



**Process and Load Impact
Evaluation of the Single-Family
Affordable Solar Housing and
Disadvantaged Communities-
Single-Family Affordable Solar
Housing Programs**



Final Research Plan

Submitted by Evergreen Economics

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1 Introduction

This document is a research plan to evaluate the effectiveness of the Single-Family Affordable Solar Housing and Disadvantaged Communities – Single-Family Affordable Solar Housing Programs for the California Public Utilities Commission (CPUC) Energy Division. Two reports will be generated: 1) a SASH Final Program Evaluation and Vendor Assessment and 2) a DAC-SASH Program Evaluation and Vendor Assessment.

1.1 Program Background

The CPUC established the Single-Family Affordable Solar Housing (SASH) program (as well as a similar program directed at the multifamily sector) in response to AB 2723 that directed at least 10 percent of California Solar Initiative (CSI) funds for assisting low-income households in the electric IOU service territories, and the program began offering incentives to eligible customers in 2009. The CPUC reauthorized funding for SASH in 2015, extending it through the end of 2021 or until it exhausts its funding. The Disadvantaged Communities – Single-Family Affordable Solar Housing program (DAC-SASH) was created in 2018 to increase the adoption of renewable generation in the electric IOUs' DACs. While the CSI general market program closed at the end of 2016, the CPUC continues to provide incentives to low-income customers installing solar PV systems through SASH and DAC-SASH (as well as the net energy metering program for all solar customers and incentives for solar water heaters).

The SASH and DAC-SASH programs are intended to decrease electricity usage and reduce energy bills by offering incentives to offset the expense of solar ownership for low-income and DAC single-family homeowners residing in the electric IOU service territories. The programs also are intended to provide job training and employment opportunities in the solar energy and energy efficiency sectors. Both programs are required to refer residents to the IOUs' Energy Savings Assistance Program (ESAP) to encourage energy efficiency upgrades first, before considering solar installations.

The programs are administered by the non-profit organization, GRID Alternatives. The programs share some common features including optimized sizing of PV equipment (between 1 and 5 kW) and incentives (\$3/watt), and requirements for installers that are supportive of the workforce development program goals. Third-party ownership financing structures are also allowed for both programs – currently based on GRID's partnership with Sunrun Inc.

The key program differences are income eligibility and whether homeowners live in DACs or not. SASH requires household incomes to be 80 percent or less of the area median income, and homes must be qualifying affordable housing (based on CPUC Code 2852). DAC-SASH require households to live in a DAC (either being among the top 25 percent of census tracts identified by

CalEnviroScreen 3.0 plus census tracts that have the highest pollution burden) and meet the IOUs’ low-income rate assistance programs’ eligibility (i.e., at or below 200 percent of the federal poverty level). The CPUC (in Decision 20-12-003, December 2020) expanded DAC-SASH eligibility to include tribal lands (i.e., California Indian Country as specified for the Self-Generation Incentive Program). Figure 1 highlights key program features.

Figure 1: Key Program Features of SASH and DAC-SASH

	SASH	DAC-SASH
Affordable Housing Requirement	Yes	No
DAC Requirement	No	Yes
Income Eligibility	80% of area median income or less	CARE/FERA (200% of FPL or less)
Sizing Requirement	1 kW – 5 kW	
Incentive	\$3/watt	
Installer Job Training Requirement	Yes	
Third-Party Ownership Financing Allowed	Yes	

Based on the July 2021 SASH Program Semi-Annual progress report¹, the reauthorized SASH (SASH 2.0) program is fully subscribed for PG&E and SDG&E and is expected to be so for SCE in late 2021. By mid-2021, nearly 10,000 projects were installed through the program with an average of 3.5 kW of capacity each. Through partnerships with job training organizations, nearly 45,000 community volunteers have attended GRID’s pre-installation orientations, and GRID indicated in its latest quarterly report that the majority of those have participated in a PV installation. COVID-19 impacted both programs’ marketing and outreach, PV installations, and job training efforts. By

¹ https://gridalternatives.org/sites/default/files/SASH_Q1-Q2_2021_SAPR.pdf

summer of 2021, GRID adjusted its job training offerings to use outdoor, online, or socially-distance training spaces.

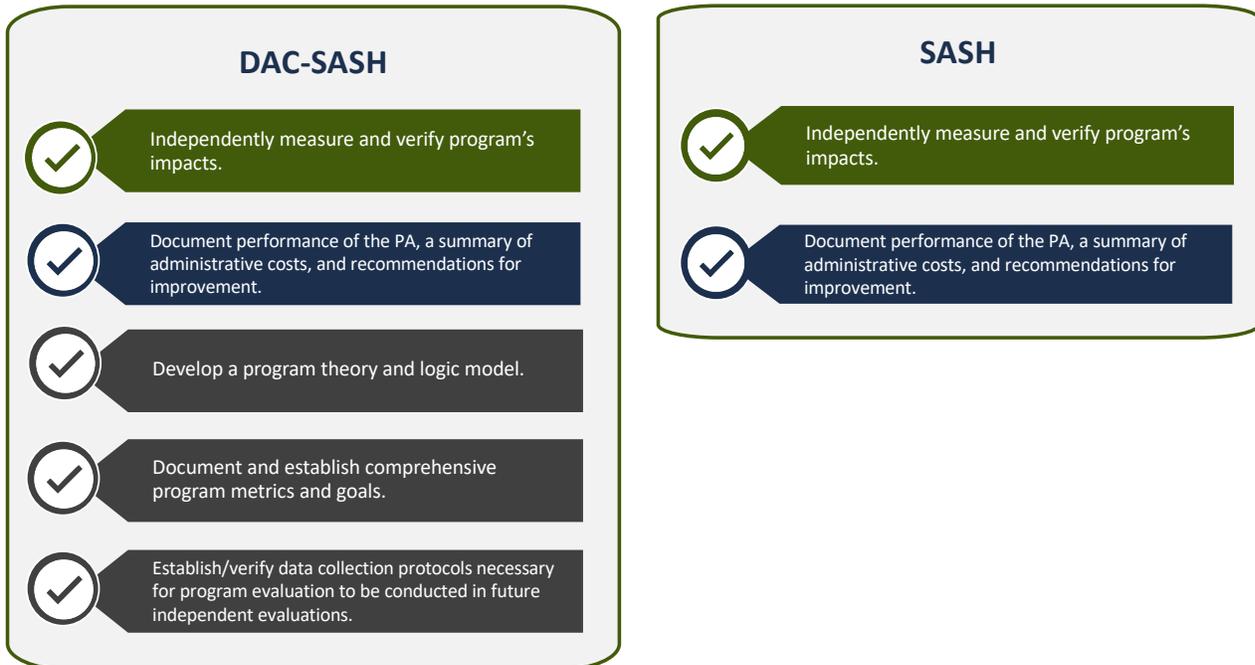
As of mid-2021, nearly 1,000 PV systems have been installed through DAC-SASH with about 3.5 MW installed capacity (an average system size of 3.7 kW), as reported by GRID in the July 2021 DAC-SASH Program Semi-Annual progress report². At that time, ninety percent of projects were third-party-owned (and leverage the federal investment tax credit). GRID developed a marketing, education, and outreach (ME&O) plan that it began implementing in 2021, which includes tribal land outreach as of December 2020.

ME&O strategies the PA (Grid Alternatives) is using include leveraging partnerships with existing organizations, providing consumer education sessions, encouraging adopters to share their participation experience with friends and neighbors, and using media and marketing collateral (including co-branding with cities, counties, and/or IOUs). As directed by CPUC Decision 20-12-003, GRID is also using customer data provided by the electric IOUs and coordinating with the IOUs' low-income Energy Savings Assistance program outreach to inform more targeted ME&O.

1.2 Study Objectives

In D.15-01-027 that reauthorized the SASH program, the CPUC also required a “close of program” evaluation. In D.18-06-027, which created the DAC-SASH program, the CPUC required the Energy Division to select a contractor to conduct a measurement and verification study every three years beginning in 2021. Per the study RFP, the study must accomplish the following (note the differences by program, with DAC-SASH requiring more comprehensive evaluation framework development):

² https://gridalternatives.org/sites/default/files/DAC-SASH_Q1-Q2_2021_SAPR.pdf



Evergreen categorized the initial set of program evaluation metrics developed by the CPUC to organize our evaluation approach for both SASH and DAC-SASH into a set of research questions (described in more detail after the list of bullets) that the evaluation will cover:

- Program administration:** How effective is program administration? What have the programs spent to-date on administration, management, direct implementation, and marketing? Have there been issues related to underutilizing budget (for DAC-SASH only) or other issues with tracking administrative costs? How effective has program marketing been? Has the PA made use of customer data provided by the IOUs, and has that impacted program enrollment?
- Customer participation:** What are the characteristics of participants v. eligible non-participants? What are the main barriers to participation? Are customers satisfied with the programs? How effective are the programs in driving enrollment in other related programs? What is the size of the total eligible customer pool? How many out of program / market adoptions are happening among the eligible population?
- PV system performance:** Have systems degraded over time since installation? What factors contribute to such degradation? How cost-effective was the SASH program?

- **Customer bill impacts:** What is the average monthly bill reduction outcome for program participants? Are there any measurable changes in energy usage post-participation?
- **Environmental benefits:** What environmental benefits are the programs creating as a result of installed projects? Are participating customers aware of the programs’ environmental benefits?
- **Workforce development:** What job training programs are being leveraged? How many local jobs are being created? What are the longer term job outcomes for trainees?

The study research and analyses will support the development of recommendations regarding:

- Whether incentives should be revised, where appropriate
- The appropriateness of adjusting program design such as geographic eligibility requirements in order to expand the number of eligible HHs
- Improving the program to meet its goals
- How to course correct if underutilization of program funding is occurring
- The feasibility, economic benefit, and cost-benefit of adjusting the program design such as instituting an ‘open contractor’ model to diversify the installation aspect of the program.
- Improvements based on known best practices in invoicing, project oversight, ME&O, and other administrative roles

Below is a brief discussion regarding the study’s objectives relating to each of the initial research issues. We include list of required research tasks from the scope of work in the brief discussion and they are further mapped to the research in Table 1 in Section 2.

						
Program administration	Program marketing	Customer participation	PV System Performance	Customer bill impacts	Environmental benefits	Workforce development and job training



Program administration. The study is intended to gather, summarize, and report on program costs by category (e.g., program administration, management, marketing and outreach, program tasks, and milestones) for each program. For DAC-SASH only, the study will review pending program commitments and projected demands and assess

any underutilization of program funding. The study will specifically measure and verify the following:

- Administrative costs by program; further broken out by
 - Forecasted vs. actual
 - Expenditures and uncommitted balances
 - Type/category:
 - Program Administration Costs
 - Program Management
 - IT
 - Regulatory Compliance
 - Direct implementation / installation costs
 - Marketing, Education and Outreach
 - Other TBD categories
- Summary of administrative costs by program tasks and key milestones
- Pending program commitments, reservations, obligations, and projected demands for the program (DAC-SASH only)
- Assessment of underutilization of program funding (DAC-SASH only)
- Identification of misallocated / overallotments of admin costs or other addressable cost drivers



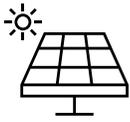
Program marketing. The study will determine the effectiveness of marketing and outreach efforts, including how the PA is making use of targeted customer data provided by the electric IOUs (as directed by CPUC Decision 20-12-003) and the impact on program enrollment. The PA has been directed to share how this will improve new program ME&O activities in 2021 ME&O plan. The study analyses will support the development of recommendations (particularly for DAC-SASH) to improve marketing and outreach to improve access to solar among the target population.



Customer participation. There are several aspects of customer participation the study seeks to address:

- *Participation/non-participation by DAC, geographic location, and other characteristics*) – The study will include summaries of participation by program and, for DAC-SASH, by DAC and geographic location, as well as other customer characteristics of interest. The CPUC defined program eligibility based on geographic location and income for DAC-SASH, and the study’s results may be used to determine if any changes (to marketing and outreach efforts and/or eligibility requirements) are warranted to ensure sufficient levels of participation and equal access among the target population. We will also assess what percentage of SASH participants were located in a DAC per CalEnviroScreen 3.0.

- *Enrollment in related programs such as San Joaquin Valley Disadvantaged Communities (SVJ DAC) pilots and CARE/FERA and ESAP for income-eligible customers* – SASH and DAC-SASH are part of a larger set of programs targeted to DACs and CARE/FERA-income eligible customers. Part of the study’s charge will be to identify awareness among target customers of the various programs designed to serve them and whether the programs are helping increase enrollment in the other programs such as SGIP.
- *Customer satisfaction with the programs* – A study component will be to solicit input from customers on their experience enrolling in the programs, experience and satisfaction with the PA, and identifying ways to improve their satisfaction going forward. Evergreen will consider the length of the survey and may only include a simplified satisfaction survey battery in order to focus customers on other aspects of the program.
- *Effectiveness of the programs in addressing barriers to participation* – The CPUC identified several barriers to clean energy adoption among residential customers in DACs, and these programs were designed to address those barriers. The DAC-SASH logic model developed early on in the study will systematically document the theory behind that program’s interventions and the intended outcomes, providing a framework to assess not only whether the program is successful in its administration and implementation, but also whether the underlying theory of barriers and program design is accurate. The study’s research will be designed explicitly to map to the logic model and program theory, which will ensure that wherever the data show that there are breakdowns in either the theory or the implementation, it will be clear where that breakdown lies. Ultimately, such an approach supports the development of recommendations clearly supported by the data to update the program theory/design and how the programs are being implemented.
- *Market adoptions of rooftop solar among eligible households* – We will attempt to identify how much natural solar adoption is happening outside of the program among eligible households.
- *Size of the eligible customer market* – We will attempt to identify the eligible customer pool for DAC-SASH program to inform assessments of customer participation, program eligibility and the effectiveness of program outreach and marketing.



PV System Performance. The PV performance study component will assess:

- System performance degradation
- Cost effectiveness (for SASH only)

Solar photovoltaic (PV) system performance may be impacted by numerous factors resulting in system generation that over- or under-performs as compared to the initial system design. These factors may include shading, soiling, degradation, etc. Additionally, performance amongst identically-sized systems can vary based on the type of equipment installed and the manufacturer of that equipment. To measure the performance of the program-sponsored PV systems, the evaluation will use a sample of installed systems and compare the modeled generation to actual metered generation for each sampled system. The sample design will be stratified based on key parameters such as system technology, ownership structure, or geographical location. The outcome of this analysis will provide insight into how well the program PV systems are performing as well as identify any data trends that may inform better management of PV systems in subsequent program years.

For SASH only, the study includes a cost-benefit assessment including the total resource cost (TRC) test, the ratepayer impact measure (RIM) test, and the societal cost tests (SCT).

For SASH and DAC-SASH, the study will also assess:

- Average system costs by equipment, installation, gap funding provided by GRID for each project, and/or other customer acquisition costs



Customer bill impacts. The study will examine changes in participating customers' bills and also their energy use patterns. Specifically, the study will assess:

- Monthly bill reduction outcomes for program participants, compared across those who own their systems and those who are engaged in a TPO construct
- Changes in post-participation customer energy usage patterns



Environmental benefits. The programs are designed to ensure that low-income and DAC customers are able to participate in and benefit from renewable energy programs. The study will:

- track and quantify the programs' environmental benefits resulting from installed projects (including greenhouse gas [GHG] reductions and other emissions such as PM₁₀ and NO_x), and

- explore customers' (both participating and non-participating) awareness and understanding of those benefits.

The research results may be used to develop recommendations to improve marketing and outreach regarding the programs' benefits.



Workforce development and job training. The programs are focused on providing local economic benefits, including job training and local hiring that leads to the creation of jobs installing PV systems. The study will document job training and local hiring efforts and the number of local jobs created. The research will identify if the training and local hiring efforts lead to new local jobs, and inform recommendations to increase the programs' impact on local economic benefits (particularly DAC-SASH, since SASH is nearly fully subscribed). Specifically, the study will determine:

- The number of leveraged job training programs
- The number of local job hires linked to the program
- The number of trainees and job outcomes

2 Workplan

This section describes the study approach. Section 2.1 provides an overview, and Section 2.2 details the scope of work and budget by task. The study schedule is provided in Section 3.

2.1 Overview of Proposed Approach

The evaluation process starts with a review of program documents and development of a logic model for DAC-SASH. The program theory and logic model will systematically identify and document the goals and expected outcomes and impacts for DAC-SASH. Evergreen will develop (and build upon those already included in this plan) a comprehensive set of metrics that may be used by this evaluation and future evaluations to measure the program’s progress towards meeting its goals.

We will link the metrics to the research activities described in this plan to ensure that all metrics are included in the evaluation research. Evergreen will develop a data collection plan that documents the linkages of the study research components to the metrics, ensuring a systematic approach to assessing the programs. This set of metrics and linked data collection plan will establish data collection protocols that may be used by subsequent evaluations of the programs.

Even though there is not a SASH logic model, many of the program objectives and implementation strategies are the same, and the DAC-SASH logic model and associated metrics may be leveraged/adapted for the SASH evaluation as well.

Table 1 on the next page illustrates how our study research (shown in the columns) aligns with the initial set of metrics identified by the RFP’s scope of work (shown in the rows), which we have placed into eight research issue categories. In the table, a “P” indicates the research component intended to be the primary way that we address the corresponding metric category. An “S” indicates the research component will be secondary. As shown, we plan to often use multiple data sources to fulfill each study area of inquiry.

Below the table, we provide more detail about each of the study research approaches (the table columns), with more detail provided in Section 2.2; and more detail about the categories of research issues. A detailed mapping of metrics to logic model outcomes is presented in Appendix C. This list of metrics will be updated as part of the initial stages of the research.

**Table 1: Evaluation Metrics and Data Sources
(P=Primary, S= Secondary Source)**

Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
Program Administration										
Costs by program; further broken out by:		P								
Forecasted vs. actual		P								
Expenditures and uncommitted balances		P								
Type/category:		P								
Program Admin Costs		P								
Program Management		P								
IT		P								
Regulatory Compliance		P								
Direct implementation / installation costs		P								
Marketing, Education and Outreach		P		S	S					
Other TBD categories		P								
Summary of admin costs by program tasks and key milestones		P								
Pending program commitments, reservations, obligations, and		S							P	



Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
projected demands for the program (DAC-SASH only)										
Assessment of underutilization of program funding (DAC-SASH only)		P								
Identification of misallocated / overallocments of admin costs or other addressable cost drivers		P								
Program Marketing										
Enrollment % of eligible population over time		P								Estimates of market adoptions and eligible population (based on IOU data and Census/ RASS)
Effective use of IOU customer data on eligible population		S							P	
Customer Participation										
The programs' geographic coverage across the state, including Disadvantaged Communities		P								Geographic data

Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
Number and location of eligible customers (SAIDs) and enrolled customers		P								Geographic data
Number and location of eligible customers not served		P	S							Geographic data
Market adoptions of rooftop solar among eligible households			P							
Size of the eligible customer market			S							Census, RASS
Number of installations completed and pending		P					S			
Overall participation levels in relation to eligible population overall and by segment		P	S							Geographic data
Number of customers who have successfully enrolled in CARE and FERA in the process of signing up for the program			P							
Other clean energy programs that customers (such as those in SJV pilot communities) have participated in along with enrolling in the program	S	P		S					S	Other program tracking data
Customer satisfaction with the program				P	S	S			S	

Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
PA performance from perspective of participants				P		S	S			
The effectiveness of each program in addressing specific barriers to solar adoption facing low-income customers and customers in DACs	S			P	s	S	S		S	
Perception of non-participants / exploration of program participation barriers among qualified customers	S				P	S			S	
PV System Performance										
PV System Performance Degradation - Expected v. Metered Performance							P			Optional PV system metered data
Cost-Benefit assessment (TRC, RIM, SCT) (SASH only)		P								Secondary data for C/B model inputs
Average system costs by equipment, installation, and/or other customer acquisition costs		P								
Customer Bill Impacts										
Monthly bill reduction outcomes for program participants			P	S						

Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
Changes in post-participation customer energy usage patterns			P	S						
Environmental Benefits										
Environmental benefits - program PV installation GHG and other emission impacts (PM-10, NOx)	P	P		P					P	Secondary data on benefits
Participating and non-participating customer understanding and perception of each program's environmental or social benefits	S	S		P	P	S			S	Secondary data on benefits
Workforce Development and Job Training										
The number of leveraged job training programs	S	P								
The number of local job hires linked to the program	S	P								
The number of trainees and job outcomes	S	P				S		S	S	
Program Design Recommendations										
Whether incentives should be revised, where appropriate (DAC-SASH only)						S	S		P	review all the data and

Initial metrics (from RFP SOW)	Secondary Data			Primary Data						Other Data Sources
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	In-Person Field Visits / Ride Alongs	On-Site Verification Visits	Trainee web survey	PA/ Stakeholder Interviews	
The appropriateness of adjusting program design such as geographic eligibility requirements in order to expand the number of eligible HHs (DAC-SASH only)									P	research and compare to current program design and objectives and make recommendations
Recommendations for improving the program to meet its goals (DAC-SASH only)									P	
Recommendations for how to course correct if underutilization of program funding is occurring (DAC-SASH only)									P	
The feasibility, economic benefit, and cost-benefit of adjusting the program design such as instituting an 'open contractor' model to diversify the installation aspect of the program (DAC-SASH only)									P	
Recommendations for improvement based on known best practices in invoicing, project oversight, ME&O, and other administrative roles									P	

The study approach consists of the following research components:

> **Developing logic model, program theory, and evaluation metrics for DAC-SASH. See Appendix A.**

> **Gathering secondary information and data:**

- Background documents (which we have already reviewed to prepare this work plan) including relevant CPUC Decisions and Resolutions, PA program progress reports and marketing plans for DAC-SASH, California Standard Practice Manual
- Program documentation and reports including program implementation plans, marketing and outreach plans, budgets and expenditures
- PA program tracking data (on customers and solar projects)
- IOU billing system data (including CARE flag and customers with net energy metering interconnection)
- Geographic data to support geographic analyses
- Environmental benefit assumptions (such as lookup values for GHG reductions and other emissions)
- Optional PV system metered data
- Secondary data for cost-benefit modeling
- Secondary data on eligible customers to inform estimates of the number of eligible customers

> **Conduct primary research**

- Over 650 customer surveys
- Up to 36 telephone interviews with PA (including regional offices)/IOUs/M&O organizations/TPO partner (Sunrun)/ CPUC Tribal Liaison/ Trainees
- Web survey with trainees
- 9 person days of in-person field research of solar installation sites, marketing and outreach, and/or trainings
- 20 on-site solar verifications

Below, we describe our approach to analyzing the primary and secondary data we collect to support the main areas of study assessment. The categories below match the research issue categories presented earlier in Table 1.

Program Administration

Evergreen will collect data and information from the PA in order to conduct a comprehensive assessment of program administration.

This initial evaluation provides an opportunity to collect, combine, and summarize data on program administration and ensure the PA is complying with CPUC directives and will support the development of recommendations for adjusting program design (particularly for DAC-SASH, which will benefit from forward looking recommendations). The RFP provided a list of study objectives that provide a starting point for this assessment, and we will build on that as a result of developing the DAC-SASH logic model and associated metrics.

The assessment will at a minimum provide summaries of actual versus forecasted costs by category (program management, administration, direct implementation, marketing, etc.), as well as expenditures and uncommitted balances. Evergreen will explore the issue of allocation/ overallotment of administration costs or other cost drivers. The analysis will support identification of future funding allocations that may be needed based on a comparison of program costs to-date and projected future program demand and associated costs, and examine possible underutilization of program funding for DAC-SASH.

Program Marketing

The assessment of program marketing will be supported by information and documents from the PA and feedback from customer surveys and stakeholder interviews. We will also be able to gather data during M&O in-person field visits if outreach is being done at the time of our visits.

Based on our review of background documents, we understand that GRID Alternatives uses a variety of marketing and outreach strategies – leveraging partnerships with existing organizations, providing consumer education sessions, encouraging adopters to share their participation experience with friends and neighbors, and using media, marketing collateral (including co-branding with cities, counties and/or IOUs), and events to raise awareness. GRID modified its strategies to adapt to COVID-19-related constraints that impacted construction logistics and marketing and outreach approaches.

The evaluation will include gathering and review of marketing collateral and review of program websites. (We have already reviewed GRID’s program status reports, handbooks, and the DAC-SASH marketing and outreach plan.) Interviews with GRID, PG&E and SCE will provide additional background regarding marketing approaches and offer their perspectives on what has worked well and what might be improved going forward, as will interviews with M&O organizations and Sunrun and other solar companies. Customer surveys will similarly provide the customer perspective. For participants, we will ask how they learned about the programs and whether they had sufficient information to inform their decision. For eligible non-participants, we will ask if they are aware of the programs—if yes, how they learned about it, and if no, what are their preferred information sources.

In-person field research will also provide an opportunity to observe marketing strategies by M&O organizations and how this is received by customers. We can also learn about how trainings are marketed through in-depth interviews with the PA and with trainees.

Our in-person research and interviews will differentiate between DAC SASH and SASH and will inquire about how marketing has changed or may change in the future given COVID.

Customer Participation

We will analyze CIS (participant and non-participant) data to determine participation rates by DAC, program, geographic location, and other customer characteristics. This analysis will determine the number and location of eligible, participating, and non-participating customers to determine any differences across communities. As previously noted, we will conduct a geospatial analysis of program coverage and participation across the state and specific DACs. Additional data, such as air quality, can be layered into this analysis to produce more detailed findings. These results will help determine if the CPUC should re-evaluate program eligibility based on geographic location.

We will also use the CIS data to examine the number of eligible customers who successfully enroll in CARE or FERA during the process of enrolling in the programs. It is our understanding that close to 80 percent of eligible participants are also eligible for CARE. If additional tracking data for other programs are available that may be readily merged with the CIS/billing data, we can explore analyzing participation in any other energy efficiency or clean energy programs (such as ESAP, Self Generation Incentive Program (residential equity and residential equity resiliency budget portions) and the SJV DAC pilot program). We may also ask customers to self-report any other related programs they enrolled in as a result of learning about them through their experience learning about the DAC-SASH and/or SASH programs.

Evergreen will also analyze secondary data on the size of the eligible customer pool and market adoptions of rooftop solar among eligible households to inform review of program eligibility requirements.

The customer survey will help to determine customer satisfaction and the overall effectiveness of the programs. Participating customers will be asked about the drivers that ultimately influenced them to enroll and their experience with the PA and the programs thus far, including the enrollment and installation process. Non-participating customers will be asked about the barriers that prevented them from enrolling in the programs (including a lack of awareness) and what could have been done to encourage them to enroll. We will also ask customers about their awareness of other programs such as SGIP. These survey responses will be analyzed by program/DAC (for DAC-SASH) and combined with participation counts to determine overall effectiveness of the programs. Evergreen will also include these topics in the in-depth interviews, particularly with organizations that interfaced with communities and customers, to seek their input on satisfaction and participation barriers and drivers, ultimately to identify ways to improve the programs.

Additionally, Evergreen will observe customer interaction with M&O staff and installers (if home during time of visit) to get a sense of satisfaction with the programs and hesitations expressed during recruitment.

PV System Impacts

To assess PV impacts, the evaluation will have a two-part goal: 1) verify total PV installed capacity achieved through the programs, and 2) understand how this installed capacity performed compared to expectations and what factors may be most impactful on system performance. The verification activities will begin with review of program documentation and tracking data on installed PV systems. These data will be requested of GRID and TPOs. If we are unable to get data from GRID and TPOs, we will explore requesting data directly from the participants/owners. Our team will base its analysis on a stratified sample of 20 sites that will consider strata based on system technology, ownership structure, geographical location, or other key parameters that are expected to impact system performance.

The verification task will encompass a review of the program tracking data as well as desk reviews of randomly sampled EPBB calculator outputs and any available third-party inspection documentation. These data will allow our team to identify the key parameters influencing the system's CEC-AC rating and design factor. Based on these reviews, we will identify and investigate any system outliers, confirm eligibility, and ensure accuracy of program reported impacts. The desk reviews will further be supplemented by a nested sample of site visits to program-installed PV systems. The purpose of these site visits is to affirm system design as documented in the program tracking data and supporting

documentation. The team will use these data to determine the accuracy of the program-reported design factor for installed solar systems. This method is a continuation of the prior evaluation, which will allow for direct comparison to past program reporting performance. As a final step, our team will model solar generation for the evaluation period based on the sample of verified PV system parameters. These verified parameters will serve as model inputs to simulate solar generation using NREL's System Advisor Model (SAM). This modeling exercise will additionally support the second goal of our analysis of assessing program-installed PV system performance.

In order to assess PV system performance, our team will leverage the PV system generation modeling for sampled systems and compare this performance to metered generation. Metered generation data will provide the most robust dataset to determine the presence of system degradation and the amplitude of that degradation. Our team will consult with the PA on whether metered data are readily available and how to obtain the data. However, if metered generation data cannot be made available through the PA, we anticipate working directly with PV system owners to obtain data on their systems for use in our analysis. These data may be obtained during the verification site visits or requested during participant process surveys. Additionally, we will work with third-party solar lessors to obtain anonymous metered solar data.

As part of our data collection activities, we will inquire with system owners about system maintenance and associated costs to better understand discrepancies between modeled and metered generation.

To complete our impact analysis of the program's solar generation, we will calculate a realization rate between the generation modeled based on program data and documentation and the metered data obtained for sampled projects. We will apply this realization rate to the modeled generation and extrapolate across the program population in order to estimate the program's verified energy generation. This solar generation will serve as the basis for estimating environmental benefits associated with the avoided emissions realized by the program-installed PV systems.

Cost Effectiveness Analysis

The estimation of impacts will feed the cost-benefit assessment that our team will conduct for the SASH program in order to confirm that the program is maximizing the overall benefit to ratepayers (as required by Assembly Bill 217³).

³ https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB217

The cost-benefit assessment will replicate the format and general content requirements of the 2001 CPUC California Standard Practice Manual for performing Economic Analysis of Demand-Side Programs and Projects across the five tests outlined in that manual (Total Resource Cost Test, Societal Cost Test, Program Administrator Cost Test, Participants Test, and Ratepayer Impact Measure test).

A variety of models and tools will be used to calculate all of the costs and benefits of the program using the PA project data inputs, PV impact results, and the secondary data described previously (including project cost based on characteristics including system size, equipment and installation costs, rebates, and annual energy production). Analyses will encompass bill reductions, avoided costs, incentives, administrative costs, metering costs, participant ownership costs, participant NEB, and utility NEB. Other inputs that will be used include discount rates, inflation rates, and PV output degradation rates. All of these inputs will be used to aggregate the cost and benefit streams to calculate cost effectiveness for the SASH program by IOU and install year / SASH v 1.0 and 2.0.

Evergreen will also review the process for providing gap funding and will investigate which types of projects require gap funding and which type of gap funding is utilized.

Customer Bill Impacts

An analysis of pre and post participation billing data will be conducted to estimate energy usage changes associated with program participation. If the sample groups are large enough, we can also compare participants who are under TPO agreements and those that are not. As a first step in this process, we will attempt to create a comparison group using non-participants with similar energy consumption as participants (before program enrollment). This comparison group will allow us to measure any significant changes in energy consumption due to program participation.

We will estimate energy usage changes using a fixed effects billing regression model and billing data from both the participants and the comparison group. The fixed effects model is the most common specification used to estimate savings for these types of programs where both data from both the treatment and comparison groups are available. This model will help to determine significant changes in energy consumption of participating households. It is hypothesized that energy consumption will change for some households (due to bill credit) and remain constant for others.⁴

$$kWh_{it} = \alpha_i + \beta_1 Post_{it} + \beta_2 (Post_{it} * Part_i) + \beta_3 (Part_i) + \beta_4 CDD_{it} + \beta_5 HDD_{it} + \varepsilon_{it}$$

Where:

⁴ Evergreen Economics. 2020. *Avista Income Based Payment Program/Balance Management Arrangement Pilot Program Evaluation*.

kWh_{it} = Electricity usage by the i^{th} home in the t^{th} time period
 $Post$ = Indicator variable for post – participation in the program
 $Part$ = Indicator variable for pilot participants only
 CDD_{it} = Cooling degree days for the i^{th} home in the t^{th} time period
 HDD_{it} = Heating degree days for the i^{th} home in the t^{th} time period
 α, β = Coefficients to be estimated in the model
 ε = Random error term

We will utilize the comparison group to help control for COVID and other factors. We will also test addition of COVID timeline indicators to the regression model (i.e., retain these terms if coefficients are significant and improve model fit).

Variations of this model will also be explored, including one where participation variables are also interacted with the weather variables in the post-period. In addition, we may incorporate data from the survey responses to further improve the model or customer segmentation approach.

Environmental Benefits

The team plans to calculate environmental benefits associated with verified solar generation achieved during the defined evaluation period. We can also estimate prospective environmental benefits based on an extrapolated estimate of the lifetime solar generation of program-installed PV systems. As noted previously, we will collaborate with the study team to determine how best to estimate environmental benefits resulting from avoided emissions in a manner that is consistent with evaluated environmental benefits from similar programs.

We plan to analyze the environmental benefits associated with verified solar generation by program resources during the evaluation period based on hourly emissions data. These data are available through Watttime and are used in the SOMAH and DAC-GT and CS-GT evaluations. Our team will leverage its verified modeled solar generation at the hourly level to align with the hourly emission data to estimate avoided GHG emissions.

The team will also conduct an analysis of environmental benefits associated with avoided criteria air pollutants (i.e., NO_x and particulate matter in the 10-micron size range [PM_{10}]). We recognize a component of the programs' focus supports including an analysis of benefits related to criteria air pollutants that affect the health and well-being of SASH and DAC-SASH participants. The team will estimate these criteria pollutants based on verified solar generation and relevant emission factors. We will consult with the study team to identify an avoided emission analysis method that is consistent with other similar program evaluations.

In addition, we will include a survey battery for participating and non-participating customers regarding their perceptions of the programs' environmental and societal

benefits. These questions will be designed to gauge customers' awareness and understanding of the environmental benefits that renewable energy projects generate. The survey will also explore how customers learned about the programs' environmental benefits (e.g., program marketing materials, PA and/or CBO outreach, trainings). We will analyze the survey results to explore differences in awareness and perceptions by program, DAC (for DAC-SASH), and other variables of interest.

Workforce Development and Job Training

We will analyze the number of local jobs created and the training opportunities offered for both programs. We will request staff rosters (including hires for the programs) and training materials from the PA to support this analysis. These data and materials will be used to determine the number of local jobs created to support the programs and the training opportunities offered to those new employees and volunteer installers. These results will be differentiated by program, IOU, and for DAC-SASH, community. The training materials and events will be reviewed to assess their effectiveness towards supporting workforce development.

As an addition to this analysis, we will conduct in-depth interviews with trainees who have done installations and those who have not yet participated in an installation. These interviews would focus on training experiences and outcomes, identifying successes and opportunities for improvement. We will expand on these topics in a web survey in order to reach a broader group of trainees to ask them about their experience and how this has impacted their careers. Trainees and trainers will also be a part of our in-person research either through attendance of trainings or in-person field visits during installations in which Evergreen staff will have a set of questions to ask both trainees and trainers in addition to observing their work.

Our findings from attending trainings, observing installations, interviewing trainees, and the web survey of trainings will be used to test the expected outcomes and activities related to trainings as laid out in the program logic models. Evergreen will update the logic model after PA interviews and program document review to ensure they reflect the intended logic and expected outcomes related to workforce development, and design trainee and other stakeholder research instruments to test those assumptions.

We will review GRID's Subcontractor Participant Program to assess how sites that did and did not utilize these programs vary in administrative costs and project costs along with how many sites utilize participants from this program.

The assessment will examine not only the effectiveness of training materials and implementation, but also the program theory behind local hiring, examining whether the

assumptions and linkages between program activities and expected outcomes are observed. Even if the trainings are effective, that may not translate into new local jobs. We understand that this study component is not a traditional training program assessment, but instead is focused on how to improve the programs' efforts to create local jobs and associated economic benefits. Outcomes of the evaluation may be suggestions for improvement to the training materials and delivery, and/or updates to the program theory and design such as identifying additional barriers and strategies for overcoming those barriers.

Program Design Recommendations

Ultimately, the data collection and analysis will be combined to support the development of recommendations to improve program design and implementation, including:

- Whether incentives should be revised, where appropriate.
- The appropriateness of adjusting program design such as geographic eligibility requirements in order to expand the number of eligible households.
- Recommendations for improving the program to meet its goals.
- Recommendations for how to course correct if underutilization of program funding is occurring.
- The feasibility, economic benefit, and cost-benefit of adjusting the program design such as instituting an 'open contractor' model to diversify the installation aspect of the programs.
- Recommendations for improvement based on known best practices in invoicing, project oversight, M&O, and other administrative roles.

Evergreen will add to this list throughout the research planning and implementation as we develop the logic model and metrics and learn more about the current status of the programs. Our team will develop recommendations that are supported by the data for improving the programs to meet their goals.

2.2 Scope of Work

This section presents the study scope of work by task, including deliverables and task budgets.

Task 1: Project Initiation Meeting

The first study task consists of planning and conducting a project initiation meeting, which was held on November 29, 2021. Prior to the meeting, Evergreen developed a draft study plan based on the proposal, for discussion at the meeting. Meeting discussion items will included:

- Overview and discussion of study scope and methods
- Project communication protocols (e.g., setting up recurring study team meetings, identifying Energy Division and IOU study team contacts)
- Programs' status
- PA/IOU data requests
- Project schedule and next steps

Evergreen provided a summary memo following the meeting.

Task 1 in Review: Project Initiation Meeting

Deliverables:

- Proposed Study Plan
- Project initiation meeting presentation slide deck and meeting notes memo

Task 2: Develop Detailed Research Plan and Schedule

Following the project initiation meeting, Evergreen modified the Proposed Study Plan based on feedback from the meeting and developed this draft research plan with additional study methods and an updated schedule.

Evergreen also developed a program logic model for the DAC-SASH program and metrics that are included as an appendix to this research plan. The plan identifies metrics that will be linked to the data collection plan outlined in this research plan, consistent with a theory-based evaluation approach. This plan may be used for subsequent evaluations of the programs (and updated if there are changes made to program design).

As mentioned below in the proposed scope for Task 4, we reviewed publicly available program materials concurrently with drafting the research plan, and that information informed the

development of updated logic models (for DAC-SASH) that reflect how the programs are being implemented.

Task 2 in Review: Research Plan and Schedule

Deliverables:

- Draft detailed research plan including logic models

Task 3: Conduct Public Webinar on Draft Research Plan

Evergreen will plan and conduct a public webinar (scheduled for December 17 at 2 pm) to present the draft research plan for comment and discussion. Evergreen will document public comments and webinar discussion in a memo, along with any appropriate action items (such as changes to the research plan).

Based on the input received during the public webinar and subsequent discussions with the study team, Evergreen will modify the research plan and produce a final research plan (clean and redline versions). If desired, we will provide an appendix that documents the changes requested by participants of the public webinar (and written comments submitted to the Public Documents Area during the required two-week comment period) and how the team addressed the changes (or the rationale for not making changes).

Task 3 in Review: Conduct Public Webinar

Deliverables:

- Webinar slide deck
- Meeting summary memo
- Final research plan with final logic model

Task 4: Conduct Program Material Review

Evergreen will commence Task 4 concurrently with Tasks 2 and 3, with this review informing the final research plan and the DAC-SASH logic model. We will submit a request for information to the PA for program documents (that are not already available publicly; GRID has status updates and some planning documents on its website that we have reviewed for this proposal) that will provide us with a working understanding of program administration and implementation. Per the RFP, at minimum we will request and review the following for each program:

- Program organizational and management structure;
- Program information systems, including the Program Administrator workflow management system;
- Existing PA Database for applicable information;
- Training events and tracking information;
- Marketing, Education, and Outreach efforts and plans and a list of partnering organizations;
- Internal administrative procedures and quality controls;
- Accounting and disbursement methods, including contractor payment/compensation processes;
- Data processing and record retention; and
- Program costs.

The RFP included a literature review of legislative, policy, and research documents that provide a background on the programs. As part of the preparation of this proposal, Evergreen reviewed the following publicly available documents:

- Foundational documents for SASH including Senate Bill (SB) 1, D.07-11-045, AB 217 (Bradford 2013), and D.15-01-027.
- Foundational documents for DAC-SASH including AB327, D.18-06-027, D.20-12-003, and Resolution E-5020.
- DAC-SASH and SASH Program Handbooks
- PA invoices
- California Energy Commission Low-Income Barriers Study, Part A: Overcoming Barriers to Energy Efficiency and Renewables for Low-Income Customers and Small Business Contracting Opportunities in Disadvantaged Communities
- PA implementation plans and budgets
- PA semi-annual reports

The Evergreen team will refer to these foundational documents as needed during the course of the evaluation and will monitor them for any updates. This review will inform the development of stakeholder interview guides, which we discuss in Task 5, as well as assessments of program administration and marketing and outreach.

Per the RFP, Evergreen will also ensure the evaluation is consistent with relevant CPUC policies (i.e., the Energy Efficiency Policy Manual, the 2016 Demand Response Cost-Effectiveness Protocols, the *January 12, 2017 Distributed Energy Resources Cost Effectiveness Evaluation*:

Societal Costs Test, Greenhouse Gas Adder, and Greenhouse Gas Co-Benefits Staff Proposal) and previous customer generation evaluations.

Task 4 in Review: Conduct Program Material Review

Deliverables:

- Request for PA program documents

Task 5: Conduct Research and Analysis in Accordance with the Final Research Plan

Task 5 consists of designing and conducting research and analysis in accordance with the final approved study research plan. The DAC-SASH logic model developed earlier in the study will provide a unifying analysis framework that will support reporting of results by that program's objectives. Below, we discuss the research and analysis sub-tasks, which include the development of draft and final research instruments and sample plans that will be reviewed by the study team:

- Primary research (customer surveys, stakeholder interviews, on-site inspections, in-person field visits, and a trainee web survey)
- Secondary research (gathering and reviewing a variety of data sources including from the PA and IOUs via formal data request and other external sources of geographic, cost and benefit and environmental benefits data)
- Analyses (combining primary and secondary data sources to conduct the various study analyses)

Conduct Primary Research

The customer research we propose to conduct includes customer surveys (with participating and non-participating customers) and interviews with the PA and stakeholders. We also plan to conduct a web survey with trainees who have and have not installed solar systems along with on-site visits to installation sites, trainings, and/or M&O events and verification visits. We also have dedicated a contingency budget that can cover various possible needs such as incentives, additional stratification, and metering.

Customer Surveys

We plan to conduct web and telephone surveys with customers to gather feedback on, at minimum, the following topics:

- Program marketing and enrollment effectiveness;
- Customer satisfaction;
- Effectiveness of programs in addressing barriers to participation;
- Perception of their community's needs and strategies and steps to increase adoption amongst neighbors, community members, and other low-income homeowners;
- Awareness/participation in other related programs and technologies like storage; and
- Environmental/social benefits.

We discuss our approach to conducting assessments on each of these topics in more detail after the description of data sources.

Sample Design

We will draw our participating customer sample frame from PA tracking data that record participation and provide contact information for customers (including phone numbers for all customers, and, we assume, email addresses for a subset of customers).

For non-participating customers, we will draw our sample from utility customer information system data (screening out the participating customers). If possible, we would like to differentiate between eligible non-participating customers who were reached (e.g., by GRID or CBOs) to discuss the program but decided to not participate versus those that are unaware of the program, but eligible. We will request data from the PA on eligible customers they have outreached to but did not participate to use in our non-participant sample frame. We plan to include both types of eligible non-participants – those that were contacted by the PA and those that were not – so we can explore the full range of participation barriers (e.g., lack of awareness and issues with the program requirements and participation process).

We expect to stratify samples by program (DAC-SASH vs. SASH 2.0 vs. SASH 1.0). Additional variables of interest are IOU and CARE/FERA status (we expect 80 percent of participants to be eligible). For non-participants, we will screen for home type (i.e., single-family), homeownership and income eligibility to ensure that our completed survey responses are from eligible non-participants.

Based on our understanding of the program's current participation levels, we have developed an initial customer survey sample design (shown in Table 2) that we will refine after receiving PA program data. We assumed a 10 percent response rate and then capped the targeted number of surveys at an amount that would allow for analysis. We projected DAC-SASH participants through the end of the year. For SASH, we used participation counts from SASH 2.0 and 1.0, though we allocated more targets to 2.0. Once we get actual counts of participation by program and receive

input from the study team, we will revisit and refine the sample design. Our budget assumes a total of 783 completed customer surveys.

Table 2: Initial Customer Survey Sample Allocation

DAC-SASH		DAC-SASH	SASH 1.0	SASH 2.0	Total
Participants	Projected number of participants through 2021	1,329	5,264	4,458	
	Target Completes: Capped based on assumption of 10% response rate	133	100	150	383
Eligible Non-Participants	Aware of Program	100		100	200
	Unaware of Program	100		100	200
Total Number of Target Survey Completes		333		350	783

Survey Approach

We plan to use a hybrid/dual mode approach, with an initial web survey followed by phone surveys. Both the web survey and the phone survey will be offered in Spanish. Web survey invitations will be sent to a sample of customers that have email addresses. Phone surveys will be used after the initial web survey invitations are sent to meet the target completes. We will monitor web survey completes by strata and other variables of interest including CARE/FERA status and IOU to ensure the final sample is representative of the target population. A web survey alone is not appropriate to gather feedback on programs that target DACs, but it may be used in combination with another mode such as phone with the appropriate monitoring of completes.

We have included a contingency budget that may be used for incentives or for other strategies if needed to ensure customer survey sample representativeness. For example, if participation in the participant survey is low and the required incidence rate to meet the survey targets is lower than what may be achieved with the planned web/phone survey, we could add an incentive. Similarly, if the non-participant survey response rate is low and there are concerns about non-response bias, an incentive could be added for non-participants. We may also reserve the budget for alternative research modes such as in-depth telephone interviews with customer segments of interest, or other qualitative methods. Once Evergreen has obtained further information regarding the size of the participant pool and available data, we will discuss options with the study team.

Our partner CIC Research will conduct the Computer-Assisted Telephone Interviewing (CATI) surveys. Evergreen will create a unique identifier for each CATI survey response so that any sharing of customer contact information is limited. CIC Research will be given a unique ID created by



Evergreen that will be used when CIC delivers the data back to Evergreen for analysis. During the analysis period, Evergreen will scrub data of confidential information that was used in the initial effort to contact customers, to protect customer confidentiality. Evergreen will also perform test calls with CIC Research to ensure that the guide is programmed and being delivered as expected and will request recordings of a set of calls after the initial test calls to ensure that the interviews are going as planned.

Analysis

The surveys for participants and eligible participants will be developed from the study’s research questions and will be structured so that responses can be compared between participants and non-participants where relevant. For DAC-SASH, questions will be connected to better understanding if the program is achieving outcomes identified in the logic model.

Interviews with PA and Stakeholders

Evergreen plans to conduct up to 31 telephone interviews with the PA, IOUs, M&O Partners, the CPUC Tribal Liaison, solar companies, and trainees.

Table 3: Target Stakeholder Interviews

Stakeholder	Target Number of Interviews
GRID - 8 regional offices	8
IOUs	3
M&O Partners (CBOs)	5
CPUC Tribal Liaison	1
Solar Companies (TPO partner/ Sunrun, and others)	4
Trainee attendees who completed installations	10
Trainee attendees who did not complete an installation	5

Evergreen will work with the study team and the PA to determine the appropriate contacts for the interviews. Evergreen team staff will conduct the interviews (likely one hour each) in an open-ended format using a study team-approved interview guide. We may use a panel approach for some interviews. The interviews are intended to gather feedback from entities involved in administering, promoting, and installing solar projects on the following topics:

- Program marketing and enrollment effectiveness;
- Customer satisfaction;
- Effectiveness of programs in addressing barriers to participation;
- Consideration of combining solar with batteries (PA only);
- Use of gap funding;
- Effectiveness in educational follow up visit provided after installation;
- Promotion of other related programs; and
- Customer awareness of environmental/social benefits.

The trainee interviews will cover:

- Training value in career progression;
- Job outcomes;
- Experience with installations;
- Interactions with GRID; and
- Geographic specific training differences.

Web Survey with Trainees

We plan to a conduct web survey with trainees who both have and have not participated in installations. Questions will be developed after the in-depth interviews with trainees who both have and have not performed installations but will likely expand upon the topics covered in the in-depth interviews:

- Training value in career progression;
- Job outcomes;
- Experience with installations;
- Interactions with residents; and
- Geographic specific training differences.

We discuss our approach to conducting assessments on each of these topics in more detail after the description of data sources.

Sample Design

We plan to draw our participating trainee sample frame from GRID's tracking database. With study team input, we may also consider surveying trainees from relevant courses at community college



and other solar installation trainings. A web survey will allow us to reach out to a large number of trainees at a minimal cost.

We would like to survey trainees that have participated in installations and those who have only done training(s). For those who have completed installations, we will create targets by program (DAC-SASH and SASH) and will vary questions for installers who worked on one or the other or both.

Based on our understanding of the programs’ current training strategies, we have developed an initial trainee survey sample design (shown in Table 4). This will be further stratified by trainees who have and have not completed installations.

Table 4: Target Trainee Web Survey Completions

Trainee Type	Unique Participants		Target Web Survey Completions	
	DAC-SASH	SASH	DAC-SASH	SASH
Team Leader	3	2,700 trainees since 2019	1	100
Interns	3		1	
SolarCorps Fellow	51		5	
Job Training Student	297		30	
Installation Basics Training Participant	73		7	
Design and Construction Intern	Unknown	Unknown		
Trainee that has completed work under a subcontractor through the Subcontractor Partnership Installation Program	4	267 (may be included in number above)	1	

In-Person Field Visits

Evergreen has budgeted for 9 person days to conduct in-person research across three regions. This would cover observations of program processes and how the program is being implemented, customer interactions, etc. As an example, one trip could include a visit to GRID’s Fresno office to observe a training for one day followed by a day of site visits to any current installations. Another day could include observing outreach to prospective participants. This work will be scheduled, and

locations will be chosen to maximize our ability to meet with a variety of people involved with the program. Below, we share the types of in-person research we plan to conduct, depending on the stage of program implementation at the time of this research.

On-Site Solar Installations (Installers, Trainees, and Customers)

SASH requires three volunteers from the Installer Basic Training Certificate Program to be involved, and DAC-SASH requires at least one volunteer during an installation. Evergreen plans to conduct in-person field visits to a solar installation to both observe and to interview the volunteers and the installers. We plan to cover the following topics:

- Training experience;
- Installation experience; and
- Program barriers and benefits.

If residents are also on-site during the time of installation, Evergreen can also ask a similar set of questions to the ones posed in the web survey and phone interviews.

Trainings (Trainers and Trainees)

Evergreen will attend trainings and both observe trainings and do mini-interviews with the trainees and the trainers. This will allow Evergreen to get a sense for how these trainings fit into the career objectives of the trainees, and trainers can give a longer-term vision of the value of these trainings and the programs' role in creating long term solar careers.

Marketing and Outreach Events (M&O Organizations and Perspective Participants)

Evergreen may also attend outreach with M&O organizations where we will be able to observe customer concerns and M&O staff strategies and approaches, and will also be able to ask questions in-person of the M&O staff and participants where feasible.

On-site PV System Verification Visits

As part of our PV system verification efforts, we plan to conduct on-site inspections to collect data from a sample of program-installed PV systems. Site visits will be recruited as part of the participant survey effort and will be a subset of the verification desk reviewed participants. Based on the stratification design of the participant sample, we anticipate recruiting a nested sample of 20 customers. The purpose of these visits is to support our verification of program tracking data and system documentation. In addition, we will use these visits to support our analysis of PV system performance by learning how system owners maintain their solar arrays as well as obtain

metered data if available from the participating resident. Data to be collected while on site will include but are not limited to:

- PV module model/manufacturer
- Inverter model/manufacturer
- Array size
- Tilt and azimuth
- Performance degradation (shading, soiling, etc.)

To improve recruitment, we intend to offer participants a \$50 incentive for their time and cooperation.

Gather Secondary Data

The Evergreen team plans to gather and analyze a variety of secondary data sources to support the study analyses (in addition to program documents and background addressed in Task 4).

PA Tracking System Data and IOU Customer Information System (CIS)/Billing Data

Evergreen plans to rely on data from the PA and IOUs to support the following:

- Development of customer survey sample frames;
- Contact information for customer surveys (including participants and if available, eligible customers who the PA contacted but did not ultimately participate);
- Location of eligible customers (both participating and non-participating);
- Summary of customers on CARE/FERA;
- Program project data (e.g., costs, size) to support cost benefit assessment;
- PV system characteristics;
- Estimates of the number of eligible customers adopting rooftop solar without the program (e.g., CARE flag, NEM indicator);
- Analysis of gap funding including which type of projects utilize it;
- A sample of invoices to assess evaluability of project level costs;
- Geographic analysis of participation; and
- Analysis of participating customer bill impacts.

We will draft a data request for all participating customers (CIS and billing data) and eligible non-participating customers (e.g., based on matching PA participant data with IOU CIS data) early in the study research planning phase to allow for adequate time for the PA and IOUs to respond. If

the PA and/or IOUs want to limit the amount of eligible customer data (e.g., for the non-participant survey) that is provided, we can handle the request in two phases, with an initial phase at a summary level without confidential data, and a second phase for just a sample. Please see Section 6 for a more complete discussion of how Evergreen will handle customer data.

Geographic Data

Evergreen will access the geographic data used to define DACs through the latest version (e.g., version 4 if released) of CalEnviroScreen,⁵ which identifies census tracts that are disproportionately burdened by multiple sources of pollution and other environmental and health indicators (e.g., lead exposure). The CPUC defines a DAC as any community that is among the top 25 percent of CalEnviroScreen or the 22 tracts in the highest 5 percent of CalEnviroScreen's Pollution Burden. When evaluating DAC-SASH historically, we will use 3.0 and when looking forward we will use 4.0 and frame findings to account for this change. The geographic shape files of these DACs and associated data are available for public access. We will access and analyze these data using the open-source software language, R. Evergreen has conducted similar geographic analysis for an Avista low-income needs assessment, as well as for the LGP Co-Benefits and DAC-GT/CSGT studies (see Appendix B for a work sample).

These geographic data will be combined with the addresses from the program tracking and IOU CIS data for participating and non-participating customers. These data will be combined to conduct a geospatial analysis of program coverage across the state, including the geographic spread of participating customers. The geographic data will support the assessment of customer participation, allowing for visual and spatial analysis.

Secondary Data to Estimate Size of Eligible Customer Pool for DAC-SASH

Evergreen will gather secondary data such as Census and residential saturation survey data (including variables on income level, home type (i.e., single-family) and home ownership) to estimate the size of the eligible customer pool. We will review program eligibility requirements with this context in mind.

Environmental Benefits Data/Assumptions

⁵ <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-30>

To estimate benefits associated with the energy produced by installed systems during the evaluation period (i.e., baseline emissions avoided), we anticipate using emissions data and/or emissions factors to quantify the impacts or avoided GHG emissions as well as criteria pollutants such as PM10 and NOx. To estimate avoided GHG emissions, we anticipate using hourly marginal emissions data published by Watttime. This approach was used in the recent Solar on Multifamily Affordable Housing (SOMAH) evaluation and is being used to quantify greenhouse gas impacts for the DAC-Green Tariff and Community Solar Green Tariff program evaluation. By applying this method to the SASH and DAC-SASH programs, GHG benefits can be consistently compared across multiple programs. Alternatively, our team can also quantify GHG emission reductions based on methods used in the prior evaluation sourced from the E3 CSI/SGIP Avoided Cost Calculator. To estimate additional environmental benefits resulting from reduced emissions such as criteria pollutants, we will work with staff to explore the data sources most appropriate for use given the need for consistency with existing tracking and reporting systems. Potential resources for quantifying criteria pollutant emission reductions may include the California Air Resource Board's (CARB's) criteria air pollutant emissions inventory or the Environmental Protection Agency's (EPA's) Avoided Emissions and Generation Tool (AVERT).

Cost Benefit Analysis

In addition to project data from the PA and PV impact analysis results, we will review and compile data for the cost benefit assessment from a variety of secondary sources that may include:

- E3's Avoided Costs Model (e.g., to forecast energy, line losses, ancillary services, emissions, generating capacity, and transmission and distribution)
- E3 CSI Single-Installation Cost-Effectiveness Tool (e.g., for ownership costs including financing, insurance, operations and maintenance, and inverter replacement)
- Other sources Evergreen will review to obtain measure cost and savings inputs for the cost benefit analysis include:
 - California Solar Initiative Cost-Effectiveness Evaluation
 - 2019 Update to the California Energy Efficiency Standards for Residential and Non-Residential Buildings: Impact Analysis
 - 2018 EIA Updated Buildings Sector Appliance Equipment Costs and Efficiencies
 - 2017 NREL Electrification Futures Study
 - 2018 E3/CEC Deep Decarbonization in a High Renewables Future

Conduct Analyses

Evergreen will conduct analysis on the primary and secondary data gathered for this study to address the study research issues. The analysis will be guided by the logic model and metrics to ensure that all research issues are covered by as many potential data sources as possible.

Logic Model: To begin the evaluation, we developed a logic model to represent the theory underlying program interventions and expected outcomes. Then, we used these activities and outcomes to develop a full set of metrics that may be used to measure the success. The multi-modal data collection activities are linked to the metrics to ensure a deep and holistic understanding of the programs' successes and challenges.

In-depth interviews and on-site visits: Experienced researchers on the Evergreen team will conduct any in-depth interviews and on-site visits, collecting feedback in a spreadsheet format and summarizing the qualitative information in a report format. We will report information in the aggregate and keep individual customer responses confidential.

Telephone and web surveys: We will use in-depth interviews to help guide development of questions for the telephone and web surveys. After guides are reviewed by Energy Division staff, Evergreen staff will conduct pre-tests with the target audience to ensure that the questions are understood. Telephone interviewees will be targeted multiple times at differing times of day to allow an opportunity for response and web survey respondents will also be reminded about the survey more than once.

Documentation and data review: Once the Evergreen team receives billing and program data from IOUs and GRID, we will conduct quality control/ quality assurance measures to ensure the data are consistent with our needs (as stated in our data request) and do not contain any apparent errors or omissions. We will conduct these reviews immediately upon receipt of each data set. We will also review any data dictionaries to ensure we understand what each variable represents and any limitations the variable may have. Evergreen will use R and internal quality control procedures for all data analysis.

Task 5 in Review: Conduct Analysis

Deliverables:

- PA / IOU data requests
- Draft and final primary research instruments and sample plans
- Disposition reports for in-field research, verifications, customer survey, and trainee survey

Task 6: Monthly Status Reports and Interim Drafts

Evergreen will prepare monthly invoices with accompanying written monthly status reports for the Energy Division and SDG&E. Per the RFP, the status reports will include at minimum:

- Description of progress towards completing milestones for each objective;
- Percent complete by objective and task;
- Percent of budget spent to date; and
- Preliminary findings.

Evergreen will plan and conduct monthly check-in meetings with the Energy Division project manager. The Evergreen project manager will facilitate discussions regarding research planning and interim findings for each study objective as milestones are completed.

Task 6 in Review: Monthly Status Reports and Interim Drafts

Deliverables:

- Monthly written status reports
- Monthly check-in meetings including interim findings

Task 7: Draft & Final Reports

Task 7 includes the development of draft and final study reports for SASH and DAC-SASH (separate reports for each). A senior manager and our technical editor will review all reporting deliverables, which will include full reports as well as interim memos and presentations. These reviews will help ensure that the content is appropriate to the audience, and that the message is effectively communicated with a focus on clear graphics that convey main points. All study deliverables will adhere to CPUC-ED EM&V report guidelines.⁶

At minimum, the study reports will include the following sections, per the RFP:

1. **Executive Summary** emphasizing the major findings and the most significant recommendations.
2. **Introduction** section including the research objectives and description of this study.

⁶ Guidelines for CPUC-ED & California IOU Evaluation Measurement & Verification Reports, available at http://www.calmac.org/events/2013-2014_CPUC-IOU_EM&V_Consulting_Report_Guidelines.pdf

3. **Methodology** section describing and justifying the chosen approaches, data sources, and data collection methods used in the study, adapted from the Final Research Plan.
4. **Analysis Findings and Recommendations** for each of the study objectives along with the relevant data collection protocols.
5. **Appendices** including but not limited to:
 - a) Bibliography
 - b) Reference list
 - c) Spreadsheet of Recommendations
 - d) Program logic model(s)
 - e) Program metrics

Task 7 in Review: Draft & Final Reports

Deliverables:

- DAC-SASH and SASH draft and final study reports

Task 8: On-Going Public Webinars and Response to Public Comments

Evergreen will plan and conduct two public webinars to present the draft report findings for stakeholder comment and discussion; one webinar will be hosted during the research plan stage and the second will be hosted during the draft report stage. We will document public comments and webinar discussion in a memo, along with any appropriate action items (such as changes to the report).

Based on the input received during the public webinars and subsequent discussions with the study team, Evergreen will address public comments in the final reports (clean and redline versions for each). If desired, we will provide an appendix that documents the changes requested by participants of the public webinars (and written comments submitted to the Public Documents Area during the required two-week comment period) and how the team addressed the changes (or the rationale for not making changes).

Task 8 in Review: Public Webinars and Response to Public Comments

Deliverables:

- Two webinar slide decks
- Two meeting summary memos



3 Project Timeline

A table of deliverables and a detailed study timeline are shown in Table 5 and Table 6 on the next three pages. The deliverables are numbered by task in each table.

Table 5: Study Deliverables and Due Dates

Task/Deliverable	Due Date
TASK 1 - Project Initiation Meeting	
1.1 Initial study plan (v1) – <i>completed</i>	November 29, 2021
1.2 Meeting slide deck – <i>completed</i>	November 29, 2021
1.3 Summary memo – <i>completed</i>	November 30, 2021
TASK 2 - Research Plan and Schedule	
2.1 Draft research plan and logic model (v2) - <i>completed</i>	December 7, 2021
2.2 Revised draft research plan and logic model (v3) - <i>completed</i>	January 11, 2022
TASK 3 - Conduct Public Webinar	
3.1 Webinar slide deck – <i>completed</i>	January 20, 2022
3.2 Public webinar– <i>completed</i>	January 27, 2022
3.3 Revised draft research plan and logic model (v4)	February 24, 2022
3.4 Final research plan (v5)	March 11, 2022
TASK 4 - Conduct Program Material Review	
4.1 Submit PA request for program documents – <i>completed</i>	December 17, 2021
TASK 5 - Conduct Research and Analysis	
5.1 PA/Stakeholder Interviews: Develop draft interview topics/list of interviewees	March 25, 2022
5.2 Finalize interview topics/guide	April 15, 2022
5.3 Trainee Web Surveys: Develop draft interview topics/list of interviewees	July 22, 2022
5.4 Finalize interview topics /guide	August 12, 2022
5.5 On-site field research: planning documents	March 11, 2022
5.6 Customer Survey: Draft and submit PA customer and program tracking data request (including PA/stakeholder contact info)	February 25, 2022
5.7 Develop customer survey sample design	April 1, 2022
5.8 Revised interview list of topics/guide	April 15, 2022
5.9 Finalize customer survey instrument	April 22, 2022
5.10 Launch phone survey/weekly disposition reports	May 20, 2022
5.11 On-site inspections – Planning documents	March 23, 2022
TASK 6 - Monthly Status Reports	
6.1 Ongoing written monthly status reports	monthly
6.2 Ongoing monthly check-in meetings	monthly
TASK 7 - Draft and Final Reports	
7.1 Draft reports (v1 for SASH and v1 for DAC-SASH)	September 30, 2022



Task/Deliverable	Due Date
7.2 Revised draft reports (v2 for SASH and v2 for DAC-SASH)	October 14, 2022
7.3 Revised draft reports (v3 for SASH and v3 for DAC-SASH)	November 18 2022
7.4 Final reports (41 for SASH and v4 for DAC-SASH)	December 2, 2022
TASK 8 - Public Webinars	
8.1 Plan webinar, prepare meeting slide deck	October 28, 2022
8.2 Public webinars (SASH and DAC-SASH)	November 4, 2022
8.3 Workshop summary memos	November 11, 2022

Appendix A: Logic Model and Metric Mapping

DAC-SASH Program Logic Model

The study includes the development of a logic model and metrics for DAC-SASH, which allows for systematic assessment of that relatively new program. We will employ a theory-driven evaluation framework that is guided by the program logic model, which will identify causal mechanisms and support the testing of hypotheses that the successful implementation of program activities (often involving multiple actors) will lead to expected outputs, and that these in turn will eventually yield expected benefits.

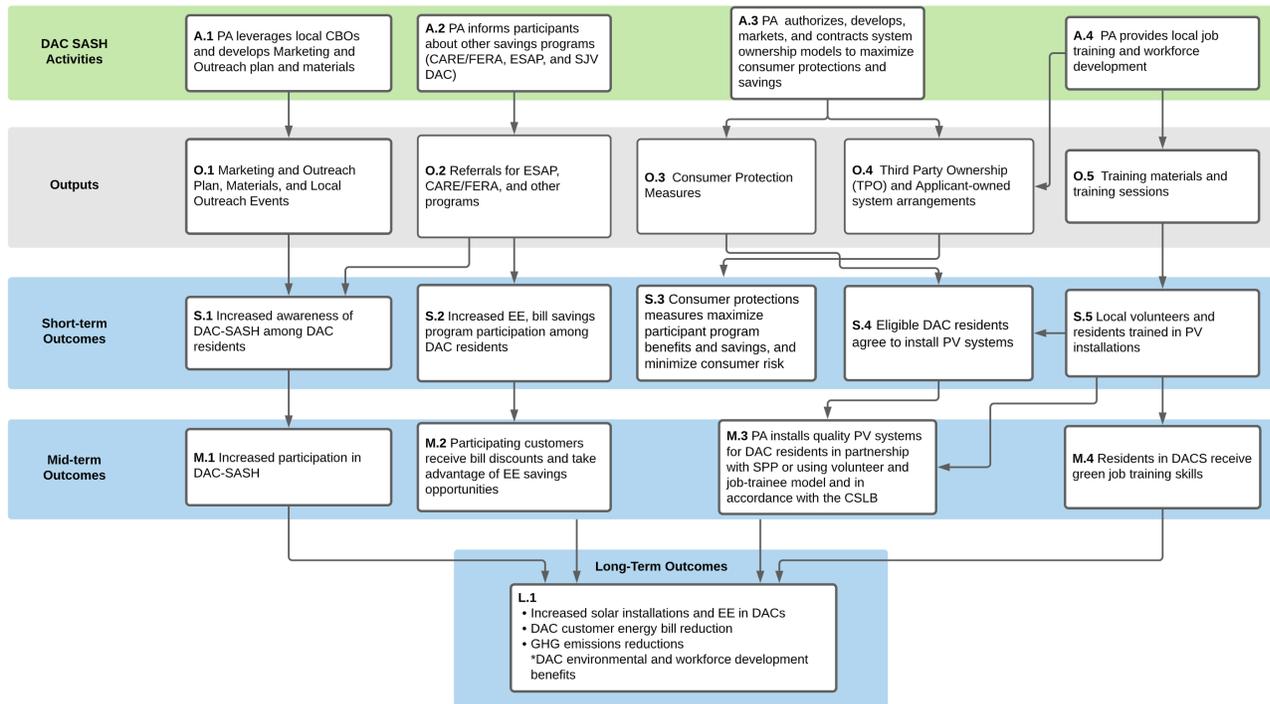
This theory-driven approach⁷ relies on mixed methods involving the collection and analysis of both quantitative and qualitative data covering program inputs, activities, outputs, and outcomes. The RFP included a starting point for the development of metrics that are associated with desired program outcomes and objectives. To begin the evaluation, we developed a logic model to represent the theory underlying program interventions and expected outcomes. Then, we used these activities and outcomes to develop a full set of metrics that may be used to measure the success. The multi-modal data collection activities are linked to the metrics in a detailed data collection plan to ensure a deep and holistic understanding of the programs' successes and challenges.

This type of evaluation approach is useful for programs that are intended to generate longer term outcomes. The approach facilitates early and regular assessments (as required in this case) to determine if the programs are on track by identifying immediate outputs and shorter-term outcomes that would be expected. Instead of waiting many years to identify if there are problems with program design and/or implementation, the logic model and metrics allow for checking in early on evidence of short-term outcomes and identifying if there are breakdowns in the program design (e.g., barriers to participation not accounted for) and/or problems with implementation (e.g., an ineffective marketing campaign).

Figure 2 presents a logic model for the DAC-SASH program that we developed, based on the materials available. The logic model shown includes theorized short-, mid-, and long-term outcomes expected as a result of program activities and outputs. The set of metrics we may use to evaluate whether DAC-SASH is achieving its expected outcomes is linked to the theorized outcomes (following the logic model).

⁷ Ruegg and Feller, 2003; Chen, 1990; Rogers, 2000, 2008; Rogers et al., 2000; Weiss, 1995, 1997; Coryn, 2011, and consistent with the Emerging Technologies Protocol in the California Energy Efficiency Evaluation Protocols (<http://www.cpuc.ca.gov/General.aspx?id=5399>).

Figure 2: DAC-SASH Program Logic Model



Metrics

Evergreen identified a set of metrics (Figure 3 on the next page) that may be used to measure whether DAC-SASH is achieving its expected outcomes and linked them to the theorized outcomes. These metrics are mapped to the outcomes from the DAC-SASH logic model.

Multi-modal data collection activities are linked to metrics in the subsequent figures, ensuring a deep and holistic understanding of pilot successes and challenges, with a focus on developing actionable recommendations for scaling up pilot efforts.

Figure 3: Mapping of Metrics to Logic Model Outcomes

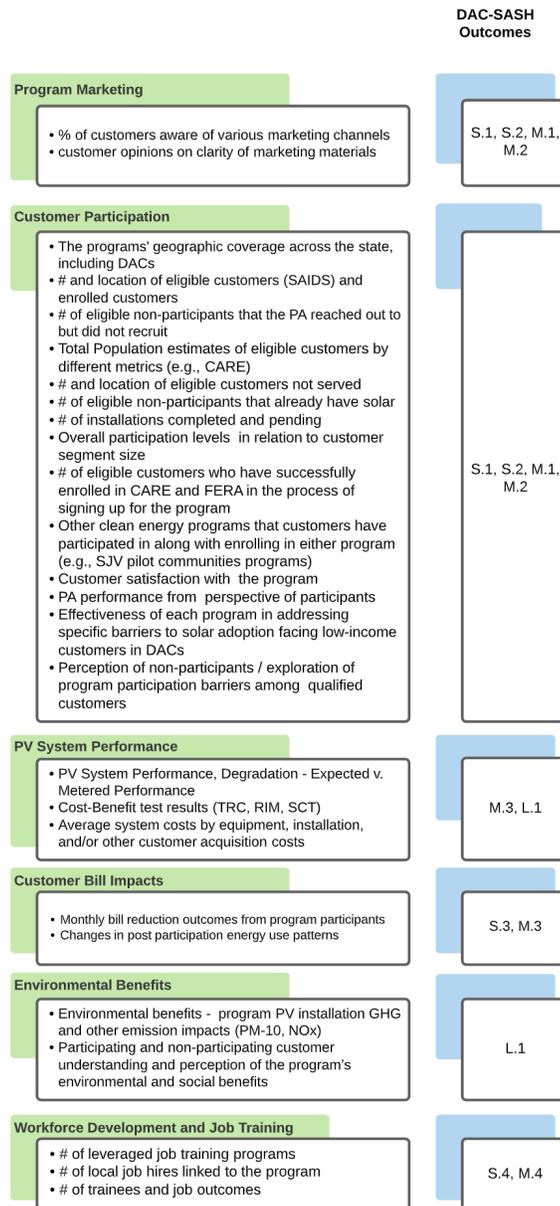


Figure 4 through Figure 9 detail the data sources required for each metric. We also include a bullet list of each of the outcomes from the logic model.

First, Figure 4 describes that program background and implementation documents, PA program tracking data, participant and non-participant customer surveys, and interviews with PAs, IOUs, and M&Os will be utilized to measure the metrics for program and marketing targets. Figure 5 shows that for customer participation metrics, all data sources, except trainee web surveys, are leveraged. We will also use geographic and census data for all location metrics. Both metric categories aim for the following outcomes:

- Increased awareness of DAC -SASH among DAC residents (S1);
- Increased energy efficiency, bill savings, and program participation among DAC residents (S2);
- Increased participation in DAC-SASH (M1); and
- Participating customers receiving bill discounts and taking advantage of energy efficiency savings opportunities (M2).

Figure 4: Program Administration and Marketing Metrics

	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	Ride Alongs	Inspections	Trainee web survey	Interviews with PAs, IOUS, M&O	External Data (Census, etc.)
Costs by program, further broken down by type/category, forecasted vs. actual, and expenditures and uncommitted balances		●								
Summary of administrative costs by program tasks and key milestones		●								
Pending program commitments, reservations, obligations, and projects demands for the program		●							●	
Assessment of underutilization of program funding		●								
Identification of misallocated/overallocments of administrative costs or other addressable cost drivers	●			●	●				●	
% of customers aware of various marketing channels	●			●	●					
customer opinions on clarity of marketing materials	●			●	●					

Figure 5: Customer Participation Metrics

	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	Ride Alongs	Inspections	Trainee web survey	Interviews with PAs, IOUS, M&O	External Data (Census, etc.)
Customer Participation										
The programs' geographic coverage across the state, including Disadvantaged Communities		●								●
# and location of eligible customers (SAIDS) and enrolled customers		●								●
# of eligible non-participants that the PA reached out to but did not recruit		●	●							
Total population estimates of eligible customers by different metrics (e.g., CARE)	●									●
# and location of eligible customers not served			●		●					●
# of eligible non-participants that already have solar		●	●		●					
# of installations completed and pending		●					●			
Overall participation levels in relation to customer segment size		●	●							
# of customers who have successfully enrolled in CARE and FERA in the process of signing up for the program			●							
Other clean energy programs that customers have participated in along with enrolling in either program (e.g., SJV pilot communities programs)	●	●		●					●	
Customer satisfaction with the program				●	●	●			●	
PA performance from perspective of participants				●		●	●			
Effectiveness of pr in addressing specific barriers to solar adoption facing low-income customers in DACs	●			●	●	●	●		●	
Perception of non-participants / exploration of program participation barriers among qualified customers	●				●	●			●	

Next, Figure 6 details the data required for PV system performance metrics. For the three metrics identified, we will use PA program tracking data and inspections to evaluate PA installs of quality PV systems for DAC residents (M3), and increased energy efficiency in DACs (L1). We will also use secondary data for the cost-benefit assessment model inputs.

Figure 6: PV System Performance Metrics

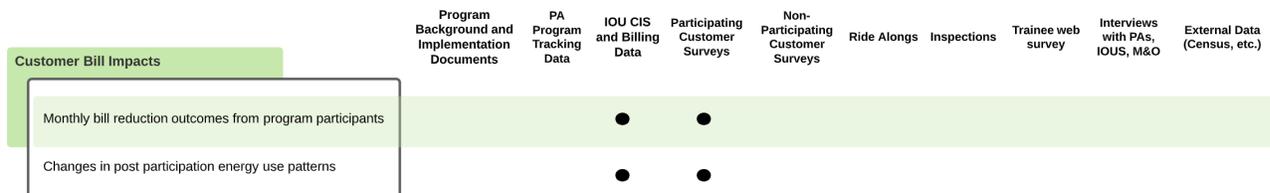
	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	Ride Alongs	Inspections	Trainee web survey	Interviews with PAs, IOUS, M&O	External Data (Census, etc.)
PV System Performance										
PV system performance degradation - Expected vs. Metered Performance							●			
Cost-Benefit Assessment (TRC, RIM, SCT)		●								●
Average system costs by equipment, installation, and/or other customer acquisition costs		●								



To evaluate customer bill impacts, we will use IOUS CIS and billing data, in addition to participating customer surveys to determine the monthly bill reduction outcomes from program participants and the change in post participation energy use patterns (Figure 7). These metrics inform the outcomes listed below:

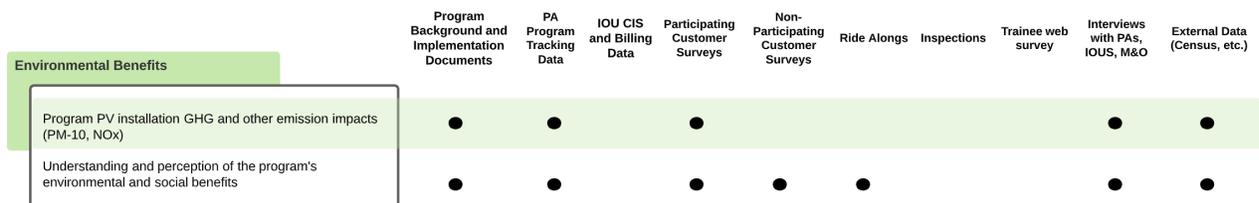
- Whether customer protections measures maximize participant program benefits and savings, and minimize consumer risk (S3); and
- To determine whether PA installs the PV systems for DAC residents in partnership with SPP or using volunteer and job-trainee model and in accordance with the CSLB (M3).

Figure 7: Customer Bill Impacts Metrics



Under the environmental benefits category, we will use program background and implementation documents, PA program tracking data, participating and non-participating customer surveys, ride along data, and interviews. We will also use additional secondary data on environmental benefits to analyze both metrics. As shown in Figure 8, these data will inform the metrics of program PV installation GHG and other emission impacts along with the customer perception of the program’s environmental and social benefits. These benefits are linked to the long-term outcome of increased solar installation and EE in DACs, DAC customer energy bill reduction, GHG emissions reductions, and DAC environmental and workforce development benefits (L1).

Figure 8: Environmental Benefits Metrics



Finally, Figure 9 describes the data needed to evaluate the metrics under workforce development and job training. These metrics are linked to the outcomes below:

- Eligible DAC residents agree to install PV systems (S4); and
- Residents in DACs receive green job training skills (M4)

Figure 9: Workforce Development and Job Training Metrics

Workforce Development & Job Training	Program Background and Implementation Documents	PA Program Tracking Data	IOU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	Ride Alongs	Inspections	Trainee web survey	Interviews with PAs, IOUS, M&O	External Data (Census, etc.)
# of leveraged job training programs	●	●								
# of local job hires linked to the program	●	●								
# of trainees and job outcomes	●	●				●		●	●	

Appendix B: Subcontractor Partnership Detail

This section includes information on GRID's Subcontractor Partnership Program from the Program Implementation Plan from the first half of 2019.

B. Subcontractor Partnership Program

GRID's Subcontractor Partnership Program (SPP) was launched statewide in 2010 under the SASH program and is a proven model for engaging local installers as subcontractors while providing paid work opportunities for job trainees. GRID will utilize this program for DAC-SASH, hiring high-quality, fully vetted installers to install a portion of the DAC-SASH program PV systems, based on a reduced-cost structure and modified scope of work to match the structure of GRID's model. Under SPP, GRID provides the same homeowner screening, site visits, and education as for GRID-conducted installations, including a dedicated outreach coordinator to serve as an 12 advocate and liaison. GRID will perform up-front due diligence with each new subcontractor prior to entering into contract with them. In addition to being licensed by the CSLB and holding a C-10 or C-46 license, SPP requires that installers: ● Have completed at least 20 installations under their current contractor's license, ● Provide professional and customer references that GRID verifies, ● Provide financials (balance sheet, statement of cash flow and credit verification) which GRID reviews to ensure strong financial positions, ● Pass two Quality Assurance inspections by a third-party inspector on projects selected at random from the 20 installations listed in their SPP application Each subcontracted installation will be inspected and approved by the local building department, and the subcontractors will provide a 10-year labor warranty for each system, in addition to the manufacturer's warranty on all equipment. One hundred percent of each subcontractor's installations in DAC-SASH will be initially inspected for quality by a third-party inspector, and GRID may modify this percentage for consistently high-performing subcontractors.¹⁶ In addition, subcontractors will be required to hire at least one paid trainee onto each of their DAC-SASH projects as further detailed in Section V, A. Job Training Requirements. Through the SASH program, SPP has cultivated a network of installers to serve low-income families and communities that typically would be outside of their customer base, and fostered new connections between installers and California's job training programs through its workforce development requirement. For the DAC-SASH program, GRID will target installation companies located in DACs to participate as subcontractors in the program, further deepening community impact. To add to our existing partners, GRID plans to announce a statewide call for subcontractors for DAC-SASH as soon as the program is approved by the Commission.

Quality Assurance (QA) Inspections - Conducted post-installation by a third-party inspection company for projects installed in the Subcontractor Partnership Program (SPP), and a sampling of projects installed using GRID's "in-house" model, to ensure installation quality meets GRID's standards, program requirements, and all industry-standard best practices. QA inspections feature

a detailed review of the installation and system components, including the main service panel, conduit runs, racking, and more. The inspector provides photos of the system components and includes a written summary of the inspection, with any recommendations or items for immediate correction.

2. Job Training Requirements for the Subcontractor Partnership Program (SPP) installation model

In the 2015 AB 217 Implementation Decision, the Commission formally adopted the SASH job training requirement for projects installed by subcontractors through SPP. Each subcontracted installation must include at least one paid workday opportunity for a job trainee from an eligible job training program.²⁰ GRID has utilized this requirement since it launched the SPP program in 2010, and this standard has since been utilized as the foundation for the MASH job training requirement under AB 217, as well as the forthcoming SOMAH program. GRID will use this program model for DAC-SASH SPP projects. Documenting Compliance: As in the SASH program, an affidavit process will be implemented in DAC-SASH that requires the subcontractor and job trainee to verify that the workday opportunity occurred. The affidavit provides additional information about the type of work, and hours worked, that GRID will include in the aggregate, in the semi-annual program reports, as further described in Section VII, Reporting, Accounting, and Evaluation. No exceptions will be made to the job training requirement. B. Tracking and Reporting of Job Training Outcomes GRID plans to include robust data collection and reporting on the workforce development impacts of the DAC-SASH program. As further described in Section VII, Reporting, Accounting, and Evaluation, GRID will include aggregated (non-personally identifiable information) data on the job training initiatives in the semi-annual program progress reports and also aims to include job training information on the CalDGStats webpage. Specific details are included below:

In-house installation model: All participants on GRID's in-house installations submit an intake form providing additional information about the individual's goals and objectives in working in the solar industry. This intake form can be utilized by GRID staff to offer information about specific training opportunities and resources to trainees, and help ensure individuals are successful in reaching their goals. GRID will reach out to participating Job Training Programs to receive feedback on their experience having students participate in DAC-SASH installations, and in accessing other job training resources in the DAC-SASH program. Sub-contractor installation model: GRID will build upon the job training affidavit used in the SASH and MASH programs to include additional information on wages paid, and using trainee addresses to determine local hiring success and impacts in DACs. Trainees submitting affidavits will be entered into a customer relationship management (CRM) tool for easy data management, and GRID may contact them to survey them on their training experience, share professional development resources, and collect data on long term job placement. GRID will 20 Decision 15-01-027, p. 21 18 also survey SPP Program installers on their long term hiring of program trainees, trainee recruitment experience, and trainee quality on a semi-annual basis. Feedback from trainees, employers, and Job Training Programs will inform revisions to improve the effectiveness of the training and job training requirements.

Appendix C: Response to Comments

#	Commenter	Page	Comment/feedback/change requested	Evaluators Response
1	GRID HQ	Page 32	We agree with the CPUC that adding a Panel Interview as well may be fruitful, as stakeholders and programs can be so siloed.	OK we will update the plan to reflect that.
2	GRID HQ	Overarching	Will the report include an evaluation of the number of eligible households per county, per utility or otherwise? You say that participation rates will be determined by geographic area (page 19) - which geographic breakdown will be used? More granular breakdowns would likely be most useful to GRID in the future (by county, census tract, zip code).	We plan to have data at the County level. Getting more granular than that means that we would be introducing more uncertainty. We plan to use Athens for the CARE estimate and then will combine it with Census PUMs data for own/rent and home type).
3	GRID HQ	Page 19	Will the analysis of rooftop solar market adoptions within the eligible customer pool include research to measure the specific barriers to solar adoption in those DAC communities?	Our non-participant customer surveys will explore barriers to solar adoption in DAC communities.
4	GRID HQ	Overarching	Will the evaluation incorporate best practices identified by the LBNL in a report "How LMI Solar Programs Are Evaluated"?	We reviewed the best practices mentioned in the report and confirmed that our research plan is consistent with the identified best practices.
5	GRID HQ	Page 43	Ideally Evergreen can prioritize completing the DAC-SASH program's draft report first, especially if there will be delays - since the program is active and ongoing in 2022 and beyond. So this approach would be more actionable.	Yes we can prioritize the analysis and reporting phases of the study on DAC-SASH. But the majority of the primary data collection is focused on DAC-SASH so the schedule can only be moved up marginally (e.g., a couple weeks).
6	GRID HQ	Page 7	Please consider including the SGIP program (Self Generation Incentive Program) as one of the related programs in your review of enrollment in related programs, in addition to ESA and CARE for example? Specifically the residential equity and residential equity resiliency budget (ERB) portions of SGIP.	We updated the plan to add this program and we also added it to the data request.

#	Commenter	Page	Comment/feedback/change requested	Evaluators Response
7	GRID HQ	Overarching	Will the report consider the efficiency of pairing solar with storage as part of the program?	We will add a question in the interviews to the PA if they've considered it and why or why not (unclear if allowable in handbook).
8	GRID HQ	Page 7	"Priority communities" which include the SJV pilot area, were incorporated into the program's ME&O Plan after the DAC-SASH Decision was published and the program established. This additional focus area is not a permanent fixture in the program and was a request by a past Commissioner; therefore it may not make sense for it to be part of this evaluation or future evaluations.	Since we are looking historically at the program, we plan to ask customers about what other programs they heard about when they became aware of DAC-SASH. If GRID has a sense of when they started implementing this focus area that could be helpful to know.
9	GRID HQ	Page 30	GRID recommends an addition to the list of customer feedback topics found at the top of page 30 on customer perception of their community's need. For example, you could ask what strategies/steps they believe would increase adoption of renewables in their community, among their neighbors, and other low income homeowners they know.	Added a bullet to cover this request.
10	GRID HQ	Page 31 and 39	During the webinar, Evergreen stated that customer interviews would be completed in English and Spanish. Is it correct to assume that this will apply to the in-depth interviews and site visits as well (page 39)? Page 31 states that CIC Research will conduct Computer Assisted Telephone interviews for the customer surveys. What are CIC Research's language/multicultural abilities?	CICR is able to complete surveys in Spanish. Customer phone and web surveys will be in Spanish and English but in-depth interviews and site visits will be conducted in English.
11	GRID HQ	Page 31	Will the initial web survey at minimum be written in combination English/Spanish? Target Completes: is how many clients you will reach out to total, or how many you'd like responses from total?	Yes it will be available in English and Spanish. We added clarification on this to the plan. We are estimating that we will have to reach out to 10 people to get 1 survey complete but are hoping that incentives improve this. This estimate will vary for participants and non-participants.

#	Commenter	Page	Comment/feedback/change requested	Evaluators Response
12	GRID HQ	Page 12 and 13	It is established that social influence and social networks play a large role in LMI rooftop solar adoption (https://www.nrel.gov/solar/market-research-analysis/2017-2019-study.html). Can you include an analysis of social influence/social networks in your customer surveys, in your analysis of the effectiveness of marketing and outreach strategies that GRID has employed? In, essence, how will the nuances of reaching lower-income, harder to reach populations be accounted for?	We will add questions to the customer surveys, field research and stakeholder interviews to assess how customers heard about the program, how they would like to hear about the program, and if they participated, how likely they'd be to share with others in their communities.
13	GRID HQ	Page 12 and 18	On page 18 you state that feedback from customer surveys will be used to assess program marketing. Please add customer surveys as a data source for the metrics in Table 1 (page 12).	We have added this to the data source table.
14	GRID HQ	Page 17 (primary research table)	Conducting web surveys with job trainees may be challenging but GRID can assist ahead of time in order to get more response, if helpful.	Yes we would appreciate help obtaining contacts for this effort and increasing response. We will coordinate w/ GRID on this effort while ensuring no introduction of bias.
15	GRID HQ	Page 19	Program Marketing: Speaking to IOUs will not shed light on program marketing, as only GRID and local partners are directly involved in both programs' marketing at this time. The IOU's solar webpages include mention of the programs, but that is largely the extent of their involvement to date (that is beginning to change recently). The one exception is some very helpful co-marketing with SCE in the past 3 years (2019-present), where they work with us to send out SCE-branded flyers or letters to promote SASH and soon DAC-SASH.	We have removed the references to the IOUs in that section.
16	GRID HQ	Overarching	Will the DAC-SASH report consider or account for the changing net metering (NEM) landscape in any way? In reference to future client savings. Will you consider the impacts of annual NEM billing (PG&E, SDG&E) and monthly NEM	When we ask about customer satisfaction we will ask a follow up open ended question to better understand reasons for their responses. We will see if we get responses about the monthly or annual nature of the bill or see if they



#	Commenter	Page	Comment/feedback/change requested	Evaluators Response
			billing (SCE) on customer satisfaction and perception of program benefits and savings?	share any awareness of the changing NEM landscape.
17	GRID HQ	Page 31 and elsewhere	Contingency budget for customer survey respondent incentives: would you consider providing incentives regardless, to compensate clients for their time? By having an incentive upfront, it may help homeowners with more barriers to respond (and therefore have less biased results perhaps).	We agree and will likely offer incentives for the customer surveys using a portion of the contingency budget
18	GRID HQ	Page 37	FYI that GRID to date has used the CalEnviroScreen 3.0 and is switching to the 4.0 version this month (once the DAC-only map is published by the State agency, as it's easier for our Outreach staff to work with that the full CES map).	We will use 3.0 when our research is looking back and use 4.0 when looking forward or framing findings for the future.
19	GRID HQ	Overarching	Will the analysis of usage changes take into account usage before and during/after COVID? In 2020/2021 for example.	Yes, the matched comparison group is especially important for measuring the impact of solar when that install took place shortly before or during COVID. We will add additional variables to the regression model that are intended to absorb the incremental impact of COVID on homes (from participants and matched comparisons) -- these will be retained in our final model if the coefficients are statistically significant and improve model fit.
1	Jahon Amirebrahimi - Pacific Gas & Electric's Evaluation, Measurement, and Verification Team	20	What is the counterfactual for the Program administration analysis? Do we know of similar programs that are more or less cost-effective to compare this program against?	There aren't any CPUC programs to use but looking beyond the CPUC programs could be done in future evaluations. For now, we do have cost benefit analysis planned looking at E3s avoided cost model and the E3 Single-Installation Cost-Effectiveness tool.

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2	Jahon Amirebrahimi - Pacific Gas & Electric's Evaluation, Measurement, and Verification Team	21	Will we have data on how engaged a customer is with the existing ME&O efforts? E.g. number of clicks to a advertisement? How many customers picked up the phone during an initial call or called back?	We can ask GRID as part of our customer data request - we will be requesting data on customers who have received outreach (including type of engagement and outcome of engagement) to form our non-part customer survey sample. If there are not sufficient data on customer outreach we will consider making recommendations for improving tracking of customer outreach to support future evaluations.
3	Jahon Amirebrahimi - Pacific Gas & Electric's Evaluation, Measurement, and Verification Team	22	What approach would you recommend for analyzing survey responses? Will we consider eligible non-participants in the survey as a counterfactual?	Yes, for certain survey questions we will consider eligible non-participants in the survey as a counterfactual. We added a section to the customer survey section about our analysis strategy.
4	Jahon Amirebrahimi - Pacific Gas & Electric's Evaluation, Measurement, and Verification Team	23	To what extent will customer load data for IOU's be necessary to assess PV system performance?	To assess PV system impacts, we will request PV system data from GRID and TPOs. If we are unable to get data from GRID and TPOs, we will explore requesting data directly from the participants/owners.



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5	<p>Jahon Amirebrahimi - Pacific Gas & Electric's Evaluation, Measurement, and Verification Team</p>	24	<p>Billing data is usually monthly and reports total and peak usage. Will this be sufficient (12 points per customer per year) be sufficient to capture an effect on such a small program population). Should we consider hourly fluctuations? And if we are looking for the full D-in-D effect, should we not include the Part_i variable as an additional term? Are there any customers that may have EV or storage which we should control for?</p>	<p>12 points per customer per year should be plenty to estimate overall annual kWh impacts, especially given how large the treatment effect is expected to be. Hourly load shape impacts are not necessary to estimate the overall kWh and bill impacts.</p> <p>Yes, we have modified the research plan to include Part_i as a standalone term to absorb any difference in baseline between the treatment and comparison group. Ideally the matched comparison group selection from the pool of non-participants will identify customers that are sufficiently similar in baseline energy usage that this term will be statistically insignificant.</p> <p>We won't always know if they have an EV but we can certainly require that participants with an EV rate be matched to nonparts with the same rate. If they get an EV during the study period, that's probably best to exclude rather than try to control for it. Storage is rare as an isolated technology, it is usually only installed alongside solar. If we know which of the participants are solar and storage, that would be a good group to analyze separately.</p>