and married, speak only English in the home and not have a foreign-born household member than non-alt-fuels customers (Table 18). In regard to housing, alt-fuels customers are more likely to own their home, live in a single-family or manufactured/mobile home, and live in a larger sized home than non-alt-fuels customers. In addition, alt-fuels customers are more likely to live in the Desert/Mountain or North Coast regions and less likely to live in the South Coast and Inland regions than non-alt-fuels customers.

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<sup>48</sup> SCG customers are excluded since they have natural gas service.

Table 18. Differences in Characteristics of Alt-Fuels and Non-Alt-Fuels Customers <sup>a, b</sup>

Energy Burden	Alt-Fuels Customers		Non-Alt-Fuels Customers	
	N	Stat	N	Stat
Average energy burden without alt-fuels costs <sup>c</sup>	138	5.1%	1,077	5.5%
Average modified energy burden without alt-fuels costs <sup>c</sup>		4.8%		4.8%
Average energy burden with alt-fuels costs <sup>c</sup>		8.7%*		5.5%*
Average modified energy burden with alt-fuels costs <sup>c</sup>		7.5%*		4.8%*
Average months during past year had difficulty paying energy bills <sup>d</sup>	134	3.0*	982	2.2*
Fuel Costs and Income	N	Stat	N	Stat
Average annual electricity/natural gas costs <sup>e</sup>	138	\$1,145	1,077	\$1,289
Average annual alt-fuels costs <sup>e</sup>		\$789*		\$0*
Average annual household income (\$1,000s)		\$31.0*		\$35.0*
Economic and Health Hardship				
Average economic hardship index <sup>f</sup>	138	3.5*	958	3.0*
Average health hardship index <sup>f</sup>	131	4.6*	985	4.0*
Other Characteristics	N	Stat	N	Stat
Receives fixed income	138	47%*	1,077	38%*
Has retired household members		39%*		27%*
Has disabled household members		35%*		26%*
Has employed household members		58%*		65%*
Does not have foreign-born household members	119	88%*	1,021	68%*
Speaks only English in the home	136	85%*	1,030	63%*
White race/ethnicity	136	75%*	1,039	46%*
Married/domestic partnership	138	56%*	1,077	45%*
Owns home		62%*		44%*
Lives in single-family home	135	64%*	1,032	53%*
Lives in manufactured or mobile home		28%*		5%*
Lives in apartment/condo with 5+ units		3%*		30%*
Average number of rooms in home		5.7*		5.1*
Geographic Region	N	Stat	N	Stat
Lives in Central Valley, Desert/Mountain or North Coast regions	138	92%*	1,077	63%*
Lives in South Coast or South Inland regions		8%*		37%*

<sup>a</sup> Alt-fuel customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets.

<sup>b</sup> \* = statistically significant difference at p≤.10 between total alt-fuels customers and non-alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); energy and modified energy burden with alt-fuels costs include the self-reported annual cost of alt-fuels as part of annual energy bills.

<sup>d</sup> Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

<sup>e</sup> Electricity/natural gas costs are from IOU billing data and alt-fuels costs are self-reported. Only non-alt-fuels customers have natural gas costs since alt-fuels customers do not have natural gas service.

<sup>f</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

## 6.2 How do alt-fuel customers' energy burdens and hardships vary by their characteristics?

Several factors differentiate alt-fuels customers energy burdens and hardships from those experienced by non-alt-fuels customers. The largest contributors to surveyed alt-fuels customers' higher alternative energy burden is their higher average annual energy total costs (\$1,934 vs. \$1,289) and lower average annual incomes (\$31K vs. \$35K) compared to non-alt-fuels customers. Other key differentiators of alt-fuels customers' energy burden and hardships that were statistically significant in regression models include:

- Geography, where energy burden and economic hardship is higher for alt-fuels customers who live in the in the Central Valley region than in the Desert/Mountain region and, to a greater extent, in the North Coast region.
- Education, where health hardship is higher for customers with lower levels of education.
- Housing tenure, where economic hardship is higher for those who rent their homes.
- Housing type, where energy burden is higher for those who live in manufactured/mobile homes than in single-family homes.

Several other factors also contribute to higher energy burden and hardships (e.g., lower annual income, receiving fixed income or public assistance, not having employed household members, etc.) but they are common among both surveyed alt-fuels and non-alt-fuels customers (and are not unique for alt-fuels customers). See Volume 2, Appendix F for more details.

### 6.2.1 Propane Vs. Wood/Pellets Alt-Fuels Customers

Another key driver of energy burden and hardships among the surveyed alt-fuels customers is based on the types of alt-fuels they use (propane vs. wood/pellets).<sup>49, 50</sup>

The available evidence suggests that propane users have higher average energy burdens and economic hardship, and reported more difficulty paying their bills, than wood/pellets users (Table 19). Although both propane and wood/pellets users reported similar average annual incomes and electricity costs, the propane users reported more than double the alt-fuels costs than wood/pellets users.

Propane users' alt-fuel costs appear to be a key driver of their higher burden and hardship because they reported characteristics that tend to be associated with lower energy burden and hardship: they more likely to have employed household members and receive earned income and are less likely to have retired or disabled household members and receive fixed income compared to wood/pellets users. Propane users are more likely to rent their home, with a central furnace and AC and without a fireplace, than wood/pellets users, which could contribute to their higher fuel costs.

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<sup>49</sup> The sample sizes for wood/pellets users are too small (n=34) for conclusive results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the subgroup.

<sup>50</sup> We also asked about kerosene/oil/diesel alt-fuels but only four respondents reported using these as their primary fuel for space heating, water heating, and/or cooking.

Table 19. Differences in Characteristics of Propane and Wood Alt-Fuels Customers <sup>a, b</sup>

	Alt-Fuels Customers			
	Propane		Wood/Pellets	
Energy Burden and Economic Hardship	N	Stat	N	Stat
Average energy burden without alt-fuels costs <sup>c</sup>	123	5.2%*	34	4.2%*
Average modified energy burden without alt-fuels costs <sup>c</sup>		4.9%*		4.0%*
Average energy burden with alt-fuels costs <sup>c</sup>		9.1%*		8.2%*
Average modified energy burden with alt-fuels costs <sup>c</sup>		8.5%*		6.9%*
Average economic hardship index <sup>d</sup>	111	3.6*	32	3.2*
Average months during past year had difficulty paying... <sup>e</sup>				
Energy bills	110	3.1*	33	2.4*
Rent/Mortgage		2.1*		1.5*
Other basic needs		2.7*		2.0*
Medical bills		2.3*		1.6*
Fuel Costs and Income	N	Stat	N	Stat
Average annual electricity costs	138	\$1,170	34	\$1,129
Average annual alt-fuels costs		\$785*		\$320*
Average annual household income (\$1,000s)		\$31.2		\$30.8
Other Characteristics	N	Stat	N	Stat
Receives earned income	123	60%*	34	38%*
Has employed household members		60%*		47%*
Receives fixed income		36%*		50%*
Has retired household members		36%*		56%*
Has disabled household members		33%*		41%*
Owns home	138	60%*	34	82%*
Has furnace	110	61%*	32	30%*
Has wall/space heater		55%*		42%*
Has fireplace		48%*		80%*
Has central AC	122	54%*	34	38%*

<sup>a</sup> Alt-fuel customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets. Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for results to be conclusive.

<sup>b</sup> \* = statistically significant difference at p≤.10 between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); energy and modified energy burden with alt-fuels costs include the self-reported annual cost of alt-fuels as part of annual energy bills.

<sup>d</sup> Economic hardship index is on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

<sup>e</sup> Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

Propane and wood/pellet alt-fuels customers also reported very different experiences with using their alt-fuels (Table 20). Propane users are more likely to report using propane because they can't get natural gas service whereas wood/pellet users are more likely to report using wood/pellets because it is affordable, convenient, safe, and good for the environment. Propane users also reported that the cost is the primary disadvantage of using propane while wood/pellets users find no significant disadvantage to using wood or pellets.

Table 20. Surveyed Alt-Fuel Customers' Reported Reasons, Disadvantages, Assessment, & Costs of Using Alt-Fuels <sup>a, b, c</sup>

Alt-Fuel Usage Reasons, Disadvantages, Assessment, and Costs	Alt-Fuel Customers			
	Propane		Wood/Pellets	
Reasons for Using Alt-Fuel Instead of Electricity or Natural Gas <sup>d</sup>	N	%	N	%
Can't get natural gas service	97	67%*	32	19%*
Alt-fuel is affordable		18%*		66%*
Alt-fuel is convenient		14%*		31%*
Alt-fuel is safe		13%*		34%*
Prefer to be off the grid		8%*		16%*
Alt-fuel is good for the environment		7%*		23%*
Can't get electricity service		6%		6%
Other reason <sup>e</sup>		4%		3%
Disadvantages of Using Alt-Fuel <sup>d</sup>	N	%	N	%
Alt-fuel is expensive	97	68%*	32	13%*
Alt-fuel is not convenient		19%		22%
Alt-fuel is bad for the environment		11%		13%
Alt-fuel is not safe		11%		9%
None		12%*		28%*
Other disadvantage <sup>f</sup>		4%*		13%*
Don't know		12%*		0%*
Assessment of Alt-Fuel Usage	N	%	N	%
Using alt-fuel is more of an advantage	96	22%*	32	61%*
Using alt-fuel is more of a disadvantage		40%*		16%*
Advantages and disadvantages of using alt-fuel are equal		38%*		22%*

<sup>a</sup> Alt-fuel customers reportedly use propane and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service.

<sup>b</sup> \* = statistically significant difference at  $p \leq .10$  between propane alt-fuels customers and wood/pellets alt-fuels customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

<sup>c</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

<sup>d</sup> Respondents could select all that apply.

<sup>e</sup> Other reasons respondents provided are "the alt-fuel is less expensive (than electricity/gas)" and "the alt-fuel is a better fuel (than electricity/gas)".

<sup>f</sup> Other disadvantages respondents provided are "the alt-fuel can be messy," "the alt-fuel requires more work/time," and "the alt-fuel is the only choice (of fuels) in the area".

### 6.3 To what extent do CARE, ESA, and other energy assistance or efficiency programs mitigate alt-fuel customers’ energy burden and hardships?

The available evidence suggests that surveyed alt-fuels customers with the highest energy burdens and hardships are participating or have participated in the CARE, ESA, and/or other IOU energy efficiency programs, which potentially helped reduce their average annual electricity costs compared to nonparticipants (Table 21).<sup>51</sup> Trends for surveyed non-alt-fuels customers indicate that CARE and ESA may have slightly greater impacts on reducing their energy burden than the burden experienced by alt-fuels customers, likely because the latter do not receive the CARE discount on their alt-fuels costs or receive ESA equipment upgrades on their alt-fuel equipment (see Volume 2, Appendix F).

Table 21. Surveyed Alt-Fuels Customers’ Energy Burden and Hardship Metrics, by Program Participation <sup>a, b, c</sup>

Hardship Metrics	CARE Program			ESA Program		Other IOU Programs	
	Current CARE Participant (N)	Past CARE Participant (N)	CARE-Eligible Non-participant (N)	ESA Participant (N)	ESA Non-participant (N)	Participant (N)	Non-participant (N)
Average Annual Electricity Costs	\$1,296 (35)	\$1,388 (32)	\$1,577 (17)	\$1,036 (43)	\$1,354 (56)	\$1,158 (18)	\$1,272 (119)
Average Annual Alt-Fuel Costs	\$748 (35)	\$856 (32)	\$601 (17)	\$882 (43)	\$623 (56)	\$893 (18)	\$741 (119)
Average Energy Burden <sup>d</sup>	(35)	(32)	(17)	(43)	(56)	(18)	(119)
w/out alt-fuel costs	4.8%	4.4%	6.0%	5.2%	4.9%	5.1%	4.8%
w/alt-fuel costs	8.2%	7.5%	8.2%	10.2%	7.0%	9.3%	8.2%
Average Modified Energy Burden <sup>d</sup>	(35)	(32)	(17)	(43)	(56)	(18)	(119)
w/out alt-fuel costs	4.6%	4.3%	5.6%	4.8%	4.7%	4.6%	4.5%
w/alt-fuel costs	7.6%	7.0%	7.7%	9.2%	6.8%	8.6%	7.5%
Average Economic Hardship Index <sup>e</sup>	4.0 (30)	3.8 (30)	2.6 (16)	3.3 (40)	3.2 (51)	4.3 (17)	3.2 (110)
Average Health Hardship Index <sup>e</sup>	4.3 (33)	5.2 (31)	3.7 (16)	4.7 (41)	4.1 (52)	5.7 (15)	4.4 (112)

<sup>a</sup> Alt-fuel customers reportedly use propane, kerosene/oil/diesel, and/or wood/pellets for space heating, water heating, and/or cooking and do not have natural gas service; nearly all reported propane or wood/pellets.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

<sup>c</sup> CARE and ESA program participation was determined by IOU program data and other IOU program participation was self-reported in the customer survey.

<sup>d</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income); energy and modified energy burden with alt-fuels costs include the self-reported annual cost of alt-fuels as part of annual energy bills. Current CARE participants’ energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>e</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

<sup>51</sup> Samples sizes of alt-fuels customers who participated in CARE (n=35), ESA (n=43), and/or other IOU energy efficiency programs (n=18) are too small for conclusive results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the subgroups.

In addition, surveyed alt-fuels current and past CARE participants indicated that CARE had moderately high to high positive impacts on their household's financial situation and rated CARE processes as low to moderately low in difficulty. Surveyed alt-fuel ESA participants who received heating, cooling, and/or enclosure measures reported moderately high to high satisfaction and significant improvements to the HCS of their homes. Trends are mostly similar for surveyed non-alt-fuels customers, providing evidence that CARE and ESA programs do not have large differential impacts based on customers' alt-fuel usage or lack thereof. The exceptions are that alt-fuels ESA participants are ineligible to receive upgrades to their alt-fuel using equipment and alt-fuels CARE participants do not receive a discount on their alt-fuels costs, whereas these limitations does not apply to most non-alt-fuels ESA participants. Results from these analyses are in Volume 2, Appendix F.

## 7. Low Service Reliability Customer Hardships

We present the summary results for the research objective (RO4) of assessing the hardships of low-income customers who live in areas with low electrical service reliability. We defined low-service reliability customers as those who live in PG&E, SCE, and SDG&E areas with a SAIDI and/or SAIFI value one standard deviation or more above the mean value for all areas within an IOU's service territory; we defined all other customers as high service reliability customers.<sup>52, 53</sup>

Results are from the survey with 153 low-income low service reliability customers and 994 low-income high service reliability customers, and their IOU customer, program, and billing data. The sections below are based on the key research questions for this objective.

See Appendix G in Volume 2 for more detailed results. We did not report results by IOU since sample sizes are too small for conclusive results at the IOU-level.

Due to the sampling design for surveying and identifying low and high service reliability customers, the surveyed respondents may not be representative of the statewide population of low-income customers in these areas. Instead, they comprise a snapshot of a sample of these customers in California and others like them. Although the following results may not be representative, the sample size is large enough for 90/10 confidence/precision and the results do reflect the experiences of the surveyed sample of low-income low service reliability customers that are potentially found among the statewide population.

### 7.1 What are the energy burden, hardships, and characteristics of low service reliability customers compared to high service reliability customers?

Low service reliability customers have greater energy and modified energy burdens, driven by lower incomes than by higher energy costs, compared to high service reliability customers (Table 22).

However, the low service reliability customers reported similar general economic and health hardships compared to high service reliability customers and are also different in few other characteristics that correlate with greater energy burden: they reported more difficulty paying energy bills and more disabled household members. In addition, the low service reliability customers are more likely to live in warmer climate zones and in the Desert/Mountain and South Coast and Inland regions (vs. Central Valley and North Coast regions).

Overall, it appears that customers with higher energy burdens are more likely to live in areas with lower service reliability rather than low service reliability contributing much to customers having higher energy burdens since there are few other differences between customers in low vs high reliability areas.

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<sup>52</sup> The System Average Interruption Duration Index (SAIDI) is a measure the duration of electrical outages and the System Average Interruption Frequency Index (SAIFI) is a measure of the frequency of electrical outages reported by the IOUs at the electrical circuit, Census tract, and/or zip-code level; higher SAIDI/SAIFI values mean lower service reliability (e.g., electrical outages of longer durations and/or more frequent outages).

<sup>53</sup> SCG customers are excluded since they have natural gas service and SCG does not have SAIDI/SAIFI data.

Table 22. Differences in Characteristics of Low and High Service Reliability Customers <sup>a, b</sup>

	Low Service Reliability Customers		High Service Reliability Customers	
	N	Stat	N	Stat
<b>Energy Burden</b>				
Average energy burden <sup>c</sup>	153	6.6%*	994	5.3%*
Average modified energy burden <sup>c</sup>		5.7%*		4.7%*
Average months during past year had difficulty paying energy bills <sup>d</sup>	144	2.5*	899	1.7*
<b>Fuel Costs and Income</b>				
Average annual electricity/natural gas costs	153	\$1,256	994	\$1,290
Average annual household income (\$1,000s)		\$31.3*		\$35.1*
<b>Economic and Health Hardship</b>				
Average economic hardship index <sup>e</sup>	138	3.2	958	3.3
Average health hardship index <sup>e</sup>	131	4.0	985	4.1
Has disabled household members	153	33%*	994	26%*
<b>Climate Zone by Temperature</b>				
Cool	153	8%*	994	16%*
Cool/Moderate		13%*		25%*
Moderate		28%		24%
Hot/Moderate		30%*		20%*
Hot		21%*		15%*
<b>Climate Zone by Geography</b>				
Central Valley	153	16%*	994	30%*
Desert/Mountain		25%*		16%*
North Coast		8%*		22%*
South Coast		22%*		11%
South Inland		30%*		20%*

<sup>a</sup> Low service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

<sup>b</sup> \* = statistically significant difference at  $p \leq .10$  between lower and higher service reliability customers; two-tailed t-tests used to compare averages and two-tailed z-tests used to compare proportions; N = total number who answered survey question.

<sup>c</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income).

<sup>d</sup> Respondents could choose Never (0), 1 to 3 months (2), 4 to 6 months (5), 7 to 9 months (8), or 10 to 12 months (11); we coded the variable so that values represent the midpoints.

<sup>e</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

## 7.2 How do low service reliability customers' energy burdens and hardships vary by their characteristics?

Four factors differentiate the energy burden and hardships experienced by customers who have low service reliability compared to those with high service reliability:

- Household composition, where energy burden is higher for surveyed low service reliability customers who have senior household members.
- Race/ethnicity, where energy burden is higher for surveyed low service reliability customers who are non-white (vs. white).
- Housing type, where energy burden is higher for surveyed low service reliability customers who live in a manufactured/mobile home (vs. other housing types).
- Household size, where health hardship is higher for surveyed low service reliability customers who have fewer household members.

Several other factors also contribute to higher energy burden and hardships (e.g., lower annual income, receiving fixed income or public assistance, not having employed household members, etc.) but they are common among both surveyed low and high service reliability customers (and are not unique for low service reliability customers). See Volume 2, Appendix G for more details.

In addition, the energy-using experience reported by surveyed low service reliability customers also differentiates some from high service reliability customers (Table 23). Low service reliability customers reported experiencing slightly more electricity outages in 2018 but reported that the outages were much shorter in duration than high service reliability customers.

However, the outages reportedly caused more difficulty for low than high service reliability customers, indicating the lower reliability may slightly contribute to increasing the burdens or difficulties low service reliability customers experience during outages.

Table 23. Surveyed Low and High Service Reliability Customers' Experience of Electrical Outages During 2018 <sup>a, b</sup>

Electricity Outages in 2018	Low Service Reliability Customers		High Service Reliability Customers	
	N	Statistic	N	Statistic
<b>Number of outages <sup>c</sup></b>				
Average number of outages in the past year reported by only customers who experienced one or more outages	100	2.9*	694	2.2*
<b>Duration of outages <sup>d</sup></b>				
Average minutes of all outages	85	188*	597	259*
<b>Assessment of difficulty <sup>e</sup></b>				
Average level of difficulty caused by outages	100	5.2*	691	4.5*

<sup>a</sup> Low service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

<sup>b</sup> \* = statistically significant difference at  $p \leq .10$  between lower and higher service reliability customers; two-tailed t-tests used to compare averages; N = number who answered survey question.

<sup>c</sup> Respondents could select None (coded as 0), 1 to 2 times (coded as 1.5), 3 to 4 times (coded as 3.5), 5 to 6 times (coded as 5.5), 7 to 8 times (coded as 7.5), 9 to 10 times (coded as 9.5), and more than 10 times (coded as 11.5).

<sup>d</sup> Respondents were asked how long outages lasted on average and how long the longest outage lasted; they could select less than 15 minutes (coded as 7.5), 15 minutes to less than one hour (coded as 37), one hour to less than six hours (coded as 210), six hours to less than 12 hours (coded as 540), 12 hours to less than a day (coded as 1080), One to two days (coded as 2160), and more than two days (coded as 4320).

<sup>e</sup> Respondents used an 11-point scale from 0 (no difficulty) to 10 (great difficulty).

### 7.3 To what extent do CARE and ESA programs mitigate low service reliability customers’ energy burden and hardships?

The available evidence suggests that surveyed low service reliability customers with the highest energy burdens and hardships are participating or have participated in the CARE and/or ESA programs, which potentially helped to reduce their average annual electricity costs compared to nonparticipants (Table 24).<sup>54</sup> These trends are similar to those found for surveyed customers in high service reliability areas, indicating that CARE and ESA impacts on energy burden does not vary significantly by electric service reliability (see Volume 2, Appendix G).

Table 24. Surveyed Low Service Reliability Customers’ Energy Burden & Hardship Metrics, by Program Participation <sup>a, b, c</sup>

Hardship Metrics	CARE Program			ESA Program	
	Current CARE Participant (N)	Past CARE Participant (N)	CARE-Eligible Non-participant (N)	ESA Participant (N)	ESA Non-participant (N)
Average Annual Electricity Costs	\$1,278 (44)	\$1,441 (32)	\$1,573 (31)	\$1,100 (36)	\$1,341 (93)
Average Energy Burden <sup>d</sup>	6.2% (44)	5.6% (32)	6.3% (31)	6.6% (36)	6.5% (93)
Average Modified Energy Burden <sup>d</sup>	4.9% (44)	5.7% (32)	5.8% (31)	5.8% (36)	6.0% (93)
Average Economic Hardship Index <sup>e</sup>	3.7 (42)	3.1 (28)	2.4 (28)	3.1 (35)	3.1 (84)
Average Health Hardship Index <sup>e</sup>	3.8 (43)	4.2 (29)	2.8 (28)	4.6 (32)	3.5 (85)

<sup>a</sup> Low service reliability customers live in areas where the System Average Interruption Duration Index (SAIDI) score and/or System Average Interruption Frequency Index (SAIFI) score is one standard deviation above the mean, indicating more frequent and/or longer electrical outages than higher service reliability customers.

<sup>b</sup> Sample sizes of 67 or more have 90/10 confidence/precision; sample sizes of 52 to 66 have 85/10 confidence/precision; sample sizes less than 52 have too low confidence/precision for conclusive results.

<sup>c</sup> CARE and ESA program participation was determined by IOU program data.

<sup>d</sup> Energy burden is annual energy bills divided by annual income; modified energy burden takes into account public assistance benefits (as part of income). Current CARE participants’ energy burden includes the CARE discount and would be up to 35% higher without it.

<sup>e</sup> Economic and health hardship indices are on a scale of 0 to 10, where 0 means very low hardship and 10 means very high hardship.

In addition, surveyed current and past CARE participants in low service reliability areas indicated that CARE had moderately high to high positive impacts on their household’s financial situation and rated CARE processes as low to moderately low in difficulty. Surveyed ESA participants in low service reliability areas who

<sup>54</sup> Samples sizes of low service reliability customers who participated in CARE (n=44) and/or ESA (n=36) are too small for conclusive results. However, the results do reflect the experiences of those surveyed and others like them in the state and may potentially be found among the entire California population of the subgroups.

received heating, cooling, and/or enclosure measures reported moderately high to high satisfaction and significant improvements to the HCS of their homes. Trends are similar for surveyed customers in high service reliability areas, providing further evidence that CARE and ESA programs do not have substantial differential impacts based on customers' electric service reliability. Results from these analyses are in Volume 2, Appendix G.

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