2025 Low Income Needs Assessment Draft Research Plan

Submitted by Evergreen Economics

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1.1 Introduction and Approach Overview

The current Energy Savings Assistance (ESA) program seeks to achieve deeper energy savings and/or enhance the health, comfort, and safety (HCS) of customers. The program also seeks to have the California investor-owned utilities (IOUs) collect data on customer characteristics and segmentation to enhance their program outreach and services to customers who can most benefit from the program. Given the focus on achieving deeper energy savings, the program has shifted to a usage-based approach for program delivery. The 2025 Low Income Needs Assessment (LINA) will focus on understanding the needs and energy consumption behaviors of both high and low energy users with a focus on presenting actionable program recommendations.

In this research plan, Evergreen outlines the research questions and the study approach (a user characterization, customer surveys, and focus groups in multiple languages). The approach starts with developing a set of hypothesized characteristics of high and low users followed by various research methods to test these hypotheses, with the goal of identifying actionable program recommendations for serving income-qualified[1] high and low user groups.[2]

For this study, we define high and low users as the 90th and 10th percentiles of annual consumption, which will require 12 months of billing history. We will define high users separately for electricity and natural gas. We will infer from the IOU account information and historical electric consumption data whether each home uses electricity for heating or if they likely use other fuels (e.g., natural gas, propane). This will result in three distinct groups for our analysis: electric-only users, electric multi-fuel users, and natural gas users,[3] which will then be stratified by high and low users.

1.1.1 Research Questions

The study team will address the following three research questions that pertain to income-qualified customers with high energy use and low energy use. The questions listed below are a

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[1] Households eligible for ESA must be below 250 percent of the Federal Poverty Guidelines.

[2] For the purposes of this study, 'high use' will be defined as being the top 20 percent average annual consumption in each climate zone, and 'low use' will be the lowest 20 percent of the average annual consumption.

[3] Note that we will be focusing on kWh and therms and will not be using a combined metric (total Btu). To separate the electric-only customers from the electric multi-fuel customers, we plan to look for evidence of heating signature in the electric consumption data.

high level summary of a set of 31 questions presented in Section 3 and summarized graphically in Figure 2.

1. What are the conservation-related attitudes and behaviors, household characteristics, and home/property characteristics of income-qualified customers with relatively high and low energy use? How do they compare to each other?
2. What are the proportions of these different groups?[4]
3. To what extent do the program rules and/or implementation processes meet the energy-related needs of these groups of customers? Are there programmatic changes that may be considered to better meet the energy needs of all low-income customers?
    a. What, if anything, (such as additional measures or services) may be beneficial and could be considered for either high or low usage households?
    b. What, if anything, is currently offered to high and/or low usage households and is NOT particularly beneficial to the energy needs of these households.

Four additional research questions are more general in nature (i.e., not focused on high and low users specifically); these pertain to time-of-use (TOU) rates and electrification. The full list of research questions can be found in Section 3.

1.1.2 Study Approach

Our approach largely starts with a set of hypothesized characteristics of high and low user households. This set of characteristics is shown on the following page.

Note that where rows are merged across high and low users, we do not have a hypothesis about the correlation between high and low users but plan to include these in our analysis to understand if these characteristics are more or less present when comparing the high and low user groups.

Evergreen developed this list of hypothesized characteristics from our review and synthesis of findings from the 2011 SCE LIEE Segmentation Study[5] and prior California LINA studies[6] along with discussion and input from the study team.

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[4] Where possible (survey, RASS) we will report by IOU.

[5] HINER & Partners. 2011. *Low Income Energy Efficiency (LIEE) Household Segmentation Research for Southern California Edison 2009-2011*. Prepared for Southern California Edison. https://www.calmac.org/publications/SCE_LIEE_Segmentation_Report.pdf

[6] California Public Utilities Commission. "Income Qualified Assistance Programs." https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/income-qualified-assistance-programs

Hypothesized Characteristics		
	High Users	**Low Users**
Behavior or Residents	**Behavior:** Behavior driven by lack of conservation due to lack of education or other issues	**Behavior**: Low users who practice healthy conservation
		Behavior: Low usage driven by attitudes and behaviors associated with desirable conservation and/or environmental concerns
	Behavior: Which high users can reduce usage *without* impacting HC&S?	**Behavior**: Low users conserving at expense of essential needs. Other correlated traits?
Immutable Characteristic of Home	Single-family dwellers	Multifamily dwellers
	Location (DAC, Tribal, Rural, PSPS Zone, Wildfire Zone)	
	Large homes	Small homes
	Home vintage - older	Home vintage - newer
	Extreme climate zones	Moderate climate zones
Char of Home	Low efficiency of (appliances in) home	High efficiency of (appliances in) home
Characteristic of Residents	Age of residents (children in home, working adults in homes)	Age of residents (elderly, and elderly non-working adults)
	Disabled	
	Veteran	
	Affordability or Income (3E) / Energy Burden, CARE/FERA Enrollment	
	Homeowners	Renters
	Due to medical or health related need	No medical or health related need
	Arrearages and/or Disconnections	
	Medical Baseline and/*or respiratory*	Not on Medical Baseline
	More residents	Fewer residents
		Others

We will test these hypotheses through analysis of existing data gained from a user characterization and from additional data collected via a **survey of 900 high and low users and focus groups**. The focus groups will be **conducted in-person across California by our research partner Ewald & Wasserman in four languages** (English, Spanish, and two additional languages) to ensure we reach a wide range of households.

The goal is to understand the population of low and high users with an eye towards what may or may not be addressable by the ESA program. Based on the analysis of the data as noted above, the study will identify circumstances or customer characteristics that are well-served via the ESA program and circumstances that are not currently served by the program, including those the program may or may not be able to address.

The secondary research, customer survey, and focus group data will lead to a refined list of characteristics of high and low users that will then be put through a framework to understand which of the issues we identify may be addressable by the ESA program.

We expect that hypothesized characteristics may fall into one of the following three categories:

1. Addressable through what is currently offered via the ESA program *or*
2. Possible to address with changes to the ESA program such as:
   - Changes in measures offered;
   - Changes in implementation processes (such as targeting or tailored messaging/outreach and/or screening out);
   - Changes in program rules; and
   - Changes in program goals, *or*
3. Not addressable by ESA, even with program changes.

Before the focus groups, the study team will provide a matrix of IOU approaches and offerings for the ESA program. As an example, Southern California Gas (SoCalGas) pays contractors based on savings whereas Pacific Gas and Electric (PG&E) has structured its program around baseline usage. Another example is that air conditioners are only an offering in climate zones 13, 14, and 15. These differences will be important to frame up new recommendations in the reporting phase.

Note that every household will have multiple characteristics with potentially conflicting impacts on overall usage, making it difficult to identify the most influential usage drivers. Newer homes, for example, are built more efficiently than older homes due to code changes and efficiency program efforts over the years, which will decrease energy use. New homes also tend to have more electronics, which will increase energy use and offset some of the efficiency gains from the newer construction. Where possible, we will consider a logistic regression to estimate a propensity model.

Error! Reference source not found. shows how each research activity will contribute toward a comprehensive and refined understanding of low-income high and low user groups as described above.

Figure 1: Overview of Research Process

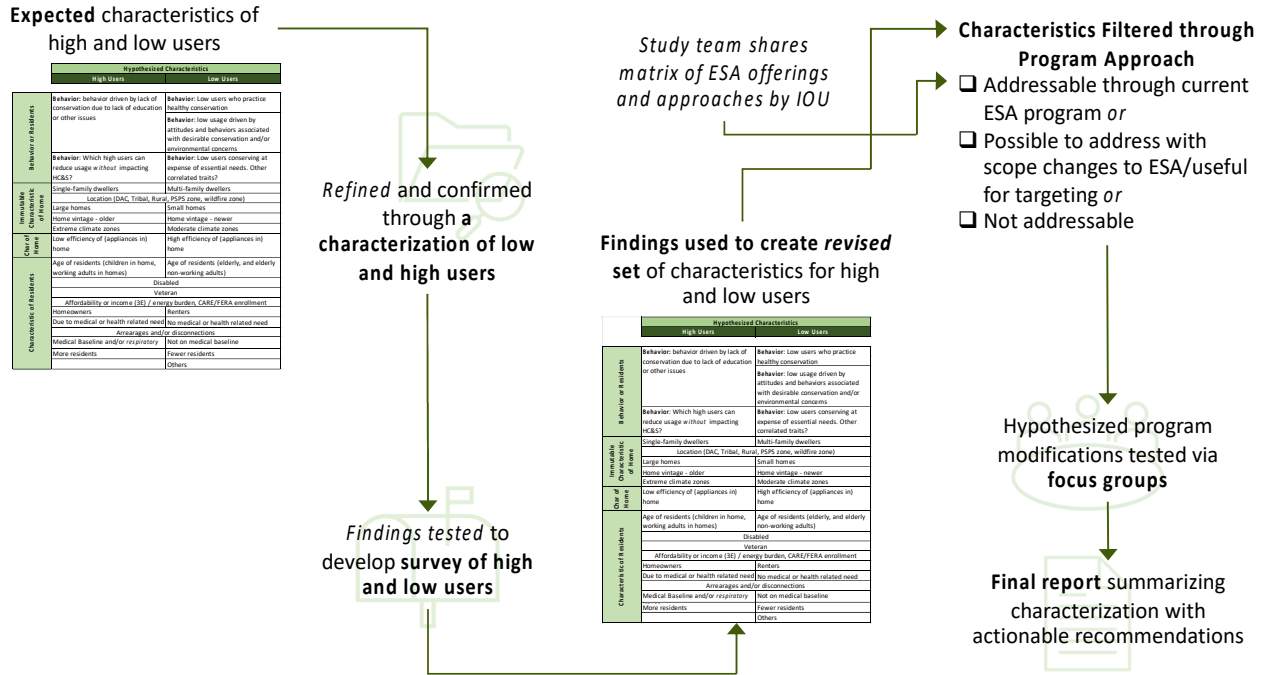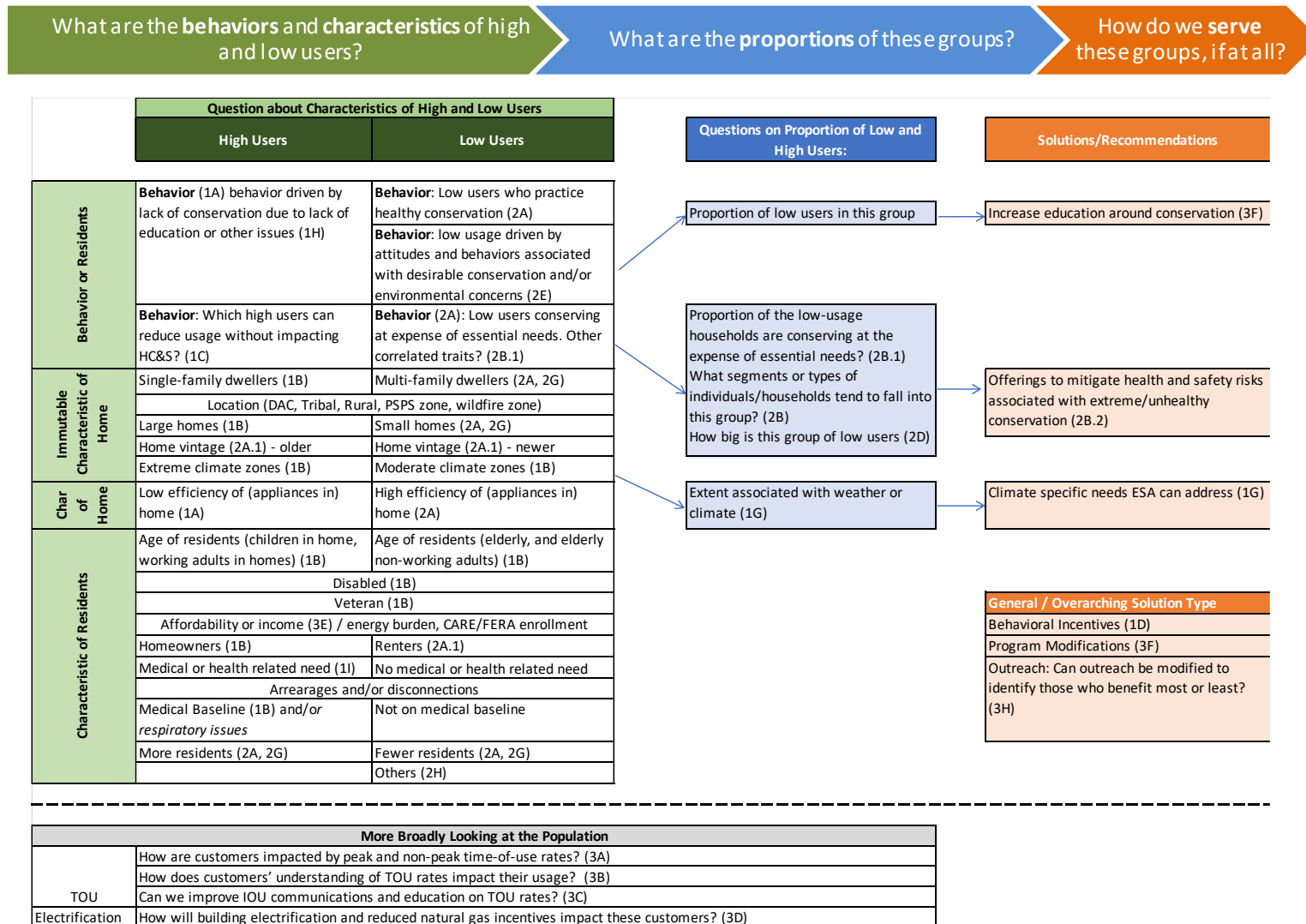Figure 2 shows the mapping of the specific research questions to the three main research questions (in green, blue, and orange at the top of the graphic). It also shows how the hypothesized characteristics become the basis for additional research questions covering the proportion of households with those characteristics and analysis of how the program may be structured to address high and low users.

Figure 2: Study Research Question Mapping

What are the **behaviors** and **characteristics** of high and low users?	What are the **proportions** of these groups?	How do we **serve** these groups, if at all?

Question about Characteristics of High and Low Users		Questions on Proportion of Low and High Users:	Solutions/Recommendations
High Users	**Low Users**		

	High Users	Low Users
Behavior or Residents	**Behavior** (1A) behavior driven by lack of conservation due to lack of education or other issues (1H)	**Behavior**: Low users who practice healthy conservation (2A)
		Behavior: low usage driven by attitudes and behaviors associated with desirable conservation and/or environmental concerns (2E)
	Behavior: Which high users can reduce usage without impacting HC&S? (1C)	**Behavior** (2A): Low users conserving at expense of essential needs. Other correlated traits? (2B.1)
Immutable Characteristic of Home	Single-family dwellers (1B)	Multi-family dwellers (2A, 2G)
	Location (DAC, Tribal, Rural, PSPS zone, wildfire zone)	
	Large homes (1B)	Small homes (2A, 2G)
	Home vintage (2A.1) - older	Home vintage (2A.1) - newer
	Extreme climate zones (1B)	Moderate climate zones (1B)
Char of Home	Low efficiency of (appliances in) home (1A)	High efficiency of (appliances in) home (2A)
Characteristic of Residents	Age of residents (children in home, working adults in homes) (1B)	Age of residents (elderly, and elderly non-working adults) (1B)
	Disabled (1B)	
	Veteran (1B)	
	Affordability or income (3E) / energy burden, CARE/FERA enrollment	
	Homeowners (1B)	Renters (2A.1)
	Medical or health related need (1I)	No medical or health related need
	Arrearages and/or disconnections	
	Medical Baseline (1B) and/or *respiratory issues*	Not on medical baseline
	More residents (2A, 2G)	Fewer residents (2A, 2G)
		Others (2H)

Questions on Proportion of Low and High Users:

Proportion of low users in this group

Proportion of the low-usage households are conserving at the expense of essential needs? (2B.1)
What segments or types of individuals/households tend to fall into this group? (2B)
How big is this group of low users (2D)

Extent associated with weather or climate (1G)

Solutions/Recommendations

Increase education around conservation (3F)

Offerings to mitigate health and safety risks associated with extreme/unhealthy conservation (2B.2)

Climate specific needs ESA can address (1G)

General / Overarching Solution Type
Behavioral Incentives (1D)
Program Modifications (3F)
Outreach: Can outreach be modified to identify those who benefit most or least? (3H)

More Broadly Looking at the Population	
TOU	How are customers impacted by peak and non-peak time-of-use rates? (3A)
	How does customers' understanding of TOU rates impact their usage? (3B)
	Can we improve IOU communications and education on TOU rates? (3C)
Electrification	How will building electrification and reduced natural gas incentives impact these customers? (3D)

Note: the alphanumeric codes in this figure identify each specific study research question that is presented in Section 3.

Note that the remainder of the subsections in this research plan describe our approach to the data collection and analysis tasks, while Section 2 specifies the deliverables and timeline associated with the project initiation meeting, draft and final research plans, public workshops, interim results, draft results and report, final report and data sets, and project management and reporting.

1.2 Background Report Review

Evergreen has already reviewed a set of existing reports to inform this research plan, and we will also rely on these reports to more fully inform the development of low-income high and low user characteristics and to address some of the study research questions. A list of the reports is included below.

- **Previous LINA Studies.** While the earlier LINA studies do not have usage levels as a primary focus, we will review the study findings from those earlier studies to see what can be leveraged to help guide our data collection for the current research. In particular, many of the prior LINA surveys included questions relating to family size and health, safety, and comfort benefits that are common drivers of energy use for high use households. Examples from the prior LINA studies include:

    - **2022 LINA**. The last LINA study focused on low-income renters, but the extensive survey effort included samples of households that are often high users (large families) and/or are more likely to increase their energy use due to health issues (seniors, households with health compromised residents).

    - **2019 LINA.** This study had a major focus on the California Alternate Rates for Energy (CARE) program and alternative fuels, but there are some data from the ESA health, comfort, and safety impact analysis that we will review as we develop our surveys and sample designs.

    - **2016 LINA.** The 2016 LINA employed a quantitative survey to understand energy burdens more comprehensively than had been done previously and focused qualitative research on selected hard-to-reach populations. This LINA also included high user focus groups, which will serve as a starting point for the development of focus group guides for the 2025 LINA.

    - **2013 LINA.** The 2013 LINA contained a detailed analysis of energy burden of low-income households (as did the later LINAs conducted by Evergreen); we will review these analyses for additional insights on how energy burden relates to usage levels.

- **2011 PG&E and Southern California Edison (SCE) Segmentation Studies, 2011 SCE Low Income Energy Efficiency (LIEE) High Usage Needs Assessment.** We will review these studies to help develop a preliminary understanding of the household and demographic characteristics distinguishing high-usage and low-usage households, which will inform the development of survey instruments and interview guides. In particular, the 2011 SCE Low

Income Energy Efficiency (LIEE) Segmentation Study characterized high and low user groups into additional descriptive profile types (e.g., "Older Coastal Conservers", "High Use Newer Homeowners", "Young Inland Conservers"), which may provide a useful framework to explore in the 2025 LINA. These studies are somewhat dated, however, and therefore will not capture some of the more systemic market changes that have occurred in recent years (e.g., remote work, electric vehicles, time-of-use [TOU] rates, increased residential PV).

- **2023 Essential Use Study.** We will review some of the use-related findings from this study as we develop survey questions and sample quotas. For example, the study found that a signification share of respondents (40%) said they needed to increase their heating on cold days for the health and well-being of household members with medical conditions. A similar percentage (35%) reported a need for increased cooling on hot days due to concerns about medical conditions of residents within the household.

- **ESA and CARE Annual Reports, ESA Impact Evaluations.** We will review these materials to inform our characterization of the general low-income market and the types of measures installed. As discussed below, we are planning to take most of the information directly from the utility tracking data for these programs. The initial review of these reports, however, may provide information regarding what types of measures are being installed within high-user and low-user households.

Through conducting background research, Evergreen may also be able to answer research questions that are not focused directly on high and low users about customer opinions on TOU rates. Relevant research questions include:

1. How are customers impacted by peak and non-peak TOU rates?
2. How does a customer's understanding of TOU rates impact their usage?
3. Can we improve IOU communications and education on TOU rates?

We plan to rely on existing research to answer the above questions. There is much existing research in California to draw upon to understand how low-income customers are impacted by TOU rates. This research has been done across different climate zones and service territories and includes examining households with seniors.[7] Evergreen will also review an evaluation of a

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[7] See for example Nexant. 2018. *California Statewide Opt-in Time-of-Use Pricing Pilot*. Prepared for the TOU Working Group under contract to Southern California Edison. https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442457172-statewide-opt-in-tou-evaluation-final-report.pdf

program where thermostats were used in an attempt to help ease the transition of low-income customers to TOU rates.[8] Existing research includes the following:

- Disaggregated Load Profiles for Low Income Customers. Update provided by Uplight in December of 2019.[9]
- Energy Upgrade California's Time of Use Community Education Project - 2018, 2020.[10]

1.3 Secondary Data Analysis

Evergreen will utilize data from multiple existing sources to develop a statewide 'user characterization' of high-use and low-use households within the low-income population. 'High use' will be defined as being the top 10 percent average annual consumption in each climate zone, and 'low use' will be the lowest 10 percent of the average annual consumption for both gas and electricity in a given climate zone.

We will request and compile customer billing data[11] from each IOU (both gas and electric) to identify the high- and low-use single-family, mobile home, and multifamily households. Customer data will exclude customers with less than 12 months of billing data, master-metered accounts, and/or net energy metered (NEM) accounts.[12] Evergreen will submit three rounds of data requests to the IOUs during this study:

1. The first data request will be for **anonymized customer data** to facilitate the user characterization. We will request **anonymized** data first to comply with data security requirements for survey questions to be approved before Evergreen can receive non-anonymized data. Once we leverage the user characterization to develop the customer survey, we will prepare the second data request. This request will also include heating fuel type for all ESA-treated homes.

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[8] Evergreen Economics. 2020. *Evaluation of the California Statewide Smart Thermostat Time of Use Pilot*. Prepared for Pacific Gas and Electric, Southern California Edison, and San Diego Gas & Electric. https://www.calmac.org/publications/PCT_TOU_Evaluation_Report_Final_033120.pdf

[9] Uplight. 2019. Disaggregated Load Profiles for Low Income Customers Presentation.

[10] Opinion Dynamics, 2020. Marketing, Education & Outreach Effectiveness Assessment: Annual Performance Report. https://www.calmac.org/publications/ME&O_23a_2019_Annual_Performance_Report_Final_CALMAC.pdf

[11] To identify use levels, we anticipate using utility billing data on annual household consumption, which is a variable tracked by each utility in the Customer Information System (CIS) and used as part of our 2022 LINA analysis. We will also request monthly consumption data on individual customers and aggregate to a yearly value.

[12] NEM customers will be excluded because they will appear to be low users without making meaningful sacrifices to health, comfort, or safety and without employing efficiency strategies that would inform findings. Master-meter customers are likely to be treated through other pathways and including them in the study would push out other high users that we could learn from to create actionable program recommendations.

2. The second data request will be for a subset of the first dataset for **customer contact information,** tied to the same customers from the first data request. This will be used for contacting survey participants and focus group participants.

3. A third data request will come after the survey has been in the field; it will cover **monthly billing data from** survey respondents.

For the 2025 LINA, the characterization plans to use:

- 2023 utility program data for the CARE program and 2021-2023 ESA program;
- 2023 Athens Research estimates of ESA and CARE eligibility by IOU, county, and zip code;[13]
- 2019 California Residential Appliance Saturation Survey (RASS) characteristics of heating, cooling, and ventilation equipment used by eligible households; we will also identify high and low users with normalized annual consumption;[14]
- 2022 US Census and American Community Survey (ACS) data with statistically representative estimates of program eligibility and characteristics of these households (e.g., tenure); we will identify high and low users based on self-reported annual fuel costs;[15] and
- 2024 IOUs' Customer Information System (CIS) data.

Table 1 maps the hypothesized characteristics to the research activity that will inform it. A 1 indicates that a research activity is the primary source of information, and a 2 indicates that the research activity is the secondary source. Focus groups are not included in the graphic below because they are intended to serve as a forum to test customer reactions to developed recommendations and dive deeper into findings that come from the customer survey and user characterization.

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[13] Athens Research. 2019. "Estimates of Energy Savings Assistance and California Alternate Rates for Energy Program Eligibility [Geography I]." Prepared for the California IOUs.

[14] DNV GL Energy Insights USA, Inc. 2020. *2019 California Residential Appliance Saturation Study*. California Energy Commission. Publication Number: CEC-200-2021-005-ES.

[15] US Census Bureau. 2023. *2009-2022 American Community Survey 5-year Public Use Microdata Samples* [JSON API]. https://www.census.gov/data/developers/data-sets/acs-5year.html

Table 1: Mapping of Research Sources to Characteristics of High and Low Users

Hypothesized Characteristics		Source		
High Users	**Low Users**	**Survey**	**User Char**	**Load Shapes**
Behavior or Residents				
Behavior (1A) Behavior driven by lack of conservation due to lack of education or other issues (1H)	**Behavior**: Low users who practice healthy conservation (2A)	1		
	Behavior: Low usage driven by attitudes and behaviors associated with desirable conservation and/or environmental concerns (2E)	1		
Behavior: Which high users can reduce usage *without* impacting HC&S? (1C)	**Behavior** (2A): Low users conserving at expense of essential needs. Other correlated traits? (2B.1)	1		2
Immutable Characteristic of Home				
Single-family dwellers (1B)	Multifamily dwellers (2A, 2G)	1	2 (IOU data, though inconsistent)	
Location (DAC, Tribal, Rural, PSPS Zone, Wildfire Zone)			1 (geographic indicators)	
Large homes (1B)	Small homes (2A, 2G)	1		
Home vintage (2A.1) - older	Home vintage (2A.1) - newer	1		
Extreme climate zones (1B)	Moderate climate zones (1B)		1 (IOU data)	
Char of Home				
Low efficiency of (appliances in) home (1A)	High efficiency of (appliances in) home (2A)	1		
Characteristic of Residents				
Age of residents (children in home, working adults in homes) (1B)	Age of residents (elderly, and elderly non-working adults) (1B)	1	2 (ACS)	
Disabled (1B)		1	2 (ACS)	
Veteran (1B)		1	2 (ACS)	
Affordability or Income (3E) / Energy Burden, CARE/FERA Enrollment		1		
Homeowners (1B)	Renters (2A.1)	1	2 (ACS)	
Due to medical or health related need (1I)	No medical or health related need	1	2 (IOU data)	
Arrearages and/or Disconnections			1 (IOU data)	
Medical Baseline (1B) and/*or* *respiratory issues*	Not on Medical Baseline	1	2 (IOU data, TBD re:)	
More residents (2A, 2G)	Fewer residents (2A, 2G)	1	2 (ACS)	
	Others (2H)	1		

An overarching goal for the secondary data analysis is to create a comprehensive characterization of low-income household energy use that is flexible enough to accommodate multiple research goals. Examples of analyses we propose include the following:

1. **Sample Design.** The user characterization will inform the sample design for the multi-mode survey and focus groups. Building the user characterization based on the broader population data (e.g., CARE, CIS, Census) will allow for the survey results to be weighted to the population of high and low users while accounting for the different language groups targeted in the data collection.

- **Geographic Distribution.** This will further identify important characteristics (IOU service territory, rural vs. urban, climate zone, disadvantaged community, etc.) that are related to

use level and help delineate which factors can realistically be addressed by the ESA program.

- **Energy Burden.** Past LINAs have included energy burden analysis, and constructing the user characterization will allow for energy burden to be estimated as part of the current research. This will also allow for comparison with energy burden results from the last several LINA studies.

- **AMI Analysis/Load Shapes.** We will request advanced metering infrastructure (AMI) data for the subset of customers that complete the survey so that we can create seasonal daily average load shapes for these households. This will allow us to examine in greater detail what is driving energy use (e.g., AC versus no AC) and potential responsiveness to TOU rates. The AMI analysis will also allow us to link load shape patterns to survey responses on household demographics, home characteristics, and attitudes regarding energy use and energy efficiency. Overall, we plan to look at the following metrics:

    - Annual kWh
    - On-peak, mid-peak, off-peak kWh for summer and winter
    - Incremental kWh per CDD and HDD – an estimate of their heating and cooling loads

Once this characterization is established, it will be used to create a statistically representative sample for the multi-mode survey and help guide the structure of the focus group interviews. At the back end, expanding the results from the survey to this low-income user characterization will help us understand the size and/or relative impact of various policy and program recommendations made at the end of this study.

Table 2 shows an illustrative group of hypothesized characteristics and provides an initial assignment of categories regarding observability and addressability by the ESA program. Note that the actual filtering process for identifying addressability is more nuanced than the high level characterization provided in the last column of the table. The table demonstrates that most of the data to identify reasons for high and low usage are **not observable in IOU data**.

Much of the data used in the user characterization will help with a summary level analysis of high and low users. Summary level analysis will utilize some of the proxy data identified in Table 2 (such as the percentage of homes in an area that are likely to be large), but we will not be able to tie certain proxy data to specific customer accounts. The implication is that the program will likely need to rely on the implementer's own investigation of a household's size, age, etc. if recommendations from this research suggest that there is value in targeting such households.

Table 2: Assessment of Ability to Identify Homes with Hypothesized Characteristics

| Characteristic | Hypothesis | | Observable in IOU Data | Observable via Manual Lookups | Observable via Proxy Data | Addressable via ESA Program Changes |
	Low Users	High Users				
Appliance Efficiency	Higher	Lower	No	No	~Load shape, heating/cooling slope (cannot distinguish between high efficiency and low comfort)	Addressable through current ESA program
Home Size	Smaller	Larger	No	Yes, MLS and rental listings	By geography (% likelihood of being large)	Not addressable through offerings but may be useful for targeting or tailored messaging
Home Type	MF	SF	No, inconsistent	Yes, MLS	By geography (% likelihood of being MF), housing density	Not addressable through offerings but may be useful for targeting or tailored messaging
Climate (HDD and CDD)	Moderate	More extreme	Yes, by geography	Yes	-	Addressable through current ESA program
Home Vintage	Newer	Older	No, inconsistent	Yes, MLS	By geography (% likelihood of being ___)	Not addressable through offerings but may be useful for targeting or tailored messaging
Number of Home Electronics	Fewer	More	No	No	~Load shape, spikes in consumption unrelated to HVAC hours	Only addressable with custom track outside of ESA. Otherwise risk offering more electronics to other customers
Number of Occupants	Fewer	More	Should be in CARE/FERA applications for all except SDG&E	No	None known	Addressable through current ESA program
Home Ownership	Rent	Own	No	Yes, MLS and rental listings	Account tenure	Not addressable through offerings but may be useful for targeting or tailored messaging
Home Occupant(s) Health Issues	Fewer	More	Yes, but only for Medical Baseline	Yes, Medical Baseline	The Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS) by geography and demographics	May be useful for targeting or tailored messaging, particularly for medical baseline customers
HH Occupant(s)' Awareness of Energy Efficiency	Higher	Lower	No	No	None known	Possible to address within scope changes to ESA such as increased education of offerings or actions that can be taken

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Background Research and Secondary Data Analysis Deliverables
</div>

- Analysis plan linked to specific data collected
- **Interim Results**: User Characterization Draft Memo
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1.4 Quantitative Primary Data Collection and Analysis

The low-income user characterization (comprised of the background research and secondary data analysis) will provide a sample frame for primary data collection, with enough detail for appropriate weighting to the population of high and low users and for designing a sample that can yield statistically representative results.

We will conduct a multi-mode (primarily web) survey of 900 high and low users that uses both email and physical mail (postcard) recruitment and offers the option for interested respondents to call staff at Ewald & Wasserman (our partner for survey and focus group implementation) and arrange to take the survey by phone in either Spanish or English. Participants will be given $25 to thank them for their time.

The survey will gather self-reported information on what causes high and low users to fall into the extreme ends of usage in their homes, as well as the degree to which they make compromises on comfort or reasonable living conditions to reduce energy bills. Ultimately, this information will be used to refine the characterization of high and low users and to develop recommendations for program changes and modifications that will be tested through 90 minute in-person focus groups where participants will be recruited by Ewald & Wasserman and offered an incentive of $150.

Multi-Mode Survey Sample Quotas

The multi-mode survey will be the main source of primary data collected in our proposed approach; it will be used to provide additional detail for the analysis of existing secondary data sources. The survey will be conducted on both high and low users and will be no more than 20 minutes in length. Respondents will be thanked with a $25 physical or emailed gift card.

We believe that a web survey is the optimal mode to reach these households, with the option for a phone survey for respondents who are not as comfortable performing tasks online (e.g., elderly, disabled, or those without convenient web access). We will send postcards inviting customers to an online survey or giving them a call-in number to take the survey if they would prefer. Our multi-mode approach accounts for this move away from phone interviews while still allowing the method to be utilized for respondents who prefer it.

We will conduct 900 surveys with low-income households using sample quotas established by four climate groups (described below) and usage level (high and low); we will use the CARE flag in the utility data to identify low-income households in addition to the FERA flag since FERA has the same income requirement as ESA.

We have already begun to utilize 2019 Athens data to characterize CARE customers by cooling and heating degree days (HDDs and CDDs, respectively). Without customer data, this does not yet account for high and low users, but it does help to identify regional segments that will be valuable to use for stratification.

Table 3 shows our mapping of climate zones to the number of HDDs and CDDs.[16] We placed each climate zone into either a high-HDD or low-HDD and a high-CDD or low-CDD group. This led to four categories based on regional HDDs/CDDs. Those with high-HDDs and high-CDDs are expected to have large heating and cooling loads. Those with low-HDDs and low-CDDs are expected to have low heating and cooling loads and exist in more temperate climates.

Table 3: Climate Zone Mapped to HDDs and CDDs and Evergreen Categorization

CA Zone	HDD	CDD	Evergreen HDD/CDD Category
1	4,295	15	High-Low
2	3,144	500	High-Low
3	3,071	183	High-Low
4	2,550	666	High-Low
5	2,654	464	High-Low
6	1,383	742	Low-Low
7	1,497	865	Low-Low
8	1,481	1,072	Low-Low
9	1,460	1,456	Low-High
10	1,685	1,620	Low-High
11	3,149	1,354	High-High
12	2,621	1,226	High-High
13	2,443	1,599	High-High

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[16] The Pacific Energy Center's Guide to: California Climate Zones and Bioclimatic Design. 2006.

CA Zone	HDD	CDD	Evergreen HDD/CDD Category
14	2,422	3,056	High-High
15	1,177	4,760	Low-High
16	5,057	596	High-Low

Table 4 shows that much of the high-HDD high-CDD group resides in PG&E's service territory, whereas the low-HDD and low-CDD groups reside in Southern California.

Table 4: Percentage of the Evergreen HDD/CDD Category CARE-Eligible Households That Are Served by Each IOU

Evergreen HDD/CDD Category	PG&E	SCE	SoCalGas	SDG&E
High-High	69%	17%	14%	0%
High-Low	88%	4%	8%	0%
Low-High	0%	37%	57%	5%
Low-Low	0%	40%	42%	18%

Table 5 show the climate category across each IOU. This will be relevant to consider as we continue working on our sample design.

Table 5: Percentage of the Utility CARE Eligible Households Within the Evergreen HDD/CDD Category

Evergreen HDD/CDD Category	PG&E	SCE	SoCalGas	SDG&E
High-High	58%	15%	10%	1%
High-Low	42%	2%	3%	0%
Low-High	0%	44%	54%	27%
Low-Low	0%	38%	32%	72%

This sampling strategy will allow us to look at different drivers *within* the high and low user groups. By looking at high users outside the most cooling-dominant climate zones, we can capture drivers of high usage beyond extensive cooling needs. This strategy will also help identify low users that are making energy sacrifices in more extreme climate areas.

Survey Language

The survey will be offered in English (quota of 700 completes) and Spanish (quota of 200 completes).

Survey Instrument Development

To develop the survey instrument, we will build on prior research to answer questions about drivers, behavior, and what may be contributing to high and low use. Table 6 maps the hypothesized characteristics to the research activity that will inform it. A 1 indicates that a research activity is the primary source of information and a 2 indicates that the research activity is the secondary source.

Table 6: Mapping of Research Sources to Characteristics of High and Low Users

| | Hypothesized Characteristics | | Source | | |
	High Users	Low Users	Survey	User Char	Load Shapes
Behavior or Residents	**Behavior** (1A) behavior driven by lack of conservation due to lack of education or other issues (1H)	**Behavior**: Low users who practice healthy conservation (2A)	1		
		Behavior: low usage driven by attitudes and behaviors associated with desirable conservation and/or environmental concerns (2E)	1		
	Behavior: Which high users can reduce usage *without* impacting HC&S? (1C)	**Behavior** (2A): Low users conserving at expense of essential needs. Other correlated traits? (2B.1)	1		2
Immutable Characteristic of Home	Single-family dwellers (1B)	Multi-family dwellers (2A, 2G)	1	2 (IOU data, though inconsistent)	
	Location (DAC, Tribal, Rural, PSPS zone, wildfire zone)			1 (geographic indicators)	
	Large homes (1B)	Small homes (2A, 2G)	1		
	Home vintage (2A.1) - older	Home vintage (2A.1) - newer	1		
	Extreme climate zones (1B)	Moderate climate zones (1B)		1 (IOU data)	
Char of Home	Low efficiency of (appliances in) home (1A)	High efficiency of (appliances in) home (2A)	1		
Characteristic of Residents	Age of residents (children in home, working adults in homes) (1B)	Age of residents (elderly, and elderly non-working adults) (1B)	1	2 (ACS)	
	Disabled (1B)		1	2 (ACS)	
	Veteran (1B)		1	2 (ACS)	
	Affordability or income (3E) / energy burden, CARE/FERA enrollment		1		
	Homeowners (1B)	Renters (2A.1)	1	2 (ACS)	
	Due to medical or health related need (1I)	No medical or health related need	1	2 (IOU data)	
	Arrearages and/or disconnections			1 (IOU data)	
	Medical Baseline (1B) and/or *respiratory issues*	Not on medical baseline	1	2 (IOU data, TBD re:	
	More residents (2A, 2G)	Fewer residents (2A, 2G)	1	2 (ACS)	
		Others (2H)	1		

We will ask about demographics (number in household, language, ethnicity, age of household members, tenure at current home, home type, own/rent, age of bill payer, veteran status, medical baseline, and health status) and building characteristics and will consider how customer-identified heating and cooling needs map to existing program offerings, accounting for the varied offerings by climate zone and service territory.

Beyond these home characteristics and demographics, the survey will address and include the following:

- Questions that help delineate low users that model behavioral strategies to reduce energy usage with and without risk to their **health and safety;**

- A factoring of how **customer perceptions** affect their responses;

- An understanding of the types of appliances and electronics used in households;

- A question battery to understand customer **awareness of how to reduce energy usage**; and

- Questions about **willingness to make behavioral changes**.

We will tailor questions for the high and low user groups as needed, but we believe that asking the same questions of all respondents (particularly about health, comfort, and safety) can help us better understand if there are differences between groups attributable to **real or perceived sacrifices** in health, comfort, and safety. The questions will also have response categories structured in such a way (i.e., numerical) that we can test for statistically significant differences in responses between the high and low user groups.

We plan to leverage questions developed by Evergreen for previous studies, specifically when they allow findings to have a point of comparison. As an example, for the 2016 LINA, we asked customers to provide their degree of agreement with the following questions in order to assess energy insecurity:

a) We only use electricity when it's really needed; there is no way we could cut down.
b) We have to conserve energy at home because we can't afford to pay higher utility bills.
c) My family's health would suffer if we heated our home any less in the winter.
d) My family's health would suffer if we cooled our home any less in the summer.

These questions will allow us to identify if customers (low users in particular) are making potential sacrifices in their health that may be contributing to them being a low user. In the 2016 LINA, 42 percent of households reported that their health would suffer if they heated their home less. By using this set of questions and adding new questions about other customer actions (e.g., spending time in less practical spaces of their home to keep cool/warm), we can arrive at a better understanding of what the program may need to address to reach its goals.

> **Quantitative (Primary) Data Collection and Analysis Deliverables**
>
> • Draft and Final Sampling Plan
> • Draft and Final Outreach Material (postcards, incoming phone script)
> • Draft and Final Survey
> • **Interim Results**: Summary of Findings from Survey

1.5 Qualitative Primary Data Collection and Analysis

Toward the end of our data collection period, we will conduct focus groups to finalize study findings and test the viability of tentative recommendations about how low-income high and low users could be better served by ESA. Focus groups will also be used to dive deeper on findings from the user characterization and survey.

The focus groups will allow us to:

- Confirm or better understand the results from the other parts of the study;
- Assess the implications of high and low usage on households, their needs, and their potential engagement with ESA; and
- Vet the viability of potential recommendations and suggestions with the targeted households.

As a reminder, solutions and recommendations will fit into the following categories, which are mapped to the full set of research questions in Section 3:

Table 7: Research Questions Related to Solutions and Recommendations

Solutions/Recommendations
Increase education (e.g. around possible conservation actions) (3F)
Offerings to mitigate health and safety risks associated with extreme/unhealthy conservation (2B.2)
Climate specific needs ESA can address (1G)
Behavioral incentives (1D)
Program modifications (3F)
Outreach: Can outreach be modified to identify those who benefit most or least? (3H)

We propose to conduct a total of seven in-person focus groups located in varied geographies across the four IOU service territories. Focus group participants will be the primary decision-makers for low income (ESA-eligible) households with either high or low energy usage and will be offered $150 for their participation. Focus groups will occur in-person in three different locations that will be selected based on findings from the user characterization, proximity to language speakers, and the survey findings. Focus groups will be 90 minutes each and will include snacks and beverages. Video recordings and translations will be provided and depending on location, we can have the opportunity for study team staff to attend. We will draw from the four language groups included in this study, so the final focus group make-up will be:

- Four groups in English – two with high users and two with low users;
- One group in Spanish – representing either high or low users, depending on the tendency we see in survey data for culturally Hispanic or Spanish-speaking households to be higher or lower energy users;
- Two in a non-English non-Spanish language. One focus group will be done in each of the top two relevant languages (i.e., Cantonese, Mandarin, Tagalog, etc.), again either of high or low users. These three languages are likely the most common languages spoken in low-income households in California after English and Spanish, although the Census data sometime group Cantonese and Mandarin together, which makes it difficult to determine a ranking of the most common languages within the low-income population.

Evergreen will lead the design of the focus group discussions with input from the study team. Evergreen will also involve the study team in the choices of the targeted participant characteristics for the three non-English groups. Focus group recruitment will be done by Ewald & Wasserman. While English and Spanish focus groups will be recruited from completed surveys, the two focus groups conducted in other languages will be recruited separately. The actual moderation will be done by professional focus group moderators affiliated with Ewald & Wasserman who are bilingual speakers of the respective languages. The moderators will synthesize the results and themes of each focus group, and the Evergreen team will assess the implications of these take-aways and themes.

Discussion questions for the focus groups will be influenced by the study results up to that point; we anticipate including the following general topics:

- The degree to which households think about their energy usage and make efforts to control it;
- The degree to which energy bills are a concern and their relative role in making ends meet;
- Understanding how households make trade-offs among comfort, convenience, and energy use;

- Understanding what households consciously do to control energy consumption;

- Perceptions of things households can do (but do not do regularly) to control energy consumption further;

- Main drivers of energy consumption in their homes;

- The degree of comfort they experience in their homes, including self-reports of actual temperatures, thermostat settings, and temperature management practices across seasons;

- Unique needs for higher or lower temperatures or other uses of energy in the household;

- Sources of information about saving energy or reducing energy costs;

- Perceptions and reactions to current ESA offerings; and

- Perceptions and reactions to possible recommendations our study team has for the ESA program (as a way of exploring the value households see in them and their potential).

Qualitative (Primary) Data Collection and Analysis Deliverables

- Focus Groups
  - Draft focus group guide and group selection strategy

1.6 Synthesis and Recommendations

The results of the data collection and analysis will provide a detailed picture of low-income high and low energy users in the service territories of the four IOUs in California, one that captures all the important variations and usage drivers in their households. The user characterization and the quantitative multi-mode survey data will enable us to understand the different types of households and track how well factors such as climate, house size, family size, and health concerns are correlated with energy use. The AMI load shape analysis of survey respondents will further improve our understanding of how these key factors relate to how energy is consumed throughout the day.

The survey, focus groups, and in-language data collection will provide additional information on the home characteristics and variety of needs across different user groups. This information may also support the creation of customer profiles within both the high and low user customer groups, similar to what was done in prior segmentation studies. This allows for more tailored recommendations rather than a 'one size fits all' approach that will miss opportunities for each user group.

1.6.1 Formalizing the Synthesis Process

With multiple research activities and the need to focus on recommendations that fit within the ESA program's reach, our study approach includes time for internal Evergreen meetings to discuss each research phase as the study progresses. Specifically, this will include:

- Internal meetings as the team writes interim, draft, and final reports to allow for brainstorming across research activities and to develop findings in a group setting.
- Reviews of findings by team members who were not involved in specific research (such as having a staff member who worked on the user characterization review deliverables such as focus group guides and writeups) with the goal of ensuring that research will lead to clear recommendations relevant to the program and that are supported by the data.

Synthesizing results in a way that leads to *actionable* recommendations will require a systematic approach to understand what characteristics of low and high users can and cannot be modified and that also considers how identified areas can or cannot be addressed by the ESA program. As mentioned above, we developed a list that can help to focus research on actionable program changes both during the research development phase and as Evergreen comes together as a team to draw conclusions from completed research. At this phase, Evergreen will also address the question of how program modifications may raise concerns regarding equity as to not reward high usage or penalize low users with fewer upgrade opportunities. Characteristics of low and high users will fit into one of the following categories:

- ❏ Addressable through current ESA program *or*
- ❏ Possible to address within scope changes to ESA (measures, targeting, or screening*) or*
- ❏ Not addressable

Table 8: Project Timeline and Deliverables

▼ Research	April 4, 2025 → May 1, 2025
▼ 📅 Data Collection/Characterization	May 1, 2024 → June 1, 2024
▶ weekly progress reports	May 17, 2024 → June 1, 2024
▶ analysis plan linked to specific data collected	May 17, 2024
▶ analysis plan linked to sampling plan	May 17, 2024
▶ Analysis	May 23, 2024 → May 31, 2024
▶ User Characterization Draft Memo	June 1, 2024 → June 30, 2024
+ New sub-item	
▼ 🎞 Multi-mode Survey	August 1, 2024 → December 30, 2024
▶ Draft guide and outreach material	August 30, 2024
▶ Survey in field	October 1, 2024 → December 30, 2024
▶ Final guide and outreach material	September 30, 2024
▶ Sampling Plan	August 16, 2024
+ New sub-item	
▶ AMI Load Shapes	January 30, 2025 → April 17, 2025
▼ 🗣 Focus Groups	March 1, 2025 → May 30, 2025
▶ Draft focus group guide and group selection	March 1, 2025 → March 30, 2025
▶ Focus Group Fielding	May 1, 2025 → May 31, 2025
+ New sub-item	
+ New sub-item	
▼ 📝 Reporting	
▶ Draft Interim Summary of Survey Findings	March 1, 2025 → March 31, 2025
▶ Draft User Characterization	
▼ Draft Report	April 1, 2025 → June 30, 2025
▶ Draft Report that conforms to CPUC/IOU Guidelines	June 30, 2025
+ New sub-item	
▼ Public Workshop/Draft Report	July 1, 2025 → September 30, 2025
▶ PowerPoint Presentation/Agenda	September 8, 2025
▶ Presentation on Draft Report	September 15, 2025
▶ Workshop Minutes	September 22, 2025
▶ Comment matrix with team input	September 29, 2025
▶ Revised schedule for finalizing report	September 29, 2025
+ New sub-item	
▼ Final Report	October 1, 2025 → December 27, 2025
▶ Final report that conforms to CPUC and IOU guid	December 9, 2025
▶ Data documentation and appendicies	December 9, 2025
▶ Survey cross-tabulations	December 9, 2025
▶ Project database and documentation	December 9, 2025
▶ Data dictionary	December 9, 2025

The research questions below come from the request for proposals (RFP) and from discussions with the study team. The study team screened the full list at the outset of the study planning process, identifying which are primary and must be addressed by the study research and which are secondary and may not be fully addressable by this current study and its resources and timeframe. Secondary research questions are marked with an asterisk (*).

1A. What are the drivers of high usage? Efficiency of home, behavior, etc.?

1B. Are certain customer segments more likely to exhibit high usage? (e.g., single-family dwellers, homeowners; those on medical baseline, disabled, veteran, elderly; extreme climate zones; large homes.)

1C. Which high-usage segments are more likely able to reduce usage without impacting their health or safety?

1D. What mix of measures, education, and behavioral incentives might ESA offer to these customers? How big is this group of high users? (What % of high users fall into this group?)

1E. What "high usage" issues can be addressed by the ESA program? (measures offered or education?) How big is this group (what percentage of high users fall into this group)?

1F. What characteristics/factors of high usage are unlikely to be mitigated by ESA?

1G. To what extent is high usage associated with weather or climate? What climate-specific needs may be addressed via ESA?

1H. To what extent is high usage driven by a lack of conservation due to a lack of education or other issues?

1I. To what extent is high usage driven by medical or health-related needs?

2A. What are the drivers of low usage? Efficiency of home, housing type, behavior, etc.? Healthy conservation; dangerous conservation, small home, few in the home, etc.?

*2A.1. Are there segments more likely to exhibit low usage? (e.g., multifamily renters, small homes, new homes, homes with few residents, etc.)

2A.2. What are the key characteristics of low-usage customers?

2B. To what extent is low usage driven by extreme conservation at the expense of basic health and safety needs?

2B.1. What proportion of the low-usage households are conserving at the expense of essential needs? What segments or types of individuals/households tend to fall into this group?

2B.2. What, if anything, can ESA offer to mitigate health and safety risks that may be associated with extreme/unhealthy conservation?

2C. What, if any, needs of low usage customers can be accommodated by what ESA offers?

2D. How big is this group of low users? (What % of low users fall into this group?)

*2E. To what extent is low usage driven by attitudes and behaviors associated with desirable conservation and/or environmental concerns?

*2F. Roughly what proportion of the low-usage households fall into this group?

*2G. To what extent is low usage based on other factors such as size of home, number in home, and/or type of home?

2H. What factor or factors best characterize the low-usage segment of the low-income population?

3A. How are customers impacted by peak and non-peak time-of-use rates?

*3B. How does customers' understanding of TOU rates impact their usage?

*3C. Can we improve IOU communications and education on TOU rates?

*3D. How will building electrification and reduced natural gas incentives impact these customers?

*3E. To what extent does affordability or income correlate with energy use?

3F. What modifications might improve information and education for high energy use households, for low energy use households, and for segments with different information needs? How can we increase knowledge re conservation?

*3G. What modifications can improve outreach to identify households that would not benefit significantly from the ESA program? (cost savings)

*3H. What modifications can improve outreach to identify households that would benefit the most from the program? (getting results)

The final question was redefined as a question regarding findings rather than a research question in and of itself by the study team during the review of the work plan:

*3I. Are there modifications that equitably address the needs of both high use and low use customer segments? (e.g., not reward high use with more measures; or penalize low users with fewer measure upgrade opportunities)