

SOLAR ON MULTIFAMILY AFFORDABLE HOUSING SECOND TRIENNIAL REPORT

Submitted to:
California Public Utilities Commission

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1 EXECUTIVE SUMMARY

This report represents the second triennial evaluation of the Solar on Multifamily Affordable Housing (SOMAH) Program. The goal of this report is to provide an update on the SOMAH Program's progress towards meeting its goals via an assessment of the program's metrics, key performance indicators (KPIs), and M&V reporting requirements (as outlined in D.17-12-022 and PU Code 2870(j) and 913.8). This report will also provide an assessment of the program's impacts (energy, environmental, and economic), cost-effectiveness, and progress made by the SOMAH PA and IOUs to implement the recommendations stemming from the first SOMAH evaluation.

1.1 BACKGROUND

California State Assembly Bill (AB) 693 directed the California Public Utilities Commission (CPUC) to institute a new program intended to make qualifying solar energy systems accessible to low-income and disadvantaged communities (DAC).¹ In December 2017, the CPUC issued Decision (D.) 17-12-022 creating the SOMAH Program and establishing program goals and eligibility requirements. The primary goal of this program is to install solar energy systems that have a generating capacity equivalent to at least 300 MW (CEC-AC) on qualified multifamily affordable housing properties through December 31, 2030² and to increase workforce development and training activities to support economic development in underserved communities.

The SOMAH Program provides significant subsidies for the installation of solar photovoltaic (PV) systems on qualifying multifamily affordable housing properties (i.e., multifamily housing financed with low-income housing tax credits, tax-exempt mortgage revenue bonds, general obligation bonds, or local, state, or federal loans or grants). To qualify for SOMAH incentives, properties must be existing deed restricted properties, have at least five units, and separately metered tenant units. They must also satisfy either having A) 80% of their total tenant households with incomes at or below 60% of the area median income or B) be in a DAC that scores in the top 25% of census tracts statewide, as identified by the Office of Environmental Health Hazard Assessment (OEHHA) on behalf of the California Environmental Protection Agency (CalEPA).

¹ California AB 693. Multifamily Affordable Housing Solar Roofs Program. Eggman, 2015.
https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB693

² This program is funded by Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas and Electric (SDG&E), Liberty Utilities, and PacifiCorp, collectively the investor-owned utilities or IOUs.

1.2 RESEARCH AREA AND EVALUATION APPROACH

Table 1-1 presents the primary areas of research for the second triennial evaluation of the SOMAH Program along with an overview of the approach employed to conduct this research. A comprehensive overview of the evaluation methods used is provided in Section 3 of this report.

TABLE 1-1: RESEARCH FOCUS AND EVALUATION APPROACH

Research Focus	Evaluation Approach
Program Participation Assessment to quantify and characterize SOMAH participation using metrics such as the number and size of installed projects, the location of homes served and eligible homes not served, and an accounting of program and project costs by system purchase type.	Comprehensive analysis of SOMAH application and project data stored in the PowerClerk program tracking database.
Program Process Assessment to assess progress made towards minimizing identified contractor and property owner barriers to participation and the effectiveness of SOMAH's recent ME&O and workforce development activities, and to identify areas where continued improvements are needed to help the SOMAH Program achieve its goals.	In-depth interviews with participating and non-participating contractors and property owners, the SOMAH PA, CBOs and other program partners to assess current experiences with the SOMAH Program and opportunities for improvement.
Program Impact Assessment to quantify SOMAH's energy (kWh and kW), environmental (GHG and criteria pollutants), and economic (tenant and common area bill savings and CARE subsidy reductions) impacts.	PV simulation adjusted by performance ratios; Calculate utility energy and demand impacts using adjusted PV production; Estimate GHG reductions; Bill modeling using Verdant's Cost Effectiveness Model.
Program Cost-Effectiveness Assessment to determine the cost-effectiveness of the SOMAH Program using three California Standard Practice Manual tests.	Model cost-effectiveness for each completed SOMAH project using Verdant's Cost Effectiveness Model, historical customer consumption, and PV simulation adjusted by performance ratios.

1.3 KEY EVALUATION FINDINGS

The key evaluation findings and select program recommendations are presented here.

Participation and Process Findings and Recommendations

Program Performance Findings

- **SOMAH is capable of reaching 10-year program goal**, though new strategies for outreach and participation barrier reduction are needed to achieve 300MW
- **Application rate continues to decline**. 49 applications submitted in 2022
- **Average project PV capacity has decreased to 150 kW**
- **Participation varies by IOU** with PG&E having the largest share of projects, followed by SCE and SDG&E; PacifiCorp and Liberty Utilities only have 3 applications total

Program Participation and Eligibility Findings and Recommendations

- **Fewer Track A applications with 2x the cancellation rate** --> reassess bid requirements and allow projects to transition to Track B
- **DAC applications rose slightly (28% to 31%)**
- **73% of submitted applications are TPO with higher completion rates and lower cancellation rates than HCO** --> Increase engagement & support of HCO projects
- **69% of applications submitted by 21 property owners** (with 10+ applications each)
- **Eligibility currently excludes properties that could benefit from SOMAH**
- **Prime contractor diversity is lacking** but >50% of subcontracted projects completed by small or underrepresented owned businesses

Program Awareness and Motivations to Participate Findings and Recommendations

- **Program awareness driven by contractor outreach** ---> Reevaluate role of CBOs and change marketing materials to highlight property owner financial benefits
- **Participation amongst city and county housing authorities has increased 4x**
- **The SOMAH PA has developed and added case studies of completed projects** to illustrate the energy, environmental, and tenant benefits of the program to their website

Contractor Experience Findings and Recommendations

- **Smaller contractors face significant challenges with administrative aspects of SOMAH** --> Increase outreach and offer additional support
- **Smaller contractors report difficulty "breaking into" market against larger solar contractors** --> Offer additional trainings/information on how to secure leads and find projects
- **Financial cost of the program and inability to withstand financial risk limits smaller contractor participation** --> Make progress payment pathway the default, not opt-in
- **Contractors report elongated timelines to communicate and fix program issues** --> Establish a communication channel for program feedback to the PA and CPUC

Project Cancellations, Future Participation Findings and Recommendations

- **Cancellation rate has increased to 40%** (up from 22% at last evaluation)
- **Nearly 2/3 of cancellations are potentially 'recoverable'** --> Prioritize outreach to these applications to facilitate future participation
- **There are still many eligible, non-participating property owners unaware of program** --> Prioritize direct outreach to non-participating property owners

Participation and Process Findings and Recommendations

Project Cancellations, Future Participation Findings, and Recommendations (cont.)

- **75% of participating and 80% of non-participating property owners likely to submit future application** --> Prioritize building relationships with participating property owners to identify additional eligible properties and provide necessary support for future projects

Project Cost Findings

- TPO project costs are more expensive than HCOs, but incentive rates are lower because of ITC
- SOMAH project costs are comparable to similar programs

Application Processing Findings and Recommendations

- **Participation timelines continue to be long.** Average 2 years and 7 months from application submission to incentive paid.
- **Interconnection timelines are long and burdensome to contractors and property owners (estimate average 5-8 month timeline)** --> PA and IOUs should work together to expedite this process
- **Time from interconnection to bill credits is long (up to four months) but improving**
- **Plans to pair SOMAH PV with battery storage has dropped (6 active projects)** --> Update handbook with guidance on pairing SOMAH PV with battery storage

Program Tracking Data Findings and Recommendations

- **Program tracking data continues to improve** --> continue to include additional fields as needed

Tenant Education Findings and Recommendations

- **Low awareness of tenant education materials & tenants rely on property owners for bill questions** --> Develop tenant partnership role for tenants to educate fellow tenants and support property owners in ongoing tenant education and support

Workforce Development Findings and Recommendations

- **Low contractor awareness of job training resources** --> Greater outreach to contractors to ensure awareness of these resources
- **Most workforce development trainees were brought on as temporary employees.** 11% still employed at training company 6 months later.

Impact & Cost-Effectiveness Findings and Recommendations

PV Production and Energy Impact Findings

- **Observed PV production:** 898 MWh in 2021 and 9,199 MWh in 2022
- 77% realization rate (observed 2022 full-year) --> poor performance
- **Forecasted PV production:** 16,202 MWh annually (completed projects) and 83,959 MWh annually (completed and active projects)
- 85% realization rate (forecasted) --> poor performance

Customer Electricity Consumption Findings

- Following PV installation, average change in monthly consumption per tenant was small relative to consumption: -18.1 kWh in PG&E, -4.8 kWh in SDG&E, and +3.5 kWh in SCE

Demand Impacts Findings

- **CAISO Gross Peak** --> coincident generation of 146 kW (2021) and 2,354 kW (2022)
- **CAISO Net Peak** --> coincident generation of 32 kW (2021) and 5 kW (2022)

Environmental Impact Findings

- **Observed Emissions Reductions:** 229 metric tons of CO₂ (2021) and 2,351 metric tons of CO₂ (2022)
- **Forecasted Emissions Reductions:** 3,983 metric tons of CO₂ per year (completed projects) and 20,835 metric tons of CO₂ per year (completed and active projects)
- **Forecasted Emissions Reductions Monetary Value:** \$101k/year (completed projects) and \$539k/year (completed and active projects)

Economic Impact Findings

- **Common Area:** 58% saved on average monthly in 2022
- **Tenant:** \$39/month, or 59% saved on average monthly tenant bill in 2022
- **CARE Tenant:** \$34/month, or 60% saved on average monthly bill in 2022
- Spending reduced on CARE budget by over \$800,000 in 2022 (assuming tenant on CARE year-round)

Cost-Effectiveness Assessment Findings

- **Benefit-cost ratios:** 0.61 TRC, 0.65 sTRC, and 0.19 RIM

Impact and Cost-Effectiveness Recommendations

- Increase the SOMAH PA monitoring threshold that flags underperforming systems to 90%
- Track and report SOMAH bill credits as a secondary measure of data quality and system performance
- Consider additional system performance enforcement measures
- Research update to incentive calculations away from EPBB

2 INTRODUCTION

The Solar on Multifamily Affordable Housing (SOMAH) Program offers incentives to applicants for the installation of solar photovoltaic (PV) energy systems on multifamily affordable housing as a means of increasing access to solar energy and bill savings among low-income households and disadvantaged communities (DACs) throughout California. The SOMAH Program also engages in workforce development and training activities to support economic development in underserved communities.

Verdant Associates (Verdant) and ILLUME Advising (ILLUME) (the “evaluation team”) have been contracted by San Diego Gas and Electric (SDG&E) on behalf of the California Public Utilities Commission (CPUC) to conduct the second triennial evaluation of the SOMAH Program, as directed by CPUC Decision (D.) 17-12-022. The evaluation team also conducted the first evaluation of the SOMAH Program (completed in 2021) which provided feedback on the program’s evaluability and assessed the program’s performance against a series of metrics and key performance indicators (KPIs), and provided actionable recommendations for program improvement. This report provides an update on the SOMAH Program’s progress towards meeting its goals via an assessment of the program’s metrics, key performance indicators (KPIs), and M&V reporting requirements (as outlined in D.17-12-022 and PU Code 2870(j) and 913.8). It also assesses the program’s impacts (energy, environmental, and economic), cost-effectiveness, and progress made by the SOMAH PA and IOUs to implement the recommendations stemming from the first SOMAH evaluation.

This report also fulfills the SOMAH reporting requirements as directed by Public Utilities (PU) Code 913.8. A matrix of the SOMAH reporting requirements and the evaluation team’s fulfillment of these requirements is provided in Appendix A.

2.1 BACKGROUND

California State Assembly Bill (AB) 693 directed the CPUC to institute a new program intended to make qualifying solar energy systems more accessible to low-income and DACs.³ The goal of this program is to install solar energy systems that have a generating capacity equivalent to at least 300 MW (CEC-AC) on qualified multifamily affordable housing properties through December 31, 2030.⁴ In accordance with AB 693, the CPUC issued D.17-12-022 on December 14, 2017, creating the SOMAH Program and establishing

³ California AB 693. Multifamily Affordable Housing Solar Roofs Program. Eggman, 2015.
https://leginfo.ca.gov/faces/billTextClient.xhtml?bill_id=201520160AB693

⁴ This program is funded by Pacific Gas and Electric Company (PG&E), Southern California Edison Company (SCE), San Diego Gas and Electric (SDG&E), Liberty Utilities, and PacifiCorp, collectively the investor-owned utilities or IOUs.

program goals and eligibility requirements. On April 23, 2020, the CPUC issued D.20-04-012 that determined that there is adequate revenue, participation and interest in the SOMAH Program. That decision continued authorization of allocation of funds to the SOMAH Program through June 30, 2026.

The SOMAH Program is jointly administered statewide by a single program administrator (PA) team made up of the Association for Energy Affordability (AEA), Center for Sustainable Energy (CSE), GRID Alternatives (GRID), and the California Housing Partnership Corporation (CHPC). The program has distinct rules and eligibility requirements, including an increasing focus on serving properties in DACs. In compliance with the terms of AB 693, the SOMAH Program provides significant subsidies for the installation of solar photovoltaic (PV) systems on qualifying multifamily affordable housing properties (i.e., multifamily housing financed with low-income housing tax credits, tax-exempt mortgage revenue bonds, general obligation bonds, or local, state, or federal loans or grants). The SOMAH Program serves utility and community choice aggregator customers in the territories of PG&E, SCE, SDG&E, Liberty Utilities, and PacifiCorp. To qualify for SOMAH incentives, properties must also be occupied by a majority of residents (80%) with incomes at or below 60% of the area median income or be in a DAC, as identified by the Office of Environmental Health Hazard Assessment (OEHHA) on behalf of the California Environmental Protection Agency (CalEPA).

Section 4.1 of D.17-12-022 directs the SOMAH PA to annually evaluate the incentive levels and decrease them to ensure they stay in-line with the actual market cost of solar. The annual incentive step-down, documented in the SOMAH Handbook, calls for reducing the SOMAH incentive levels “either by 5% or by the annual percent decline in residential solar costs as reflected by National Renewable Energy Lab’s cost analysis (whichever is less).” The SOMAH Program incentives were stepped-down in July of 2020 and were slated to be stepped-down again July 2021, however the second step down was put on hold due to a delay in the NREL cost analysis report. In August of 2022, the SOMAH PA issued a Petition for Modification (PFM) to “modify the methodology for calculating an annual step-down in incentives for the SOMAH Program.” In March of 2023, the Commission adopted D.23-03-007 in response to this PFM, which increased SOMAH incentive levels and eliminated the annual incentive step-down process. The new incentive levels were increased beyond incentives levels that were in place at the launch of the SOMAH Program. A summary of the SOMAH incentive levels is provided in Table 4-12 and further discussion of SOMAH incentives is included in Section 4.4.1 of this report.

As of December 31, 2022, the SOMAH program had received 719 applications, of which 287 have been cancelled by property owners (voluntarily withdrawn or unresponsive) or were determined to be

ineligible. The active application capacity is 63 MW_{AC}. The total submitted/reserved incentive amount for these completed and active projects is \$130,000,000.⁵

2.2 PRIMARY RESEARCH OBJECTIVES

The primary research objectives of the second triennial SOMAH evaluation are the following:

- **Objective 1:** Assess progress towards the program goals and metrics, determine cost-effectiveness, and meet Legislative reporting requirements,
- **Objective 2:** Determine electrical system benefits, environmental benefits, workforce outcomes, and customer/participant outcomes, and
- **Objective 3:** Review the progress made for meeting past evaluations' recommendations and identify recommendations for improving the program to meet its goals.

Within this report we will present comprehensive findings and recommendations from the data collection and analysis conducted to meet these research objectives.

2.3 REPORT ORGANIZATION

The remaining sections of this report are organized as follows:

- **Section 3: Evaluation Data and Methods.** This section provides an overview of the evaluation methods used to answer the primary research questions. It includes a summary of the data collection activities, sample sizes, and quantitative analysis completed.
- **Section 4: Participation Assessment.** This section provides a summary and assessment of SOMAH participation to date.
- **Section 5: Process Assessment.** This section presents the results of the SOMAH process assessment activities conducted as part of this evaluation.
- **Section 6: Impact Assessment.** This section presents the results of the second SOMAH impact assessment. It includes estimated energy, environmental, and economic impacts of SOMAH projects.
- **Section 7: Cost-Effectiveness Assessment.** This section provides the results of the SOMAH cost-effectiveness assessment.

⁵ This total represents the reserved incentive, or the submitted incentive amount if the reserved was missing from the program tracking database.

- **Section 8: Findings and Recommendations.** This section presents a summary of the findings and recommendations from the participation, process, impact, and cost-effectiveness assessments of the SOMAH Program. It also includes recommendations for future research.
- **Appendix A: PU Code 913.8.8 Reporting Requirements.** This section presents a table documenting the PU Code reporting requirements for the SOMAH Program and where the reporting results are located.
- **Appendix B: SOMAH Metrics and KPI Assessment.** This section includes an assessment of the current state of the SOMAH Program using the defined metrics and KPIs.
- **Appendix C: Data Collection Activities and Interview Guides.** This section summarizes the data collection activities conducted for this evaluation and includes the contractor and property owner interview guides.
- **Appendix D: Customer Electricity Consumption Regression Methodology.** This section includes further details describing the methodology used for the customer electricity consumption analysis.
- **Appendix E: California Air Resources Board Greenhouse Gas Savings.** This section includes the estimated lifetime greenhouse gas emissions reductions attributable to proceeds per the California Air Resources Board requirements.

3 EVALUATION DATA AND METHODS

3.1 DATA SOURCES AND TOOLS

The primary data sources used in this evaluation included a mix of pre-existing data sources and data collected during evaluation research activities.

Pre-existing data sources

- **SOMAH PowerClerk Project Database** (as of December 31, 2022). This dataset includes SOMAH Program tracking data from all 5 participating utilities service territories, including data on completed, active, and cancelled/withdrawn projects. It was used to assess program participation through 12/31/2022 and to develop the sample frame for the contractor and property owner interviews. VNEM allocation forms were also obtained from the PowerClerk project database for all completed projects.
- **Contractor diversity database.** This database contains a listing of all SOMAH eligible contractors along with firmographic data for these contractors to assess their experience, size, and diversity.
- **Salesforce Eligible Property database.** This database contains recent contact information for property management companies and housing authorities located within California. These data were used to contact non-participating property owners for interviews on SOMAH program awareness.
- **Tenant Education survey data.** This survey data file contains data from the SOMAH PA survey of 84 tenants who participated in SOMAH tenant education.
- **Job Trainee survey data.** This survey data file contains data from the SOMAH PA survey of 7 participating contractors, representing 182 unique job trainees.
- **Bill setup dates.** The SOMAH PA provided data on the date that each completed SOMAH project was set up to begin receiving SOMAH bill credits.
- **California Measurement Advisory Council (CALMAC) weather data.**⁶ This weather data includes both typical (most representative of a span of years) and historical (single year) weather data files for 127 California weather stations.
- **IOU and CAISO 2021 and 2022 hourly load** from the CAISO Open Access Same-time Information System (OASIS) website.⁷

⁶ <https://www.calmac.org/weather.asp>

⁷ <http://oasis.caiso.com>

- **Marginal greenhouse gas (GHG) emissions** signal developed by WattTime.⁸ The real-time marginal carbon dioxide (CO₂) emissions signal represents the compliance signal used for CPUC's Self-Generation Incentive Program (SGIP). The WattTime data are considered a reliable approximation of actual conditions during a particular year.
- **The 2022 CPUC Avoided Cost Calculator v1b⁹** which includes hourly utility avoided costs by climate zone.

Data provided through request from utilities or other sources

- **SOMAH PV generation data.** The lifetime net generation output meter (NGOM) PV interval generation data for completed SOMAH projects was collected from all utilities. Interval PV generation data was also collected from select performance monitoring and reporting service (PMRS) entities and from the SOMAH PA.
- **Utility AMI usage and billing data** for SOMAH project common area and tenant beneficiaries. This data was collected from utilities for completed SOMAH projects starting from one-year prior to the system's PTO date. Additional billing information was collected, including rate selections over time and CARE participation status.
- **Multifamily Affordable Solar Housing (MASH) and Low-Income Weatherization Program (LIWP) PV system cost data.** MASH system cost data was obtained from the California Distributed Generation Statistic website (DG Stats).¹⁰ LIWP PV system cost data was collected directly from the LIWP program administrator.

In-depth Interviews (IDIs) with program stakeholders, administrators, and participants

- **4 IDIs** with SOMAH program administrators,
- **5 IDIs** with participation IOUs,
- **6 IDIs** with program partners, including Community Based Organizations (CBOs) and financing organizations,
- **13 IDIs** with participating and eligible SOMAH contractors, and
- **26 IDIs** with participating and non-participating SOMAH affordable housing property owners.

⁸ <http://sgipsignal.com>

⁹ A copy of the 2022 Avoided Cost Calculator and documentation can be found here:
<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/energy-efficiency/idsm>

¹⁰ <https://www.californiadgstats.ca.gov/>

Additional tools

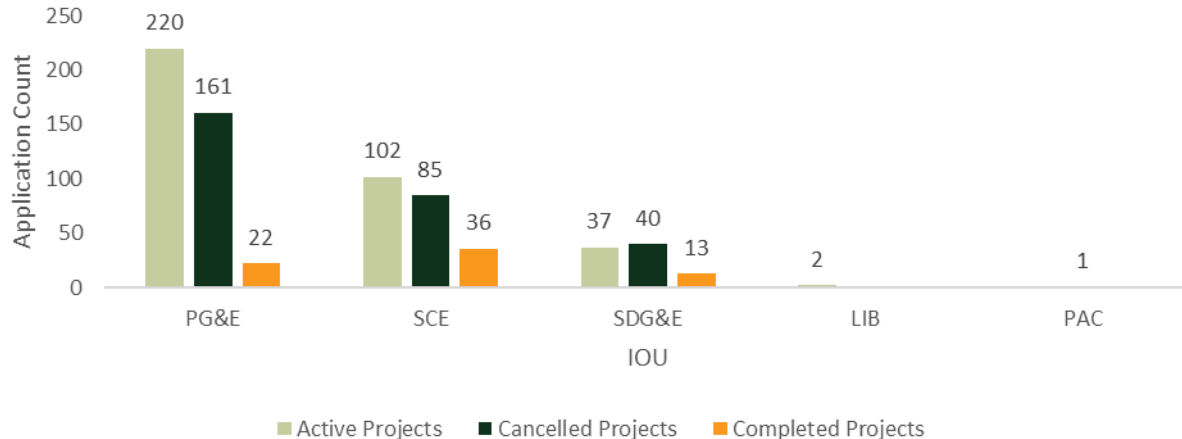
- **Verdant’s Cost Effectiveness and Bill Calculation Model (VCE Model).** In 2020, Verdant completed a cost effectiveness study¹¹ of PG&E, SCE, and SDG&E’s NEM 2.0 tariffs. In support of this study, Verdant created a model to evaluate the cost-effectiveness of PV systems using CPUC Standard Practice Manual (SPM) tests. The model also includes a bill savings module that calculates customer’s total bill payments under various NEM 2.0 tariffs.

3.2 EVALUATION METHODOLOGY

3.2.1 Participation Assessment Methods

The participation assessment included a comprehensive analysis of SOMAH application and project data stored in the PowerClerk program tracking database (www.calsomah.powerclerk.com). The analysis was performed on all submitted SOMAH applications (active, completed, and cancelled/withdrawn) from the program’s inception (July 2019) through December 31st, 2022. The figure below summarizes the status of the 719 applications included in the analysis by IOU.

FIGURE 3-1: SOMAH PROJECT STATUS BY UTILITY (AS OF 12/31/2022)



LIB = 2 Active Projects, PAC = 1 Cancelled Project

3.2.2 Process Assessment Methods

The process assessment relied on numerous interviews with key program actors (the SOMAH PA, the IOUs, and CBOs and other partners) and participating and non-participating contractors and affordable

¹¹ Details on the NEM 2.0 Lookback study can be accessed here: https://verdantassoc.com/wp-content/uploads/NEM-2_Lookback_Study.pdf

housing property owners. These interviews provided detailed information on how the program is currently operating, including the effectiveness of marketing, education, and outreach (ME&O) activities and program changes to address identified contractor and property owner barriers to participation. They also gathered information to assess tenant education and workforce development activities and the later stages of the SOMAH participation process (solar installation, interconnection, and application of bill credits) which were not assessed during the first evaluation due to the limited number of projects that had reached those stages.

3.2.3 Impact Assessment Methods

As of December 31, 2022, a total of 71 SOMAH projects have been completed and have received incentive payments. The key objectives of the impact assessment are to estimate the energy, environmental, and economic impacts of these completed SOMAH projects. The impact assessment also evaluated the impact of completed SOMAH projects on the CARE subsidy.¹²

To develop these impacts, we first estimated the SOMAH system's PV production, analyzed the potential change in customer energy consumption, and estimated the change in utility load after system installation.

PV Production and Energy Impacts

Several types of PV production estimates are reported throughout Section 6 (Impact Assessment Results): These include Simulated PV Production, Observed PV Production, and Forecasted PV production.

Simulated PV Production

We simulated hourly PV generation for all active and completed SOMAH projects; these simulations were used to develop forecasted PV production estimates. We created two types of simulations: Typical weather simulations for all active and completed SOMAH projects, and actual weather simulations using 2021 and 2022 weather data. The actual weather simulations were only developed for completed projects.

PV generation simulations were created using the python package, *pvlb-python*. This package is an open-source software, initially developed by Sandia National Laboratories.¹³ *Pvlb-python* uses different simulation models to estimate electricity production of grid-connected PV systems based on various inputs. We chose to use the PVWatts simulation model to best align with the EPBB calculator used to

¹² Due to the timing of bill credit setup, we did not evaluate the impact of SOMAH on customer arrearages.

¹³ William F. Holmgren, Clifford W. Hansen, and Mark A. Mikofski. "pvlb python: a python package for modeling solar energy systems." *Journal of Open Source Software*, 3(29), 884, (2018).
<https://doi.org/10.21105/joss.00884>

calculate incentives.¹⁴ *Pvlib-python* requires, at a minimum, the following inputs to simulate hour-by-hour output over a period of one year for any PV system: nameplate capacity (DC), tilt, azimuth, latitude, longitude, elevation, and associated weather data. Table 3-6 shows the list of Inputs required for the *pvlib-python* simulation along with the value or source of value used for this evaluation. SOMAH projects in PowerClerk generally contained modules with different models, tilt, and/or azimuth. For this reason, each module was simulated individually with *pvlib-python*, and the hourly generation for a given project was calculated as the sum of each module’s output within the hour.

TABLE 3-1: PVLIB-PYTHON REQUIRED INPUTS WITH SOURCE OR ASSUMPTION USED

Pvlib-Python Input	Value/Source
Nameplate Capacity (DC)	[PowerClerk Program Tracking Data]
Tilt	
Azimuth	
Weather Data	[CALMAC Weather]
■ Latitude, Longitude, Elevation	
■ Dry Bulb Temperature	
■ Direct Normal Irradiance (DNI)	
■ Global Horizontal Irradiance (GHI)	
■ Wind Speed	
■ Diffuse Horizontal Irradiance (DHI)	
■ Solar Altitude Angle	
Array Type	Fixed – Roof Mounted
Module Type	Standard

We used CALMAC weather data to develop the simulated PV production. CALMAC provides both typical year weather files (most representative of a span of years), and historical weather data for 127 weather stations throughout California. For typical simulations, we used the typical weather dataset known as CZ2018, which represents typical weather from years spanning from 2006 to 2017.

To select the appropriate weather stations for each SOMAH project, we geospatially mapped each SOMAH project to find its closest station. We then reviewed the quality of the CALMAC weather data at the station, determining the percentage of weather data (for both typical and historical weather data) that was interpolated due to missing or poor-quality data. If the closest weather station had interpolated more than 20 percent of either their historical or typical-year data, the next closest station was selected. Almost 90 percent of projects utilized weather data from a station within 20 miles of the facility address, and over 40 percent utilized weather data from a station within 10 miles of the facility.

¹⁴ CSI EPBB Calculator - Documentation (csi-epbb.com)

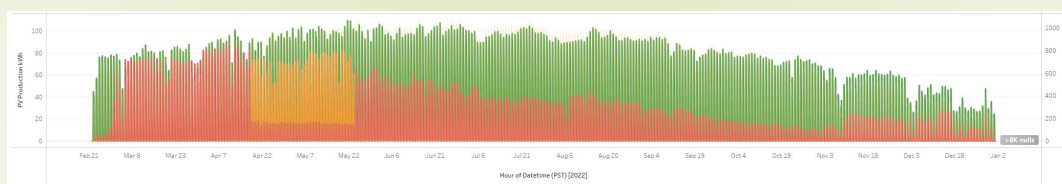
Observed PV Production

Observed PV production represents the observed PV generation from the 71 completed SOMAH projects. The evaluation team collected interval (15-minute or hourly) lifetime PV generation data for 70 of the 71 completed SOMAH projects from each utility.¹⁵ In 2021 there were 14 completed projects, while in 2022 there were 71 (including both projects completed in 2021 and 2022). We conducted thorough quality control (QC) and validation of the PV production data. As part of the validation process, we also collected interval PV generation data from multiple SOMAH performance monitoring and reporting service (PMRS) entities and directly from the SOMAH PA. The QC process utilized a Tableau dashboard to bring in the simulated PV generation as well as the different sources of metered generation to visualize the data.

Quality Control Dashboards

The screenshot below highlights the approach taken to manually review the data collected for every project to ensure quality data. While the text is too small to read, the figure is provided to demonstrate the benefits of a graphical representation of metered data, overlaying different streams of PV generation data (**green is simulated**, **red is PMRS data**, and **orange is utility data**) to see the differences. The QC dashboard is filterable by project number and highlights details about the PV system.

In this example, the **utility data** matches the data provided by the **PMRS**, during the entire time-period except for several months where the **PMRS** data drops significantly. A plausible explanation could be that a **PMRS** meter went out of service for a few months and then was fixed.



The team looked for anomalies in the data, including abnormally high readings,¹⁶ instances where the different data sources did not agree, and instances where metered data differed significantly from simulated. We flagged cases of abnormal operations, such as where the meter data indicated possible failed inverters or where metered data was poorly performing for unknown reasons. We also identified cases where certain time periods should be removed from analysis or where the entire metered dataset

¹⁵ PV generation data was not provided by the utility for one project.

¹⁶ Readings that are significantly higher than the rated capacity of the system and therefore not physically capable of being generated.

for a project was considered unreliable and therefore unusable. Based on our QC processes, the meter data for 9 projects was unreliable, and therefore not used in the analysis.¹⁷

Month-hour PV ratios (24 hours x 12 months = 288 ratios) were developed for each utility, using the average hourly observed generation for each month divided by the average hourly simulated generation for each month. These ratios represent an adjustment to allow conversion from simulated PV data to generation levels that are more closely aligned with observed PV generation. The impacts for the 9 sites with unreliable observed PV data and the 1 site where no data was provided by the utility or the PMRS entities were estimated using the month-hour PV ratios for each utility.

Forecasted (Expected) PV Production

The evaluation team forecasted the expected hourly and annual PV generation for all SOMAH projects that were completed or are active in PowerClerk. Although there were 432 active (excluding cancelled, withdrawn, waitlisted, or unsubmitted) projects in PowerClerk, eight of them did not provide any nameplate capacity details and were therefore not included in this analysis.¹⁸ These forecasted results reflect typical weather PV simulations. Because we don't always expect that installed systems will behave as ideally as simulations would expect, we applied the month-hour PV ratio (defined above) to the typical-weather simulated PV generation, which accounted for differences in observed and simulated data.

PV Realization Rate

As a measure of system performance, we used the annual PV production tracked in PowerClerk as the basis to calculate a PV realization rate for SOMAH projects. Two different SOMAH program realization rates were calculated:

- The **forecasted realization rate** reflects the forecasted (expected) PV production divided by the estimated annual PV production tracked in PowerClerk.
- The **observed realization rate** reflects the observed PV production divided by the estimated annual PV production tracked in PowerClerk.

The PowerClerk annual PV production estimates match the value used to calculate the SOMAH incentive. This PV production estimate is developed using the California Solar Initiative (CSI) expected performance-based buydown (EPBB) calculator, driven by NREL's PVWatts v2 Calculator.¹⁹ Note that the EPBB

¹⁷ For two of the nine excluded projects, the utility data was almost completely zero during the entire period. The other seven projects were excluded because the utility, PMRS, and simulated data were drastically different from each other. The team was unable to identify which data stream (utility or PMRS), if any, was reliable and accurate.

¹⁸ These were Track A projects that were earmarked and had not yet determined system specifications.

¹⁹ CSI & MASH Calculator. Developed by AESC Inc. <https://csi-epbb.com/>

calculator has not been updated since 2014, and the current version of NREL's PVWatts calculator is now v8.1 (released in January 2023). The more recent versions of PVWatts, starting with v5 increase performance estimates by approximately 10 percent.²⁰

Capacity Factor

The PV Production and Energy Impacts Results section also includes estimates of capacity factor. Capacity factor is a metric of system utilization and is defined as the amount of energy generated during a given period divided by the maximum possible amount of energy that could have been generated during that period. Annual capacity factors are useful when comparing utilization across technology types or project sizes. The annual DC capacity factor was calculated as the annual PV generation during all 8,760 hours of a typical year divided by the product of the project's DC nameplate capacity and 8,760.

Utility Energy Impacts

Note that the customer electricity consumption analysis (discussed in the next section) did not find a significantly large increase in energy consumption following PV installation. Therefore, the SOMAH utility energy impacts are equal to the reported PV production estimates.

Customer Electricity Consumption

The evaluation team analyzed whether SOMAH beneficiaries changed their energy consumption following the installation of solar. Other studies have found that many customers in single-family homes increase their energy consumption after PV systems were installed. However, SOMAH beneficiaries might not behave similarly to single-family PV customers. SOMAH beneficiaries receive their benefits through the VNEM structure; therefore, they are less directly involved in the project's development and their economic situation likely differs from those of the typical single-family PV owner. In addition, educational material that is often left behind at SOMAH properties encourages tenants to reduce their consumption of electricity. On the other hand, SOMAH does provide PV bill credits that could lead beneficiaries to increase their energy consumption.

We used historical AMI consumption data provided by utilities at 15-minute or hourly intervals to analyze potential changes in customer's energy consumption. We requested data starting from one-year prior to the SOMAH project's PTO date. Customers that did not have a full year of consumption data in both the pre-installation and post-installation were excluded from analysis.²¹

²⁰ Dobos, A. P. *PVWatts Version 5 Manual*. United States. <https://doi.org/10.2172/1158421>

²¹ Note that data from certain utilities were particularly limited by this constraint. The evaluation team had difficulties with data collection from SDG&E. Evaluation time and budget constraints made it impossible to obtain a full set of consumption data for all requested accounts spanning the full requested time period.

For this analysis, we defined the beginning of the post-installation period as the earliest date that beneficiaries received SOMAH PV credits on their bills. For beneficiaries in SCE and SDG&E's service territories, this date was provided directly by the utility. The post-installation period for PG&E beneficiaries was defined to start at the SOMAH PV system's permission to operation date.

We used a two staged regression approach to estimate changes in energy consumption. The consumption analysis focused exclusively on tenant's usage. Further details on the two staged regression approach can be found in Appendix D.

Demand Impacts

Coincident peak demand impacts are defined as generation from SOMAH PV systems during hours of CAISO or IOU peak demands. The single largest annual CAISO or IOU peak hours provide brief snapshots of program coincident demand impacts. However, analyzing peak demand over the top 200 peak hours can provide a greater insight into how SOMAH projects impact the grid during the hours of highest load. By coincidentally generating during CAISO or IOU peak hours, participating SOMAH customers allow their electric utility to avoid the purchase of high-cost wholesale energy. At the same time, the electric utility reduces its transmission and distribution losses during hours of high system congestion. It should be noted however, that these hours are not necessarily when SOMAH PV systems have their highest output.

IOU and CAISO load data were obtained from the CAISO OASIS website. Coincident peak demand impacts were estimated at the utility and CAISO system level based on observed PV generation in 2021 and 2022.

Environmental Impacts

Greenhouse gas (GHG) impacts were estimated using marginal carbon dioxide (CO₂) emissions data developed by WattTime as part of the Self-Generation Incentive Program (SGIP) GHG signal.²² The WattTime data are considered a reliable approximation of actual conditions during a particular year. Carbon dioxide emission impacts were calculated as the avoided emissions that would have occurred in the absence of the program. The hourly marginal emissions rates and the hourly PV generation were combined to estimate avoided emissions in metrics tons of CO₂.

The monetary value of the change in emissions was calculated by applying the value of GHGs from the 2022 California Avoided Cost Calculator V1b to hourly PV generation. The total avoided value of GHG emissions reductions was based on four factors, the cost of the GHG adder, the cost of the added cap and trade, the cost of the GHG rebalancing, and the cost of methane. The GHG adder and the cap-and-trade price reflect the annual economy wide value of GHG emissions reductions. The GHG rebalancing accounts for how utilities move production around, reducing GHG emissions as demand declines. And finally, the

²² <http://sgipsignal.com/>

methane portion accounts for the leakage in methane due to transport to the electric production power plants.

Finally, the estimated lifetime GHG emissions reductions attributable to proceeds were calculated per California Air Resources Board (CARB) reporting requirements. Methods and results of this calculation can be found in Appendix E.

Economic Impacts

Two approaches were used to estimate the program's bill impacts. The first method compared actual pre- and post-installation utility bills. The second method directly estimated the bill credits received in 2022 from SOMAH PV generation. The evaluation team also estimated the CARE budget impact from SOMAH systems in 2022.²³

Year-over-Year Utility Bill Comparison

The evaluation team calculated year-over-year (YoY) bill impacts for customers with completed SOMAH projects. We used monthly customer utility billing data to analyze potential changes in energy consumption.

The YoY bill savings were calculated by determining average monthly bill estimates for each customer in the period before and after bill credits began. For customers in SCE and SDG&E's service territories, the date bill credits began was provided directly by the utility. The post period for PG&E customers was defined to start at the SOMAH PV system's permission to operation date.

Utility bill periods typically start and end on different dates for different customers. Therefore, the utility bill amounts were first apportioned by billing-days to standard monthly periods. The average pre and post period monthly bill was calculated at the customer level, and then aggregated to the project level and utility level. Customer bills were included in the analysis if they had at least three months of post period data. Overall, 65 of the 71 completed SOMAH projects were included in this analysis. For consistency, averages in the pre period were only calculated from the year directly preceding the assumed bill credit date, and only for months that occurred in both periods. For example, if a customer's post period only included October, November and December 2022, the pre-period would be limited to October, November, and December 2021. After calculating averages in both periods for each customer, the averages were aggregated to the utility level to show the average billing impacts across the analysis population.

²³ Due to the timing of bill credit setup, we did not evaluate the impact of SOMAH on customer arrearages.

The cause of customer bill changes between pre- and post-installation can be multiple factors aside from bill credits from SOMAH systems. Changes in weather across years, customer behavior, and utility rate amounts can all contribute to bill differences year-over-year. While the YoY bill analysis does not account for changes in weather or customer behavior (this was explored in the Customer Electricity Consumption analysis described above), we conducted a variation of the YoY bill analysis to account for rate increases.

Electricity rates can increase over time due to inflation, demand, fuel costs, and energy generation shifts. we compared the time-of-use (TOU) rate most common for SOMAH customers in each utility over time from 2020 through 2022. YoY rate increases were analyzed based on the effective rate levels as of June 1 of each year. Table 3-2 below presents the YoY percent rate increase averaged across TOU periods and seasons. We determined an adjustment value based on these rate increases to convert customer's bill amounts to 2020 base-year values. The YoY billing analysis was performed with both adjusted and unadjusted dollar amounts.

TABLE 3-2: AVERAGE YEAR-OVER-YEAR RATE INCREASE BY UTILITY

Utility	Rate	2020 to 2021 Percent Increase	2021 to 2022 Percent Increase
PG&E	E-TOU-C	1%	20%
SCE	TOU-D 4-9PM	13%	22%
SDG&E	TOU-DR1	19%	18%

Bill Credit Estimation

The evaluation team directly estimated the bill credits customer would have received from SOMAH completed projects using Verdant's Cost Effectiveness and Bill Calculation Model (VCE Model). To calculate bill credits, we estimated the difference between customer bills with and without PV benefits during 2022. Inputs required for the bill calculation included hourly PV system generation, hourly customer load, and customer tariff selections. Common area and tenant bill credits were estimated for each completed SOMAH project.

Historical AMI usage for all common area and tenant beneficiaries with completed projects in 2022 were used for this analysis. Accounts without a full year of historical usage in 2022 were excluded from analysis. The VNEM allocation forms found on PowerClerk were used to apportion the observed PV hourly generation to each individual metered account. We selected the most popular rates for the bill modeling. Rates covering at least 90 percent of tenants and 70 percent of common areas were included in the analysis. Table 3-3 presents a summary of the proportion of tenants and common areas in properties with completed projects that were included in the analysis.

TABLE 3-3: TENANT AND COMMON AREA REPRESENTATION IN BILL CREDIT ANALYSIS

Utility	% of Tenants Included	% of Common Areas Included
PG&E	80%	72%
SCE	31%	50%
SDG&E	55%	38%
Total	49%	54%

CARE Budget Impact

Results from the bill credit estimation (described above) were used to estimate the SOMAH program’s impact on the CARE budget in 2022. Customers participating in CARE receive a 30 to 35 percent reduction applied to their electrical bill. The average per-tenant impact on the CARE budget was calculated from the average per-tenant bill savings for CARE customers as follow:

$$\begin{aligned}
 &avg_CARE_budget_impact_per_tenant \\
 &= avg_annual_CARE_bill_saving_per_tenant * \frac{pct_CARE_reduction}{1 - pct_CARE_reduction}
 \end{aligned}$$

The total CARE budget impact was then determined by multiplying the total number of SOMAH customers with completed projects that participate in CARE by the average per-tenant CARE budget impact.

3.2.4 Cost Effectiveness Methods

The evaluation team calculated cost-effectiveness of SOMAH systems using Verdant’s Cost Effectiveness and Bill Calculation Model (VCE Model). The VCE Model evaluates cost-effectiveness of SOMAH PV systems using the format and content requirements of the 2001 CPUC California Standard Practice Manual (SPM) for performing Economic Analysis of Demand-Side Programs and Projects. We quantified cost-effectiveness using the total resource cost (TRC) test, the ratepayer impact measure (RIM) test, and the societal cost test (sTRC). The sTRC is a version of the TRC that used a different discount rate.²⁴

We examined cost-effectiveness by utility and system ownership type. The model calculates the bill impacts of SOMAH PV systems throughout the 20-year life of the systems and the associated acquisition costs including financing, insurance, and tax costs (or credits). Looking from the utility perspective, the model quantifies the changes in the utility’s marginal operating costs and considers incentive payments and program administration/interconnection costs. The model quantifies the present value of all cost and

²⁴ Per D.19-05-019 the sTRC should include a 3% real discount rate, air quality adder, and greenhouse gas adder. For this analysis, air quality adder and greenhouse gas adder were excluded.

benefit streams for the entire life of the system, accounting for changes in retail rates, technology operating costs, and changes in utility marginal costs.

The inputs used and assumptions made in the VCE model are described below.

Load Shapes

We developed two representative load shapes for each completed project, one to represent the common area and one to represent the typical tenant. Average load shapes were created from customer's historical 2022 AMI usage data. Load shapes were then scaled by the common area and tenant average annual usage in 2022, as calculated from the historical usage data.

For some projects there was not sufficient data available to create project-specific load shapes. In these cases, aggregated typical load shapes from other projects were applied. Aggregate load shapes were applied first if available by utility, climate zone, and fuel mix combination. If that was not possible, the load shape was aggregated by the utility and climate zone, and finally by the utility. The aggregated typical load shapes were scaled for each project that did not have sufficient available data by using the common area and tenant annualized kwh usage reported in PowerClerk.

PV

Simulated PV generation data using 2022 actual weather was used for this analysis. The PV simulations were adjusted by utility specific month-hour PV Ratios, as described in the PV Production and Energy Impacts methods section above. Tenant and common VNEM allocations were used to apportion the PV. The allocated tenant PV generation was equally divided across the total number of tenant units, to estimate the average tenant PV allocation for each project.

Rates

For each completed project, we chose the most common utility rate for common area and tenants as of the end of 2022. Retail rates were assumed to escalate at four percent per year.²⁵

Model Inputs by Ownership Type

Model inputs varied depending on whether the SOMAH PV system was owned by the host customer (HCO) or a third party (TPO). For TPO systems, we applied the power purchase agreement (PPA) rate (\$/kWh) as reported in PowerClerk. We assumed a two percent cost escalator on the PPA rate. For HCO systems, the system's total cost, upfront incentive amount, and ITC or LIHTC tax credits (as reported in PowerClerk) were applied. We assumed that HCO systems did not take advantage of any additional financing to cover the cost of the systems. The modeling for HCO systems also included the costs of a one-time inverter

²⁵ As shown in Table 3-2 above, observed rate increases from 2020 to 2022 were substantially higher than 4% per year. This assumption may be conservative.

replacement and ongoing operations and maintenance costs of \$20/kW/year.²⁶ For TPO systems, these costs were assumed to be the responsibility of the third-party owner.

Program Administrative Costs

The total program administrative costs to-date of \$35,056,477 were apportioned equally to each active or completed SOMAH project (432 projects). The cost-effectiveness modeling was only conducted on completed projects. For modeling, the program administrative costs per project were further apportioned between tenant and common areas by their VNEM allocation.

Discount Rates

We used utility specific weighted average cost of capital (WACC) rates to determine the net present value (NPV) of all costs and benefits in the TRC and RIM tests (PG&E 7.34%, SCE 7.68% and SDG&E 7.55%).²⁷ The sTRC test used a nominal discount rate of five percent.

Avoided Costs

The avoided costs due to SOMAH PV Systems were also calculated using the VCE model, as part of the modeling described above. The avoided costs in the NEM model were calculated based on the CPUC 2022 Avoided Cost Calculator (ACC) v1b. The analysis includes all components of the avoided costs in the 2022 ACC, including: Cap and Trade, greenhouse gas (GHG) adder, GHG rebalancing, energy, generation capacity, transmission capacity, distribution capacity, ancillary services, losses, and methane leakage.

²⁶ The National Renewable Energy Laboratory “Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems; 3rd Edition” mentions O&M costs for grid-tied distributed generation-scale systems varying from \$19 to \$21 per kW per year. <https://www.nrel.gov/docs/fy19osti/73822.pdf>

²⁷ Utility WACC was taken from <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/historical-electric-cost-data/rate-of-return>

4 PARTICIPATION ASSESSMENT

The participation assessment served to independently verify participation levels as of December 31st, 2022²⁸ and identified notable changes in participation since the last evaluation.

4.1 CURRENT APPLICATION STATUS

As presented below in Figure 4-1, the SOMAH Program has received 719 applications to date across the five eligible IOUs, representing 113 MW_{AC} of generation capacity. As this figure shows, project application submittals continue to be nonlinear with large increases occurring the month prior to previous incentive step downs.²⁹ The number of applications submitted in 2022 (49) was a fraction of those submitted during the previous three years (170 in 2021, 183 in 2020, and 317 in 2019).³⁰ The program has seen a significant increase in completed projects over the last year, with 71 projects completed by the end of 2022. Application cancellations or withdrawals have also continued to increase and now account for 40 percent of all applications submitted to the program.

FIGURE 4-1: CUMULATIVE SOMAH APPLICATIONS AND CAPACITY SINCE PROGRAM INCEPTION

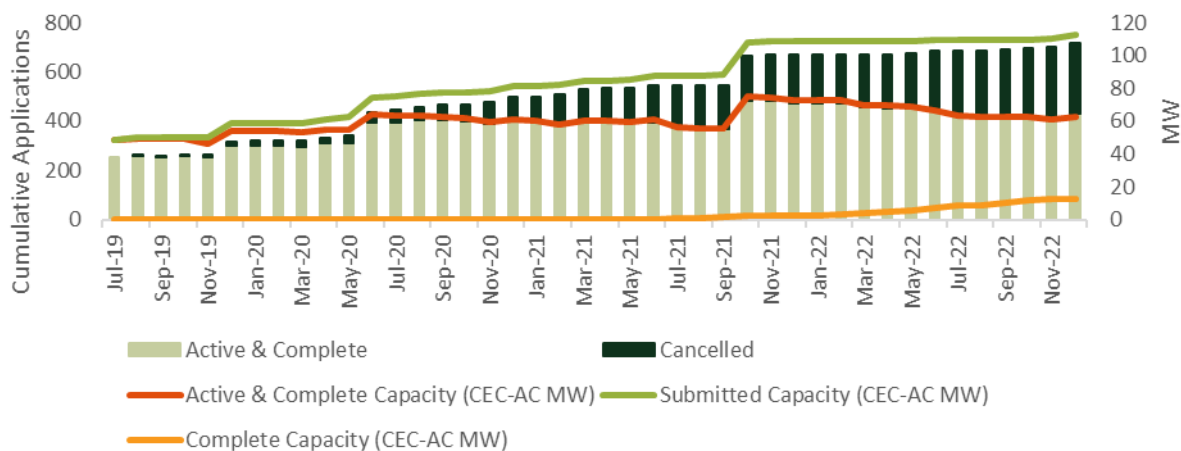


Table 4-1 presents the number of active and completed SOMAH applications and project capacity (kW_{AC}) by IOU. As this table shows, PG&E made up the largest share of projects and capacity, followed by SCE and SDG&E. PacifiCorp and Liberty had significantly fewer applications submitted (1 and 2, respectively)

²⁸ All evaluation results presented in this report are as of December 31, 2022, unless otherwise noted.

²⁹ The July 2021 step-down was delayed until October 29th, 2021, in response to a SOMAH PA request issued as a result of a delay of the NREL cost analysis report.

³⁰ As of May 11th, nine applications have been submitted in 2023.

and no completed projects. Section 5.1.1 below provides findings from interviews with PacifiCorp and Liberty staff regarding the rationale for the limited SOMAH participation in their service territories. Table 4-1 also shows the variability in average project capacities across IOUs and the current statewide average system capacity (150 kW_{AC}) of projects with complete or active applications. This statewide capacity is significantly lower than the average capacity at the time of first SOMAH evaluation (170 kW_{AC}) due to the cancellation of some large SOMAH projects (average capacity of cancelled projects is 195 kW_{AC}). SOMAH system capacities were found to be 17 percent larger than projects incentivized through other California LIMF solar programs (California Solar Initiative Multifamily Affordable Solar Housing Program, MASH 2.0 and the Low-Income Weatherization Program, LIWP) in 2021 and 2022.³¹ Section 4.4 below includes additional comparisons between the SOMAH, MASH and LIWP programs including a comparison of PV system costs on a \$/kW basis.

TABLE 4-1: SOMAH PROGRAM APPLICATIONS BY UTILITY AS OF DECEMBER 31, 2022

Utility	Total Number of Applications (Including Cancelled)	Active & Complete Applications				PV System Capacity (kW _{AC}) ³²	
		Active	Active %	Complete	Complete %	Total Active & Complete Capacity	Average Active & Complete Capacity*
Liberty	2	2	100%	0	0	148	74
PacifiCorp	1	0	0%	0	0	0	
PG&E	403	220	55%	22	5%	29,922	126
SCE	223	102	46%	36	16%	25,598	188
SDG&E	90	37	41%	13	14%	7,845	163
Total	719	361	50%	71	10%	63,513	150

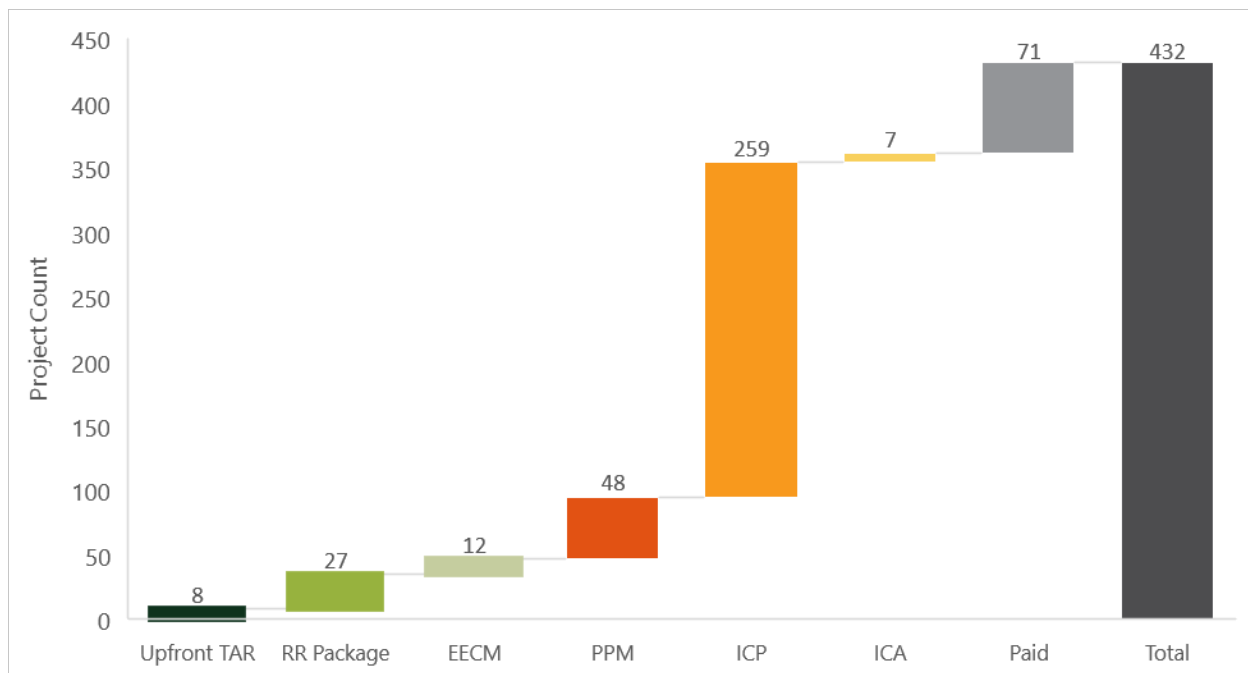
*Total average active & complete capacity is for 424 applications (eight Track A applications do not yet have capacity data in PowerClerk).

The SOMAH application process consists of a series of discrete steps that each application must go through to participate in the program and claim the SOMAH incentive. Figure 4-2 below shows the status of the 432 active and completed applications. As this figure shows, there has been significant growth in the number of projects that have been completed (from 1 to 71). The progress of the remaining projects span the other applications steps with marked shifts from the first evaluation—notably there was an increase in the number of Incentive Claim Package (ICP) (n=259), suggesting that most active projects are close to being completed. Seven additional projects have had their Incentive Claim approved and are awaiting payment.

³¹ This analysis was completed using kW_{DC} since we only received kW_{DC} data for LIWP.

³² The accuracy of the active system capacity has not been verified by the evaluation team. It is the capacity submitted by the applicant.

FIGURE 4-2: CUMULATIVE SOMAH ACTIVE AND COMPLETED APPLICATIONS BY PROGRAM STATUS



TAR = Technical Assistance Request. RR = Reservation Request. EECM = Energy Efficiency Compliance. PPM = Proof of Project. ICP = Incentive Claim Package. ICA = Incentive Claim Approved.

The evaluation team calculated how long, on average, SOMAH applications take to get approval for each of the application steps (calculated from the day the application was submitted). Key takeaways are summarized below.

- **Upfront Technical Assistance Request (Track A only):** There have been 13 applications that have completed this step. Prior to April 2021,³³ the average time, in days, it took for a Track A project to complete the Upfront Technical Assistance step was 115 days (n=5), and this has since risen to 141 days (n=8).³⁴ Eight active Track A applications were in this step or had recently completed it as of the end of 2022.
- **Reservation Request Package:** To date, 455 applications have completed this step. The average time to obtain reservation request approval is 332 days. Seventy-four applications have been submitted since 2021 and received RR approval. The time to obtain approval for these applications is 228 days. This is a significant reduction in the time since the last evaluation (104 days), however there continues to be room for improvement as it is still taking more than 7 months to get reservations approved.

³³ The data cutoff date for the first SOMAH evaluation was April 29, 2021.

³⁴ It should be noted that V6 of the SOMAH Handbook increased the time for which the incentive funding is earmarked for Track A projects (from 3 months to 180-days) to allow greater time to utilize Upfront Technical Assistance and obtain/review project bids from multiple contractors.

- **Energy Efficiency Compliance Milestone:** Until September 2021, SOMAH applicants were allowed to postpone this step until the Incentive Claim Package due to the COVID-19 pandemic—making it infeasible to conduct on-site audits. Since September 2021, 54 applications have completed this step with the average time to obtain approval now at 321 days.
- **Proof of Project Milestone:** 372 applications have achieved proof of project milestone. Since the last evaluation, the average time to this step from application submission has decreased from 583 days to 384 days.
- **Incentive Claim Approved and Paid:** 78 projects have reached the Incentive Claim Approved (7) or Paid (71) steps by the end of 2022. The average time from application submission to incentive paid date is 942 days (2 years and 7 months), with the shortest project completed in just under a year (354 days). It took an average of 237 days from PPM approval to Incentive Claim Approved and an average of 260 days from PPM approval to Final Payment date.
- **Cancelled Applications:** To date, 287 applications have been cancelled or withdrawn. The average time to cancellation from application submission was 317 days as of April 2021, but has decreased to 143 days since that date. Identifying ineligible, infeasible or other non-viable projects sooner decreases the time contractors, property owners and the SOMAH PA spend on these projects.

4.1.1 Application Cancellations

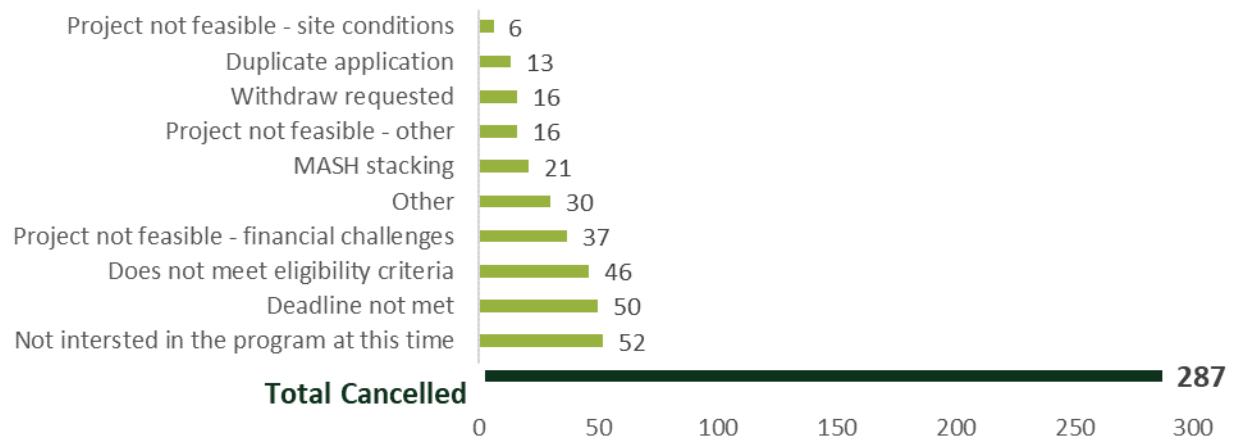
Since the SOMAH Program’s inception a total of 287 applications have been cancelled or withdrawn (40 percent of all submitted). These cancellations represent 50MW of lost solar capacity. In response to prior evaluation recommendations, the SOMAH PA enhanced the reason for cancellation data captured in PowerClerk to gain a better understanding of the underlying rationale for cancellations.³⁵

Figure 4-3 provides the distribution of cancellation reasons from PowerClerk tracking data. The most frequent reasons were a “lack of interest in the program” (52 applications) and “deadline not met” (which also indicates a lack of interest in the program,³⁶ 50 applications). The cancellation rates were reviewed and categorized as either recoverable (i.e., cancelled for a reason that could potential be addressed) or non-recoverable (i.e., unlikely to become a future SOMAH project—ineligible, duplicate, MASH project, etc.). Of the 287 cancelled applications, nearly two-thirds were classified as recoverable cancellations. The SOMAH PA should prioritize outreach to these potentially recoverable cancelled applications to determine if and how their needs can be addressed to facilitate SOMAH Program participation.

³⁵ The SOMAH PA has also updated the PowerClerk tracking data to populate cancellation reason for all cancelled applications.

³⁶ According to the SOMAH PA, the cancellation reason “deadline not met” is used when the PA is “unable to get a response from the applicant that would better indicate why they are not moving forward/letting the deadline pass and cancelling the project.”

FIGURE 4-3: CUMULATIVE SOMAH CANCELLED APPLICATIONS



According to PowerClerk, the 15 participating property owners interviewed submitted 68 of the 287 cancelled applications (24 percent). Contrary to the last evaluation, some property owners reported they were likely (highly (n=5) or somewhat (n=1)) to resubmit a previously cancelled application. Additionally, two property owners reported that some or all of their applications classified as cancelled in PowerClerk were actually still active.³⁷

Analysis of PowerClerk tracking data found cancellation rate varied by participation track (A vs. B) and purchase type (TPO vs. HCO). Table 4-2 below shows the cancellation rate for Track A was double that of Track B. The SOMAH PA reported some Track A projects are cancelling and reapplying under Track B, however currently this is not being tracked in PowerClerk. Allowing projects to transition from Track A to B would reduce the quantity of Track A cancellations,³⁸ the burden of application resubmittal, and allow information from the initial application to be retained. Table 4-3 below shows that HCO projects were more than twice as likely as TPO projects to cancel their applications. HCO cancellations were most often cancelled due to "deadline not met" or "not interested in the program at this time" (61 percent of HCO applications provided these reasons compared to only 17 percent of the TPO applications) indicating that HCO projects are losing interest in the SOMAH program after they have applied. Many of the participating property owners interviewed reported that the TPO contractor they were working with managed most of the SOMAH application process. The SOMAH PA should increase engagement with property owners using HCO to ensure they have adequate support to navigate issues they encounter and keep their projects on track.

³⁷ It is not clear if these applications had been cancelled and resubmitted or inadvertently cancelled.

³⁸ According to program tracking data, 4 Track A cancellations (15% of Track A applications) were cancelled as they planned to switch to Track B.

TABLE 4-2: CANCELLATION RATE ACROSS PROGRAM TRACK

Participation Track	Applications	Cancellations	Cancellation %
Track A	45	34	76%
Track B	674	253	38%
Total	719	287	40%

TABLE 4-3: CANCELLATION RATE ACROSS SYSTEM PURCHASE TYPE

System Purchase Type	Applications	Cancellations	Cancellation %
Third Party Owned	464	139	30%
Host Customer Owned	168	115	68%
*Track A Pre-RR or Undecided Purchase Type	87	33	38%
Total	719	287	40%

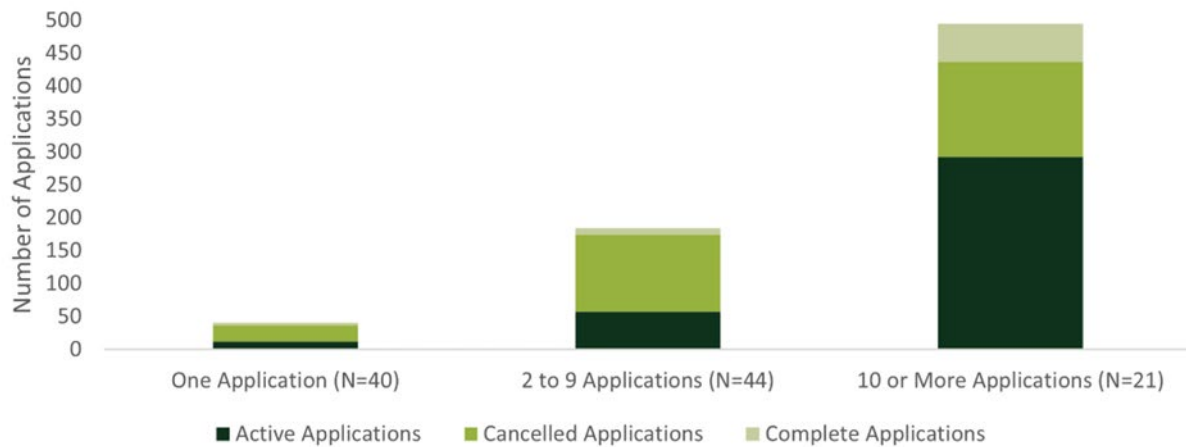
*There are 46 active Track B applications in the EECM or PPM stage that have not recorded their system purchase type, and eight active Track A Pre-Reservation Request stage applications that have not decided on a purchase type.

4.2 KEY CHARACTERISTICS OF SOMAH PARTICIPANTS

4.2.1 Property Owner Characteristics

Program applications continue to be submitted by property owners who own or manage a portfolio of low-income properties. As shown in Figure 4-4 below, 69 percent of SOMAH applications were submitted by 21 property owners who had submitted 10 or more applications (out of the 105 total unique property owners who have submitted SOMAH applications). Thirty-eight percent of participating property owners had a single SOMAH project, these applications made up 6 percent of all submitted applications. Property owners who submitted ten or more applications were also less likely to cancel their projects (29 percent cancellation rate compared to 63 percent for those who submitted less than ten applications).

FIGURE 4-4: DISTRIBUTION OF APPLICATIONS SUBMITTED BY PROPERTY OWNERS



The PowerClerk tracking data includes the variable “Umbrella Company” which identifies if a property is part of a large affordable housing portfolio. Table 4-4 below presents a summary of the 21 umbrella companies that have submitted 10 or more SOMAH applications and who make up 69 percent of all applications submitted to date. The last row of this table includes the remaining 84 property owners who have submitted fewer than 10 applications.

TABLE 4-4: DISTRIBUTION OF APPLICATIONS ACROSS UMBRELLA COMPANIES

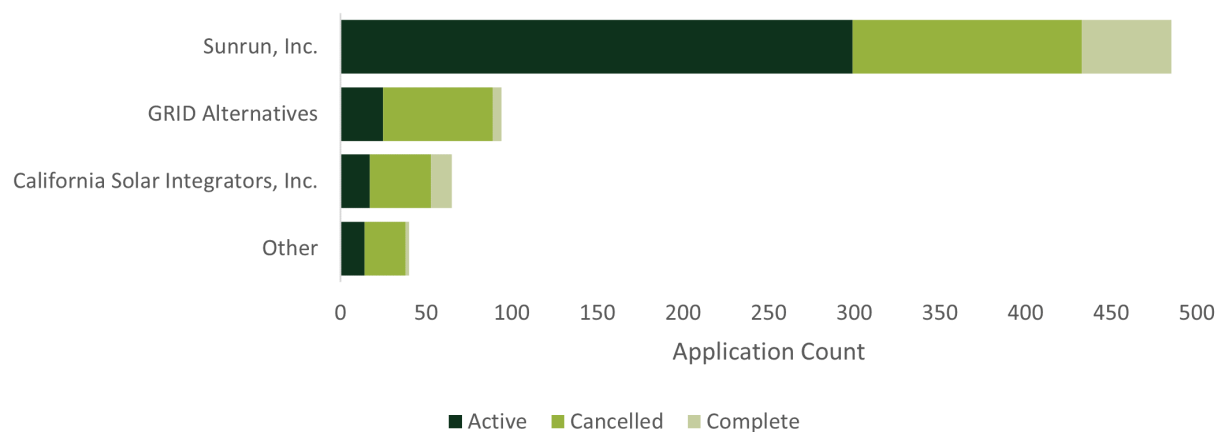
Umbrella Company	Applications Submitted	Applications Active	Applications Completed	Applications Cancelled
National CORE	60 (8%)	29 (48%)	20 (33%)	11 (18%)
Burbank Housing	54 (8%)	42 (78%)	0 (0%)	12 (22%)
MidPen Housing	40 (6%)	25 (63%)	2 (5%)	13 (32%)
BRIDGE Housing	36 (5%)	23 (64%)	7 (19%)	6 (17%)
The Michaels Organization	26 (4%)	19 (73%)	0 (0%)	7 (27%)
Jamboree Housing	24 (3%)	14 (58%)	7 (29%)	3 (13%)
Eden Housing	21 (3%)	17 (81%)	1 (5%)	3 (14%)
Fresno Housing Authority	21 (3%)	18 (86%)	0 (0%)	3 (14%)
Humangood	21 (3%)	13 (62%)	2 (9%)	6 (29%)
CHISPA	20 (3%)	3 (15%)	0 (0%)	17 (85%)
EAH Housing	20 (3%)	16 (80%)	2 (10%)	2 (10%)
ROEM Corporation	20 (3%)	2 (10%)	1 (5%)	17 (85%)
Affirmed Housing	19 (3%)	6 (32%)	1 (5%)	12 (63%)
Community Corporation of Santa Monica	18 (3%)	17 (94%)	0 (0%)	1 (6%)
Related California	17 (2%)	11 (64%)	3 (18%)	3 (18%)
Resources for Community Development	16 (2%)	7 (44%)	0 (0%)	9 (56%)
Self-Help Enterprises	16 (2%)	4 (25%)	12 (75%)	0 (0%)
Retirement Housing Foundation	15 (2%)	6 (40%)	0 (0%)	9 (60%)
Napa Valley Community Housing	11 (2%)	7 (64%)	0 (0%)	4 (36%)
Community Housing Works	10 (1%)	3 (30%)	0 (0%)	7 (70%)
Mercy Housing	10 (1%)	10 (100%)	0 (0%)	0 (0%)
Remaining 84 companies who submitted less than 10 applications each	224 (31%)	69 (31%)	13 (6%)	142 (63%)
Total	719	361 (50%)	71 (10%)	287 (40%)

The PowerClerk tracking database includes an “Ownership Type” variable that takes the values: For-Profit, Non-Profit, or Hybrid. The prior SOMAH evaluation found this variable was largely blank or indicated the organizational structure of the contractor rather than the property owner. A review of the current program tracking data found that this field is now well populated and reflective of the property owner’s status. According to SOMAH’s 2022 ME&O plan, 175 applications were submitted by for-profit or hybrid for-profit/non-profit organizations and the remainder were submitted by housing authorities (29) or non-profit organizations (515). Interviews with property owners found differences in the rationale for program participation between non-profit and for-profit organizations. Non-profits overwhelmingly reported their primary motivation for participating in SOMAH was the financial benefits solar provides to their tenants. While for-profit organizations also report a desire for tenant benefits, their primary driver for participation was a benefit (typically financial) that SOMAH would provide to their organization.

4.2.2 Participating Contractor Characteristics

The distribution of active, cancelled, and completed SOMAH projects by the top three solar contractors and the remaining 13 participating contractors (“Other”³⁹) is shown in Figure 4-5. As this figure shows, Sunrun, Inc. was the prime contractor for the majority of SOMAH applications submitted (71 percent) and the top three active contractors accounted for 94 percent of all applications.⁴⁰ Similarly, Sunrun was the contractor for 73 percent of completed projects and 84 percent of active projects. Currently 17 contractors have submitted a SOMAH application and only five have completed a SOMAH project.

FIGURE 4-5: DISTRIBUTION OF SOLAR CONTRACTING COMPANIES



For this second SOMAH evaluation, the evaluation team received an updated list of SOMAH-eligible contractors. This list contained 153 contractors (up from 117 in the last evaluation), however only 14⁴¹ had an active or completed program application (four more than in mid-2021). This indicates that while the SOMAH PA has successfully increased the number of eligible contractors, most contractors are continuing not to participate in the program. This indicates the primary barrier to contractor participation from the first SOMAH evaluation is likely still a significant problem (Contractor Barrier #1 - SOMAH application process presents significant administrative burden). The contractor data included contractor-reported estimates of the number of solar installations completed, the number of staff employed, and company’s diversity status (owned by a woman or underrepresented group⁴²). The contractor data was compared to the SOMAH application data (excluding cancelled or withdrawn applications) to assess the representativeness of eligible versus participating contractors. As shown in the tables below, prime

³⁹ The “Other” category represents all other contractors with less than 10 applications submitted.

⁴⁰ Excluding 35 Track A applications that had no contractor associated with them.

⁴¹ Three of the 17 who have submitted an application have subsequently cancelled that project.

⁴² These contractors were identified in the SOMAH PA Contractor tracking database as “minority-owned” businesses.

contractors continue to be large (84 percent have 250 or more employees), highly experienced (96 percent of applicants' contractors reporting experience have installed 100 or more PV systems), and not owned by a woman or underrepresented group (98 percent)—indicating they are not representative of the pool of eligible contractors.

TABLE 4-5: SOLAR INSTALLATION EXPERIENCE, APPLICATIONS VS. SOMAH ELIGIBLE CONTRACTORS

Number of Solar Installations	SOMAH Applications to Date		Eligible SOMAH Contractors	
	#	%	#	%
0 – 25	14	2%	47	31%
26 – 50	6	1%	18	12%
51 – 75	2	0.1%	7	5%
76 – 99	1	0.1%	9	6%
100 or more	559	78%	38	25%
N/A or Blank	137	19%	33	22%
Total	719	100%	152	100%

TABLE 4-6: NUMBER OF CONTRACTOR EMPLOYEES, APPLICATIONS VS. SOMAH ELIGIBLE CONTRACTORS

Number of Contractor Employees	SOMAH Applications to Date		Eligible SOMAH Contractors	
	#	%	#	%
25 or less	22	3%	72	47%
26 – 99	68	9%	29	19%
100 – 249	0	0%	7	5%
250 or more	485	68%	4	3%
N/A or Blank	144	20%	40	26%
Total	719	100%	152	100%

TABLE 4-7: DIVERSITY STATUS OF PARTICIPATING CONTRACTORS VS. SOMAH ELIGIBLE CONTRACTORS

Diversity Status	SOMAH Applications to Date		Eligible SOMAH Contractors	
	#	%	#	%
Women-owned	7	1%	22	14%
Underrepresented owned	23	3%	58	38%
Non-Women/Underrepresented owned	559	78%	41	27%
N/A	136	19%	33	22%
Prefer not to say	13	2%	15	10%
Total	719	103%*	152	111%*

* Sums to more than 100% since some businesses are both women and underrepresented-owned.

While prime contractor diversity continues to be a problem, one prime contractor reported subcontracting a portion of their SOMAH installations to smaller or diverse subcontractors. Documentation of subcontractor participation is required as part of the Proof of Project Milestone step, and as of the end of 2022, 54 active and completed projects reported utilizing subcontractors. A single prime contractor was associated with all but two of these 54 projects, and the subcontracted work was allocated to 16 distinct subcontractors.⁴³ Subcontractors are significantly more likely to be diversity businesses⁴⁴ and thus overall contractor diversity is increasing despite a lack of diversity of prime contractors.

4.2.3 Participating Tenant Characteristics

The distribution of tenant rates before and after SOMAH PV installation, as well as the percentage of tenants that are on a CARE rate is shown in Table 4-8 below. The tenant rates post PV installation and the percentage of tenants on CARE were determined from tenants in properties with completed projects as of the end of 2022. In PG&E and SCE around two-thirds of tenants are CARE participants. In SDG&E, almost 83 percent of tenants were on a CARE rate. All three utilities are required to transition to default time of use (TOU) plans. As of June 2022, all eligible customers of SDG&E, PG&E, and SCE had been transitioned to TOU.⁴⁵ As shown below, the majority of tenants with completed projects in PG&E and SDG&E are now on TOU rates. The most common rate for tenants with completed projects in SCE is still the Domestic (D) rate (which is not a TOU rate).

⁴³ Fourteen of these 16 subcontractors were in the SOMAH PA's eligible contractor database and two of these 16 also participated in SOMAH as a prime contractor.

⁴⁴ More than half of subcontracted projects going to a small (i.e., <=25 employees) or underrepresented owned business, though women-owned businesses still make up only 2 percent of applications.

⁴⁵ Per <https://energyupgradeca.org/time-of-use-faqs>

TABLE 4-8: MOST COMMON RATES FOR TENANTS PRE AND POST PV INSTALLATION BY UTILITY

Utility	Percentage of Tenants on CARE	Tenant Rate	% of Tenants on Rate Pre- PV	% of Tenants on Rate Post-PV
PG&E	68.7%	E-TOU-C-CARE	23.0%	62.7%
		E-TOU-C	8.8%	29.8%
		E-1-CARE	51.6%	4.8%
		E-1	15.2%	0.8%
		<i>Other Rates</i>	<i>1.4%</i>	<i>1.9%</i>
SCE	67.2%	D-CARE	63.3%	48.3%
		D	13.2%	17.5%
		TOU-D 4-9PM-CARE	11.0%	14.2%
		TOU-D 4-9PM	5.2%	10.6%
		TOU-D 5-8PM	2.4%	4.5%
		<i>Other Rates</i>	<i>4.9%</i>	<i>4.8%</i>
SDG&E	82.7%	TOU-DR1-CARE	48.5%	76.8%
		TOU-DR1	19.1%	15.4%
		DR-SES-CARE	0.0%	4.3%
		DR-CARE	24.6%	0.0%
		DR	2.7%	0.0%
		<i>Other Rates</i>	<i>5.0%</i>	<i>3.5%</i>

The distribution of common area rates before and after SOMAH PV installation is shown in Table 4-9 below. In all three utilities, the majority of common areas in properties with completed SOMAH projects are now on TOU rates.

TABLE 4-9: MOST COMMON RATES FOR SOMAH COMMON AREAS PRE AND POST INSTALLATION BY UTILITY

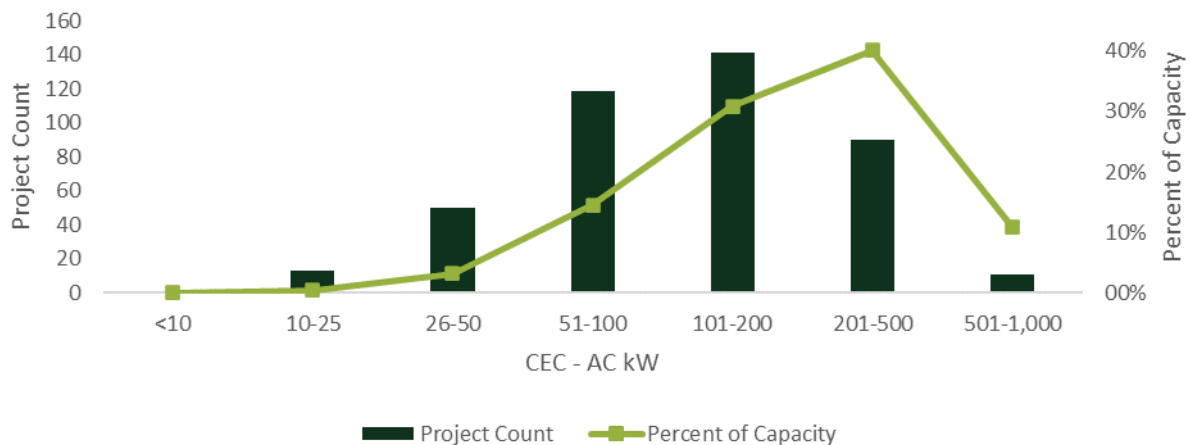
Utility	Common Area Rate	% of Customers on Rate Pre-PV	% of Customers on Rate Post-PV
PG&E	E-TOU-C	6.1%	44.4%
	B-1	30.3%	30.2%
	B-10	13.6%	13.6%
	A-10	4.5%	4.5%
	B19	4.5%	4.5%
	E-1	24.1%	0.0%
	E-6	13.4%	0.8%
	<i>Other Rates</i>	3.3%	1.9%
SCE	TOU-GS-1-E	51.3%	53.9%
	TOU-GS-2-D	25.0%	25.0%
	TOU-GS-1-D	16.3%	16.2%
	AL-2-F	4.8%	3.0%
	<i>Other Rates</i>	2.7%	1.9%
SDG&E	TOU-DR1	37.3%	51.7%
	TOU-A	18.6%	29.3%
	DR-SES	0.0%	8.3%
	TOU-A3	10.0%	6.3%
	DR	29.1%	0.0%
	<i>Other Rates</i>	5.0%	4.4%

4.3 KEY CHARACTERISTICS OF SOMAH PROJECTS

This section presents project-specific characteristics including the project purchase types, capacities (CEC PTC kW), the tenant versus common areas PV allocations, and plans to pair with on-site energy storage. Figure 4-6 presents the distribution of PV system capacities for the 424 active or completed projects that have capacity recorded in PowerClerk.⁴⁶

⁴⁶ Eight active projects were excluded from this figure as there was no capacity listed in the tracking data.

FIGURE 4-6: DISTRIBUTION OF PROPOSED PV SIZING⁴⁷



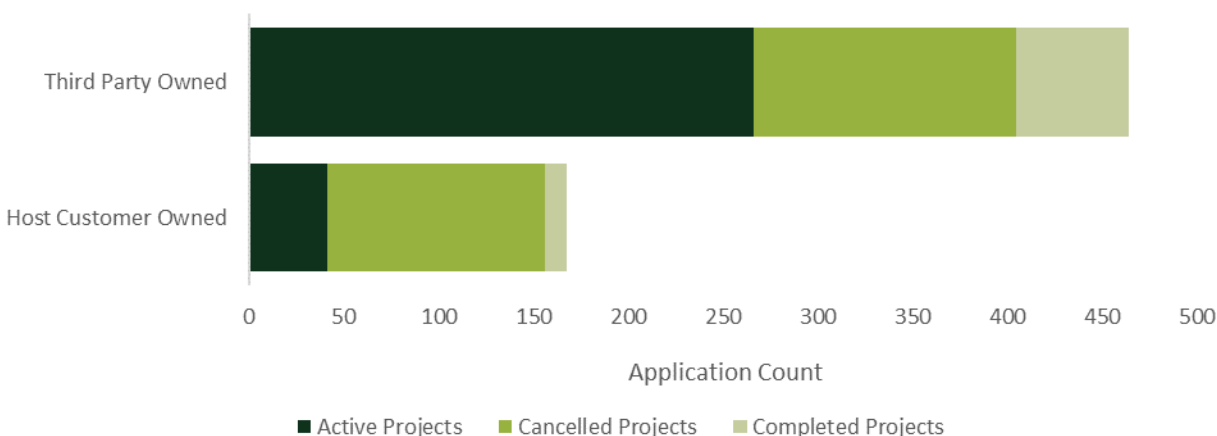
4.3.1 System Purchase Type

During the Reservation Request step SOMAH projects select their system purchase type: Third Party Ownership (TPO) or Host Customer Ownership (HCO). At the end of 2022, 73 percent of all submitted applications had selected TPO.⁴⁸ As shown in the figure below, TPO projects had a significantly higher completion rate than HCO projects (13 versus 7 percent) and a lower cancellation rate (30 versus 68 percent). This aligns with what property owners reported, namely that TPO was preferred due to the ease of participation, the availability of project financing, and on-going operation and maintenance of the system.

⁴⁷ This includes projects that have not yet received their RR Approved and thus the project sizing has not yet been validated.

⁴⁸ System purchase type was missing for 87 applications in PowerClerk. Half of these applications were Track A applications and the other half were Track B in either the EECM or PPM steps.

FIGURE 4-7: DISTRIBUTION OF PROGRAM SUBMISSIONS BY SYSTEM PURCHASE TYPE



The average incentive paid (or expected to be paid) per Watt for HCO and TPO systems was also compared and, as shown in Table 4-10, the average incentive rate was \$0.50/Watt less for both completed and active TPO projects as most TPO systems are leveraging the tax credit which lowers their incentive rate.

TABLE 4-10: AVERAGE SIZE AND INCENTIVE OF ACTIVE AND COMPLETED HCO VS TPO PROJECTS

Metric	Completed		Active	
	HCO	TPO	HCO	TPO
# of Projects	12	59	41	266
System Capacity	118 kW	183 kW	179 kW	141 kW
Incentive (paid or estimated) Total	\$245,534	\$282,044	\$455,262	\$281,379
Average Incentive (\$/W)	\$2.08	\$1.54	\$2.54	\$2.00

4.3.2 Capacity of Applicant Projects

As one would expect, the system capacity (kW) of SOMAH projects is positively correlated with the number of units at the property. However, a review of program data also found a relationship between the average system capacity and the system purchase type. As shown in Table 4-11, the average capacity of HCO projects is highest at 165 kW, compared to 149 kW for TPO projects. This contrasts with the findings from the first SOMAH evaluation which found TPO projects tended to be larger. A review of cancelled applications found both HCO and TPO cancelled projects were larger than active or completed projects, however TPO cancelled projects were 40 percent larger, while the HCO were only 8 percent larger.

TABLE 4-11: PROJECT SIZE (PER TENANT UNIT AND OVERALL) VERSUS SYSTEM PURCHASE TYPE

System Purchase Type	# of Projects	# of Tenant Units	Total kW for Projects	Average kW per Tenant Unit	Average kW per Project
Host Customer Owned	53	4,286	8,740	2.0	165
Third Party Owned	324	26,429	48,256	1.8	149
Undecided*	54	3,508	6,403	2.1	139
Total	431**	35,715	63,399	2.0	150

*54 projects are undecided as to system purchase type in the tracking data. Eight of these are Track A applications still in the Upfront TAR step and do not include data on project size. 46 of these are Track B applications in the EECM and PPM steps.

**One TPO project in the tracking data does not have number of tenant units recorded so is not included in this chart.

4.3.3 Projects Located in a DAC

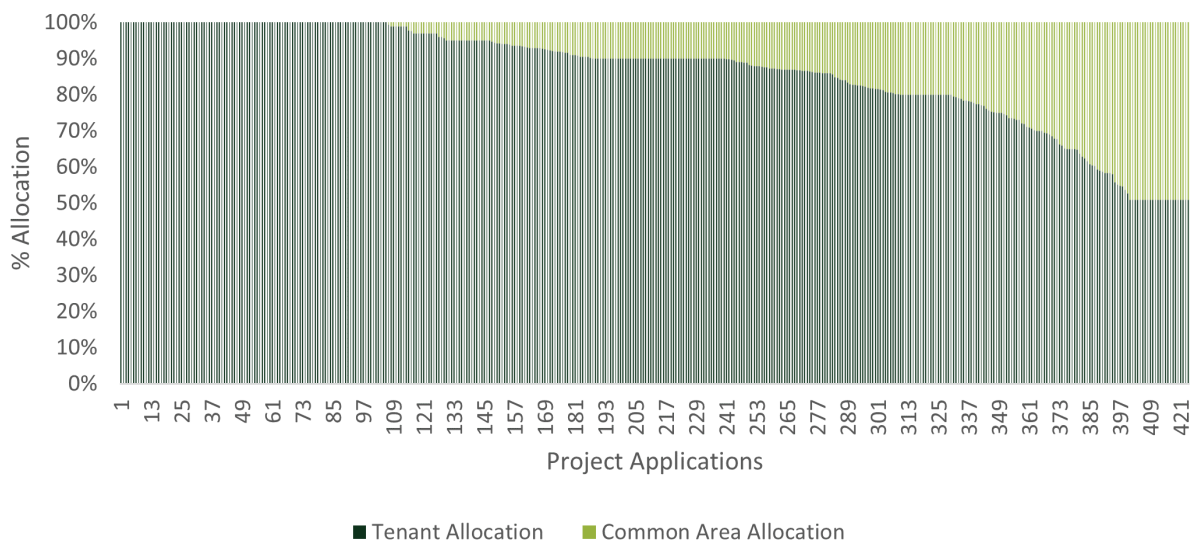
For a property to be eligible for SOMAH, the property must be deed restricted with at least 10 years remaining on the term, be a property with at least five units (and tenant units must be individually metered), and they must either be located in a DAC⁴⁹ or 80 percent of tenants have incomes at or below 60 percent of the Area Median Income (AMI). A current voluntary benchmark in the SOMAH Program Handbook is to increase application submissions from properties located within a DAC. The evaluation team found that efforts to accomplish this goal yielded a slight increase in the percentage of applications located within a DAC (from 28 to 31 percent). Analysis into cancellation and completion rates of DAC applications found these rates did not differ significantly from non-DAC applications.

4.3.4 Tenant versus Common Area PV Allocation

The SOMAH Program requires that a minimum of 51 percent of each project's electrical output is allocated to offset tenant's load. Figure 4-8 presents the distribution of tenant area versus common area allocations for active and completed SOMAH projects. The average tenant allocation across the active and completed projects is 86 percent (weighted by estimated PV production) which is similar to the average allocation from the first SOMAH evaluation (88 percent). The average tenant allocation was similar for both TPO (86 percent) and HCO (85 percent) projects.

⁴⁹ As defined by CalEPA pursuant to Health and Safety Code Section 39711.

FIGURE 4-8: TENANT VERSUS COMMON AREA ALLOCATION



4.3.5 Paired with Battery Storage

Analysis of the program tracking data found a significant reversal in SOMAH projects being paired with battery storage. Contrary to the previous evaluation, where program tracking data indicated upwards of 92 percent of TPO projects planned on installing battery storage, currently only six active projects (less than 2 percent) still assert they are planning to pair their SOMAH system with battery storage.⁵⁰ As none of these six projects have been completed, it is still possible for the pairing with storage to fall through.

The challenges in leveraging SGIP incentives for SOMAH/VNEM projects were discussed in CPUC Decision D.21-06-005.⁵¹ In this decision, the CPUC states that application of the current VNEM tariff to SGIP multifamily buildings may need to be adjusted. The VNEM tariff pays for export compensation from the installation of in-front-of the meter renewable generation. The IOUs submitted Advice Letters⁵² in late 2022 that modified VNEM tariffs to clarify the terms by which VNEM generators and battery storage may be interconnected and “isolate from the grid to provide backup power during grid outages.” Despite these clarifications, issues remain that are keeping battery storage from being installed alongside SOMAH PV systems. Commission staff acknowledge this programmatic challenge that needs to be resolved as

⁵⁰ The “Paired with Storage” field is populated in 602 of the 719 applications in the tracking data.

⁵¹ CPUC Decision D. 21-06-005. June 3, 2021.
<https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M387/K064/387064243.PDF>

⁵² PG&E Advice Letter 6792-E-A; SCE Advice Letter 4917-E-A; SDG&E Advice Letter 4119-E-A.

described in a May 2023 ALJ Ruling Inviting Comments on Potential Modifications to SOMAH.⁵³ Additional feedback on solar and battery storage pairing battery gathered from contractor and property owner interviews are presented in Section 5.4.5 below.

4.4 KEY PROJECT COST CHARACTERISTICS

4.4.1 Program Incentives Levels

On March 21, 2023, the Commission adopted D.23-03-007, which increased current incentive levels and eliminated the annual incentive step-down process adopted by D.17-12-022. The decision defers consideration of proposed higher incentive levels for projects located in disadvantaged communities. SOMAH incentive rates (\$ per AC Watt) vary based on whether the applicant is planning to claim the Federal Investment Tax Credit (ITC) or receives the Low-Income Housing Tax Credits (LIHTC) (described in the section below). As shown in Table 4-12 SOMAH incentives are reduced by 30 percent if a project takes advantage of one of these tax credits and by 50 percent if the project takes advantage of both tax credits.

TABLE 4-12: SOMAH INCENTIVE RATES

Federal ITC	LIHTC	Tenant \$ per AC Watt				Common Area \$ per AC Watt			
		7/19-6/20	7/20-6/21	7/21-3/23	3/23 onward	7/19-6/20	7/20-6/21	7/21-3/23	3/23 onward
No	No	\$3.20	\$3.04	\$2.97	\$3.50	\$1.10	\$1.04	\$1.02	\$1.19
Yes	No	\$2.25	\$2.14	\$2.09	2.45	\$0.80	\$0.76	\$0.74	\$0.87
No	Yes	\$2.25	\$2.14	\$2.09	2.45	\$0.80	\$0.76	\$0.74	\$0.87
Yes	Yes	\$1.60	\$1.52	\$1.49	1.75	\$0.60	\$0.57	\$0.56	\$0.65

Tax Credits

As shown in the table above, tax credits provide additional funding for SOMAH projects and can help to extend the reach of SOMAH Program incentives. As of the end of 2022, 77 percent of completed SOMAH projects are leveraging either the ITC or the LIHTC to offset a portion of their solar installation costs. The ITC is a one-time credit on federal taxes and can be used to offset a portion of the total PV system cost. Because it is a tax credit, it could not (until recently⁵⁴) be claimed by non-profit organizations. As a result, it is common for non-profit organizations to utilize TPO so the ITC can be placed with a for-profit third-

⁵³ ALJ's Ruling Inviting Comments on Potential Modifications to SOMAH Program. May 5th, 2023. <https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M507/K814/507814249.PDF>

⁵⁴ The Inflation Reduction Act of 2022 (IRA) provides non-profit organizations an opportunity to benefit from tax credits such as the ITC and LIHTC via "direct pay" tax credits, which are effectively cash payments that can be used to offset clean energy project.

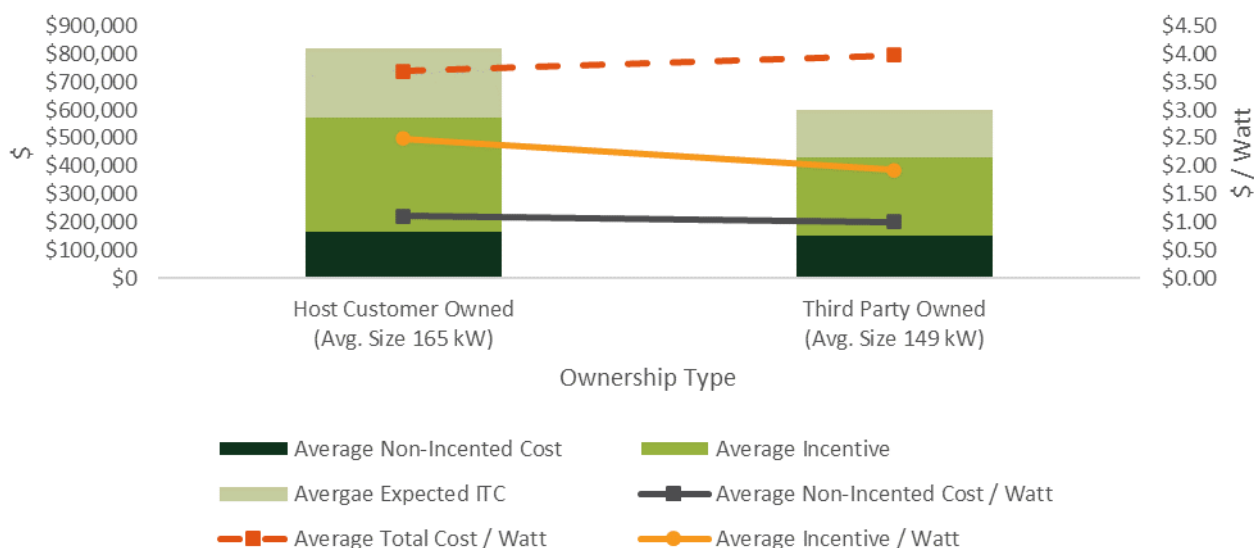
party entity to help offset a portion of the system cost. The ITC was 30 percent for systems installed in 2019, declined to 26 percent in 2020, and was slated to fall to 22 percent in 2021, however the 26 percent level was extended through 2022. The ITC was then increased to 30 percent in 2023 as part of the Inflation Reduction Act of 2022 (IRA). The LIHTC is an indirect Federal subsidy used to finance the construction and/or rehabilitation of low-income affordable rental housing. These tax credits are awarded to affordable housing developers and then typically sold by the developers to private investors to obtain funding to finance the project. Once the project is placed in service (i.e., rentable) the investors can claim the LIHTC over a 10-year period.

At the end of 2022, both completed and active SOMAH projects were much more likely to use the ITC than the LIHTC, with 73 percent of completed projects and 82 percent of active applications claiming the ITC and 4 percent of completed projects and 2 percent of active applications planning to claim the LIHTC. Interestingly, all completed projects planning to claim the ITC were third-party owned (TPO), and projects planning to claim the LIHTC were host customer owned (HCO).

4.4.2 Project Cost Assessment

The evaluation team reviewed total project costs and SOMAH incentives across project applications by system purchase type. Figure 4-9 below shows the average project incentive, expected ITC, and cost not covered by the program (which is either paid for or financed by the property owner or included in TPO payments). The figure also provides three lines indicating the average incentive per Watt (light orange line), non-incented cost per Watt (grey line), and total project cost per Watt (red dotted line). As this figure shows, the average total system cost per Watt is slightly higher for TPO projects, however the average SOMAH incentive for these projects is lower as they typically leverage ITC thereby decreasing the SOMAH incentives for those projects.

FIGURE 4-9: SYSTEM COSTS AND INCENTIVES PER WATT BY SYSTEM PURCHASE TYPE⁵⁵



A comparison of average total system costs, and cost per kW, for active and completed projects by system purchase type is provided in Table 4-13 below. This table shows that both active and completed TPO projects are, on average, more expensive than HCO projects when accounting for size (on a cost/kW basis).

TABLE 4-13: AVERAGE TOTAL SYSTEM COST AND COST/KW FOR ACTIVE AND COMPLETED SOMAH PROJECTS

SOMAH Project Status	HCO		TPO	
	Average Total System Cost	Average System Cost/kW	Average Total System Cost	Average System Cost/kW
Active	\$668,170	\$3,861	\$581,828	\$4,101
Completed	\$351,588	\$3,132	\$613,884	\$3,433

A more detailed breakdown of the costs by system purchase type is shown in the table below for completed projects. Active projects were excluded as many TPO projects did not have disaggregated system component data. The total costs of HCO and TPO systems may not be comparable due to the costs included in the Balance of System (BoS) costs.⁵⁶ BoS costs for TPO systems may include other allowable

⁵⁵ The average expected ITC is estimated as the percentage of active projects that stated they would claim the ITC times the average total cost (\$) times the current ITC incentive of 22 percent.

⁵⁶ Balance of System (BoS) costs include the parts of the solar PV system that are not modules and inverters. This includes the wiring to connect modules to each other and the inverter(s), framing to support the modules, and all other hardware.

costs (such as system design or feasibility study costs) which increase the total system cost and ultimately the cost basis for the ITC.

TABLE 4-14: SYSTEM COMPONENT COSTS BY SYSTEM PURCHASE TYPE FOR COMPLETED PROJECTS

Average System Costs	HCO	TPO
Number of Applications	12	59
Average System Size	118 kW	183 kW
Average Incentive Amount	\$265,798	\$326,001
Average Project Cost	\$351,588	\$613,884
Average PV Module Cost	\$116,092	\$115,842
Average Inverter Cost	\$62,264	\$48,254
Average PMRS Cost	\$14,160	\$13,259
Average Carport Cost	\$31,164	\$81,310
Average Permitting Fees	\$6,976	\$8,289
Average Balance of System Costs	\$144,305	\$397,921

During the evaluation interviews, several contractors and property owners reported many SOMAH projects had considered installing solar PV on carports (either new or existing). Not only do carports allow for additional roof space to install solar (increasing the potential capacity installed), they also provide additional tenant benefits (such as car shading which reduces their internal temperatures and decreases damage caused by the sun) and reducing urban heat island effects which can be particularly problematic in DACs. These plans were changed, however, due to the increased material and labor costs associated with carports. Many property owners interviewed expressed the hope that augmented SOMAH incentives would increase the feasibility of carports in the future. One property owner sought clarification from the SOMAH PA regarding the feasibility of including carports in SOMAH projects where the PV panels serve as the carport roof to reduce the cost of carport materials.

A comparison of the cost per kW_{DC} for SOMAH, MASH, and LIWP projects completed in 2021 and 2022 is displayed in Table 4-15 below.⁵⁷ As the table shows, SOMAH installed systems had the lowest average cost/kW_{DC} of the three programs. The average LIWP average cost/kW_{DC} is skewed higher due to an outlier project with cost/kW_{DC} ten times higher than other LIWP projects. The median LIWP cost/kW_{DC} is more in line with the other programs. SOMAH also has the lowest system costs based on median cost/kW_{DC}.

⁵⁷ System costs from the program tracking data are reported by the contractor and were not independently verified.

TABLE 4-15: COMPARISON OF SOMAH, MASH, AND LIWP PROJECT COST AND SIZE FOR PROJECTS COMPLETED IN 2021 AND 2022

Program	# of Completed Projects	Average Project Cost	Average Project Size (kW _{DC})	Average Cost/kW _{DC}	Median Cost/kW _{DC}
SOMAH	71	\$569,552	189	\$3,081	\$3,179
MASH	71	\$642,628	194	\$3,493	\$3,344
LIWP	10	\$467,970	122	\$8,445	\$3,245

4.4.3 Forecasted SOMAH Installed Capacity

The evaluation team updated the scenarios that were provided in the first SOMAH report to determine the maximum megawatts of solar the program could incentivize at the new incentive levels and how that compares to the program’s goal of installing 300 MW of solar over 10 years. The three incentive level scenarios were: 1) the incentive levels prior to the March 2023 increase, 2) the increased March 2023 incentive levels, and 3) the March 2023 incentive levels assuming the ITC or LIHTC is claimed on 77 percent⁵⁸ of the projects. All scenarios assume the annual program budget is \$100M and 90 percent of the budget is allocated to program incentives and the remaining 10 percent is allocated to program administration and include the roughly \$450M in incentives that are currently available from previous years. Additionally, all scenarios assume an 86/14 percent tenant/common area solar allocation (the tenant/common area allocation at the end of 2022). As Table 4-16 below shows in Scenario #1, if the program were to leave incentives at the prior level for the remainder of the SOMAH period (6 years), the program would incentivize 431 MW of solar (144 percent of the program goal). Scenario #2 shows that if the newly increased incentives were used for the remainder of the program and no tax credits were levered, the program could incentivize 375 MW of solar (125 percent of the program goal). And if the tax credits continue to be leveraged with the same frequency as in the end of 2022 (77 percent), the program could incentivize 469 MW of solar (156 percent of the program goal). This exercise illustrates that with the increased 2023 incentives, the program continues to be capable of exceeding its goal of 300 MW of solar within the existing program budget if it is able to increase program participation.

⁵⁸ As of December 2022, 77 percent of completed projects planned to leverage either the ITC or LIHTC.

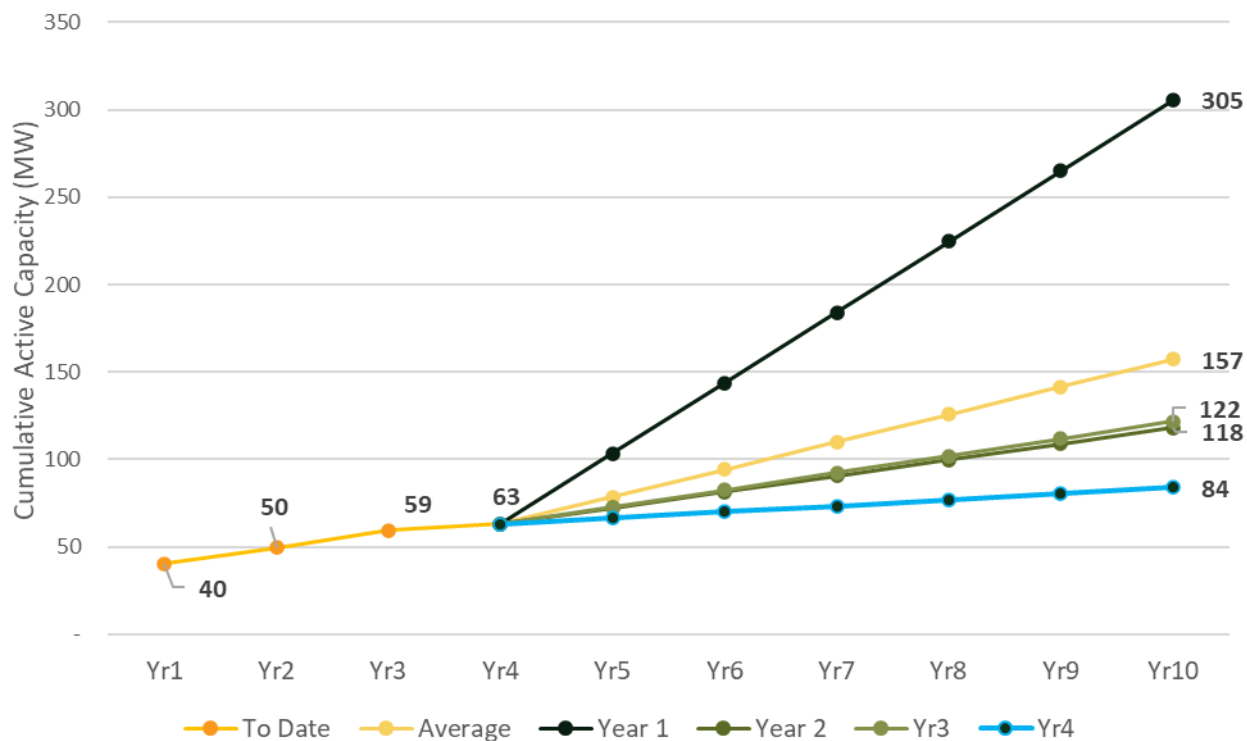
TABLE 4-16: SOMAH INCENTIVE LEVELS MAXIMUM PRODUCTION SCENARIOS

	Scenario #1 2022 Incentives	Scenario #2 2023 Incentives	Scenario #3 2023 Incentives with ITC or LIHTC*
Annual SOMAH Budget (A)	\$100,000,000	\$100,000,000	\$100,000,000
Admin Costs (B)	10%	10%	10%
Annual Incentives (C)	\$90,000,000	\$90,000,000	\$90,000,000
Tenant Incentive/watt	\$3.04	\$3.50	\$2.45
Common Area Incentive/watt	\$1.04	\$1.19	\$0.87
Tenant/Common Area Split	86%/14%	86%/14%	86%/14%
Completed Projects claiming tax credit	N/A	N/A	77%
Blended Incentive/watt (D)	\$2.70	\$3.18	\$2.44*
Max Annual MW at (D) (E = C/D)	33.4 MW	28.3 MW	36.8 MW
6 Year Max MW (F = E * 6)	200.2 MW	170.0 MW	221.1MW
Active and Installed MW (as of 12/22) (G)	63.5 MW	63.5 MW	63.5 MW
Available Unallocated Incentives	\$450,000,000	\$450,000,000	\$450,000,000
MW's from Unallocated Incentives (H)	166.9 MW	141.7 MW	184.2 MW
Program Years 2019 to 2030 Max MW (F + G + H)	430.6 MW	375.2 MW	468.8 MW
% of Program Goal	144%	125%	156%

* This scenario assumes 77 percent of completed projects are leveraging the ITC or LIHTC based on current completed SOMAH projects.

Figure 4-10 below shows the 10-year forecast of installed capacity based on program applications as of May 14, 2023. This forecast includes the 10-year projections assuming participation continued at the same pace as program's first year (July 2019 – June 2020), second year (July 2020 - June 2021), third year (July 2021 – June 2022), and fourth year (July 2022 – mid-May 2023). As this figure shows, the only scenario in which the program achieves its 10-year goal of installing 300 MW of solar is if program participation returned to the level it experienced in the first year of the program and remained at that level for the final 6 years of the program. The alternative forecasts (which are likely more realistic if significant changes are not made to the program), show the program falling short of its 300 MW goal.

FIGURE 4-10: SOMAH 10-YEAR FORECAST OF INSTALLED CAPACITY, Q2 2023



4.5 TOTAL PROGRAM EXPENDITURES TO DATE

SOMAH has an annual budget of up to \$100 million per year through June 2026. The SOMAH PA compiles and submits a Semi-annual Expense Report that tracks expenditures by category, including program incentives and administration expenses for the SOMAH PA, CPUC Energy Division, and the IOUs.⁵⁹ Administrative costs are capped over the lifetime of the program to not exceed 10 percent of the total available funds, but there is flexibility as to when funds can be utilized.⁶⁰

The following table shows the total expenditures through December 31, 2022.⁶¹

⁵⁹ SCE holds the SOMAH contract. A single invoice is submitted by CSE to SCE on behalf of all four organizations that make up the PA.

⁶⁰ D.19-03-015 Ordering Paragraph 1.

⁶¹ Semi-annual Expense Report: July 1, 2019 – December 31, 2022.

TABLE 4-17: TOTAL PROGRAM EXPENDITURES FOR 2018 - 2022

Budget Category	2018	2019	2020	2021	2022	Total
SOMAH Program Administration	\$1,896,345	\$3,361,236	\$4,007,467	\$3,819,534	\$3,709,732	\$16,794,337
SOMAH Marketing, Education, & Outreach	\$412,041	\$1,681,468	\$2,158,198	\$2,817,200	\$3,236,819	\$10,305,726
SOMAH Workforce Development	\$22,049	\$282,027	\$497,327	\$512,235	\$552,900	\$1,866,538
SOMAH Technical Assistance	-	\$232,941	\$186,594	\$231,039	\$494,056	\$1,144,629
SOMAH Evaluation Expenses	-	-	\$231,237	\$275,937	\$101,677	\$608,851
Investor-Owned Utility (IOU) Expenses	-	\$1,410,785	\$1,631,647	\$584,941	\$710,506	\$4,336,395
Total Program Admin Expenditures	\$2,330,0446	\$6,967,604	\$8,711,861	\$8,240,887	\$8,805,689	\$35,056,477

The Semi-annual Expense Report tracks the incentive budget and actual and forecasted incentive payments. The following table shows the annual incentive budget and actual incentive payments through December 31, 2022, and the forecasted incentive payments through December 2025. As this table shows, the current budget for incentives far exceeds the forecasted incentive payments.

TABLE 4-18: TOTAL PROGRAM INCENTIVE BUDGET AND PAYMENTS (TO DATE AND FORECASTED)

Incentive Budget and Payments	2016 - 2019	2020	2021	2022	2023	2024	2025	Total
Budget	\$270.2M	\$84.4M	\$79.9M	\$100M				\$534.5M
Payments	Actual	\$126k	\$6.5M	\$23.9M				\$30.6M
	Forecasted				\$68.4M	\$23.4M	\$11.5M	\$103.3M

5 PROCESS ASSESSMENT

This section presents the results of the process assessment conducted as part of the second triennial SOMAH Program evaluation, which differs significantly from the process assessment that was completed as part of the first evaluation. The first assessment was focused on documenting the SOMAH application process, determining contractors and property owners' motivations/barriers to participation and their experience and satisfaction with the program, and providing actionable recommendations for program improvement. This second process assessment provides insights on the current state of the program, the progress made responding to prior evaluation recommendations, and areas where additional program improvements are still needed. This section is organized by the following topical areas:

- The effectiveness of the SOMAH program's marketing and outreach activities to increase program awareness and knowledge and build a pipeline of future SOMAH projects,
- How SOMAH contractors and property owners are currently experiencing the SOMAH program, including the effectiveness of recent program changes, and
- Findings from later stages of the SOMAH participation process that were not researched in the first SOMAH evaluation (such as the effectiveness of SOMAH's Tenant Education and Workforce Development activities).

The findings in this section stem primarily from a second round of in-depth interviews conducted with the SOMAH PA, IOUs, CBOs, participating and non-participating contractors and property owners, and surveys conducted with SOMAH tenants and job trainees.⁶²

5.1 EFFECTIVENESS OF PROGRAM OUTREACH AND AWARENESS ACTIVITIES

SOMAH Marketing, Education and Outreach (ME&O) activities accounted for 29 percent of SOMAH's overall expenditures since program inception (2018 – 2022 ME&O spending was reported to be \$10,305,726 according to the Semiannual Expense Report published in January of 2023) and 37 percent of program spending in 2022. Table 5-1 below presents a breakdown of the ME&O category expenditures by year. As this table shows three tasks accounted for the majority of the total M&EO spending. These tasks included: Community Based Organizations (CBOs, 31 percent), ME&O Admin (19 percent), and Website Development & Enhancements (10 percent).

⁶² The evaluation team will make this assessment based on data collected by the SOMAH PA via their tenant and job trainee surveys. The assessment of this data also included a review of these survey instruments to ensure they are collecting the information needed to assess the program's related metrics and KPIs.

TABLE 5-1: TOTAL ME&O EXPENDITURES BY ME&O CATEGORY FOR 2018 - 2022

SOMAH ME&O Category	2019 and Prior	2020	2021	2022	Total	%
ME&O Admin	\$358,770	\$462,255	\$526,898	\$600,959	\$1,948,882	19%
Website Development & Enhancements	\$333,174	\$206,662	\$220,177	\$287,451	\$1,047,464	10%
Community Based Organizations	\$276,697	\$821,387	\$979,592	\$1,076,892	\$3,154,567	31%
Cooperative Marketing Efforts	\$132,079	\$52,473	\$120,942	\$177,736	\$483,230	5%
Conferences	\$136,387	\$54,181	\$119,637	\$90,442	\$483,230	4%
Tenant Engagement	\$235,132	\$43,177	\$71,261	\$139,695	\$400,647	5%
Property Owner Engagement	\$169,693	\$202,617	\$247,929	\$214,156	\$489,265	8%
Contractor Engagement	\$81,728	\$48,429	\$87,302	\$92,122	\$834,395	3%
Contractor Training	\$68,661	\$29,070	\$42,007	\$37,252	\$309,581	2%
Marketing Collateral Development	\$75,330	\$58,721	\$117,859	\$198,549	\$176,991	4%
Communications	\$108,816	\$80,818	\$136,270	\$92,020	\$450,459	4%
Media	\$14,634	\$8,628	\$76,836	\$154,386	\$417,924	2%
ME&O Plan Development	\$102,408	\$89,780	\$70,490	\$75,159	\$254,485	3%
Total ME&O Expenditures	\$2,093,509	\$2,158,198	\$2,817,200	\$3,236,819	\$10,305,726	100%

5.1.1 2022 Marketing, Education and Outreach Plan

The 2022 SOMAH ME&O plan detailed the proposed marketing tactics for the SOMAH Program in 2022.⁶³ These tactics included: direct outreach (events, webinars, conferences), the SOMAH website, paid media (Google, and social media advertising, local community newspapers), organic social media (LinkedIn, Twitter, Facebook, and Instagram), earned media (press conferences/releases, editorials, story pitching), owned media (educational content, testimonials, email marketing), and shared media with partners and CBOs (content calendar, quarterly content kits, cross-promotion).

The ME&O plan also detailed the goals for the SOMAH program in 2022. The evaluation team assessed the progress made towards these goals in 2022 as detailed in the table below.

⁶³ https://www.californiadgstats.ca.gov/static/documents/somah/2022_SOMAH_MEO_Plan_A.pdf

TABLE 5-2: 2022 ME&O GOALS AND PROGRESS

ME&O Goal	Progress made in 2022	Recommendations
Goal 1: Engage property owners to build and maintain a multi-year pipeline of diverse projects.	The majority of participating property owners continue to report that they learned of the SOMAH program through their contractor or other trusted sources. While there were only 49 applications submitted in 2022, the percentage of applications located within a DAC increased from 28 to 31 percent.	■ The SOMAH PA should tailor their marketing materials to highlight the financial benefits of SOMAH for property owners. ■ The SOMAH PA should prioritize direct outreach to non-participating property owners to ensure they are aware of and knowledgeable about the program. ■ The SOMAH PA should prioritize building relationships with participating property owners to correctly identify additional eligible properties and provide support.
Goal 2: Continue to build a robust and diverse contractor base and support.	As of 2022, 17 contractors have submitted an application and only five have completed a project. There are three contractors that account for 94 percent of all project applications. Nonparticipating contractors are enthusiastic about the program but feel discouraged to participate.	■ The SOMAH PA should do greater outreach to contractors to ensure they are aware of all available SOMAH resources. ■ The SOMAH PA should offer additional trainings or information to contractors on how to secure leads and find eligible projects.
Goal 3: Ensure sufficient job trainee participation and preparation for SOMAH job training opportunities or relevant careers.	Not all contractors were aware of the SOMAH PA's job training resources and reported they would be interested if they existed. About one-third of job trainees were still employed with their contractor 9 months after their SOMAH training.	■ The SOMAH PA should do greater outreach to contractors to ensure they are aware of all available job training resources, specifically the job board.
Goal 4: Educate SOMAH-eligible tenants and tenants living in participating SOMAH properties about the program and how to maximize their benefits.	Many tenants did not recall ever seeing materials in their building related to the SOMAH program. Of those who did, a little less than half thought the materials helped them feel prepared for their building's solar installation.	■ The SOMAH PA should provide a flyer that can be posted in common areas by property management staff, if desired, promoting the tenant hotline.
Goal 5: Ensure stakeholders are informed and helping to co-market the program.	Almost 30 percent of ME&O spending was on CBO activities (more than \$1M in 2022) and the primary activity that the CBOs indicated they were involved in was to conduct outreach for the SOMAH program, mainly to property owners and local governments.	■ The SOMAH PA should reevaluate the role of CBOs in SOMAH implementation to determine if a more appropriate role for CBOs is to focus on promoting SOMAH's job training opportunities and partnering with contractors and property owners to maximize the value of tenant education.

5.1.2 Primary Sources of SOMAH Program Awareness

As shown in the table above, the first ME&O Goal in 2022 was to engage property owners and build a pipeline of diverse projects. Accomplishing this goal relies on ensuring all SOMAH-eligible property owners are aware of the SOMAH Program. As such, interviews with participating and non-participating property owners focused on sources and levels (non-participants only) of SOMAH Program awareness.

Participant Awareness

The majority of participating property owners continue to report that they learned of the SOMAH program through their contractor, and not from program contracted CBOs. Other common means included trusted partners not affiliated with SOMAH Program implementation, such as another non-profit housing organization or lender, and online research. Only one participating property owner recalled receiving outreach materials from the SOMAH PA, however they stated their decision to participate was ultimately determined by a trusted solar contractor who convinced them to take part. Participating property owners also report having limited knowledge of the SOMAH Program despite their participation as their contractors manage all aspects of program participation including the application process and interactions with the SOMAH PA and the IOUs.

Non-Participant Awareness

Just over half of the non-participants interviewed were aware of the SOMAH Program (very familiar 27 percent, somewhat familiar 27 percent)⁶⁴ and those who were familiar reported having similar exposure to the program as participating members – through trusted contacts (contractors and consultants from other LIMF housing programs) or online research – with only two reporting they had interacted with the SOMAH PA. This lack of SOMAH program awareness can be viewed both as an opportunity (i.e., there may be many property owners who are likely to participate in the future) and as an indication of the need to reassess the program’s primary outreach methods and the program’s reliance on CBOs for this type of outreach. It is concerning that three years into the program so many non-participating property owners interviewed were unaware or ill-informed of the program. The evaluation team recommends the SOMAH PA prioritize outreach efforts to non-participating property owners to ensure they are aware of and knowledgeable about the program.

5.1.3 Generating Project Leads

Participating contractors noted that the most frequent way of generating SOMAH project leads was through existing client contacts. In other cases, they have relationships with affordable housing staff who approached them to learn more about SOMAH. At least one larger participating contractor reported their

⁶⁴ It should be noted that a number of these respondents who claimed to be aware of the program were later found to have an inaccurate or incomplete understanding of the program.

organization has invested in and built up an in-house marketing team to conduct SOMAH outreach to affordable housing organizations. Contractors mentioned that working with larger property owners with several multifamily properties is often easier and more efficient, as communications and decision points can apply to multiple sites.

Several contractors mentioned that an affordable housing conference, the annual Southern California Association of Non Profit Housing (SCANPH) conference, could be an avenue for the SOMAH PA to engage with affordable housing property owners. However, all of those who mentioned the conference noted that currently the SOMAH PA's presence at this conference is smaller and more "reserved." Contractors recommended greater participation at this conference so that lead generation might be easier, particularly for smaller contractors who do not have existing connections in either the multifamily solar or affordable housing space.

Application Pipeline

In 2022, there were only 49 applications submitted to the program, and property owners indicated that their primary source of awareness of the program was from contractors or trusted resources other than the SOMAH PA. Both participating and non-participating contractors provided insight into this application slowdown and the disconnect between the SOMAH PA's marketing and the source of awareness among property owners.

A few contractors mentioned that there was a sense among participating contractors that there were going to be changes coming to the program to increase incentives, and they were waiting to submit applications until those changes were enacted. Another sentiment among smaller participating and non-participating contractors was that all the "low-hanging fruit" had already been taken by larger contractors. Meaning properties that are eligible for the program, with roofs that are easily amenable to solar have been accounted for already, and "the harder properties are the ones that are left."

One of the larger participating contractors indicated that there was a disconnect between the marketing strategy for this program and its target audience. According to multiple contractors and program partners interviewed for this evaluation, the decision-makers for potential projects are the property owners, who resonate more with messaging about the financial benefits of SOMAH as opposed to the social and environmental benefits and are ultimately driven by the financial savings. A few contractors mentioned that tailoring marketing materials specifically to this group and their priorities might make it easier to "sell" the program to property owners.

Another contractor indicated that the incentive structure of the program was not appealing to property owners as the incentive "pretty much will just cover the solar installation and nothing else, which is fair because that's what the program is designed to do. It's to help improve the lives of the tenants.

Unfortunately, the people that own these properties are like, well, what's in it for me? And it's hard for us to sell the SOMAH program to people who want something additionally in it.” One contractor suggested that SOMAH PA resources might be better spent towards tenant education and coordination with IOUs, leaving contractors or other organizations to market the program to property owners.

Participating and nonparticipating property owners were asked their opinions on how best to market and raise awareness of programs such as SOMAH with the affordable housing community. Responses included:

- Outreach at time of re-syndication when projects have funding, personnel, and can more readily make such improvements.⁶⁵
- Housing conferences, both local and national.
- Through contractors and consultants on other LIMF projects.
- Through their utilities.
- Through city jurisdictions at time of planning and permitting for different upgrade projects.
- Through realtors who can present opportunities for building upgrades when properties change hands.

Identifying Eligible Properties

Some contractors discussed difficulties surrounding program eligibility requirements in generating projects for the program. One contractor discussed the 10-year compliance eligibility requirement and said this prevents some property owners from participating who want to sell their building. They stated that this requirement might “limit the people who are going to want to buy if they know they have to keep operating this building [as deed-restricted affordable housing] for 10 years because of this incentive that we applied for.”

Both participating and non-participating contractors expressed frustration surrounding the SOMAH program’s eligibility requirements. The most common point expressed during these interviews was the desire to include master metered properties and properties where utility bills are paid by the property owner. Advocates of doing so argue that these properties align with SOMAH’s mission as they provide housing to communities in need (often formerly homeless and youth populations). Allowing these properties to participate would increase funding available for wrap-around services for the property’s tenants and would stabilize the housing asset for these populations. Interviewees shared the idea that

⁶⁵ According to property owners TCAC makes publicly available data on properties that are coming up for re-syndication.

the SOMAH PA can ask these properties to provide evidence regarding how the money is being used to benefit their tenant community.

Many CBOs also reported some frustration with the eligibility requirements, indicating that this was a barrier to bringing more properties into the program. One CBO mentioned the deed restriction requirement and said that they “go to low-income communities that could use this, but a lot of [those properties] are not deed restricted”. Another mentioned that they were working with a couple of non-profit organizations who were interested in the program, but they did not have any properties that qualified.

Additional program eligibility concerns included confusion around new construction eligibility, a desire for expanded service territory participation (SMUD and LADWP territories were specifically called out⁶⁶), and a desire for relaxation of the DAC participation criteria to include properties that are 20 percent affordable or within close proximity (such as across the street or around the corner) to a DAC property.

The SOMAH eligible properties map includes a listing of SOMAH eligible properties that can be easily segmented by electric utility, legislative district, and disadvantaged community tract. The map includes the address of the properties, and the number of eligible units at each property. Interviewed contractors had mixed reviews of the eligible properties map. Some thought of it as a helpful tool to find potential leads, while one contractor described it as “daunting” despite their operations background. Only two contractors specifically mentioned using the map to assist them with generating project leads, although the map webpage received over 1,145 page views in Q3 and Q4 of 2022 (page views cannot be verified to contractor use).

Community Based Organizations

Per the 2022 ME&O plan, the SOMAH PA and its current CBO partners worked to recruit additional CBOs in hard-to-reach areas. These partnerships were finalized in Q1 of 2022. The evaluation team conducted interviews with five participating CBOs to gain insight into their experience co-marketing the program.

Most interviewed CBOs were new to the SOMAH Program and were attracted to it because of its equity and justice mission. CBOs expressed particular interest in supporting the mission to provide tenants with the energy and financial benefits of solar power, and with the mission to provide tenants with green energy workforce opportunities. CBOs reported being involved with establishing community connections

⁶⁶ It is important to note that expanding SOMAH to other service territories is not currently possible due to SOMAH’s funding source, however property owners report a need for similar incentives to enable them to install solar on their properties outside of SOMAH eligible territory.

and were focused largely on generating interest amongst local governments and property owners. Most CBOs were enthusiastic about their participation.

As mentioned above, the SOMAH Vendor Assessment found 29 percent of ME&O category spending (\$1,093,014) and 9 percent of all SOMAH spending was on CBO activities (including SOMAH PA and CBO spending). The primary activity that the CBOs indicated they were involved in was to conduct outreach for the SOMAH Program, mainly to property owners and local governments. While the CBOs were all involved in various efforts to engage property owners, most reported their primary success was in engaging with local governments, who in turn endorse the program. One CBO said that endorsement from local government officials makes the program an “easier talking point” with property owners, and another said that “property managers pay more attention with endorsements from local government.”

When engaging property owners, CBOs reported employing various strategies including presentations to communities and property owners, attending community events, utilizing existing networks to generate leads, and other grassroots efforts. They also reported often having to conduct multiple in-person visits to a single property to correctly identify the decision-maker and provide promotional SOMAH materials. One CBO indicated that they have pulled back from larger community outreach and instead are focusing on “targeted, in-depth property owner engagement.”

Overall, CBOs reported positive interactions with the SOMAH PA and felt supported in their activities. One CBO stated that “SOMAH has been the most amazing team to work with because we have the same passions,” and another expressed gratitude towards the PA for joining their presentations about the program and being willing to answer questions from attendees. Other CBOs praised the hands-on support they receive from the PA, including an “extensive onboarding process” and regular touchpoints and coordination.

While CBOs were generally satisfied with the SOMAH PA, there were a few areas where they indicated a need for increased support. These areas included:

- Providing CBOs with a more comprehensive proposal package, including information about energy production, costs, and incentives,
- Decreasing turnaround time to engage property owners in the program (as one CBO stated, “you can’t keep people’s interest going for 6 months”),
- Providing more information on options for financing to be able to inform property owners about what is available to them.

While the CBOs have been tasked with engaging property owners, their success in this area has been limited as evidenced by the lack of associated applications from their efforts. As stated above, most

property owners learned about the program from their contractor, not a program-contracted CBO. Interviewed CBOs also indicated that while they all had some promising leads, they had only been responsible for a handful of submitted applications. The SOMAH PA should reevaluate the role of CBOs in SOMAH implementation to determine if it is more appropriate to have them focus on educating community members about SOMAH's job training opportunities and partnering with contractors/property owners to provide tenant education (such as attending on-site tenant education events within their communities).

Track A Applications

Track A was designed for property owners who would like to receive no-cost technical assistance services from the SOMAH PA to help them assess the solar potential at their property and to identify eligible contractors for their project.

The number of Track A applications increased from 20 to 45 between the first and second evaluations, but cancellations also increased from 10 to 34 (the Track A cancellation rate as of December 2022 was 76 percent) and thus the net number of active Track A applications has only increased by one (from 10 to 11). Most Track A cancellations are due to program ineligibility. This low level of Track A participation could be viewed as an indication of the lack of lead generation from SOMAH PA outreach activities (including the CBOs) as Track B applicants typically already have identified an eligible contractor (via an existing contractor relationship or contractor outreach) that they plan to work with for their SOMAH project.

The SOMAH PA indicated that getting contractors to bid on Track A projects has been a challenge (despite an extension to the bid timeline), often requiring the SOMAH PA to recruit contractors to bid on Track A projects as obtaining multiple bids is a requirement of Track A participation. A number of Track A projects have been cancelled with the plan to resubmit as Track B (4 projects). One property owner stated in an interview they did this as they identified a contractor they wanted to work with on their project and did not want to get multiple bids. The SOMAH PA should consider if there is a means to allow a submitted Track A project to transfer to Track B (or submit a multiple bid waiver) such that these unnecessary cancellations can be avoided. Per the SOMAH PA, the Track A multiple bid requirement is currently being reviewed as part of the May 5th ALJ Ruling inviting comments on potential modifications to SOMAH to determine if it is inadvertently adding an additional burden to Track A participation.

5.1.4 Outreach and Participation Challenges

Tribal Participation

Currently, three tribal organizations from the 109 federally recognized Indigenous California Tribes are taking part in the SOMAH program, and only three tribal housing organizations are included in the non-

participant property owner database. Information on barriers to tribal participation came from interviews with non-tribal affiliated property owners and contractors.

One contractor pointed out a difficulty they have when working with tribal organizations is that not all contracts are enforceable for tribal communities. This creates uncertainty and makes it difficult to execute third party ownership, often necessitating host customer ownership. This may require higher incentive levels for these organizations in order to afford the cost of outright ownership. Interviewed contractors also expressed the need for “warm introductions to the right people” to help facilitate relationships with tribal housing organizations. Many people interviewed also shared that most tribal lands do not have traditional, large multi-family housing properties, and that properties housing low-income residents may not be deed-restricted in the manner required by the statute governing the program.

IOU Reported Challenges to Participation

IOU staff were interviewed as part of the evaluation and asked about the challenges their customers face to SOMAH participation. Findings from these interviews are shared below.

- **PacifiCorp** – The primary challenge for PacifiCorp is the limited number of eligible properties in their service territory (~30) as their territory is rural and does not have a lot of multifamily housing. Additionally, site limitations (such as properties located in heavily wooded areas or at higher elevations with significant snowfall) can result in difficulties making solar “pencil out,” and a lack of qualified solar installers can be problematic (especially since their projects would likely be smaller—making contractors less incentivized to travel from outside areas). The lack of SOMAH projects within their territory also means there is limited awareness as there is no “word-of-mouth” learning about the program. PacifiCorp reported having a battery storage grant program in their territory and have found that it is “hard to give out free money” due to a lack of qualified companies trying to get these projects into the field.
- **Liberty Utilities** – Liberty has also been challenged by the limited number of eligible properties in their territory (they estimate they have fewer than 10 SOMAH-eligible properties). Additionally, they are challenged with trying to identify and connect with property owners who tend to manage many properties. They reported their two submitted applications have reached PPM and have applied for interconnection—which they see as a big win (this occurred in 2023). These applications were submitted in 2019 and the first half of 2020, but they have seen no additional SOMAH applications since then.
- **PG&E** – PG&E has the second highest number of completed projects (23). When asked about the challenges their customers face to participation, they hypothesized it has to do with financing difficulties resulting from having to pay for system costs upfront and the time it takes to receive program incentives. They acknowledged the creation of the Progress Payment Pathway and believe it has helped, but there are still extended timelines to carry SOMAH costs. In 2023, PG&E plans to launch a Clean Energy Financing Program and are going to look into whether this program could be used by SOMAH participants to alleviate some of the upfront cost barriers. They also noted that third-party

run programs such as SOMAH can be hard for their customers as they often lack trust in third parties and prefer their IOUs to be involved. The IOUs are amenable to working with the PA to increase SOMAH co-marketing, but request further guidance from the CPUC on the budget available for such efforts.

- **SCE** – SCE is unsure why SOMAH applications in their territory have dropped off and have received little feedback from property owners on the SOMAH program. They theorize it could be due to customer outreach, lack of developer (contractor) interest, supply chain issues, or issues related to inflation.
- **SDG&E** – SDG&E is concerned that the SOMAH project pipeline is not keeping up with the goals of the program. They reported they used to get inquiries from the SOMAH PA about property usage, however in the past eight months they have not gotten any. They believe a primary barrier to participation for their customers is a lack of awareness of the program. They attributed this to the SOMAH PA being focused on current applications and note this could result in an insufficient pipeline once current projects are completed. They also were aware of the high number of project cancellations but lack clarity on why this is occurring and wondered if they could be minimized if property owners had an advocate assisting with the project so they would not lose focus to other priorities. They also thought SOMAH's budget and goals may be unrealistic (too big) and the willing and eligible pool of participants is smaller than anticipated.

Co-Marketing with IOUs

The IOUs were asked whether their organization is involved in any co-marketing of SOMAH with the PA. They reported:

- **PacifiCorp** – Staff reported that in early 2022 a SOMAH PA member planned, in coordination with PacifiCorp, to reach out directly to all 30 potentially SOMAH-eligible properties by email, mail and phone. Unfortunately, due to staff turnover at the PA this outreach was never conducted. In late 2022 they decided to reengage in co-marketing, but decided to wait until the PFM had been ruled on⁶⁷.
- **Liberty Utilities** – Staff reported outreach to their ~10 SOMAH-eligible properties had not yet occurred, but that they had met recently with a new SOMAH PA coordinator and planned on co-marketing the program starting in Q1 of 2023.
- **PG&E** – PG&E has a multifamily Single Point of Contact (SPOC) team that is run by a third-party. PG&E staff believe the SPOC team has been involved in co-marketing the program, however, due to the outsourced nature of this group they were unaware of the level of co-marketing that is being done.

⁶⁷ The PFM was ruled on by Decision (D.) 23-03-007 which amended D.17-12-022 and increased SOMAH incentive levels to \$3.50/watt for tenant areas and \$1.19/watt for common areas and ends the incentive step-down. <https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/energy-division/documents/somah/d2303007.docx>

- **SCE** – Staff report they have started to coordinate with the marketing leads of other programs (E-mobility and ESA), however noted changes in roles at SCE have slowed down these efforts. They also noted they do not have a single MF SPOC, rather the role is shared by several staff.
- **SDG&E** – Staff reported they have done a small amount of co-marketing with the SOMAH PA but see the SOMAH PA as having primary responsibility for marketing activities. They have an MF SPOC but the staffing for this role changes frequently.

Property Owner Contact Information

Identifying the correct property owner contact for SOMAH Program outreach can be difficult. This is often exacerbated by high levels of turnover at affordable housing organizations and makes it difficult to establish relationships with property owners. It can also make contact databases rapidly outdated (over 25 percent of individuals contacted for non-participating interviews were no longer employed at the organization). The evaluation team was provided a property owner database from the SOMAH PA as a source for non-participant interview recruitment. The contact information proved to be dated and insufficient for identifying interviewees. This feedback was provided to the SOMAH PA and then an updated database was provided. The new database was a significant improvement over the original database, however as shown in the table below, the evaluation team had to reach out to 159 individuals to yield 11 completed interviews.

TABLE 5-3: NON-PROPERTY OWNER CONTACT AND INTERVIEW RATES

Category	Original Database	New Database	Total
# of Organizations Contacted	8	53	61
# of Individuals Emailed	27	132	159
# of Follow-up Emails	20	86	106
# of Bounced/Person No Longer at the Organization	7	27	34
# of Individuals Called	11	8	19
# of Interviews from Completed	0	11	11

The property owner database provided by the SOMAH PA was also leveraged by the evaluation team to estimate the number of additional properties belonging to participating property owners (as these could represent future SOMAH projects). Through property owner interviews, the evaluation team verified these estimates and found that they overstated potential future SOMAH projects as many properties in the database were ineligible (master metered, already have solar), not good candidates for SOMAH (roof too small, carports too expensive), or unlikely due to property or financial constraints. Most of the larger participating umbrella companies reported they had reviewed all in-territory properties for eligibility with

their contractors and submitted all the projects that were feasible (physically and financially).⁶⁸ To address this overestimation and correctly identify how many additional eligible properties a participant in the SOMAH Program may have, we recommend that the SOMAH PA works to build relationships with participating property owners. This can be accomplished by the SOMAH PA conducting one on one outreach with each participating property owner, specifically through emails, phone calls, and/or in-person visits to introduce themselves, check-in with the property owner, collect pertinent data, and ensure that the support property owners need is available to complete any potential projects.

5.1.5 Likelihood of Future Participation at Other Properties

During evaluation interviews, participating and nonparticipating⁶⁹ property owners were asked the likelihood that their organization will submit a SOMAH application for one or more of their eligible properties in the future. As the table below shows, 60 percent of participating property owners (75 percent if those who have no additional SOMAH-eligible properties are excluded) and 80 percent of non-participating property owners state some level of likelihood of submitting a SOMAH application in the future. These results indicate significant interest in future SOMAH Program participation from those who have and have not yet participated in the program.

TABLE 5-4: PROPERTY OWNER REPORTED LIKELIHOOD OF SUBMITTING FUTURE SOMAH APPLICATIONS

Likelihood of Submitting Future SOMAH Applications	Participating Property Owners (n=15)	Non-participating Property Owners (n=10)
Very likely	5 (33%)	4 (36%)
Somewhat likely	4 (27%)	5 (45%)
Not at all likely	1 (7%)	
Properties not eligible	1 (7%)	2 (18%)
No more properties to enroll	3 (20%)	
Unsure	1 (7%)	

5.1.6 Progress on Prior Recommendations Addressing Program Awareness

The previous SOMAH evaluation provided recommendations for increasing program awareness amongst affordable housing property owners. Below we present these recommendations and the progress made to address them.

⁶⁸ A number reported they had additional ineligible properties (such as master metered or property owner paid utilities) they would like to submit applications for if program rules change.

⁶⁹ Non-participants who were unfamiliar with the SOMAH Program were provided information on SOMAH (a program description and eligibility criteria) and then were asked the likelihood of submitting a SOMAH application in the future.

TABLE 5-5: PROGRAM AWARENESS PRIOR RECOMMENDATIONS AND PROGRESS

Prior Recommendation	Progress Made to Address Recommendation
Improvement to Track A Solar Feasibility Assessments (2A) and Online Bidding Tool (2B)	The PA reports they have made improvements to the Track A Solar Feasibility Assessments, however one contractor reported that these participants continue to be presented with an unrealistic menu of options that are not representative of what is available in the market. The SOMAH PA extended the Track A timeline to allow more time for the bidding process (Handbook v6) and is allowing contractors to submit multiple bids for property owners interested in multiple purchase types. Contractor bidding for Track A has been a challenge and AEA has provided support to find contractors to submit Track A bids.
Examine SOMAH's eligibility criteria to identify modifications to extend the program's reach (5A)	This recommendation was put on hold by the SOMAH PA pending the outcome of the NEM 3.0 proceeding (Q3 2022) and thus there was little time to make progress at the time of the evaluation. The SOMAH PA correctly acknowledges that implementation of this recommendation will require CPUC involvement as VNEM is a legislative requirement of the program. Expanding eligibility to include ineligible properties (master-metered, property owner paid bills, new construction, and youth/senior/farmworker/formerly homeless housing) is recommended as it aligns with program goals.
Provide additional assistance to contractors to identify ineligible projects sooner (5B)	The SOMAH PA has begun to offer an Affordability Prescreen to help contractors and property owners ensure a property meets SOMAH's eligibility requirements. This new offering includes reviewing a property's deed restriction or regulatory agreement as well as other eligibility criteria (Calsomah.org/prescreen). Only two property owners had used this service and been deemed eligible to participate, neither of which has submitted a SOMAH application at the time the evaluation was conducted.
Raise SOMAH awareness with city and county housing authorities (7B)	Awareness has been increased within housing authorities and submitted applications have increased more than 4-fold (from 7 to 29) since the last evaluation.
Creating and distributing SOMAH project case studies (7C)	The SOMAH PA has created a number of case studies on completed projects detailing the properties, systems specs, SOMAH incentives, environmental benefits (CO2 reductions), job trainee benefits, and testimonials from residents on the benefits they've received. The SOMAH PA has also added testimonials from named members of the affordable housing community to their website.
Increase co-marketing with IOUs or local governments (8E)	IOU staff interviewed reported limited engaged with the PA to co-market the program. A number stated direct outreach to eligible in-territory participants had been planned but stalled due to staff turnover at the PA. The IOUs seek clarification from the CPUC on the budget available for co-marketing of the program. CBOs reported have success engaging with local governments who then endorse the program, making it easier for them to market the program to property owners.

5.2 CONTRACTOR PROCESS IMPROVEMENTS

The research team completed 13 contractor interviews: 6 with participating and 7 with non-participating contractors. Feedback from these interviews indicated that the affordable housing sector appeals to solar

contractors, and both participating and non-participating contractors saw business potential in the program. Several participating and non-participating contractors reported that SOMAH’s objectives to attain more equitable solar power distribution aligned well with their overall business mission. One participating contractor also stated that “we are in the business of having meaningful savings for clients” and SOMAH enables those savings. Many participating contractors were already connected to the solar or affordable housing space, or had participated in similar programs like MASH. Non-participating contractors, like participating contractors, want to break into the affordable housing space.

5.2.1 Progress Made Towards Addressing Contractor Barriers

The previous SOMAH evaluation identified several barriers contractors face to participating in the SOMAH Program (shown below in Table 5-3) and provided change recommendations to address these barriers. The remainder of this section presents findings from contractor interviews on the progress made to address the previously identified barriers and recommendations for continued improvement.

TABLE 5-6: IDENTIFIED CONTRACTOR BARRIERS TO PARTICIPATION (FIRST TRIENNIAL EVALUATION)

Identified Contractor Barriers to Participation

- #1 - SOMAH application process presents significant administrative burden
- #2 - Lack of opportunities for new or smaller contractors to participate
- #3 - Confusion over how SOMAH Program incentives can be used

Administrative Burden

Larger participating contractors stated that the PA has made “a lot of incremental” improvements to the application process, including the most recent handbook. However, for most smaller contractors, the application requirements—and particularly the policy specifications to affordable housing work—were often confusing. One participating contractor stated, “if you have never done SOMAH before, you would not know what you’re looking for [to complete the application].” Another contractor indicated that while the online portal was very user friendly, the documentation required was burdensome. This contractor reported spending “hours” with a SOMAH project manager to figure out all the documentation they were required to submit. A participating subcontractor suggested that if they had a “liaison with the program, then maybe it would be easier to get credentials, but I need someone within SOMAH.”

Non-participating contractors reported significant challenges to obtaining program experience. One non-participating contractor explained that it could “be as easy as someone taking us under their wing, and then tell us to sink or swim.” Another non-participating contractor reported similar struggles and expressed a desire for more support from SOMAH staff in entering the SOMAH space. This person said about SOMAH, “theoretically, I love it. Practically, I haven’t been able to do anything with it. It’s like a little

shiny object I can't catch. I wish they would help us get projects. We don't have trouble getting other projects."

One CBO also had concerns about the amount of administrative work required to participate and stated that "there is a small window of opportunity to make a decision. If you don't give a property owner a proposal within 24 hours, you've lost 50 percent of your chance to get a commitment, and with SOMAH there are too many moving parts. Building owners don't find SOMAH is serving them, and so I feel like it's too cumbersome to succeed."

Uneven Playing Fields

When asked about barriers to generating project leads, the most contractors reported that a couple large solar contractors have captured the market and made it so that no other company could compete. These larger contractors do provide smaller contractors the option to subcontract, which has increased the number of participating contractors from 17 to 31. Many contractors reported interest in participating in SOMAH via a subcontractor role, however others expressed reticence, and even a decreased interest in future participation. One contractor, who has subcontracted on SOMAH projects in the past, stated "we realized we weren't making much money, and [the prime contractor] kept lowering what they would pay". This contractor has decided to no longer subcontract on SOMAH projects but also was unlikely to prime a bid as they "couldn't figure out how to break in against larger contractors."

Financial Costs

Many participating and non-participating contractors report the incentive structures were too low to both engage property owners and allow contractors to be profitable. One participating contractor noted the incentive step-downs had made matters worse and their SOMAH business had "slowed to a trickle." Larger contractors are more able to withstand financial risk and secure contracts through better access to capital. One large contractor has attempted to support other contractors by making their financing available to others.

The introduction of milestone payments was seen as a very positive improvement for several contractors, however there were many participating and non-participating contractors who were unaware that milestone payments were an option. To alleviate this issue and ensure all contractors benefit from the milestone payment, we recommend the SOMAH Program should make the progress payment a default milestone rather than optional. This was also expressed by a financing organization working with SOMAH who indicated that "a lot of people don't know about [milestone payments] yet." Analysis of program tracking indicated there were 59 active or completed projects that have taken advantage of the milestone payments. Eighteen of these 59 projects have also received their final payment and the average number of days from the progress payment to the final payment ranged from 78 to 371 days, with the average

being 207 days. The time between the progress payment and the final incentive payment primarily includes PV installation and IOU interconnection.

In 2022, the SOMAH PA engaged a financing organization to help provide bridge financing loans to property owners who wanted to participate in the program, but needed assistance with the upfront cost. While the goal of this organization is to provide grants and loans to participating companies, a representative for the organization indicated that most of their time was spent raising awareness about SOMAH and explaining the program's benefits to property owners, getting leads from third party organizations that engage property owners. The financing organization also indicated that many properties they work with are very interested in solar, but do not have the money to wait a year and a half to receive the rebate.

There is some concern amongst contractors regarding how California Assembly Bill (AB) 2143 (passed in September of 2022) will affect the program as it adds new prevailing wage requirements to large solar energy projects that receive net energy metering. Contractors, for SOMAH and beyond, will need to make sure they build facilities in compliance with Public Utilities Code 769.2, and this is not a unique requirement to SOMAH.

Contractor Onboarding and Support

Contractors must complete a Contractor Eligibility Workshop delivered by the SOMAH PA and have an active license with the California Contractors State Licensing Board⁷⁰ to be eligible to participate. All participating and non-participating contractors interviewed attended the PA trainings. Overall, contractors had positive feedback about the training, indicating that it prepared them to participate in the program. Several non-participating contractors expressed a desire for the trainings to include information on how to secure leads and find eligible projects to bring on through the program, in addition to instruction on how to participate once those projects are identified.

All participating contractors interviewed noted that the SOMAH PA has been very responsive to their questions and requests and have been good to work with. One contractor mentioned that they "love the PAs, it's been very collaborative, everyone has been really good to work with, but programmatically it needs to be more consistent." While the SOMAH PA has been responsive to contractor feedback, contractors recommend establishing a well-understood communication channel by which program feedback from property owners and contractors can be passed along to the PA (and the CPUC if needed) so that issues can be resolved in a more timely manner. Relying on evaluation studies (that only occur every three years) to identify problems and make recommendations for program changes, as well as

⁷⁰ Per the SOMAH Handbook, solar installation contractors must have an active A, B, C-10, or C-46 license for photovoltaic systems.



elongated timelines for the PA to fix identified issues (oftentimes up to a year), is insufficient if the program is to succeed.

5.2.2 Progress on Prior Recommendations Addressing Contractor Barriers

The previous SOMAH evaluation provided several recommendations for reducing contractor barriers and increasing contractor support. Below we present these recommendations and the progress made to date to address them.

TABLE 5-7: CONTRACTOR BARRIERS PRIOR RECOMMENDATIONS AND PROGRESS

Prior Recommendation	Progress Made to Address Recommendation
Increase subcontractor support and opportunities to participate in SOMAH projects (3A, 6A)	Contractor participation and diversity have increased. The eligible contractor list has increased by 17% and smaller and diverse contractors increasing their participation in the program via subcontractor opportunities (Further details in Section 4.2.2)
Clarify allowable expenses that can be paid for with program incentives (8F)	This recommendation was placed “on hold” by the SOMAH PA due to the project costs exceeding the SOMAH incentives for most projects. This should be reevaluated since the incentives have been increased.
Minimize application burden by offering support services to assist with application submittal (9A)	Contractors reported receiving support from PA staff on their application, but a larger contractor reported that they had not seen significant improvements in the process.
Minimize financing barriers by offering greater support (12A)	The SOMAH PA has engaged with two bridge loan financing providers to provide additional financial support for SOMAH projects. While the financing organization has brought projects into the program, they reported most of their time being spent doing outreach to raise awareness about the program.
Assist contractors with the acquisition of electrical consumption data (14A)	Contractor’s report there have been improvements in receiving load data from the IOUs for project planning.
Track attachment of battery storage and create case studies of successful implementation (17A)	The SOMAH PA plans to include data on PV systems paired with energy storage in the tracking data and plan to create a case study highlighting a paired system when possible.
Increase SGIP awareness and provide support to increasing pairing of solar and battery storage (18A)	While the SOMAH PA responded that ensuring contractors have materials to promote and explain the benefits of solar plus storage is outside of their scope, they should advocate for and document regulatory and utility modifications needed to support SOMAH and SGIP pairings that are desired by many property owners.
Increase coordination with utilities (VA1d)	Increased coordination is still needed to ensure interconnections and PTO are carried out in a timely manner (Section 5.4.3).

5.3 PROPERTY OWNER PROCESS IMPROVEMENTS

5.3.1 Progress Made to Address Property Owner Barriers

The previous SOMAH evaluation identified numerous barriers that affordable housing property owners face to participating in the SOMAH Program (shown in the table below) and provided recommendations for changes to address these barriers. The remainder of this section presents findings from the property owner interviews on the progress made to address previously identified barriers to participation and recommendations for continued improvement.

TABLE 5-8: IDENTIFIED PROPERTY OWNER BARRIERS TO PARTICIPATION (FIRST TRIENNEIAL EVALUATION)

Identified Property Owner Barriers to Participation

- #1: Not their top priority
- #2: Lack of staff to manage a solar installation project
- #3: Property owner organizational structure
- #4: Project financing
- #5: Distrust in solar contractors marketing the program
- #6: Property physical site issues
- #7: Application burden and Property ownership structure

Application Prioritization and Participation Burden

Insufficient staffing appeared as a constant theme throughout property owner interviews and highlights one of the largest hurdles to SOMAH participation. Property owners assert that while increasing program awareness amongst non-participating property owners is essential, participation in SOMAH continues to be stifled from a lack of resources, specifically personnel. For example, despite previous participation in SOMAH and a positive experience, one property owner reported they were unlikely to submit additional SOMAH applications citing a lack of staffing. They reported insufficient resources to manage a solar installation project and difficulty hiring in the current economic climate. This sentiment was echoed by multiple participating property owners with the number one recommendation for increasing program participation to have a designated SOMAH resource to assist with SOMAH project management.

In addition to barriers around project management within an organization, property owners report issues interacting with IOUs during the end stages of the project. Property owners expressed a desire for IOUs to have a dedicated staff member who is very knowledgeable about the SOMAH Program and can help eliminate friction and provide support during the interconnection and bill credit stages. This staff member could also relieve a lot of property management burden by being a resource for tenants to contact when they have questions about their bill credits (see bill credits section for more details). As discussed in Section 5.1.4, though some (but not all) IOUs reported having a MF SPOC, they do not provide the support needed for SOMAH participants.

Overall, property owners reported satisfaction with their contractors and reported their contractors carried the majority of the burden for program participation. One property owner reported having completed projects with both a large and small contractor. They found working with the small contractor

significantly more onerous as the contractor did not understand VNEM or how to complete the allocation tables. The smaller contractor was also unable to handle the program paperwork, inspections, guarantees, and financing support like the larger contractor. Even with additional support from SOMAH PA, it was a burden on their organization, and they have decided to not work with smaller installers in the future.

Finally, smaller affordable housing organizations report difficulty with finding contractors in some cases. Larger affordable housing organizations have the advantage of big portfolios with diverse projects enabling negotiation with contractors to ensure that their more difficult or costly projects can also participate in SOMAH. Property owners with smaller portfolios often do not have this advantage and may be overlooked by contractors who are less inclined to work on smaller, more difficult, and often more costly projects without an added incentive. A sign of this is Track A projects which often require involvement from the SOMAH PA to recruit and encourage contractors to submit bids for these projects. Additionally, property owners in more remote territories also face limitations identifying contractors for their projects. For example, PacifiCorp staff are concerned that contractors are less likely to work on projects in their territory as they are often smaller and in remote locations. Property owners in remote territories often face additional barriers because lower incentive levels are available to them due to their location in geographic areas with more limited solar potential.

Project Financing

Project financing continues to be a large concern and burden for property owners. Participating property owners are frequently electing to use a TPO purchase type to eliminate their need to pay application deposits and upfront out of pocket costs (86 percent of active or completed projects are currently TPO). Additionally, property owners are allocating large shares of the PV capacity to tenant spaces (86 percent) and/or leveraging one of the two tax credits (77 percent of completed projects) in order to maximize incentives or tax credits. With the recent increase in SOMAH incentives and extension to the ITC, some contractors are reporting they are hoping to offer their customers a zero-cost TPO.

Physical Site Issues

Physical site issues also continue to be a barrier to participation. Many SOMAH-eligible properties are older and would need maintenance before adding solar to be feasible (or even practical). Roofs present the largest challenge with property owners reporting structural issues due to design (i.e., older buildings were not designed with solar in mind) that often require complete replacement for PV installation. Recently newer roofs also experience unexpected issues brought on by the immense atmospheric rivers that have hit California. These storms caused leaks halting the ability to move forward with planned SOMAH projects. While one contractor reported conducting roof structural studies and is planning to repair or replace some roofs as part of their TPO agreement, most property owners reported this was not the case for their properties. The latter property owners suggested greater coordination between low-income programs to avoid installing solar on buildings “that are falling down” and/or that funds be

allocated to support these repairs so that the “solar doesn’t outlast the building.” Another limitation of older buildings is their inefficiency. Some of the participating property owners interviewed were well versed in energy efficiency and raised concerns about putting solar on buildings that are very inefficient, even with the energy efficiency compliance milestone. Additionally, one property owner reported going all in electrifying his building at the same time the solar was being installed. Unfortunately, it took well over a year to interconnect the systems and during that time their building was stuck paying exceptionally high electric bills – the opposite situation of what they had hoped for.

Finally, one non-participating property owner brought up the issue of grid upgrades limiting their participation in the SOMAH program. They report that for some of their buildings, the grid would require a major upgrade and so the only way to get a project approved would be to show that their PV system would never export to the grid and shut down the transformer.

5.3.2 Progress on Prior Recommendations Addressing Property Owner Barriers

The previous SOMAH evaluation provided a number of recommendations for addressing property owner barriers to participation. Below we present these recommendations and the progress made to address them.

TABLE 5-9: PROPERTY OWNER BARRIERS PRIOR RECOMMENDATIONS AND PROGRESS

Prior Recommendation	Progress Made to Address Recommendation
Greater outreach from the SOMAH PA to: - Identify and ward of future SOMAH project cancellations (1A) - Support small or newly participating property owners (4A) - Provide nonbiased 3rd Party support to property owners (8D) - Clarify program rules, answer questions, and build PO relationships (10A, 13A) - Identify additional SOMAH-eligible properties (13A)	The SOMAH PA now offers an Affordability Prescreen to help property owners to determine if they meet SOMAH’s eligibility requirements in order to reduce the applications submitted for projects that are ineligible. Calsomah.org/prescreen The SOMAH PA has expanded program TA services to include introductory meetings with new property owners to provide an overview of SOMAH’s rules and offerings and to begin to develop a relationship with the property owner so they can be a trusted resource for the property owner and support them throughout their SOMAH participation. This offering was launched in Q2 of 2022. We interviewed 6 property owners who had had a meeting with the SOMAH PA and most reported this meeting was very helpful.
Expanded technical assistance offerings to augment property owner staff capacity (8A, 9A)	The SOMAH PA is attempting to meet this recommendation via the expanded TA services (referenced above, 4A) which includes an Energy Project Manager (EPM) who can serve as an advisor to support property owners.
Assist with Project Financing by provide bridge loan assistance (8C, 12A)	The SOMAH PA has engaged with bridge loan financing providers to provide additional financial support for SOMAH projects. While the financing organization has brought projects into the program, they reported most of their time is spent doing outreach to raise awareness about the program.
Minimize application and participation burdens (8H, 8I)	According to contractors, some changes have been made (such as the ability to opt out of essential emails) that have lessened participation burdens. Additional areas for improvement remain (such as decreasing the number of signatures required by POs (currently 26) throughout the application process by allowing POs to grand power of attorney to their contractor (if desired)
Increase coordination with utilities (VA1d)	Increased coordination is still needed to ensure VNEM allocations are effectively transferred to new tenants (Section 5.4.4).

5.4 FINDINGS FROM INSTALLATION ONWARDS

This section focuses on findings from the latter half of the SOMAH participation process. These program activities were not evaluated as part of the first triennial SOMAH evaluation due to the lack of projects that had reached these later steps in the participation process.

5.4.1 Assessment of SOMAH’s Tenant Education Activities

A key objective of this process assessment is to determine the degree to which the SOMAH tenant education materials and requirements are achieving their goals/purpose. The prior SOMAH evaluation

was unable to assess this program requirement as very few SOMAH projects were far enough along in the application/installation process to have had experience with the program's tenant education requirements.

The SOMAH Program requires that a tenant education affidavit be provided as a part of the Incentive Claim Package. This document certifies that all tenants residing at a SOMAH property have received SOMAH approved tenant education, either by mail or direct delivery and one additional means (i.e., email or community meeting), within 60 days of project commencement.⁷¹

Many property owners had limited awareness of SOMAH's tenant education requirements and materials, as the contractors spearheaded the education efforts. Property owners did note that tenant education was deficient as tenants were often confused regarding the timing and accounting of bill credits. This is understandable as tenant training can occur months (to a year) prior to PV installation, interconnection, and bill credit receipt. Program materials (e.g., the Solar Installation Timeline flyer⁷²) suggest a second round of tenant education should occur after solar PV installation, however it doesn't seem as if this is happening. This information time-gap and the lack of trust and familiarity with the SOMAH Program has caused an additional burden for on-site property management teams as tenants often turn to them with questions. The SOMAH PA has set up a tenant hotline which is listed on tenant educational materials and the SOMAH website. However, many property owners still reported a desire for a SOMAH or IOU representative that tenants could contact to answer questions about their bills. This indicates that tenants either lack an awareness of the hotline, do not feel comfortable using the hotline, or just find it easier to talk with property management staff.

Tenant Education Materials and Presentations

The SOMAH PA conducted surveys of tenants in multifamily buildings that participated in the SOMAH program. The surveys were conducted in Q1 and Q4 of 2022 and were sent to 695 tenants. The PA sent out mailers to invite tenants to take the survey with an option to mail back the survey or submit the survey online, and informed onsite managers about the surveys. They asked onsite staff to let residents know to expect the surveys and to post a flyer in the common areas about the survey, if possible. In total, 84 tenants completed a tenant survey.

Over one-half (56 percent) of tenants who completed the survey did not recall seeing any materials in their building related to the SOMAH program. Of those who did recall seeing materials (n=35), 60 percent saw materials related to what to expect from the SOMAH program, and materials related to the Energy Savings Assistance Program (ESA). Another 40 percent saw materials related to how their utility bill would

⁷¹ This was recently extended from 30 to 60 days in Handbook AL 114.

⁷² <https://calsomah.org/resources/tenant-education-toolkit>

change as a result of SOMAH. Of those who saw materials (n=44), almost one-half (43 percent) said that the materials helped them feel very well prepared or somewhat prepared for their building's solar installation. Notably, another 45 percent indicated that they did not know or could not judge how the materials helped them feel prepared. Those who recalled the materials said they either received them in the mail or at their door. In order to increase visibility for these materials, the PA should recommend that contractors also leave these materials in common areas for tenants.

Included in the required materials that property owners/manager must distribute to their tenants is a document ("What to expect with SOMAH") that gives an overview of the program and explains how it will benefit tenants. The tenant survey asked respondents if, after reviewing this document, they learned the following details of the SOMAH program:

- I will continue to pay my monthly utility bill.
- I can enroll in the Energy Savings Assistance (ESA) program.
- The solar system on my building is at no cost to me.
- As a resident living in a building receiving SOMAH, I am eligible for a paid job training opportunity.

Of those who remembered seeing this handout (n=41), 61 percent said they learned all of the above details after reviewing the document. For future surveys, the evaluation team recommends that the PA ask about which of the details tenants recalled seeing, instead of asking if they recalled seeing "all", "some" or "none".

Only six survey respondents indicated that their property provided an in-person or virtual workshop or presentation about the SOMAH Program; five out of the six attended the workshop or presentation and all five indicated that it helped them feel very or somewhat prepared for their building's solar installation.

Tenant Education Survey

As a part of the evaluation, the evaluation team reviewed the tenant education survey conducted by the SOMAH PA. This survey collected information from tenants in participating multifamily buildings about their experience with SOMAH tenant education, including the materials they received, workshops or presentations regarding SOMAH, awareness of SOMAH and its benefits to tenants, information about their utility bill, and how their energy bill has changed since participating in the program.

The evaluation team had the following suggestions for updates the PA could make to their tenant education survey:

- **Ask tenants how they prefer to receive information about changes property owners are making to their building.** This will help the PA learn the best way to distribute information to tenants in participating buildings.
- **Include an open-ended question to collect additional information on how the tenant education materials helped tenants feel prepared for their building’s solar installation.** This could provide more detailed information to the SOMAH PA on what messaging resonates well with tenants in participating buildings.
- **When asking about the specific tenant education documents, ask the tenant to select which of the specific details they learned, instead of “all of the above”, or “none of the above”.** This will allow the PA to learn about what specific information is being conveyed to tenants through their tenant education materials.
- **When asking about the specific resources available via the Energy Savings Assistance program, ask the tenant to select which of the specific resources they were aware of instead of “all of the above”, or “none of the above”.** This will allow the PA to learn about what specific information is being conveyed to tenants through their tenant education materials.
- **Ask tenants what other changes they have seen since the solar was installed on their building (e.g., Have there been any changes to the comfort in their home? To their awareness of ways to save energy in their home?).** This could help inform program marketing if there are other benefits to participating in the program that the PA, contractors, and CBOs can highlight during their outreach.

5.4.2 Assessment of SOMAH’s Workforce Development Efforts

Workforce Development activities are promoting local economic development and expanding solar job outcomes as a part of SOMAH’s goal to create broad and meaningful benefits in communities throughout the IOU territories. SOMAH Workforce Development activities make up 5 percent of the program spending through the end of 2022 (SOMAH Workforce Development expenditures for 2018-2022 were reported to be \$1,866,538 according to the Semiannual Expense Report published in January of 2023).

The SOMAH Handbook specifies the number of trainees a contractor must hire and hours that must be worked based on the size of the solar system.

TABLE 5-10: HANDBOOK REQUIREMENTS FOR NUMBER OF TRAINEES AND HOURS WORKED BY SYSTEM SIZE

System Size	Number of Trainees and Hours
0-50 kW	1 trainee and no less than 40 hours
50-100 kW	2 trainees and no less than 40 hours each
100 kW and greater	2 trainees and no less than 80 hours each

The SOMAH Program requires that a Job Training Affidavit be submitted as part of the Incentive Claim Package. This document must include the names of the eligible job training program used, job trainee contact information, types of job tasks completed by the trainee(s), hours worked, and wages paid.

A review of this data indicated that most trainees directly worked on solar project installation (89 percent), followed by operations and maintenance (8 percent) and project design/engineering (3 percent). Most job trainees were brought on as temporary employees (83 percent). Most job trainees were referred to contractors through job training organizations (JTOs), or the SOMAH PA. Job trainees received an average wage of \$21 per hour and worked an average of 72 total hours as a part of their training.

Contractor Feedback on Job Trainees

The SOMAH PA provides resources to support contractors in meeting the Job Training requirements, including a Job Training Portal which has a resume bank, a job board to post open positions, and a job training organization directory. Not all interviewed contractors were aware of these resources and reported they would be interested in using them. The SOMAH PA should do greater outreach to the contractors to ensure they are aware of all available SOMAH resources.

The SOMAH PA's Workforce Development Team conducted a series of four surveys of participating contractors to learn about their experience with job trainees through the SOMAH program. The first survey was conducted soon after the solar installation was completed. If that initial survey reported that a job trainee was hired, the PA deployed another survey at 3-, 6- and 9-months post-installation to assess progress of the SOMAH job trainees.

The first post-installation survey was completed by seven different contractors representing 182 unique job trainees. Regardless of employment status after the SOMAH training, contractors indicated that almost all of their trainees (97 percent) were prepared to perform the tasks assigned to them on the SOMAH job training opportunity.

At the time of the first survey, about 30 percent of job trainees were employed with the contractors who facilitated their SOMAH training, either being hired after or at the time of the SOMAH training (18 percent) or having already been employed at the company prior to the SOMAH training (12 percent). Of the job trainees who were employed at the time of the initial post-installation survey (n=52), almost 40 percent (n=20⁷³) were still permanently employed with the company at 3-, 6- and 9-months post-installation. The contractors reported that they were very satisfied with all 20 of these trainees.

⁷³ These 20 trainees represent 11 percent of all job trainees included in the first post-installation survey.

In addition to the 20 employed trainees, there were 18 trainees that, while not working with the contractor through which they participated in the SOMAH training, were hired by a subcontractor after being introduced by the SOMAH contractor.

Interviewed contractors did not report any significant issues with meeting the program's job training requirements and indicated that the PA was very helpful in providing all the materials to advertise for job training. One CBO reported that marketing of SOMAH's job training opportunities has been their most successful SOMAH activities, and that they have gotten both beneficiaries and property owners to take an interest.

The PA's Workforce Development Team also plans to conduct surveys of job trainees through Google Forms. These surveys will collect information regarding the trainee's source of awareness, safety measures during job training, experience during job training and with their contractor, and post-job training experience in the solar or construction industry. After a review of the survey guide drafted for this effort, the evaluation team recommends that the PA consider including some additional questions regarding the trainee's motivations for participating, and how their experience has impacted their career path moving forward, including their interest in solar, and career goals and expectations.

5.4.3 Findings on System Installation and Interconnection

This second SOMAH evaluation provided an opportunity to assess how the process of getting SOMAH PV systems installed and interconnected to the grid is currently working. Interviews with property owners who have completed one or more SOMAH PV system installations provided their experiences with the installation and interconnection processes.

System Installation

- **Lien on property** – One property owner reported the contractor they worked with hired a subcontractor to do the PV installation and neglected to pay the installer in a timely manner and thus the subcontractor put a lien on the property. It was eventually taken care of by the contractor; however, this identified a shortcoming in the contracting and subcontracting agreements. While these agreements are outside of the scope of the SOMAH PA, prime contractors should ensure their subcontracting agreements include a lien waiver from the installer that forbids them from penalizing the property owner for issues they run into with the prime contractor.
- **Meter installed incorrectly** – One property owner reported that their utility installed their PV generation meter incorrectly (backwards) and thus their PV generation was being read as consumption. This resulted in the property owner receiving a \$5,000 utility bill. It was eventually corrected by the utility; however, an inspection should occur at all SOMAH properties to ensure this error does not occur in the future.

- **Fannie Mae installation concerns** – One property reported they have completed PV installation on a Fannie Mae funded property but have run into issues as now Fannie Mae is not allowing them to have third-party owned systems installed on properties they fund as they are concerned that roof mounted PV systems are a threat to their collateral. For this particular property owner, the PV installation has already been completed and thus they had to get a dispensation for this project, but they have been told Fannie Mae will not provide dispensations for future projects and thus they may need to cancel them. Their contractor is currently working with Fannie Mae to overcome this issue for their projects, however the SOMAH PA should also engage with Fannie Mae to identify the root of the issue and to determine what can be done moving forward to ward off future participation challenges.
- **Older Property Concerns** - One contractor indicated challenges with installing solar projects on older buildings. They reported that older buildings are not designed for solar as often utility transformers need to be upgraded and the electric companies are unwilling to cover these upgrades.

System Interconnection

- **Interconnection “engineering standards”** – One contractor reported having deep familiarity with the IOU interconnection standards and thus little to no revisions were needed on their projects allowing interconnection to progress reasonably quickly. This contractor was aware of other contractors who were less familiar with these standards, and as a result have struggled and had elongated interconnection timelines. Contractors and interconnection timelines could benefit significantly from the IOUs clearly documenting their interconnection standards and providing this documentation to SOMAH contractors.
- **Permit approval issues** – One property owner reported encountering difficulties getting the final approval on their SOMAH PV installation as the local building inspector had initially approved the project plans, however after the PV system was installed (during onsite inspection) the inspector changed their mind and is requiring them to revise the installation. The revision includes installing a part that is capable of handling much higher amperage on their generation meter (it is a very big system with lots of inverters). Unfortunately, they are unable to readily obtain the part due to supply chain issues and thus they are experiencing a long delay (more than 9 months at the time of the interview) to getting their system interconnected.
- **Misplaced or reversed Interconnection approvals** - One contractor reported that one cause for elongated interconnection timelines was attributable to IOUs reversing their approval of a project’s interconnection application (i.e., refusing to interconnect the project as built despite the contractor getting prior approval for the method of interconnection). This situation is exacerbated by turnover at the IOUs resulting in approved interconnection applications being lost. Interconnection applications are currently sent and approved via email, making them susceptible to being misplaced. Updating PowerClerk to require uploading of approved interconnection applications could help to ensure a smoother and more timely interconnection experience.
- **Interconnection reportedly running smoothly for some property owners** – Several property owners reported that the interconnection timelines seemed reasonable (30 – 60 days), but it was their sense that the process was better for some utilities than others.

- **Elongated interconnection timelines** – While some contractors reported interconnection was running smoothly, others reported the time from project completion to interconnection was very long (and not actively being tracked). One participating subcontractor said that it was common for their solar projects to “sit for a year without connection” and that there were delays with the interconnection applications being approved by the utility. They reported the IOUs often make interconnection difficult for them with requirements such as providing all tenant bills and refusing to help despite having access to the data. There is a feeling among program participants that the utility does not endorse the program and is purposefully drawing out the process to connect to the grid because they do not want their customers to have solar. It was noted by both contractors and property owners that projects could benefit from a utility liaison to ensure applications are swiftly processed by the utilities.
- **Long interconnection timelines can be financially burdensome to contractors, property owners and tenants** - Long interconnection timelines can also be problematic for contractors as they are unable to start charging SSA payments until the project is interconnected. It can result in long periods during which the contractor is unable to collect the program incentive or SSA collecting payments from the property owner and can be hard for them financially. One property owner reported this elongated timeline was particularly burdensome for his property (both tenants and the property owners) as they had electrified the building in combination with the solar installation. The delay in interconnection meant utility bills were significantly increased and burdensome for both tenants and property owners as the property was in SDG&E territory which has high electricity rates. The financing organization working with SOMAH also expressed concerns over long interconnection wait times, indicating that the permitting process had taken a long time for the projects they were involved in. They indicated that this is reflecting poorly on the program as participating property owners are spreading the word about “how long and drawn out the process is” instead of talking about the positive benefits of SOMAH. One subcontractor said, they were “not doing projects anymore because they take too long to finish. We’ll start a project, get 90 percent done and then be stuck getting it past city inspection or there’s something the utility doesn’t like. [The prime contractor’s] payment is so skewed to themselves, and we did 95 percent of cost but receive 40 percent or revenue. We would be like a loan to [the prime contractor].”

The evaluation team attempted to quantify the time from project completion to PTO to assess how long interconnection is taking. Unfortunately, due to a lack of data on when the PV installation is complete, the assessment of time to interconnect is still relatively limited. Expanding the tracking data to include the date when PV system installation is complete (i.e., ‘Mechanical Completion’ date), or the date interconnection is requested would help to more accurately quantify the interconnection timeline in future evaluations.

The evaluation team attempted to estimate the average time to interconnect SOMAH systems based on the data that is currently available in PowerClerk and an estimate of the average project construction time

provided by an experienced multifamily solar contractor.⁷⁴ Table 5-5 below provides the estimated time for interconnection by utility. As this table shows, the estimated interconnection timing is long for all utilities but longest for PG&E (~10 months) and shortest for SDG&E (~5 months). Across the completed projects at all three IOUs, interconnection on average is estimated to take 234 days, roughly eight months. This analysis corroborated reports made by contractors, financing organizations, and property owners that interconnection wait times are on average excessively long (5 to 8 months) and the SOMAH PA and IOUs should work to expediate this process to ensure program benefits and incentives are provided in a timelier manner.

TABLE 5-11: ESTIMATED INTERCONNECTION TIMING BY UTILITY

IOU	Estimated Construction End* to PTO		
	Min Days	Max Days	Average Days
PG&E	119	701	291
SCE	88	598	228
SDG&E	26	318	147

*As construction end data was not available, it was estimated using construction start date and an estimate of the average length of SOMAH PV system installation (8 weeks).

We were also able to estimate the average time to interconnect for VNEM systems overall, in comparison to non-VNEM systems. CPUC Decision 20-09-035 in the Rule 21 proceeding ordered the three IOUs to submit data to the Rule 21 service list on interconnection timelines every quarter for systems greater than 30 kW. These reports include data for each interconnection application over 30 kW but are anonymized so we cannot easily cross reference to other tracking data. The following table shows the average time (in days) from when the utility receives the interconnection request to when it issues PTO separated out by VNEM and non-VNEM interconnection types. This is based on the 2022 Q4 reporting by each utility. The data were calculated using the 'Cycle Time L' fields in each report. This field is not a reporting requirement under Rule 21 and while there are indications that suggest this field is underpopulated, other methods to try to compare interconnection times across the three IOUs either did not give consistent results or were not feasible due to a lack of data. Note that we were only able to identify one SOMAH project from this dataset as most utilities did not separate out SOMAH specifically. This SOMAH project had time to interconnection of 278 days, which is within 5% of the 291 day average estimated for PG&E in the above analysis from the program tracking data. These data show that overall, VNEM projects tend to take significantly longer than non-VNEM projects to reach PTO. The average time from interconnection request to PTO for VNEM projects is over eight months longer in SCE, over four months longer in PG&E, and over two months longer in SDG&E. Additionally, the VNEM timelines tend to vary significantly across

⁷⁴ This contractor estimated the average time for system installation was between four and eight weeks depending on the size of the project. We used the high end of this range (8 weeks or 56 days) for our estimate of construction period for this analysis.

IOUs. While the average non-VNEM timelines across IOUs are all within nine days of each other, the average VNEM timelines differ up to 6.5 months between IOUs. Further research is required to determine what may be driving the longer VNEM timelines, however it appears this issue is not limited to SOMAH.

TABLE 5-12: VNEM AND NON-VNEM DAYS FROM INTERCONNECTION REQUEST TO PTO FROM UTILITY DATA

IOU	Interconnection Type	Min to Max Span of Days from Request to PTO	Average Days from Request to PTO	Sample Size
PG&E	VNEM	141 – 412	277	6
	Non-VNEM	0 – 475	143	136
SCE	VNEM	235 - 491	396	18
	Non-VNEM	1 - 631	148	611
SDG&E	VNEM	16 - 657	200	52
	Non-VNEM	0 - 625	134	369

5.4.4 Findings on Bill Credits

This second SOMAH evaluation provided an opportunity to assess tenant and common area bill credits resulting from installed SOMAH PV systems. This assessment found the following problematic areas that need to be addressed:

- **Providing bill credits to tenants who move after interconnection but prior to the start of bill credits appearing on monthly bills.** Several property owners expressed concerns regarding how the IOUs will track tenants who move prior to receiving bill credits that accrued while they were residents of a SOMAH property. This is exacerbated when there are delays in IOUs providing bill credits.
- **Reassignment of VNEM allocation to new tenants.** One property owner reported working with an IOU to transfer the VNEM allocation from a previous tenant to a new tenant. According to this property owner the utility does not have a process set up to do this transfer and they have been unable to find any utility staff who are willing to accept and update the tenant allocation. According to their calculation there has been nearly \$10,000 in SOMAH PV credits that have been unallocated to their tenants since project installation.
- **Tenant confusion.** Nearly all participating property owners reported tenant confusion regarding how and when the SOMAH bill credits would be applied and how to interpret their new bills. While information on bill credits is included in the Tenant Education Toolkit, the time from when tenant education takes place (SOMAH tenant education requirement is 60 days or fewer prior to the start of construction) to when tenants see the actual credits on their bill can be quite long (over two years in some cases). Property owners report an increased burden on property managers as they field questions about bill credits from tenants and suggest tenants be provided with a utility or SOMAH PA contact with whom they can discuss their bills. While the SOMAH PA has set up a tenant hotline

promoted on tenant educational materials and the SOMAH website, many tenants and property owners seem to lack awareness of this hotline as the burden is currently falling on property management staff. The SOMAH PA should provide a flyer that can be posted onsite by property management staff, if desired, promoting the hotline.

- **Annual solar true-ups.** One property owner expressed severe dissatisfaction that one of his SOMAH properties had been inadvertently set up to receive annual solar true-ups. As a result, many tenants at this property were very happy with the SOMAH program as their monthly utility bills were very small. This satisfaction turned to discontent when they received annual true-up bills for up to \$1,000. Receiving such a large bill can be problematic for any customer, but is especially so for low-income customers who lack the means to pay large bills.
- **HUD utility bill allowance calculations.** One property owner who had HUD properties reported it took a long time to get approval from HUD to participate in SOMAH due to HUDs utility bill allowance rules. They were finally able to get approval for these properties to participate, however encountered difficulties after the PV systems were installed as the tenant data received from their IOU included only net bills after the SOMAH bill credits had been applied. As a result, HUD required them to increase tenants' rent due, however that would put them out of compliance with SOMAH program rules. Dealing with this issue requires a manual workaround, placing a large burden on staff.

The evaluation team attempted to estimate the time it takes from interconnection to bill credit setup. Bill setup dates were provided by the SOMAH PA. They were used as an approximation of when tenants would begin seeing SOMAH credits on their bills.⁷⁵ The bill setup dates were compared to the PTO date to quantify the time to receive bill credits. Table 5-6 below provides an estimate of the length of time from system interconnection to bill setup for projects completed in 2021 and 2022 by utility. While wait times were exceptionally high in 2021 (all three utilities had max time windows greater than 450 days), they decreased significantly in 2022.

TABLE 5-13: DAYS FROM INTERCONNECTION TO BILL SETUP FOR COMPLETED PROJECTS BY UTILITY

Utility	2021		2022	
	Average # of Days	Min to Max Span of Days	Average # of Days	Min to Max Span of Days
PG&E	190	85 - 465	117	5 - 190
SCE	192	31 - 484	60	20 - 139
SDG&E	186	29 - 461	18	6 - 34

Effects of SOMAH on Tenant's Utility Bills

Included in the required materials that property owners/manager must distribute to their tenants is a document ("How will your utility bill change?") that details how the tenant's utility bill will change as a

⁷⁵ The bill setup is when the billing team gets things in place for bill credits to show up on customer bills. We understand from talking to utilities that it could take up to two additional billing cycles for bill credits to appear.

result of their building's solar installation. The tenant survey asked respondents if, after reviewing this document, they learned the following details of the SOMAH program:

- The solar panels send electricity to the electric grid, resulting in bill credits for my community and me.
- My utility company will calculate the savings I see on my bill.
- My bill will change due to getting solar.
- I can call the SOMAH tenant hotline or my utility company if I have questions.

Of those who remembered seeing this handout (n=40), 60 percent said they learned all of the above details after reviewing the document. Over one-half of survey respondents (n=55) said they noticed a change in their energy bill as a result of the solar installation and bill credits. Most of these respondents said their bill decreased moderately, or significantly. Only four people said they noticed an increase in their energy bill after their building participated in SOMAH.

5.4.5 Findings on Pairings with Battery Storage

As mentioned in Section 4.3.3 above, analysis of the PowerClerk tracking data completed for this evaluation found a significant reversal in plans to pair SOMAH PV systems with battery storage (plans to pair with storage decreased in the tracking data from 92 percent in the first SOMAH evaluation to 2 percent as of the end of 2022 with none yet completed). Participating property owners were asked about their plans to pair their SOMAH PV with storage and the most common response provided was “storage doesn’t work with VNEM.” Many participating property owners reported they are interested in installing battery storage at their properties but noted their contractors told them current installation issues make it infeasible. One stated that they had been working with the CPUC and PG&E on the pairing issue but that all projects were on hold until PG&E develops a tariff that supports this pairing. Several property owners reported they were unlikely to install storage at their properties due to space constraints that are common when properties are being retrofitted versus designed with solar and storage from the ground up.

The primary desired use for storage reported by property owners was for resiliency within their buildings. However, property owners were aware of rules which forbid pairing VNEM system with behind-the-meter battery storage to provide resiliency during a power outage. Property owners noted that many SOMAH properties house older residents who are more likely to have health issues. Providing backup power to common areas (which can serve as a proximal “cooling center”) and to power essential medical equipment and keep medicines cold during extended outages is a top concern. On May 5th the CPUC issued a non-standard disposition approving IOU advice letters to “add a special condition to VNEM tariffs that onsite storage may serve customers loads during grid outages or testing periods so long as those loads do not register on the Generating or Benefiting Account meters.”



One contractor acknowledged that the recent IOU advice letters provided an approved means by which VNEM solar and behind-the-meter storage could be paired, but noted that this method was not preferred by them, citing its cost and time to install. Another contractor expressed confusion regarding SOMAH's rules on oversizing program PV systems to account for current or future battery storage pairings and noted that working with IOUs on this has been very difficult and could benefit from CPUC involvement.

The Commission asked about this storage aspect in a May 5th ALJ Ruling Inviting Comments on Potential Modifications to SOMAH.

6 IMPACT ASSESSMENT

This section summarizes the results of the impact assessment. The results are presented as follows:

- PV Production & Energy Impacts
- Customer Electricity Consumption
- Demand Impacts
- Environmental Impacts
- Economic Impacts

6.1 PV PRODUCTION AND ENERGY IMPACTS

This section presents results of the PV production analysis and energy impacts.

Observed PV Production

Observed PV generation totals by utility are presented in Table 6-1. This table also shows the average total observed electric generation per SOMAH project and the annual DC capacity factor by utility. Only 14 projects were completed during 2021, and only one of those projects was completed as of January 1, 2021. The remaining projects did not come online until July 2021 or later. Of the 57 projects completed during 2022, only 20 projects were completed prior to June. Overall, completed SOMAH projects generated 898 MWh of energy in 2021 and 9,199 MWh of energy in 2022. The overall observed capacity factor was 10.1 percent in 2021 and 12.4 percent in 2022. As a point of comparison, project capacity factors calculated from PowerClerk estimated generation ranged between 15 percent and 17 percent. The lower observed capacity factors in 2021 and 2022 are due to both partial year operation and underperformance of the PV systems relative to expectation.

TABLE 6-1: 2021 AND 2022 OBSERVED PV GENERATION FROM COMPLETED SOMAH PROJECTS BY UTILITY

Utility	Total Observed PV Generation (MWh)	# Projects	Average Observed PV Generation per Project (MWh)	Annual Capacity Factor (DC)*	PowerClerk Capacity Factor (DC)
2021 Observed Impacts					
PG&E	112	3	37	9.9%	16.3%
SCE	715	9	79	10.6%	16.4%
SDG&E	70	2	35	9.9%	16.2%
2021 Total	898	14	152	10.1%	16.3%
2022 Observed Impacts					
PG&E	1,670	22	76	10.3%	15.5%
SCE	5,999	36	167	12.6%	16.3%
SDG&E	1,529	13	118	14.3%	16.6%
2022 Total	9,199	71	360	12.4%	16.1%

*Many sites were only operational for part of each year.

Forecasted PV Production

Table 6-2 presents the forecasted energy impacts of completed and active SOMAH projects. As previously discussed in Section 3.2.3, these forecasted results reflect typical weather. Because we don't always expect that installed systems will behave as ideally as simulations would expect, we applied a PV Ratio to the simulated data, which provides a month-hour ratio accounting for differences between observed generation and simulations. The forecasted PV production from completed and active SOMAH projects is 83,959 MWh per year. Completed projects alone are forecasted to produce 16,202 MWh per year.⁷⁶ The capacity factors based on the forecasted PV production presented here are higher than those from the observed PV production. This is because the observed capacity factors from many of the completed SOMAH projects are from partial years. Most of the generation observed from completed systems occurred in winter months, resulting in lower capacity factors. For comparison, the capacity factor as calculated from the PowerClerk data for all 424 projects ranged between 10 and 21 percent.

⁷⁶ Note that the forecasted annual PV production from completed projects of 16,202 MWh represents a full year of PV production. In contrast, the observed PV production presented in the prior section represent partial years for some completed projects depending on the date of installation.

TABLE 6-2: ANNUAL FORECASTED ENERGY IMPACT BY UTILITY

Utility	Forecasted Annual Energy Impact (MWh)	# Projects*	Average Annual Forecasted Energy Impact per Project (MWh)	Annual Capacity Factor (DC)
Liberty	213	2	107	15.2%
PG&E	37,678	238	158	13.2%
SCE	35,018	136	257	14.2%
SDG&E	11,050	48	230	14.8%
Forecasted Total	83,959	424	753	13.7%

* There were 432 active projects. However, 8 projects did not have nameplate rating details in PowerClerk and were therefore not included in this analysis.

PV Realization Rate

We calculated two versions of realization rates to quantify PV system performance. The forecasted realization rate is the ratio between annual forecasted generation and the annual estimated generation reported in PowerClerk. The observed realization rate is the ratio between the observed PV generation in 2022 from projects with a full year of generation and their annual estimated generation reported in PowerClerk. The observed realization rate only includes projects with a full year of observed PV production data in 2022. As of January 1, 2022 only 14 SOMAH projects were completed. Of these 14 projects, the PV generation data from three projects was not usable for analysis.

Table 6-3 summarizes the realization rates by utility. The overall forecast realization rate is 85 percent, and the observed realization rate is 77 percent. Differences in simulated and metered performance are likely driven by several factors. The primary driver of underperformance appears to be partial system downtime which could be caused by equipment failures, incomplete system commissioning, or maintenance issues. All of those are addressable with better system installations and maintenance. In addition, observed system performance was found to be higher in the morning hours but lower in the afternoon hours than the simulations projected. Weather differences between the weather station and the project site might also contribute to difference between simulated and metered data. Additionally, there were some systems identified as performing better than the simulations projected and that could be due to differences between the as-built configuration and the configuration in PowerClerk. Differences in configurations between as-built systems and PowerClerk were previously identified as a source of error for the MASH program in 2009-2010.⁷⁷ Therefore, the forecasted energy that was developed using the utility-aggregated month-hour PV ratio (as described above in Section 3.2.3) resulted in an annual energy forecast in between the simulated results and the observed results.

⁷⁷ [California Solar Initiative Low- Income Solar Program Evaluation, Program Impacts and Cost-Benefit Report PROGRAM YEARS 2009-2010](#), Navigant Consulting

TABLE 6-3: AVERAGE FORECASTED AND 2022 FULL-YEAR OBSERVED REALIZATION RATES BY UTILITY

Utility	Forecasted PV Generation		Observed Full-Year 2022 PV Generation	
	Realization Rate	# Projects	Realization Rate	# Projects
PG&E	83.2%	22	65.1%	3
SCE	85.2%	36	81.7%	7
SDG&E	89.4%	13	74.5%	1
Total	85.4%	71	76.5%	11

These realization rates are significantly lower than other programs. For example, the 2010 California Solar Initiative (CSI) Evaluation found that systems receiving an Expected Performance Buy Back (EPBB) exceeded expectations by 1.6 percent (or a realization rate of 101.6%), on average. The performance for those systems was estimated using the same EPBB calculator used by SOMAH.

Table 6-4 below highlights the realization rates by ownership type. There was not a noticeable difference in forecasted PV generation realization rate based on ownership type.

TABLE 6-4: AVERAGE FORECASTED PV GENERATION REALIZATION RATE BY SYSTEM OWNERSHIP TYPE

Utility	Forecasted PV Generation Realization Rate		
	Host Customer Owned	Third Party Owned	SOMAH Total
PG&E	80.7%	83.8%	83.2%
SCE	82.3%	85.5%	85.2%
SDG&E	90.1%	89.2%	89.4%
Total	83.5%	85.7%	85.4%

Table 6-5 below shows the percentage of completed projects by grouping of their forecasted realization rate. More than half of completed projects have forecasted performance between 80 percent and 90 percent of the PowerClerk values.

TABLE 6-5: COMPLETED PROJECTS RANGE OF FORECASTED PV PRODUCTION REALIZATION RATES BY OWNERSHIP TYPE

Completed Project's RR	% of Projects within Realization Rate (RR) Range		
	Host Customer Owned	Third Party Owned	SOMAH Total
RR less than 0.70	0%	0%	0%
RR from 0.70 to 0.79	17%	17%	17%
RR from 0.80 to 0.89	50%	66%	63%
RR of 0.90 and higher	33%	17%	20%
Total # Completed Projects	12	59	71

The SOMAH handbook states that “. . . third-party owned systems must include performance guarantees ensuring the systems will produce a minimum of 90% of the expected annual production as calculated by the EPBB calculator. . . Should a system’s annual production fall below 90% of the expected annual production after a 0.5% annual degradation factor has been applied, the third-party owner must be required to compensate the Host Customer for the lost production [. . .].”⁷⁸ The forecasted PV production realization rates shown above indicate that over sixty percent of third-party owned SOMAH completed projects operated below the third-party performance guarantee thresholds.

At the end of 2022, the SOMAH PA was in the process of setting up a system to monitor SOMAH PV performance on a monthly basis. This first version of the SOMAH PA’s monitoring software has been configured to flag systems that are underperforming by 30% or more. When a system is flagged, the SOMAH PA will alert the property owner and contractor to identify potential issues.

This monitoring system is a great step in ensuring system performance levels are maintained. However, considering the current system operating levels, the monitoring system would not flag most underperforming systems. There are 80 percent of systems with realization rates between 70 and 90 percent (as shown above). Most of these projects are third-party owned, and thus subject to performance guarantees from the third-party owner. However, it is the responsibility of the third-party owner to honor their contract with their customers. Many of these underperforming systems are missed by the SOMAH PA’s monitoring processes and the third-party owner may not be monitoring these on their own. This represents a potential gap where the benefits to property owners and beneficiaries may be overlooked. The evaluation team recommends raising the SOMAH PA’s performance monitoring threshold to 90% which aligns with system warranties and performance guarantees that third-party owners are required to include in contracts with customers.

6.2 CUSTOMER ELECTRICITY CONSUMPTION

The evaluation team analyzed whether SOMAH beneficiaries changed their energy consumption following the installation of solar. Weather normalized average monthly tenant consumption estimates are presented in Table 6-6 below. Results are presented for the pre and post analysis periods. The weather normalized consumption estimates indicated a decrease in usage in PG&E and SDG&E, with a modest increase in usage in SCE.

⁷⁸ From Section 2.3.6.2 Operations, Maintenance and Performance Guarantees for Third-Party Owned Systems of the SOMAH Handbook.

TABLE 6-6: WEATHER NORMALIZED ESTIMATED AVERAGE MONTHLY CONSUMPTION PER TENANT

Utility	Pre Period Estimated Average Monthly Consumption (kWh)	Post Period Estimated Average Monthly Consumption (kWh)
PG&E	587.9	563.4
SCE	348.2	352.4
SDG&E	299.7	292.8

We directly estimated the difference in monthly consumption based on the weather normalized consumption data using a panel model. Table 6-7 presents the coefficient estimate for the post-period from the panel model. Each of these coefficient estimates were statistically significant. The weather normalized monthly tenant consumption in PG&E and SDG&E decreased in the post period by 18 kWh and 5 kWh, respectively. As a proportion of the average weather normalized consumption in the pre period, this represents a 3.1 percent reduction in PG&E and a 1.6 percent reduction in SDG&E. This reduction in tenant energy usage is likely due to the timing of SOMAH project installations relative to the COVID-19 pandemic. The cut-off date for the post-installation period for most projects occurred in mid to late 2021. At this point in time many people had returned to in-person working and school arrangements, which would coincide with a reduction in energy usage at home. Customers in SCE's monthly consumption showed a slight increase in monthly consumption of 3 kWh. This represents a 0.96 percent increase as a proportion of the average weather normalized consumption in the pre period.

TABLE 6-7: ESTIMATED MONTHLY KWH DIFFERENCE IN WEATHER NORMALIZED CONSUMPTION

Utility	Estimated Monthly Difference in Post Period
PG&E	-18.10 kWh
SCE	3.35 kWh
SDG&E	-4.81 kWh

The electricity consumption analysis found a decrease in energy consumption in PG&E and SDG&E and only a slight increase in energy consumption in SCE. The decrease in energy consumption found in PG&E and SDG&E may have been COVID related. Therefore, we did not incorporate any consumption changes in the remainder of the impact or cost effectiveness estimates. SOMAH utility energy impacts are equal to the reported PV production estimates.

6.3 DEMAND IMPACTS

Coincident peak demand impact estimates are defined as observed generation from SOMAH PV systems during the highest hours of CAISO or IOU peak demand. The single largest annual CAISO or IOU peak hour impact provides a snapshot of program performance during the most critical grid hour. However, analyzing program performance over the top 200 hours of peak demand provides greater insight into how

SOMAH projects impact the grid during peak conditions. Electricity generated by SOMAH PV systems during peak hours provides utility avoided cost benefits and reduces grid needs during the most critical hours. In this section, we present the 2021 and 2022 observed SOMAH PV generation during CAISO and IOU annual peak load hours as well as their top 200 load hours. Table 6-7 presents the timing and magnitude of CAISO and IOU peak events during 2021 and 2022.

TABLE 6-8: 2021 AND 2022 CAISO AND IOU PEAK HOURS AND DEMANDS (MW)

Demand Type	Service Area	Peak Demand (MW)	Date	Hour Beginning (Local Time)
2021				
Net	CAISO	39,372	9/8/2021	5:00:00 PM
Gross	CAISO	43,591	9/8/2021	4:00:00 PM
	PG&E	19,931	6/18/2021	5:00:00 PM
	SCE	21,283	9/9/2021	2:00:00 PM
	SDG&E	3,808	8/26/2021	4:00:00 PM
2022				
Net	CAISO	45,390	9/5/2022	6:00:00 PM
Gross	CAISO	51,292	9/6/2022	3:00:00 PM
	PG&E	22,371	9/6/2022	3:00:00 PM
	SCE	24,355	9/7/2022	2:00:00 PM
	SDG&E	4,633	9/7/2022	3:00:00 PM

CAISO Peak Hour Impacts

Table 6-8 shows the observed SOMAH PV project generation from completed projects during the gross and net peak CAISO hours. During 2021, SOMAH projects contributed 144 kW of capacity during the CAISO gross peak hour and 3 kW during the net peak hour. SCE projects contribute the largest proportion of the gross CAISO peak hour generation, followed by PG&E, then SDG&E. The CAISO net peak hour generation follows a similar trend. PG&E had the highest 2021 peak hour capacity factor during the Gross and Net CAISO peak hours, and SDG&E had the highest in 2022. The contribution to the net CAISO peak hour is substantially lower than the contribution to the gross peak hour due to lower energy production during the later hours.

TABLE 6-9: 2021 AND 2022 OBSERVED GROSS AND NET CAISO PEAK HOUR GENERATION BY UTILITY

Utility	Gross			Net		
	Peak Hour Generation (kW)	Percent of Total	Peak Hour Capacity Factor	Peak Hour Generation (kW)	Percent of Total	Peak Hour Capacity Factor
2021 Observed						
PG&E	10	7.0%	18.3%	3	7.9%	4.5%
SCE	135	93.0%	10.7%	30	92.1%	2.3%
SDG&E	-	0.0%	0.0%	-	0.0%	0.0%
Total	146	100.0%	12.0%	32	100.0%	2.7%
2022 Observed						
PG&E	516	21.9%	21.9%	4	84.1%	0.1%
SCE	1,277	54.3%	22.3%	0	10.6%	0.0%
SDG&E	561	23.8%	29.3%	0	5.3%	0.0%
Total	2,354	100.0%	23.5%	5	100.0%	0.0%

IOU Peak Hour Impacts

Observed peak hour impacts coincident with IOU annual peak hours for 2021 and 2022 are shown in Table 6-9. The 2022 PG&E peak hour occurred on September 6th between 3 and 4 PM. During this hour, PG&E SOMAH projects produced 516 kW with a peak hour capacity factor of 22 percent. SCE's peak hour was on September 7th between 3 and 4 PM, where coincident generation was observed to be 1,689 kW with a peak hour capacity factor of 29 percent. SDG&E projects generated 540 kW with a peak hour capacity factor of 28 percent during the peak hour between 4 and 5 PM.⁷⁹ The peak hour capacity factors vary widely across IOUs, as PV system utilization is highly dependent on the sun's position which varies by time of day and time of year.

TABLE 6-10: 2021 AND 2022 IOU OBSERVED PEAK HOUR GENERATION

Utility	2021		2022	
	Observed Peak Hour Generation (kW)	Observed Peak Hour Capacity Factor	Observed Peak Hour Generation (kW)	Observed Peak Hour Capacity Factor
PG&E	6	11.3%	516	21.9%
SCE	573	36.6%	1,689	29.1%
SDG&E	-	0.0%	540	27.6%

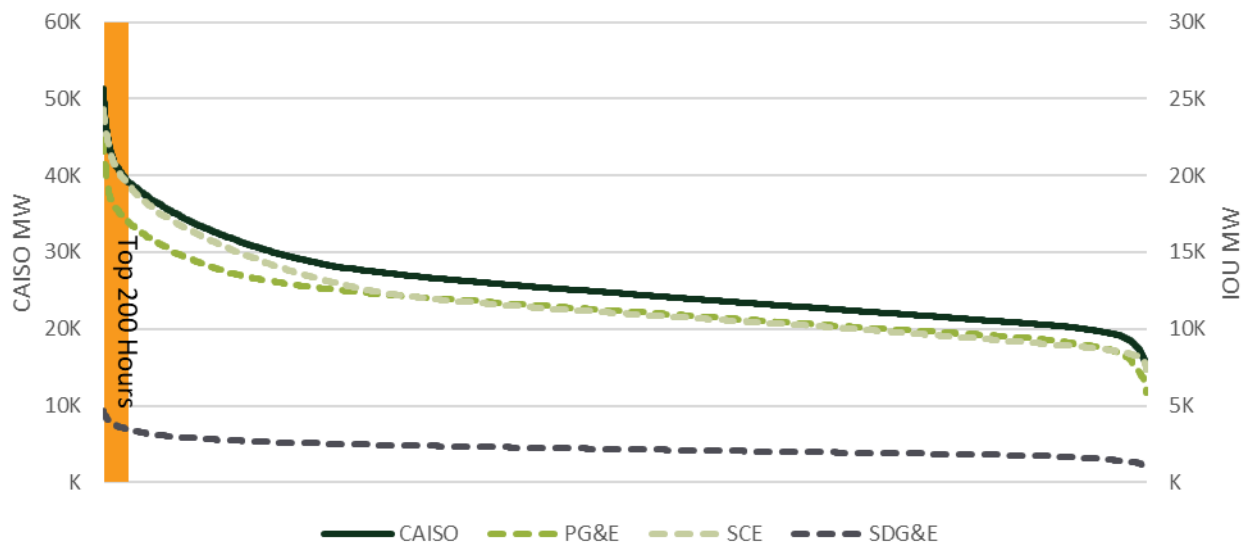
Top 200 Peak Hours

The CAISO and IOU annual peak hour coincident generation is a snapshot of beneficial program impacts. Analyzing the top 200 peak hours results in a more robust measure of impacts during CAISO and IOU peak

⁷⁹ The defined peak hours are all in local time.

grid loads. Representing just 2.3 percent of all the hours in a year, the top 200 peak hours capture the steepest part of load distribution curves. Figure 6-2 shows the 2022 CAISO and IOU load duration curves and indicates the 200-hour mark as the solid orange bar on the left side.

FIGURE 6-1: 2022 CAISO AND IOU LOAD DURATION CURVES



* Axes are scaled on the left for CAISO and on the right for the IOUs

The distribution of the top 200 hours over the course of a year differs across CAISO and the three IOUs. While generally late summer weekday afternoon occurrences, a top 200 hour can occur on weekends and into October. Table 6-10 and Table 6-11 display the distribution of the top 200 peak hours by month and weekday types in 2021 and 2022.

TABLE 6-11: 2021 AND 2022 TOP 200 PEAK HOUR DISTRIBUTIONS BY MONTH

Service Area	May	June	July	August	September	October
2021						
CAISO	0	17	68	75	40	0
PG&E	0	36	68	63	33	0
SCE	0	14	73	71	42	0
SDG&E	0	5	38	84	69	1
2022						
CAISO	0	12	13	84	91	0
PG&E	3	32	27	69	69	0
SCE	0	7	9	86	98	0
SDG&E	0	0	0	71	127	2

TABLE 6-12: 2021 AND 2022 TOP 200 PEAK HOUR DISTRIBUTION BY WEEKDAY

Service Area	2021		2022	
	Weekday	Weekend	Weekday	Weekend
CAISO	188	12	184	16
PG&E	170	30	186	14
SCE	192	8	181	19
SDG&E	172	28	160	40

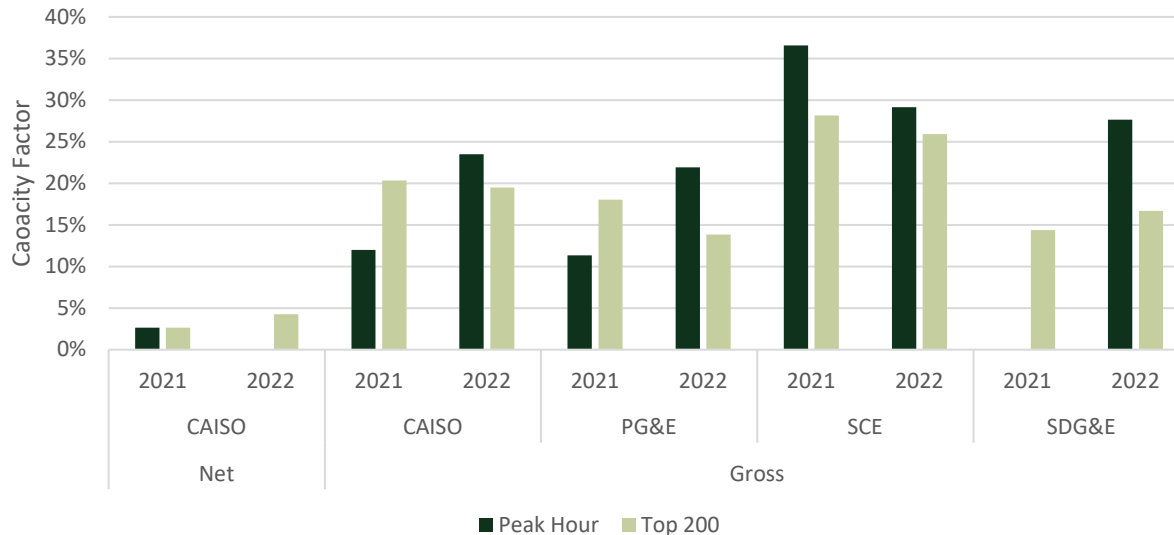
During 2021, the top 200 peak hours occurred mostly in August, with a significant number of hours occurring in September. For 2022, the opposite occurred, with most hours occurring in September, followed closely by August. For CAISO and all IOUs, weekdays dominated top hours, but some top hours also occurred during the weekend. Between 4 percent and 20 percent of peak hours were weekend hours during 2021 and 2022.

Table 6-12 presents total program observed generation coincident with the three IOU and CAISO gross and net peak hours. Whether the peak hour generation is close to the top 200 average is dependent on how the peak and top hours are distributed in relation to the peak solar output. In some cases, top hour generation was much higher than average top 200 hour generation.

TABLE 6-13: 2021 AND 2022 COINCIDENT PEAK AND AVERAGE TOP 200 HOUR COINCIDENT PV GENERATION

Demand Type	Utility	2021		2022	
		Observed PV Generation (kW) Coincident with Peak Hour	Average Observed PV Generation (kW) Coincident with Top 200 Hours	Observed PV Generation (kW) Coincident with Peak Hour	Average Observed PV Generation (kW) Coincident with Top 200 Hours
Net	CAISO	32	6	5	8
	CAISO	146	44	2,354	36
Gross	PG&E	6	10	516	20
	SCE	573	75	1,689	54
	SDG&E	-	0	540	33

Higher PV production coincident with CAISO and IOU peak hours yields higher benefits to the grid than during other hours. Figure 6-3 shows the capacity factors during the 2021 and 2022 CAISO and IOU peak hour and top 200 hours. During both 2021 and 2022 SCE saw the highest observed peak and top 200-hour capacity factors.

FIGURE 6-2: 2021 AND 2022 CAISO AND IOU PEAK AND TOP 200 HOUR CAPACITY FACTORS


6.4 ENVIRONMENTAL IMPACTS

This section discusses the observed and forecasted greenhouse gas (GHG) impacts of SOMAH PV systems. Observed impacts are based on the performance of completed projects in 2021 and 2022. Forecasted impacts estimate the annual impacts for both completed and active SOMAH projects.

Emission impacts are calculated as avoided power plant emissions that would have occurred in the absence of the program. This evaluation relies on avoided grid emissions rates developed by WattTime as part of the SGIP GHG Signal efforts. The forecasted environmental impacts presented here also include an estimate of the monetary value of emissions reductions based on the avoided cost calculator.

The evaluation team also estimated the lifetime GHG emissions reductions attributable to proceeds per California Air Resources Board reporting requirements. This analysis can be found in Appendix E.

Observed Environmental Impacts

Emissions Reductions

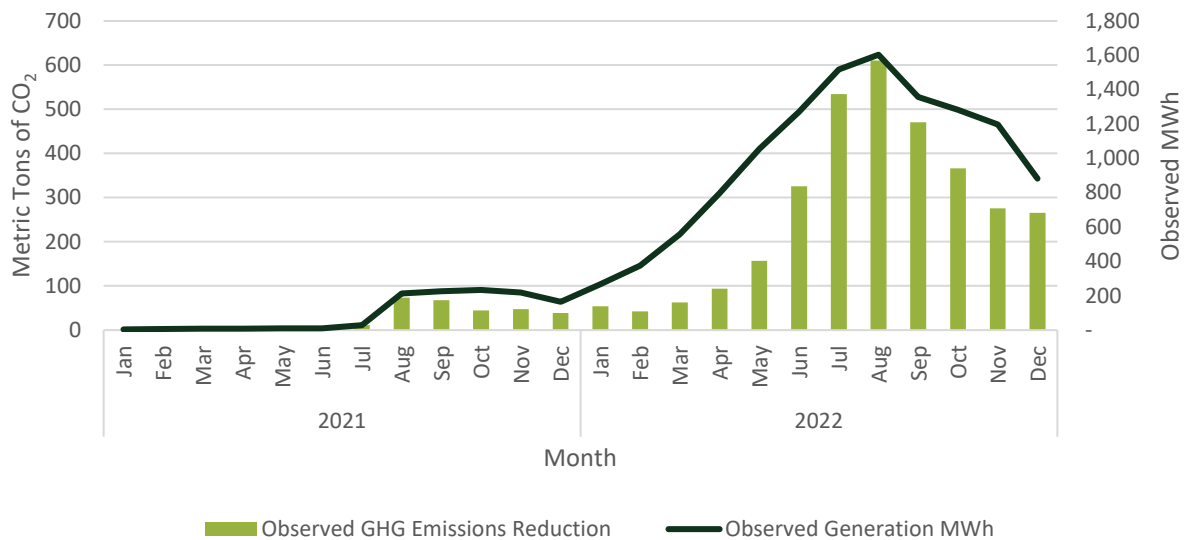
Table 6-13 below highlights the observed GHG reductions for both 2021 and 2022. As discussed previously, very few installations occurred during 2021 while installations began ramping up in the latter half of 2022. The table below presents observed GHG reductions only for the time the systems were completed. During 2022, projects in SCE's service territory represented 60 percent of the total observed GHG impacts for the program, followed by PG&E projects at 22 percent and SDG&E projects at 18 percent.

TABLE 6-14: 2021 AND 2022 OBSERVED GREENHOUSE GAS IMPACTS BY UTILITY

Utility	2021		2022	
	Observed GHG Impact [Metric Tons of CO ₂]	Observed % of Total	Observed GHG Impact [Metric Tons of CO ₂]	Observed % of Total
PG&E	33.4	14.6%	518.7	22.1%
SCE	179.3	78.2%	1,413.9	60.1%
SDG&E	16.6	7.2%	418.5	17.8%
Total	229.3	100%	2,351.1	100%

Figure 6-4 shows the observed GHG impacts by month, along with the observed total PV system generation from SOMAH projects. Note that the magnitude of GHG savings is not directly aligned with the PV system generation. More GHG savings result from specific months due to the source-mix of the avoided electricity that would have been provided by the electric utility. During 2021 and 2022, August had the highest monthly electricity production from SOMAH systems and the systems also provided their highest GHG impacts during August.

FIGURE 6-3: 2021 AND 2022 OBSERVED GREENHOUSE GAS IMPACTS AND SOMAH PROJECT GENERATION BY MONTH

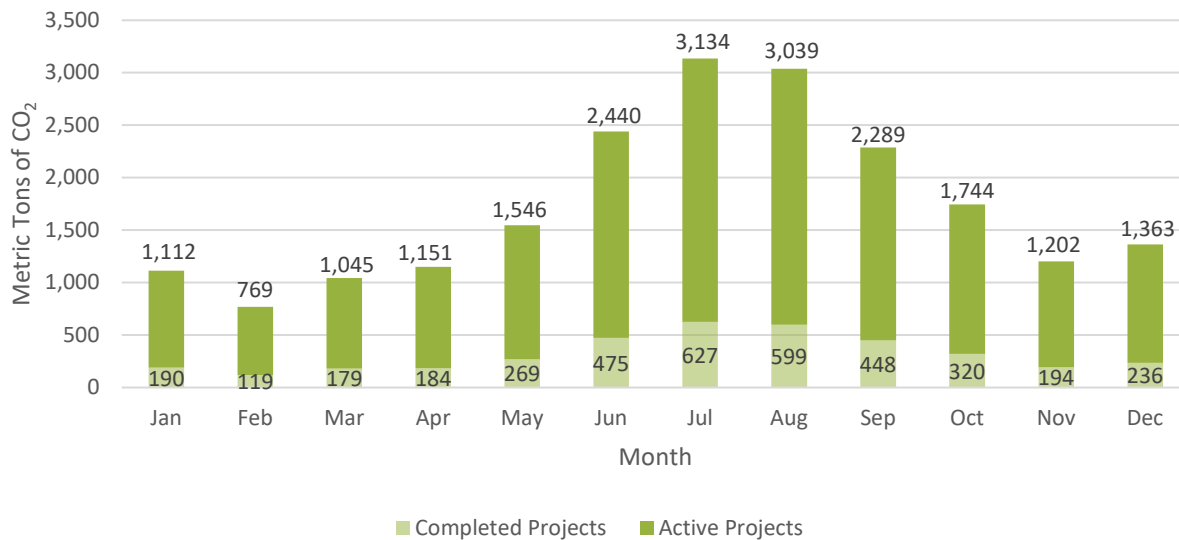


Forecasted Environmental Impacts

Emissions Reductions

Figure 6-5 presents the forecasted GHG impacts for both completed and active SOMAH projects. In a typical year, if all active SOMAH projects were installed, the program has the potential to produce reductions between 700 and 3,200 Metric Tons of CO₂ per month, or almost 21,000 Metric Tons of CO₂ annually. Completed SOMAH projects are forecasted to reduce GHG emissions by 3,838 Metric Tons of CO₂ per year.

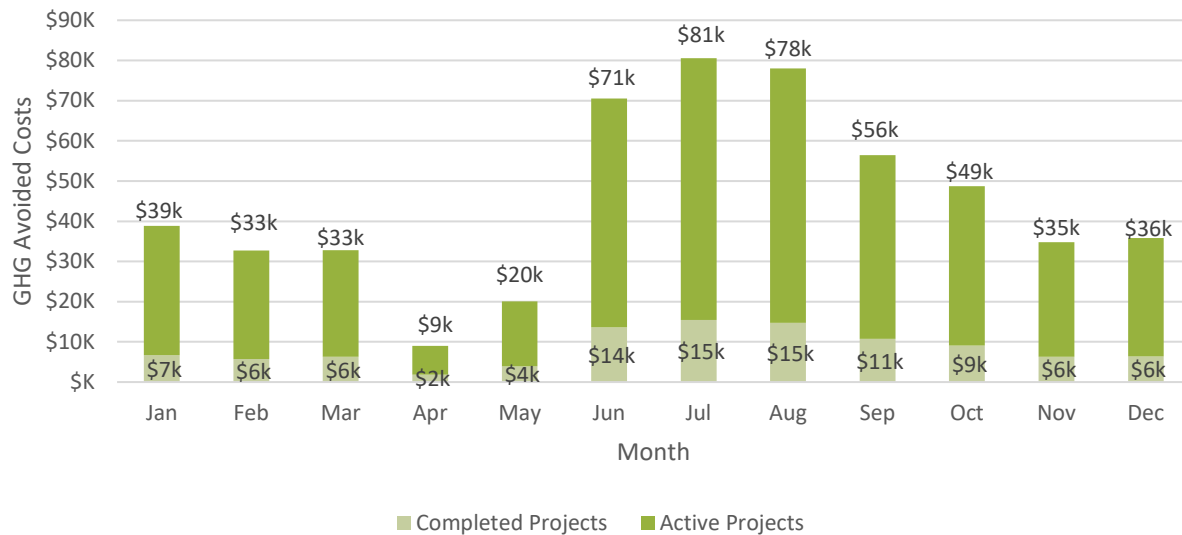
FIGURE 6-4: FORECASTED GREENHOUSE GAS IMPACTS FOR COMPLETED AND ACTIVE SOMAH PROJECTS BY MONTH



Monetary Value of Emissions Reductions

The monetary value of the change in emissions was also calculated by applying the value of GHGs from the 2022 California Avoided Cost Calculator (ACC) to forecasted hourly PV generation. The total value of GHG emissions reductions was based on four ACC factors, the cost of the GHG adder, the cost of the added cap and trade, the cost of the GHG rebalancing, and the cost of methane. Figure 6-6 highlights the forecasted monthly monetary value based on completed and active SOMAH projects. In a typical year, if all active SOMAH projects were installed, the program has the potential for emissions reductions, assessed at avoided costs, to be valued at \$81,000 during the peak of the summer, and \$539,000 annually. The forecasted value of emissions savings from currently completed SOMAH projects is \$101,000 per year.

FIGURE 6-5: FORECASTED AVOIDED COSTS FOR COMPLETED AND ACTIVE PROJECTS



6.5 ECONOMIC IMPACTS

Two approaches were used to estimate the program’s bill impacts. The first method compared actual year-over-year (YoY) pre- and post-installation utility bills. The second method directly estimated the bill credits received in 2022 from SOMAH PV generation. We also estimated the CARE budget impact from SOMAH systems in 2022.

It’s important to note when comparing the two measures of bill impacts that the YoY analysis does not separate out bill effects due to weather differences or changes in customer consumption. However, the simulated bill impacts solely represent the change to a customer’s bill due to the inclusion or exclusion of PV generation (i.e., customer’s consumption is held constant in the pre- and post-installation scenarios). Therefore, one cannot directly compare results from the two methods. The YoY analysis tells the story of the real bill changes that customer’s experienced, over time, through participation in the SOMAH program. The simulated bill impacts are exclusively an estimate of average bill credits received by customers in 2022 due to SOMAH system PV generation.

6.5.1 Year-over-Year Utility Bill Comparison

The year-over-year bill comparison analysis is presented in this section. The YoY billing analysis was performed with both adjusted and unadjusted dollar amounts. The adjusted bills were determined based

on observed rate increases from 2020 through 2022; customer's bill amounts were converted to 2020 base-year values.

The YoY tenant bill comparison results are presented in Table 6-14 below. Tenants experienced actual average YoY bill reductions ranging from \$16 to \$39 per month, by utility. After adjustments for rate increases were made, the monthly average bill reductions ranged from \$21 to \$39. As a proportion of the customer's total bill, the average adjusted monthly bill savings ranged from 39 percent to 61 percent by utility. The bill adjustment accounted for a 28 percent increase in the proportion of total bill saved in PG&E and SCE, and a seven percent increase in the total bill saved in SDG&E.

TABLE 6-15: SOMAH TENANT ACTUAL AND ADJUSTED AVERAGE MONTHLY YOY BILL DIFFERENCES

Utility	Actual Tenant Bills		Adjusted Tenant Bills (2020 Rates)	
	YoY Average Monthly Difference	YoY Average Monthly % Difference	YoY Average Monthly Difference	YoY Average Monthly % Difference
PG&E	-\$15.71	-30.6%	-\$21.47	-39.3%
SCE	-\$21.12	-37.1%	-\$25.21	-47.5%
SDG&E	-\$38.81	-57.1%	-\$38.89	-61.3%

The YoY common area bill comparison results are presented in Table 6-15 below. Common area accounts experienced actual average YoY bill reductions ranging from \$125 to \$1 per month, by utility. After adjustments for rate increases were made, the monthly average bill reductions ranged from \$118 to \$334. As a proportion of the customer's total bill, the average adjusted monthly bill savings ranged from 39 percent to 75 percent by utility. The bill adjustment accounted for a 45 percent increase in the proportion of total bill saved in SCE, a 19 percent increase in PG&E, and a five percent increase in SDG&E.

TABLE 6-16: SOMAH COMMON AREA ACTUAL AND ADJUSTED AVERAGE MONTHLY YOY BILL DIFFERENCES⁸⁰

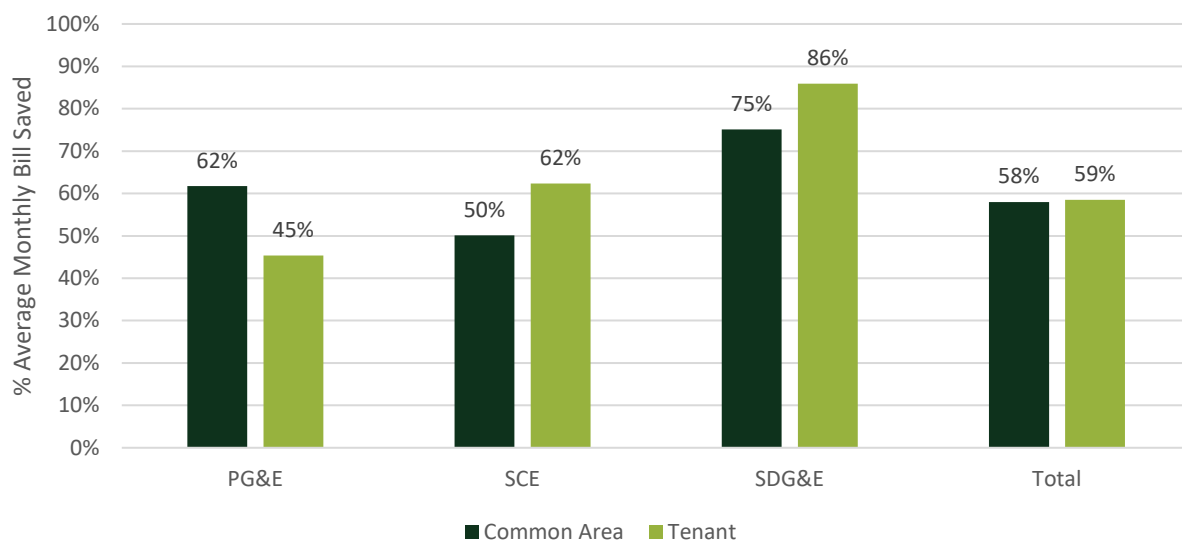
Utility	Actual Common Area Bills		Adjusted Common Area Bills (2020 Rates)	
	YoY Average Monthly Difference	YoY Average Monthly % Difference	YoY Average Monthly Difference	YoY Average Monthly % Difference
PG&E	-\$184.01	-40.1%	-\$224.61	-47.9%
SCE	-\$234.70	-27.0%	-\$333.50	-39.2%
SDG&E	-\$124.95	-71.3%	-\$118.64	-74.6%

6.5.2 Bill Credit Estimation

⁸⁰ Note that common area bill results in this section are shown by account. Many SOMAH properties have multiple common area accounts. The common area results shown in 6.5.2 Bill Credit Estimation are shown in aggregate for all common area accounts within a property.

Bill credit estimation results for 2022 are presented in Figure 6-7 as the proportion of average monthly bill saved. Common area impacts ranged from an average of 50 percent to 75 percent of average monthly bill reduced due to SOMAH systems in 2022. The per-tenant bill impacts in 2022 ranged by utility from 45 percent to 86 percent of annual bill saved. The savings as a proportion of the annual bill presented here are higher than the YoY bill analysis results presented in the previous section. The savings in the YoY results could be dampened due to weather-driven increases in consumption or changes in a customer's rate selection between the pre and post period that increased the customer's bill.

FIGURE 6-6: AVERAGE COMMON AREA AND PER-TENANT ESTIMATED SAVINGS AS PERCENTAGE OF AVERAGE MONTHLY BILL



Additional bill savings results by utility and beneficiary type are presented in Table 6-16, including the average monthly bill savings, the average monthly bill savings per kW allocated capacity, and the average bill savings per kwh generated. The bill impact metrics in SDG&E are generally higher than in the other utilities. As presented above (Section 6.1), the forecast realization rate for projects in SDG&E of 93 percent was higher than the rate in PG&E and SCE, which were both 87 percent. This higher level of system performance, coupled with more expensive electricity rates in SDG&E, leads to larger bill impacts.

TABLE 6-17: CALCULATED BILL IMPACTS BY BENEFICIARY TYPE AND UTILITY

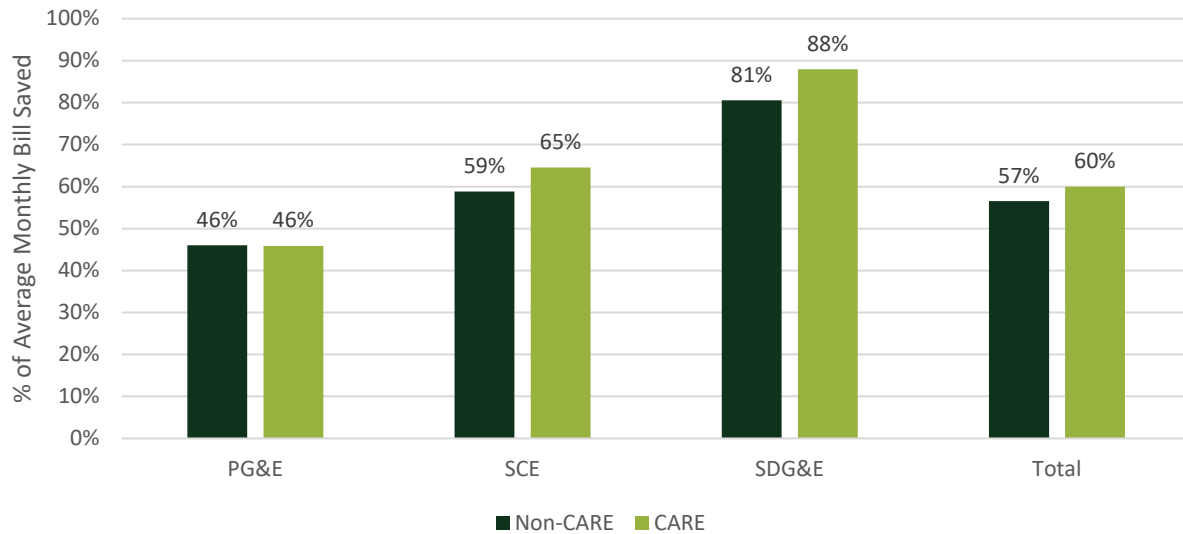
Beneficiary Type	Utility	Average Monthly Bill Savings	Average % of Monthly Bill Saved	Average Monthly Bill Savings per kW Allocated Capacity (CEC-AC)	Average Bill Savings per kWh Generated
Common Area ⁸¹	PG&E	\$906	61.7%	\$31	\$0.32
	SCE	\$793	50.1%	\$19	\$0.18
	SDG&E	\$1,463	75.1%	\$46	\$0.33
	Total	\$931	58.0%	\$27	\$0.25
Tenant	PG&E	\$30	45.4%	\$23	\$0.24
	SCE	\$41	62.3%	\$24	\$0.22
	SDG&E	\$56	85.9%	\$37	\$0.29
	Total	\$39	58.5%	\$25	\$0.24

6.5.3 CARE Budget Impacts

Estimated bill savings in 2022 are broken out here by whether tenants were California Alternate Rate for Energy (CARE) customers. CARE rates are made available to customers whose total household income is at or below specified income limits set by household size. Customers may also be eligible for CARE if they are enrolled in certain public assistance programs. Figure 6-8 shows the bill savings as percentage of average monthly bill broken out by CARE participation. In SCE and SDG&E customers on CARE rates saved more as a proportion of average monthly bill, while those in PG&E on CARE saved roughly the same.

⁸¹ Many SOMAH properties have multiple common area accounts. The common area results shown in this section are shown in aggregate for all common area accounts within a property. The common area results shown in section 6.5.1 Year over Year Utility Bill Comparison, are presented by account.

FIGURE 6-7: AVERAGE NON-CARE AND CARE PER-TENANT SAVINGS AS PERCENTAGE OF AVERAGE MONTHLY BILL



Additional bill savings results by CARE participation and utility are presented in Table 6-17, including the average monthly bill savings, the average monthly bill savings per kW allocated capacity, and the average bill savings per kWh generated.

TABLE 6-18: CALCULATED PER-TENANT BILL IMPACTS BY CARE PARTICIPATION AND UTILITY

Beneficiary Type	Utility	Average Monthly Bill Savings	Average % of Monthly Bill Saved	Average Monthly Bill Savings per kW Allocated Capacity (CEC-AC)	Average Bill Savings per kWh Generated
CARE	PG&E	\$27	46%	\$19	\$0.21
	SCE	\$36	65%	\$21	\$0.20
	SDG&E	\$52	88%	\$34	\$0.26
	Total	\$34	60%	\$22	\$0.21
Non-CARE	PG&E	\$41	46%	\$31	\$0.32
	SCE	\$57	59%	\$32	\$0.29
	SDG&E	\$73	81%	\$50	\$0.39
	Total	\$52	57%	\$34	\$0.32

The total impact on the CARE budget from installed projects was estimated based on the average monthly calculated bill savings presented above. The effective CARE discount for each utility was determined from each utility's CARE rate details. The saved to the CARE budget in 2022 is shown in Table 6-18 below. Overall, assuming tenants participated in CARE for the entire year, the SOMAH program reduced CARE budget spending by over \$800,000 in 2022.

TABLE 6-19: SOMAH PROJECT IMPACTS ON CARE BUDGET BY UTILITY

Utility	CARE Participant's Average 2022 Annual Bill Savings	CARE Discount	# of Total Tenants	% of Tenants on CARE ⁸²	Savings to CARE Budget in 2022
PG&E	\$269	34.9%	1,757	68.7%	\$174,461
SCE	\$386	30.4%	3,428	67.2%	\$388,602
SDG&E	\$620	31.7%	1,043	82.7%	\$248,517
SOMAH Total					\$811,580

⁸² This is the percentage of tenants from properties with completed SOMAH projects on CARE rates as of the end of December 2022.

7 COST EFFECTIVENESS ASSESSMENT

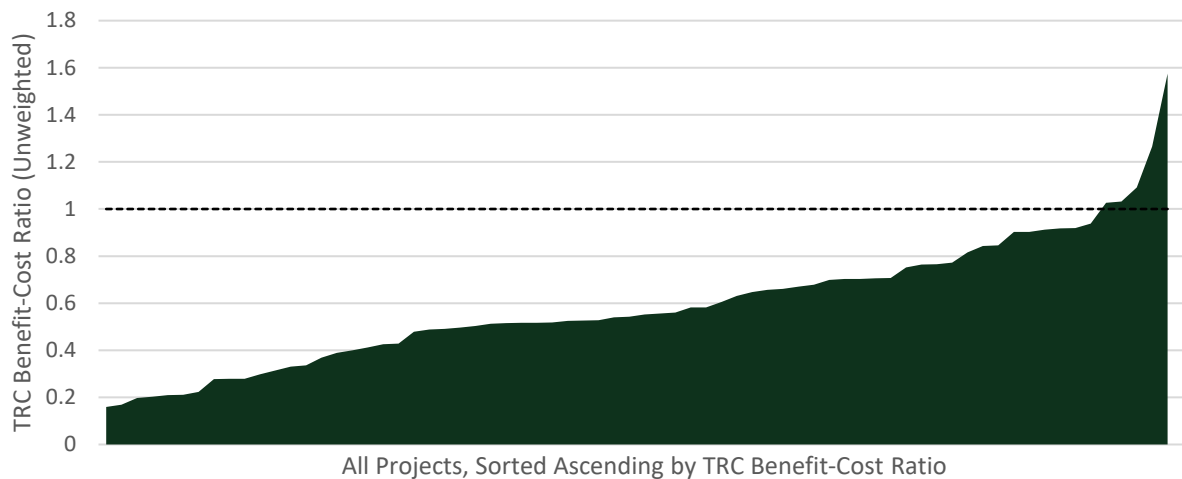
The cost-effectiveness results for the standard practice manual (SPM) tests are shown below by utility. Overall, the SOMAH benefit-to-cost ratios were 0.61 for the TRC, 0.65 for the sTRC, and 0.19 for the RIM. Program administrative costs contribute to the total costs under the TRC, sTRC, and RIM. If SOMAH was able to lower administrative costs, that would improve these cost effectiveness ratios. RIM costs also include reduced revenue; Since SOMAH PV systems contribute to customer bill savings this leads to higher RIM costs and lower overall RIM benefit-to-cost ratios. While the TRC and sTRC include federal tax credits as part of overall benefits, the RIM does not. This too leads to lower RIM benefit-to-cost ratios in comparison to the TRC and sTRC.

TABLE 7-1: SUMMARY OF COST-EFFECTIVENESS RESULTS BY UTILITY

Utility	TRC	sTRC	RIM
PG&E	0.49	0.55	0.17
SCE	0.60	0.63	0.22
SDG&E	0.86	0.94	0.15
SOMAH Total	0.61	0.65	0.19
25 th -75 th percentile range	\$10,707,971	\$13,197,932	\$10,592,516
NPV Total Benefits	\$17,688,059	\$20,349,663	\$54,976,416
NPV Total Costs	0.49	0.55	0.17

Figure 7-1 shows the unweighted TRC benefit-cost ratio for each project, ranked from lowest to highest. The horizontal line is drawn at the break-even TRC benefit-cost ratio of one. Ninety-three percent of modeled SOMAH projects resulted in a TRC benefit-to-cost ratio less than one (86 percent of projects had a sTRC ratio below one). None of the modeled SOMAH projects broke even on the RIM test.

FIGURE 7-1: TOTAL RESOURCE COST TEST RESULTS, RANKED FROM LOW TO HIGH (UNWEIGHTED)



When viewed by ownership type (see Figure 7-2 below), the TRC cost-benefit ratio for TPO projects is significantly higher than the TRC for HCO projects (0.66 and 0.38, respectively). This is likely driven by the ability of TPO to take advantage of the ITC. Eighty-eight percent of TPO completed projects took advantage of the ITC. While no HCO projects used the ITC, 25 percent of HCO completed projects did plan to use the LIHTC. The Inflation Reduction Act of 2022 (IRA) updated and expanded the ITC, with a new mechanism for nonprofits and other tax-exempt entities to receive the ITC in the form of a direct pay reimbursement. This change may allow more HCO SOMAH projects to take advantage of the ITC in the future, resulting in more favorable TRC test results for those customers. It is also important to note that the program's administrative costs are not necessarily equivalent between TPO and HCO projects. However, there is no mechanism to assign administrative costs by ownership type. If we were to assume that TPO administrative costs are lower than HCO (likely due TPO greater familiarity with the program through high project volume), then the TRC, sTRC, and RIM benefit-cost ratios for TPO projects would be even higher in comparison to HCO.

FIGURE 7-2: COST-EFFECTIVENESS RESULTS BY OWNERSHIP TYPE



Generally, programs focused on serving low-income and disadvantaged communities are not subject to the same cost-effectiveness requirements as programs for the general population. There are equity benefits of SOMAH which are not captured by the SPM cost-effectiveness tests and may not be easily quantifiable.

7.1.1 Avoided Costs

The net present value (NPV) of the total avoided costs per project and per kilowatt of capacity are presented in Table 7-2 below, by utility. Across the three utilities, the lifetime avoided cost per project was highest in SCE (\$190,965) and lowest in PG&E (\$89,688).

TABLE 7-2: NET PRESENT VALUE OF TOTAL AVOIDED COSTS BY UTILITY

Utility	NPV Total Avoided Costs	NPV Total Avoided Costs per Project	NPV Total Avoided Costs per kW Capacity (CEC-AC)
PG&E	\$1,973,132	\$89,688	\$684
SCE	\$6,874,745	\$190,965	\$938
SDG&E	\$1,744,639	\$134,203	\$885
SOMAH Total	\$10,592,516	\$149,190	\$869

8 FINDINGS AND RECOMMENDATIONS

In this section we summarize the key participation, process, impact, and cost effectiveness findings presented throughout this report, and offer recommendations to increase the future effectiveness of the SOMAH Program. Findings in this section are preceded with a square bullet (■) and recommendations are preceded by a dash (-). Not all findings have an associated recommendation. The findings and recommendations are organized by topical area below.

8.1 PARTICIPATION AND PROCESS FINDINGS AND RECOMMENDATIONS

The section summarizes the participation and process related findings and recommendations included in Sections 4 and 5 of this report.

Program Performance Findings:

- **The SOMAH Program continues to appear capable of achieving its 10-year goal of installing 300 MW of solar PV.** Achieving this goal will require new strategies and outreach efforts to build a pipeline of future projects, while continuing to address participation barriers faced by property owners and contractors.
- **Program interest has continued to decline.** SOMAH applications have declined year after year from 317 in 2019 to 183 in 2020, 170 in 2021, and only 49 in 2022. As of June 2023, 25 applications had been submitted in 2023 (17 of which were submitted after the approval of the PFM in March which increased program incentives). Currently there is more than \$450M in available funding for SOMAH incentives.
- **SOMAH participation has varied across IOU service territories.** PG&E represents the largest share of total projects, capacity, and eligible properties, followed by SCE and SDG&E. PacifiCorp and Liberty Utilities participation has been small (3 applications total)..
- **The average SOMAH project PV capacity has declined to 150 kW_{AC}.** The average PV system capacity continues to vary widely across applications, ranging from 18 kW_{AC} to 900kW_{AC}.

Program Participation and Eligibility Findings and Recommendations:

- **Track A application volumes continue to be low and experience high levels of cancellation.** To-date 45 Track A applications have been submitted, however more than three-quarters have been cancelled (double the cancellation rate of Track B applications), netting only one additional Track A application since the first evaluation. Obtaining contractor bids for Track A projects has been challenging, often requiring SOMAH PA involvement. A number of Track A projects have been cancelled stating they plan to resubmit as Track B. One interviewed property owner stated they did this as they had identified a contractor and did not want to get multiple bids.

- **The SOMAH PA should assess the Track A multiple bid requirement** to determine if it is providing its intended value or if it is inadvertently adding an additional burden to Track A participants. Note that the commission asked whether Track A’s multiple bid requirement should be removed in the May 5th ALJ Ruling Inviting Comments on Potential Modifications to SOMAH.
- **Allow projects to transition from Track A to Track B.** Allowing Track A projects to submit a multiple bid waiver would reduce the quantity of cancellations, the burden of application resubmittal, and allow information from the initial application to be retained.
- **The percentage of applications for projects located in a DAC has risen slightly (28 to 31 percent).** This is in alignment with program goals that aim to increase DAC participation. Analysis into cancellation and completion rates of DAC applications found these rates did not differ significantly from non-DAC applications.
- **System purchase type has been dominated by Third Party Owned (TPO) systems (73 percent of submitted applications).** TPO projects have a higher completion rate than HCO projects (13 versus 7 percent) and a lower cancellation rate (30 versus 68 percent) and are preferred by most property owners due to their ease of participation, lack of up front out of pocket costs, beneficial financing terms, and on-going operation and maintenance of the system.
- **The SOMAH PA should increase engagement with property owners using HCO** to ensure they have adequate support to navigate issues they encounter and keep their projects on track.
- **Participation has continued to be dominated by multi-application property owners.** To date, 69 percent of SOMAH applications were submitted by 21 property owners who have submitted ten or more applications each.
- **SOMAH Program eligibility currently excludes properties that could benefit from SOMAH.** These properties include individually metered properties, supportive housing where the property owner pays the utility bills, and properties with existing older solar systems.
- **Diversity of participating contractors has increased due to increased subcontracting opportunities.** While participating prime contractors continue to lack diversity, more than half of subcontracted projects are being completed by small (i.e., <=25 employees) or underrepresented owned business (women-owned businesses still make up only 2 percent of projects.)

Program Awareness and Motivations to Participate Findings and Recommendations:

- **SOMAH Program awareness continues to be driven by contractor outreach.** A number of IOUs reported some initial engagement with the SOMAH PA to co-market the program, but most of these efforts had stalled or been a light touch (such as including utility logos on SOMAH program materials). The majority of participating property owners continue to report learning of the SOMAH Program through their contractor or a trusted source and most participating property owners do not recall receiving any program marketing materials from the SOMAH PA. CBOs, whose efforts accounted for almost 30 percent of the ME&O budget, have not yet had a significant impact on program participation.

- **The SOMAH PA should reevaluate the role of CBOs in SOMAH implementation** to determine if a more appropriate role for CBOs is to focus on promoting SOMAH’s job training opportunities and partnering with contractors and property owners to maximize the value of tenant education.
- **The SOMAH PA should tailor marketing materials to highlight the financial benefits of SOMAH for property owners.**
- **Participation amongst city and county housing authorities has increased.** Submitted applications have increased more than four-fold (from 7 to 29) since the last evaluation.
- **The SOMAH PA has developed case studies of completed projects to showcase and promote successful SOMAH project completion.** These case studies illustrate the energy, environmental, and tenant benefits. The SOMAH PA has also added testimonials from named members of the affordable housing community to their website.

Contractor Experience Findings and Recommendations:

- **Many smaller contractors report significant challenges regarding the administrative aspects of SOMAH.** Multiple contractors reported confusion around the application process and that the level of documentation required to participate in the program was burdensome.
 - **The SOMAH PA should do greater outreach to contractors to ensure they are aware of all available SOMAH resources and to reduce administrative burden.** This can be done through increased email outreach to connect with smaller contractors and prominent features on the application portal detailing what services are available.
- **Smaller contractors struggle to “break into” the SOMAH program given the significant presence of larger solar contractors.** Contractors reported that most of the “easy” projects had been taken by larger contractors and struggled to find available, eligible properties to bring into the program.
 - **The SOMAH PA should offer additional trainings or information to contractors on how to secure leads and find eligible projects.**
- **Contractors reported that the financial costs of the program make it difficult for smaller contractors without as much capital to participate.** Participating and non-participating contractors believed that these larger contractors are the only companies able to secure contracts through the SOMAH program because they have the capacity to withstand financial risk. Both participating and non-participating contractors stated the incentive structures were too low to either engage property owners or to make a profit.
 - **The SOMAH PA should increase marketing of the progress payment pathway,** as many contractors were not aware that this was an option.
 - **The Progress payment pathway should be a default milestone** rather than opt-in.

- **Contractors report elongated timeframes for the PA to become aware of, and sometimes fix, identified issues with the program.** Relying only on evaluation studies (that only occur every three years) to identify problems and make recommendations for change is insufficient for program success.
 - **The SOMAH PA should establish a well-understood communication channel** for program feedback to be shared with the PA and the CPUC (if needed).

Project Cancellations, Future Participation Findings and Recommendations:

- **The SOMAH cancellation rate has continued to increase.** To date 40 percent of submitted applications have been cancelled or withdrawn (287 applications, 50MW of capacity). This cancellation rate has increased since the last evaluation (22 percent) but remains lower than for the MASH program (57 percent). Data documenting the reason for application cancellations has improved and nearly two-thirds of cancellations are potentially “recoverable”.
 - **The SOMAH PA should prioritize outreach to potentially “recoverable” cancelled applications** to determine if their needs can be addressed to facilitate future participation at these properties.
- **Primary reasons for application cancellations were due to a lack of interest in the program.** The SOMAH PA had expanded the tracking data fields to better document SOMAH projects’ cancellations reason. Nearly two-thirds of project cancellations may have been cancelled for a reason that could be addressed and result in a future project.
- **Property owners are likely to submit SOMAH applications in the future.** Participating and non-participating property owners who have SOMAH-eligible properties reported they were likely to submit a future application (75 percent and 80 percent, respectively).
 - **The SOMAH PA should prioritize direct outreach to non-participating property owners to ensure they are aware of and knowledgeable about the program.** The evaluation team spoke with a number of non-participating property owners who were either unaware or ill-informed about the program and were very interested in participating when provided a program overview. One way to address this would be to leverage the Salesforce database by conducting one on one outreach through phone calls and/or emails to identify the correct contact for the SOMAH Program and then working to build a relationship with that organization through these people.
 - **The SOMAH PA should prioritize building relationships with participating property owners to correctly identify additional eligible properties and provide support.** This can be done through one-on-one outreach via emails, phone calls, or in-person visits to introduce themselves, collect pertinent data, and determine what support is needed to complete any potential projects.

Project Cost Findings:

- **Third Party Owned (TPO) Project costs are on average more expensive than HCO projects, but incentive rates are lower.** TPO project costs of completed systems were roughly \$300/kW more than

HCO projects, however the average SOMAH incentive was \$0.50/Watt lower due to the majority of TPO projects leveraging the ITC.

- **SOMAH project costs are in line with other similar programs.** SOMAH installed systems had lower average system costs when compared to similar projects in MASH and LIWP. The average cost per kW_{DC} for completed projects in 2021 and 2022 in SOMAH was \$3,081 and \$3,493 in MASH.

Application Processing Findings and Recommendations:

- **Participation timelines continue to be long.** Nearly four years after program launch only 78 projects have reached the Incentive Claim Approved (7) or Paid (71) steps and the average time from application submission to incentive paid date is 942 days (2 years and 7 months), with the shortest project completed in just under a year (354 days). One of the largest contractors is hoping to reduce this to less than three quarters in the near future.
- **Some SOMAH projects have encountered installation issues.** Problems with installation have included challenges with utility transformer upgrades at older properties, incorrect utility meter installations, and issues with Fannie Mae funded properties.
 - **The final inspection should include a check for interconnection configuration errors,** such as a backwards utility meter that could lead to PV generation being read as consumption.
 - **The SOMAH PA should engage with Fannie Mae to develop a solution for Fannie Mae funded properties to have SOMAH third-party owned systems.**
- **Project interconnection timelines are long and burdensome to contractors and property owners.** Estimates of the time from project installation to interconnection range from 5 to 8 months (depending on the data used), which is excessively long and represents additional months tenants, property owners, and contractors must wait to receive SOMAH Program incentives and bill savings.
 - **The SOMAH PA and IOUs should work together to identify all issues leading to extended interconnection timelines and take steps to expedite this process to ensure program benefits and incentives are provided in a timely manner.** This could include having each of the IOUs document their SOMAH interconnection process, requiring approved interconnection applications to be uploaded to PowerClerk, and requiring all IOUs to designate a SOMAH liaison who, among other things (documented throughout this report), would be tasked with tracking projects through the interconnection process with their utility such that it can be accomplished in a smoother and faster manner. If needed, the SOMAH PA should escalate long PTO delays to the CPUC who may be able work with the IOUs to expedite processing.
- **The timeline from interconnection to bill credits is long but improving.** The average time in 2022 from interconnection date to utilities setting up bill credits ranges from 18 days in SDG&E, 60 days in SCE, and 117 days in PG&E. This timeline has shortened since 2021 in each utility, but is still two to four months in SCE and PG&E.

- **Plans to pair SOMAH PV with BTM battery storage have dropped precipitously.** Tracking data suggests only 6 active projects plan to pair SOMAH PV systems with battery storage, down from 92 percent of TPO systems in 2021. Despite IOUs recently attempts to clarify how VNEM systems can be paired with storage, confusion remains, and Commission staff have asked a question on this topic in the May 2023 ALJ Ruling Inviting Comments on Potential Modifications to SOMAH.
 - **The SOMAH PA should update the SOMAH Program handbook with guidance on pairing SOMAH PV with battery storage.** The SOMAH Program handbook provides little guidance on pairing SOMAH PV with battery storage. When the current pairing challenges are resolved, the Handbook should be updated to include details on pairing storage with VNEM solar systems.

Program Tracking Data Findings and Recommendations:

- **Program tracking data continues to improve.** Examples include a new field added to capture the detailed reasons for project cancellation and ownership type being updated to reflect the property owner's ownership.
 - **Continue to improve tracking data with additional fields.** The program tracking data could benefit by the inclusion of a construction completion or interconnection requested date to be able to better understand the time it is taking for systems to receive PTO (e.g., contractor termed, 'Mechanical Completion'), fields indicating whether an application has been resubmitted or has switched from Track A to Track B (if allowed), fields indicating when bill credits were set up by the utility, and additional review and cleaning of variables that are incomplete or invalid (e.g., the tribal indicator field and many of the date fields).

Tenant Education Findings and Recommendations:

- **Awareness of tenant education materials was low.** Less than half of the surveyed tenants recalled seeing materials in their building related to the SOMAH program. Very few tenants reported attending a workshop or presentation about the SOMAH program. Property owners reported that tenants often turn to them with questions about their bills.
 - **The SOMAH PA should provide educational materials that are posted or available to tenants in common areas of the property.** This should include flyer(s) posted in common areas to promote the tenant hotline.
 - **The SOMAH program should consider developing a tenant partnership role that would pay one tenant in each property to educate fellow tenants about SOMAH.** This person would be a resource to educate their fellow tenants about SOMAH, assist property managers in handling tenant inquiries, and point tenants to existing SOMAH support resources. They could also educate tenants about other efficiency measures and programs available to tenants.
 - **The SOMAH PA should update the tenant survey to collect more-in depth information about tenant experience and education awareness.** Details of these recommended survey changes are found in Section 5.4.1.

Workforce Development Findings and Recommendations:

- **Low Contractor awareness of job training resources.** Not all contractors were aware of the SOMAH PA's job training resources, including the job board, and reported they would be interested in using them.
 - **The SOMAH PA should do greater outreach to contractors to ensure they are aware of all available SOMAH job training resources.**
- **Most workforce development trainees were brought on as temporary employees.** Only 11 percent of workforce development trainees mentioned in a contractor survey conducted by the SOMAH PA were still employed with the company three months after their training was over. Those trainees were also still employed six months later, and the contractors were very satisfied with their performance. This contractor survey did not cover whether trainees went on to be employed at other companies within the industry.
 - **The SOMAH PA should include additional questions on the job trainee survey to better understand this program component.** While the job trainee survey was not fielded at the time of this evaluation, we reviewed the survey instrument and identified areas of improvement. This includes additional questions regarding the trainee's motivations for participating, and how their experience has impacted their career path moving forward, including their interest in solar, and career goals and expectations.

8.2 IMPACT AND COST-EFFECTIVENESS FINDINGS AND RECOMMENDATIONS

The section summarizes the impact and cost-effectiveness related findings and recommendations included in Sections 6 and 7 of this report.

PV Production and Energy Impact Findings:

- **Observed PV Production:** 898 MWh in 2021 and 9,199 MWh in 2022. The observed capacity factors (DC) were 10.1% in 2021 and 12.4% 2022. The 2022 full-year realization rate was 77%.
- **Forecasted PV Production:** 16,202 MWh annually from completed projects and 83,959 MWh annually from completed and active projects combined. Forecasted capacity factor (DC) of 13.7%. The forecasted realization rate is 85%.

Customer Electricity Consumption Findings:

- **Estimated average change in tenant monthly consumption was small relative to consumption:** Following PV installation, average monthly consumption per tenant fell by 18.1 kWh in PG&E and 4.8 kWh in SDG&E and increased by 3.5 kWh in SCE. Tenants may have reduced energy consumption due

to timing of PV installations relative to the return to in-person activities related to the COVID-19 pandemic.

Demand Impacts Findings:

- **CAISO Gross Peak:** Coincident generation of 146 kW in 2021 and 2,354 kW in 2022. Estimated capacity factor of 12% in 2021 and 23.5% in 2022.
- **CAISO Net Peak:** Coincident generation of 32 kW in 2021 and 5 kW in 2022. Estimated capacity factor of 2.7% in 2021 and 0.0% in 2022.
- **IOU Peak:** Coincident generation ranged from a low of 0 kW in SDG&E to a high of 573 kW in SCE in 2021. Coincident generation ranged from a low of 516 kW in SDG&E to a high of 1,689 kW in SCE in 2022.

Environmental Impacts Findings:

- **Observed Emissions Reductions:** 229 metric tons of CO₂ in 2021 and 2,351 metric tons of CO₂ in 2022.
- **Forecasted Emissions Reductions:** 3,838 metric tons of CO₂ per year from completed projects and 20,835 metric tons of CO₂ per year from completed and active projects combined. The forecasted monetary value of emissions reductions is \$101,000 per year from completed projects and \$539,000 per year from completed and active projects combined.

Economic Impacts Findings:

- **Common Area Bill Impacts:** 58% saved on average monthly bill in 2022 (completed projects).
- **Tenant Bill Impacts:** \$39 per month, or 59% saved on average monthly bill in 2022 (completed projects).
- **CARE Tenant Bill Impacts:** \$34 per month, or 60% saved on average monthly bill in 2022 (completed projects).
- **CARE Budget:** Spending reduced by over \$800,000 in 2022 from completed projects (assumes tenants on CARE year-round).

Cost-Effectiveness Assessment Findings:

- **Benefit-Cost Ratios:** 0.61 TRC, 0.65 sTRC, and 0.19 RIM.

Impact and Cost-Effectiveness Recommendations:

- **Increase the SOMAH PA monitoring threshold that flags underperforming systems.** SOMAH PV systems are underperforming relative to expectation. The evaluation team saw evidence of systems where production was steadily declining, or inverters had clearly gone offline. While the SOMAH PA has begun to monitor system performance, a 70% performance threshold is used to flag systems for follow-up. The evaluation team recommends raising the performance threshold to 90% which aligns with the system warranties and performance guarantees that third-party owners are required to include in contracts with customers.
- **Track and report SOMAH bill credits as a secondary measure of data quality and system performance.** The evaluation team analyzed PV generation data provided by the utilities (NGOM data) as well as data provided by certain PMRS entities. We found systems with data quality issues within the utility data but not the PMRS data, and vice versa. The utility data is used to determine tenant and common areas bill credits and the PMRS data is used by the SOMAH PA for system monitoring. There is a potential monitoring gap if utility data quality is poor but the PMRS data is clean. The SOMAH PA would not be able to flag these systems based on the PMRS data. The evaluation team recommends that utilities track and report SOMAH bill credits. This reporting would allow confirmation of system performance and enable identification of systems with potential NGOM data issues that could affect bill credits.
- **Consider additional system performance enforcement measures.** SOMAH PV systems are underperforming relative to expectation. The SOMAH PA monitoring system is an excellent first step in ensuring oversight of system performance. However, if alerts to property owners and contractors do not lead to performance improvements then more enforcement measures may be needed.
- **Research changing incentive calculations away from EPBB calculator which is based on PVWatts v2.** SOMAH incentive levels and performance expectations are developed using the EPBB Calculator which is driven by NREL's PVWatts v2 Calculator. The EPBB calculator has not been updated since 2014. The current version of NREL's PVWatts calculator is now v8.1 (released in January 2023). More recent versions of PVWatts have been shown to have higher generation estimates by approximately 10%. Therefore, SOMAH performance expectations are understated. The evaluation team recommends researching alternative methods for estimating PV system performance and setting incentive levels that are grounded in more up-to-date methods. This recommendation should be taken in concert with increased monitoring and enforcement measures to ensure systems performance is maximized and maintained. Note that the commission has asked in the May 5th ALJ Ruling Inviting Comments on Potential Modifications to SOMAH whether the EPBB methodology is functional for SOMAH projects and whether there are ways it can be refined to better support SOMAH program goals.

8.3 RECOMMENDATIONS FOR FURTHER RESEARCH

This section presents recommended areas for further SOMAH research. This research was not conducted during this evaluation as it was deemed outside the scope.

- **Review of the SOMAH PA's Salesforce database used to house property contact information.** The salesforce database contains contact information for property management companies and housing authorities located within California. A database and process review would explore how this contact information is collected, stored, and leveraged. Findings from this research could help improve property owner outreach, awareness, and engagement.
- **Research the VNEM interconnection process at each IOU to understand why they take longer than other NEM interconnections.** Longer interconnection timelines are not just a SOMAH issue, overall VNEM interconnection applications take significantly longer than other NEM interconnection applications. Once the source of the timeline delays is identified, the CPUC and SOMAH PA can then better work with the IOUs to minimize the delays associated with SOMAH (and other VNEM) interconnection applications.
- **Conduct a process study to better understand why multi-family PV systems perform poorly.** Both the SOMAH and MASH studies have found poor performance in multi-family PV systems (relative to expectations from the single-family sector). The source of this poor performance could be anything from a lack of natural incentives to monitor and maintain system performance, problems related to system size, or other issues. This study would help to determine potential changes in policy, regulations, or program design that could be implemented to ensure that public resources invested in these systems lead to production closer to expected levels of performance.

APPENDIX A PU CODE 913.8 REPORTING REQUIREMENTS

The Public Utilities (PU) Code Section 913.8 includes a list of reporting requirements that must be addressed by the SOMAH evaluation. The table below provides a summary of these reporting requirements and how and where they are addressed within the second triennial SOMAH report. The data included in this report reflects the status of the program as of December 31, 2022.

PU Code 913.8 Reporting Requirement	Status as of December 31, 2022
The number of qualified MF affordable housing property sites that have a qualifying solar energy system.	As of the end of 2022, 71 SOMAH projects have been completed and received the SOMAH incentive. An additional seven projects have had their Incentive Claim Approved. A summary of the status of active SOMAH applications is included in Section 4.1 of this report.
The dollar value of the award and the electrical generating capacity of the qualifying renewable energy system.	As of the end of 2022, the PV system capacity of the 71 completed projects is 13 MW _{AC} . The 361 active SOMAH applications have 51 MW _{AC} of capacity. The total value of the submitted/reserved SOMAH incentive for active projects is \$107M. The completed projects have received \$20M in incentives.
The bill reduction outcomes of the program for the participants.	The average bill reductions for tenants in 2022 was \$39 per month, or 59% of an average monthly bill. The average bill reduction for common areas in 2022 was \$931 per month, or 58% of an average monthly bill. Further summaries of the bill reduction analysis can be found in Section 6.5.2 of the report.
The cost of the program.	Section 4.5 of the report provides the total program expenditures, budget, and incentives paid through December 31, 2022. The total program administrative expenditures were \$8.8M in 2022 and \$35M in total across all years. Through 2022, \$31M of incentives have been paid and \$103M are forecasted to be paid in future years.
The total electrical system benefits.	The program produced 898 MWh of energy in 2021 and 9,199 MWh in 2022. The coincident generation from SOMAH systems during the top hour of CAISO Gross load was 146 kW in 2021 and 2,354 kW in 2022. This is less than 0.01% of the CAISO gross load peak. Further details on the total electrical system benefits can be found in the report (energy benefits in Section 6.1 and demand benefits in Section 6.3).
The environmental benefits.	SOMAH systems led to greenhouse gas emissions reductions of 229 metric tons of CO ₂ in 2021 and 2,351 metric tons of CO ₂ in 2022. Further details on the environmental benefits of the program are found in Section 6.4 of the report.
The progress made toward reaching the goals of the program.	Goal 1) Expanding access to solar generation and its benefits to low-income customers in multifamily housing, where it is typically limited. The 71 completed projects serve 6,228 tenant units, and of these 27 projects are in DACs supporting 2,101 tenant units. Goal 2) Incentivizing the installation of at least 300 MW of solar generation capacity. Section 4.1 of the Second Triennial report presents analysis of the SOMAH applications submitted through December 31, 2022. As this analysis shows,

PU Code 913.8 Reporting Requirement	Status as of December 31, 2022
	the PV system capacity of the 432 active and complete SOMAH applications is 64 MW_{AC} which is 21 percent of the overall program goal of 300 MW_{AC}. Goal 3) Ensuring financial benefits accrue primarily and directly to tenants and are not recaptured by other means. Section 4.3.4 of the Second Triennial report presents analysis of the program tracking data through December 31, 2022. While the SOMAH Program requires a minimum 51 percent of a project’s electrical output be allocated to offset tenant’s load, currently on average across SOMAH non-cancelled applications, the tenant allocation is 86 percent for active applications and completed projects. Goal 4) Providing greater accessibility to the program for applicants through a single point of contact, full service technical assistance, and coordination with other low-income programs. The SOMAH Program is implemented by the SOMAH PA that is made up of four distinct organizations (CSE, GRID, CHPC, and AEA), but that acts and presents itself as a single entity (“the SOMAH PA”). Roles across members of the SOMAH PA are well-understood (both internally and externally). The program provides a full suite of technical assistance offerings (from solar feasibility assessments to interconnection support) all of which are well documented on the SOMAH website. Both the structure of the SOMAH PA and the support services offered increases accessibility and lessens potential confusion on the part of program applicants. Section 4.1.4 of the SOMAH Phase I report (https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442465840-somah-phase1-evaluation-final-report.pdf) provides details on the program’s coordination with other low-income programs. This coordination includes program requirements such as notifying tenants about the IOU’s Energy Savings Assistance (ESA) programs and providing tenant information to participating IOUs for ESA outreach (ESA Program referrals). Goal 5) Promoting local economic development through job training requirements and hiring practices. Workforce Development activities are promoting local economic development and expanding solar job outcomes as a part of SOMAH’s goal to create broad and meaningful benefits in communities throughout the IOU territories. SOMAH Workforce Development activities make up 5 percent of the program spending through the end of 2022. According to a survey of contractors, 11 percent of job trainees were still employed at the company they completed their job training at 9 months after the training was completed, and another 10 percent were employed with a subcontractor in the industry. Goal 6) Facilitating efficient program administration by a single, statewide administrator. The SOMAH PA is internally aligned on the goals and objectives of the program and is working in the spirit of the legislation. Research conducted in both Phase II of the last evaluation and this current evaluation further supported this finding. Contractors rated their interactions with the SOMAH PA highly and contractors and property owners rated their satisfaction with

PU Code 913.8 Reporting Requirement	Status as of December 31, 2022
	the SOMAH Program around a seven (on a scale of 0-10). The SOMAH PA has been responsive to implementing past program evaluation recommendations.
The program's impact on the California Alternate Rates for Energy (CARE) Program budget.	Spending towards the CARE budget was reduced in 2022 by \$811,580 (assuming tenants remained on CARE rates the entire year). The CARE budget impact analysis is presented in Section 6.5.3 of the report.
Analysis of pending program commitments, reservations, obligations, and projected demands for the program to determine whether future ongoing funding allocations for the program are substantiated.	CPUC determined there was sufficient participation and interest in the program in D.20-04-012 pursuant to PUC 2870.
A summary of the other programs intended to benefit disadvantaged communities, including, but not limited to, the Single-Family Affordable Solar Homes Program established by the commission in Decision 07-11-045, the Multifamily Affordable Solar Housing Program established by the commission in Decision 08-10-036, and the Green Tariff Shared Renewables Program.	A summary of these programs was provided in Appendix F of the first triennial evaluation Phase I Report (https://www.cpuc.ca.gov/-/media/cpuc-website/files/legacyfiles/s/6442465840-somah-phase1-evaluation-final-report.pdf) DAC-SASH provides funding for installing solar PV systems on existing owner-occupied low-income households and hence SOMAH tenants are not eligible for this program. MASH and SASH are now closed. DAC-Green Tariff and Community Solar Green Tariff provide bill discounts to customers who live in DACs who are unable to install solar on their roofs. The SGIP offers rebates to lower-income, medically vulnerable, and at-risk for fire communities are at the front of the line to receive competitive incentives for battery storage.
Additional DAC Reporting Requirements	Status as of December 31, 2022
Number and percentage of applications received for projects located in a DAC	As presented in Section 4.3.3, as of December 31, 2022, a total of 223 submitted project applications are within a DAC (31 percent of all applications), demonstrating an increase in the share of DAC applications since 2021.
Number and percentage of applications for projects located in a DAC that are approved	27 of the 223 submitted projects in a DAC are completed as of December 31, 2022 (12 percent of all submitted applications).

APPENDIX B SOMAH METRICS AND KPI ASSESSMENT

Phase II of the first triennial evaluation defined SOMAH Program metrics and key performance indicators (KPIs) that can be used to track program performance over time against the programs stated goals. The tables below present the assessment of these metrics and KPIs as of December 31, 2022.

TABLE B-1: SOMAH PROGRAM METRICS

#	Metric	Metric Assessment as of December 31, 2022
1	Projects with Reservation Request Approval, Milestone Status, and Incentive Package Submitted in Track A and Track B for active and completed projects.	RR Approval: 3 Track A and 394 Track B EECM: 3 Track A and 382 Track B PPM: 3 Track A and 334 Track B ICP Submitted: 0 Track A and 78 Track B Project Paid: 0 Track A and 71 Track B
2	Number of job trainees who complete training per number of projects completed	Through 12/31/2022 the SOMAH application pipeline has created 785 job training opportunities across 78 completed projects (SOMAH Semi-Annual Progress Report January 2023).
3	SOMAH-sponsored Job Trainings Conducted and Attendees	Per SOMAH's recent SAPR, the SOMAH PA has verified the eligibility of 17 new JTOs, for a total of 83 active JTOs. Additionally, 96 new job trainees have been added to the SOMAH Job Training Portal for a total of 465 job trainees. The SOMAH PA continues to engage with job trainees and solar job seekers by facilitating career development workshops. In December 2022, the SOMAH PA hosted a Solar Career Pathways webinar for job seekers to learn about various PV installation career opportunities in the solar industry and hear the experiences of a SOMAH PV installation trainee. The webinar had 44 registrants and 30 attendees.
4	Projects with Reservation Request Approval, Milestone Status, and Incentive Package Submitted benefiting tenants who are income qualified and/or live in a DAC for active and completed projects.	RR Approval: 268 LI and 129 DAC EECM: 258 LI and 127 DAC PPM: 239 LI and 98 DAC ICP Submitted: 48 LI and 31 DAC Project Paid: 44 LI and 27 DAC
5	SOMAH Projects with Reservation Request Approval, Milestone Status, and Incentive Package Submitted in HUD & USDA Housing	RR Approval: 34 HUD and 13 USDA EECM: 34 HUD and 13 USDA PPM: 34 HUD and 12 USDA ICP Submitted 1 HUD and 1 USDA Project Paid: 1 HUD and 0 USDA This analysis was based on the Regulatory Agreement Type variable included in PowerClerk.
6	Applicants Satisfied with Technical Assistance	Seven of the 15 property owners we spoke with were aware of the SOMAH Program's Technical Assistance offering. Of these seven, four had used it. Two property owners who used it reported it to be very helpful while one believed improvements for applicants who were less informed about PV installation. The fourth was aware of it but had not used it. When asked about awareness or use of the Technical Assistance, most property owners report relying on their contractors to take care of all technical aspects of the program.

TABLE B-2: SOMAH PROGRAM KEY PERFORMANCE INDICATORS (KPIs)

#	Timing	KPIs	KPI Assessment
1	Within 1 year	SOMAH Projects with Reservation Request Approval, Milestone Status, and Incentive Package Submitted by Capacity (0-50kW, 50-100kW and over 100kW), Budget, and IOU territory	SOMAH Projects by stage (Figure 4-2): - Upfront TAR: 8 - RR Package: 27 - EECM: 12 - PPM: 48 - ICP: 259 - ICA: 7 - Complete: 71 Capacity of active and complete projects: 51 MW Active and 13 MW Complete (Figure 4-6) Total program expenditures: \$35,056,477 (Table 4-17) Participation by IOU: Table 4-1 - Liberty: 2 total, 2 active, 0 complete, 0 cancelled - PacifiCorp: 1 total, 0 active, 0 complete, 1 cancelled - PG&E: 403 total, 220 active, 22 complete, 161 cancelled - SCE: 223 total, 102 active, 36 complete, 85 cancelled - SDG&E: 90 total, 37 active, 13 complete, 40 cancelled
2		Targeted Audiences Aware of SOMAH	27 percent asserted they were very familiar with the program and 27 percent were somewhat familiar with the program and. 45 percent of non-participating, but eligible property owners were unaware of the SOMAH Program.
3	1-3 years	CBOs Participating in SOMAH	8
4		MW of Installed Capacity in MF Affordable Housing	12.72MW
5		Reduced Electricity Bill Costs among SOMAH Tenants	\$39 per month in 2022
6		SOMAH Trainees Hired for Solar Jobs	The Job Trainee report provided by the SOMAH PA indicated 48 unique job trainees had been hired to work on a total of 96 SOMAH jobs (it is possible that some of these job trainees worked on the same project). Of the job trainees hired for these 96 jobs, 14 were permanent hires and 82 were temporary.
7		Program cost and impact on the California Alternate Rates for Energy (CARE) program budget	\$811,580 reduced spending to CARE program budget in 2022
8		Energy Savings Assistance (ESA) Program enrollment among SOMAH tenants	No data was available to assess this KPI at this time.
9	3 or more \ years	Avoided CO ₂ emissions (tons)	2,351 in 2022 from completed projects.

APPENDIX C DATA COLLECTION ACTIVITIES AND INTERVIEW GUIDES

The second triennial evaluation of the SOMAH Program included numerous interviews with key program actors and participating and non-participating contractors and affordable housing property owners to understand changes that have been made to the program since the first evaluation and how those changes have impacted program participation.

Table C-1 below outlines the data collection activities conducted as part of this evaluation. Further details on each of these research efforts are provided in the sections below.

TABLE C-1: IN-DEPTH INTERVIEW DATA COLLECTION ACTIVITIES

Program Actor	Group	Population	Completes	Research Objectives
SOMAH PA	CSE, Grid Alternatives, AEA, CHPC	4	4	Identify program changes made to reduce application burden and reduce barriers to participation, areas of ME&O success and in need of improvement, current project pipeline outlook, current challenges impeding program goals, cross-program marketing and coordination efforts and results (ESA, LIWP, SGIP), assessment of current incentive levels, measurement, and effectiveness of WFD activities
IOUs	PG&E, SCE, SDG&E, PacifiCorp, and Liberty	5	5	Assess challenges within their role in SOMAH and identify potential improvements and future involvement in program delivery
Program Partners	CBOs	8	5	Role and effectiveness in SOMAH ME&O and WFD activities, perception on property owner's barriers to participation, recommendation for program improvement
	Financing Organizations	1	1	Description of SOMAH bridge financing offer and qualification, interaction with third-party system ownership, uptake of financing amongst SOMAH participants, recommendations for program improvement
Contractors and Subcontractors	Participant	42	6	Program participation experience and satisfaction, impact of recent program changes, areas in need of improvement, and likelihood of future participation
	Non-Participant	121	7	Barriers to participation, awareness/impact of recent program changes, areas in need of improvement, and likelihood of future participation
Property Owner	Participant	105	15	Program participation experience and satisfaction (including with solar PV installation and Track A technical support), drivers and barriers to participation, cross program awareness and participation, installed system performance, observed bill savings and other system benefits, reason for project cancellation/withdrawal, likelihood of future program participation, areas for additional support or program improvement
	Non-Participant	~3400	11	Level of program awareness, effectiveness of ME&O efforts, reasons for non-participation, likelihood and timing of future program participation, barriers to solar adoption, and recommendations for program improvement

*Many affordable housing organizations are responsible for multiple SOMAH eligible properties and thus this sample quantity does not represent the unique number of eligible property owners.

SOMAH Program Administrator (PA) Interviews

All four SOMAH PA members were interviewed as part of the first SOMAH evaluation. For this second SOMAH evaluation, follow-up interviews were conducted with each member of SOMAH PA to discuss recent or planned program changes, their assessment of the effectiveness of these changes, and other program implementation successes achieved or challenges faced.

IOU Interviews

As part of the first SOMAH evaluation, the Verdant team interviewed the five SOMAH IOUs. For this evaluation, follow-up interviews were conducted with each of the IOUs to discuss successes or challenges related to their role in SOMAH's implementation and to discuss potential improvements and future involvement in program delivery.

Community Based Organization (CBO) and Financing Organization Interviews

SOMAH partners, including subcontracted community-based organizations and a financing organization were interviewed by phone or Zoom by ILLUME professional staff. Interviews covered topics including their role and effectiveness in SOMAH ME&O and WFD activities, perception on property owner's barriers to participation, and recommendations for program improvement. The interview for the financing organization, which has supported SOMAH projects, covered topics such as the uptake of financing amongst SOMAH participants, and recommendations for program improvement.

Contractor Interviews

SOMAH participating and non-participating contractors were interviewed by phone or Zoom by ILLUME professional staff. Contractor interview questions covered topics such as:

- Current and previous experience with the SOMAH program,
- Assessment of program changes since the previous evaluation,
- Experience with the application process and program requirements,
- Financing and system purchase types offered to property owners interested in the SOMAH Program,
- Barriers/challenges faced by contractors to (or during) SOMAH Program participation, and
- Recommendations for SOMAH Program improvements.

These interviews included open-ended questions that allowed detailed descriptions of each contractor's experiences and enabled follow-up questioning depending on the answers provided. The interview guide used for the contractor interviews is provided below in Section C.1.

The sample for the contractor interviews was designed to gather feedback from contractors who have submitted the majority of SOMAH applications to date, participating contractors who have submitted only a few applications, participating subcontractors, and eligible contractors that have not yet participated in the program. ILLUME spoke with six participating contractor companies. ILLUME conducted two separate interviews with two representatives from a large contractor, which brings the total number of participating contractor interviews to seven. ILLUME staff also spoke with seven non-participating contractor companies.

Affordable Housing Property Owner Interviews

Interviews were completed with 15 of the 105 unique participant affordable housing property owners/developers who had submitted an application to the SOMAH Program as of December 31, 2022. The sample of participating property owners interviewed represented a diverse set of SOMAH Program participants including for-profit, non-profit, and government run (public housing agencies) organizations, Track A and Track B participants, prolific property owners (who have submitted 15 or more applications) and those who have submitted only a single application, property owners who partnered with both large and small SOMAH contractors, and those using third-party and host customer ownership financing. Most of the property owners had completed at least one SOMAH project at the time of the interview (10 of the 15 property owners either had the incentive check issued for their project or had submitted their incentive claim) with six of the property owners completing multiple projects at the time of the interview. The property owners interviewed represented a large share of the applications that had been submitted at the time the sample was drawn (271 of the 719 applications submitted, or 37 percent). The evaluation team reached out to the property owner contact listed in the program tracking data and requested to conduct an interview with the individual most familiar with their organization's participation in the SOMAH Program. The interview guides used for the participating and non-participating property owner interviews are provided below in Section C.2.

Property owners were grouped by the number of applications submitted (1, 2-9, and 10 or more) and the number of submitted and cancelled applications and completed projects for each of these groups is shown in Table C-1**Error! Reference source not found.** below. As this table shows, only five percent of applications were from a property owner who had submitted a single SOMAH application (40 unique property owners) and over two-thirds of SOMAH applications were submitted by a property owner who had submitted 10 or more program applications. It is interesting to note the variation in the project cancellation rate across the number of submitted application categories.

TABLE C-1: PROPERTY OWNER APPLICATION DISTRIBUTION (AS OF 12/31/2022)

Applications Submitted by Property Owner	Unique Property Owners		Submitted Applications		Cancelled Applications		Completed Projects		Property Owner Interviews
1	40	38%	40	5%	25	63%	3	8%	2
2 – 9	44	42%	184	26%	117	64%	10	5%	4
10 or more	21	20%	495	69%	145	29%	58	12%	9
Total	105	100%	719	100%	287	40%	71	10%	15

C.1 SOMAH CONTRACTOR INTERVIEW GUIDE



SOMAH Contractor
Interview Guide.pdf

C.2 SOMAH PROPERTY OWNER INTERVIEW GUIDE



SOMAH Property
Owner Interview Gu

APPENDIX D CUSTOMER ELECTRICITY CONSUMPTION REGRESSION METHODOLOGY

Verdant used a two staged regression approach to estimated changes in energy consumption for customers with completed SOMAH projects. The regression stages were as follows:

Stage 1 - Weather Normalization: The first stage involved weather normalization of customer electricity consumption in the pre and post periods. CALMAC weather data was used for weather normalization. The intention of weather normalizing energy consumption is to remove the influence of weather from estimates of changes in energy consumption between the pre and post periods.

Weather normalization of energy consumption relied on individual customer regression modeling and was completed separately for pre and post periods for each customer. The customer and period specific regressions were first used to establish the relationship between the energy consumption and weather (along with other independent variables) and then we used the parameter estimates to weather normalize energy consumption under typical metrological year (TMY) conditions. The first stage model specification is described in Equation 1 below.

EQUATION 1 CONSUMPTION FIRST STAGE REGRESSION

$$kWh_{m,d,h} = \beta_0 + \beta_1 Month_m + \beta_2 Hour_h + \beta_3 WeekendHoliday_d + \beta_4 HDH60_h Hour_h + \beta_5 CDH65_h Hour_h + \varepsilon_{m,d,h}$$

Where:

$kWh_{m,d,h}$	The Net Load in month m on day d in hour h
β_0	The intercept of the regression model
$Month_m$	A dummy variable for each month m
$Hour_h$	A dummy variable for each hour h
$WeekendHoliday_d$	A dummy variable for weekends and holidays for each day d
$HDH60_h Hour_h$	The interaction between heating degree hour with index at 60 in hour h and the hour of day h
$CDH65_h Hour_h$	The interaction between cooling degree hour with index at 65 in hour h and the hour of day h
ε	The regression error term

Stage 2 – Change in Energy Consumption: The second stage regression utilized a fixed effect panel data model to estimate the impact of the SOMAH PV system on energy consumption, where the dependent variable is the weather normalized energy consumption from the first stage regression. Equation 2 below describes the second stage regression model. The coefficient tied to the treatment dummy variable represented the estimated change in monthly energy consumption as a result of the installation of a SOMAH PV system.

EQUATION 2 CONSUMPTION PANEL DATA MODEL

$$\begin{aligned} \text{MonthlykWh}_{mi} &= \beta_0 + \beta_1 \text{Treatment}_{mi} + \beta_2 \text{Proj}_{pi} + \beta_3 \text{Month}_{mi} + \beta_4 \text{AVEHDD60}_{mi} \text{Month}_{mi} \\ &+ \beta_5 \text{AVECDD65}_{mi} \text{Month}_{mi} + \varepsilon_{mi} \end{aligned}$$

Where:

MonthlykWh_{mi}	The sum of weather normalized consumption in a month adjusted for days in month m for SOMAH tenant i
β_0	The intercept of the regression model
Treatment_{mi}	A dummy variable equal to 1 during the post installation period and 0 otherwise. For to each month m and tenant i
Proj_{pi}	A dummy variable signifying the project p the unit/customer consumption is attributed to for each tenant i
Month_m	A dummy variable for each month m
$\text{AVEHDD60}_m \text{Month}_m$	The interaction between average heating degree day in month m with index at 60
$\text{AVECDD65}_m \text{Month}_m$	The interaction between average cooling degree day in month m with index at 65
ε	The regression error term

APPENDIX E CALIFORNIA AIR RESOURCES BOARD GREENHOUSE GAS SAVINGS

The estimated lifetime greenhouse gas (GHG) emissions reductions attributable to proceeds were also calculated per the California Air Resources Board (CARB) requirements. The CARB GHG Benefits Estimation Tool¹ was used to develop these estimates, as presented in Table E-1 below. All projects were modeled with a 20-year expected project lifetime and a 0.5 percent annual degradation factor.² The CARB GHG Benefits Estimation Tool uses an emissions factor of 0.21 MTCO₂e per MWh. The percentage of SOMAH projects funded with auction proceeds was calculated by year as the sum of the total (submitted or reserved) incentives for the in-scope impact projects and the program expenditures, divided by the total project costs projects (net estimated ITC and LIHTC payments). The total program expenditures through December 31, 2022 were spread out over 2021, 2022 and planned projects based on the proportion of incentives paid (or planned) in each year.

TABLE E-1: ESTIMATED CARB GHG BENEFITS BY UTILITY SERVICE AREA

	Utility Service Area	Percentage of SOMAH Projects' Funding from Auction Proceeds (%)	Total Annual Production (MWh/year)	Estimated Annual GHG Emissions Reductions Attributable to Auction Proceeds (MTCO ₂ e)	Estimated Lifetime GHG Emission Reductions Attributable to Auction Proceeds (MTCO ₂ e)
Projects Completed in 2021	PG&E	98.60%	367	76	1,439
	SCE	98.60%	2,940	609	11,535
	SDG&E	98.60%	398	82	1,563
Projects Completed in 2022	PG&E	94.00%	3,181	628	11,905
	SCE	94.00%	6,955	1,373	26,032
	SDG&E	94.00%	2,362	466	8,840
Planned Projects	PG&E	85.80%	34,130	6,150	116,572
	SCE	85.80%	25,123	4,527	85,807
	SDG&E	85.80%	8,290	1,494	28,314
	Liberty	85.80%	213	38	729
TOTAL			83,959	15,444	292,735

¹ https://arb.ca.gov/cc/capandtrade/allowanceallocation/ghg_benefits_estimation_tool.xlsx

² The GHG Benefits Estimation Tool recommends a default annual degradation factor of 0.5 percent for solar PV projects.