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Appendix A: Logic Model and Metric Mapping

DAC-SASH Program Logic Model

The study included the development of a logic model and metrics for DAC-SASH, which allows for systematic assessment of that relatively new program. We employed a theory-driven evaluation framework that was guided by the program logic model, which identified causal mechanisms and supported 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 approach relies on mixed methods involving the collection and analysis of both quantitative and qualitative data covering program inputs, activities, outputs, and outcomes.¹The 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.

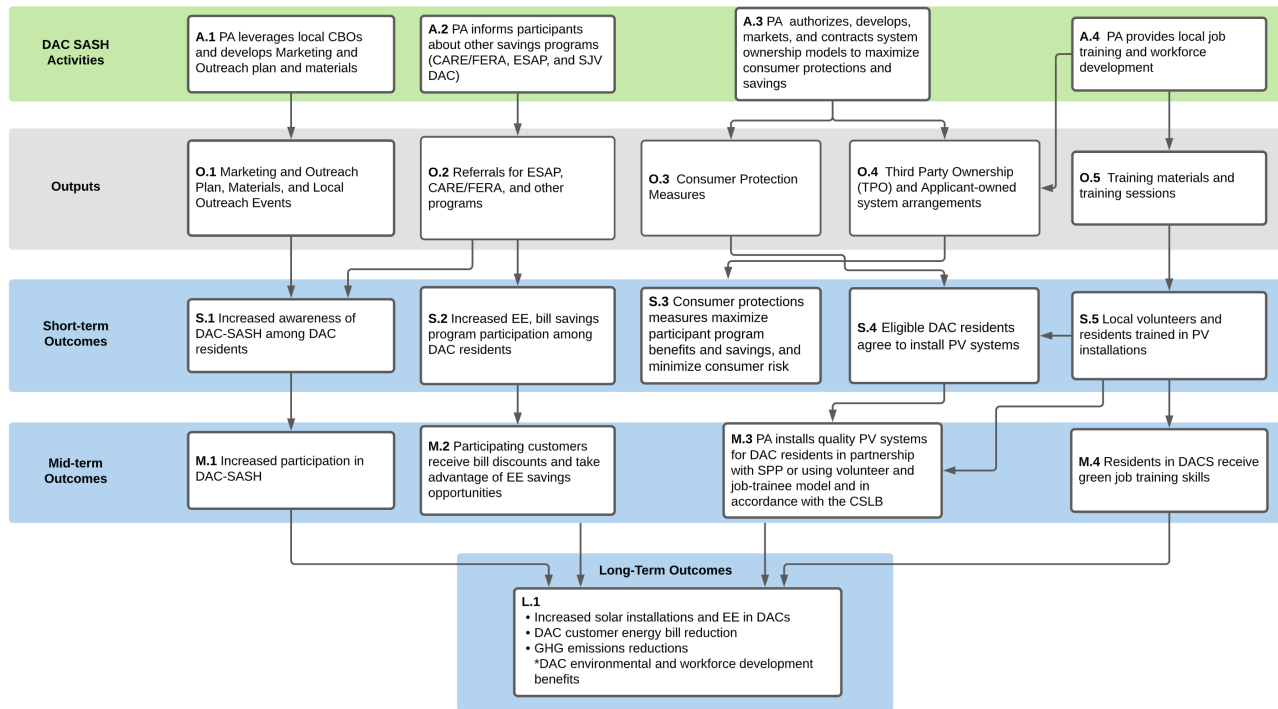
This type of evaluation approach is useful for programs that are intended to generate longer term outcomes. The approach facilitates early and regular assessments (as required in this case) to determine if the programs are on track by identifying immediate outputs and shorter-term outcomes that would 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 1 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 used to evaluate whether DAC-SASH is achieving its expected outcomes is linked to the theorized outcomes (following the logic model).

¹ 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 1: DAC-SASH Program Logic Model



Metrics

Evergreen identified a set of metrics (Figure 2) that were 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 2: Mapping of Metrics to Logic Model Outcomes

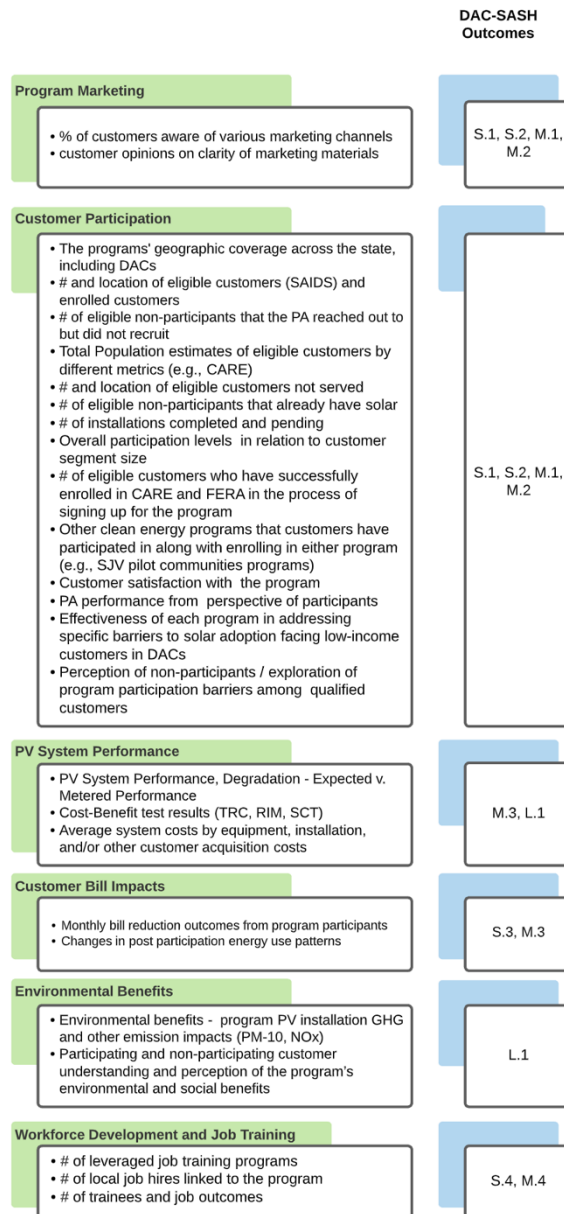


Figure 3 through Figure 8 detail the data sources required for each metric. We also include a bullet list of each of the outcomes from the logic model. First, Figure 3 describes that program background and implementation documents, PA program tracking data, participant and non-participant customer surveys, and interviews with PAs, IOUs, and M&Os will be utilized to measure the metrics for program and marketing targets. Figure 4 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 3: Program Administration and Marketing Metrics

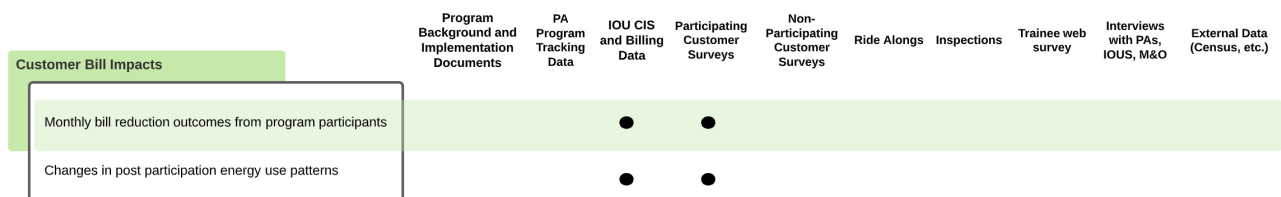
	Program Background and Implementation Documents	PA Program Tracking Data	IQU CIS and Billing Data	Participating Customer Surveys	Non-Participating Customer Surveys	Ride Alongs	Inspections	Trainee web survey	Interviews with PAS, IOUS, M&O	External Data (Census, etc.)
Costs by program, further broken down 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	●			●	●					



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 6). These metrics inform the outcomes listed below:

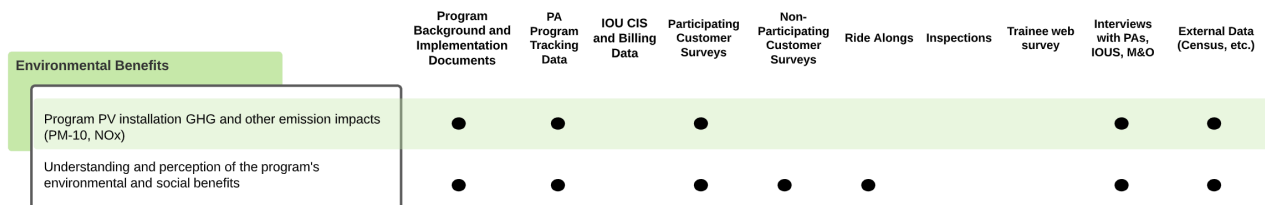
- Whether customer protections measures maximize participant program benefits and savings, and minimize consumer risk (S3); and
- To determine whether PA installs the PV systems for DAC residents in partnership with SPP or using volunteer and job-trainee model and in accordance with the CSLB (M3).

Figure 6: 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 7, 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 7: Environmental Benefits Metrics





Finally, Figure 8 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 8: Workforce Development and Job Training 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.)
Workforce Development & Job Training										
# of leveraged job training programs	•	•								
# of local job hires linked to the program	•	•								
# of trainees and job outcomes	•	•				•		•	•	



Appendix B: Methodology

Each of the research activities is described in more detail below.

1.1 Program Material & Documentation Review

Evergreen requested and reviewed the following information from the Program Administrator (PA), GRID Alternatives:

- Program organizational and management structure
- Program information systems, including the PA workflow management systems
- Existing PA database for applicable information
- Training events and tracking information
- Marketing, education, and outreach materials, plans, and a list of partnering organizations
- Accounting and disbursement methods, including contractor payment/compensation processes
- Program costs

We also reviewed the PA's website to collect publicly available reports, and reviewed the following legislative, policy, and research documents:

- Foundational documents for SASH including Senate Bill (SB) 1, D.07-11-045, Assembly Bill (AB) 217 (Bradford 2013), and D.15-01-027
- Foundational documents for DAC-SASH including Assembly Bill (AB) 327, D.18-06-027, D.20-12-003, and Resolution E-5020
- DAC-SASH and SASH Program Handbooks
- PA invoices
- PA implementation plans and budgets
- PA semi-annual reports

1.2 Customer Web Surveys

The web surveys collected information from volunteers and trainees, as well as from participants and non-participants. This section details the sample and survey approaches for the program participant survey, non-participant survey, and trainee survey.

1.2.1 Program Participants

We defined program participants as customers that had completed a solar project as of March 1, 2022. The survey gathered the following:

- 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 such as storage
- Environmental/social benefits

Survey Sample

We conducted a total of 134/368 surveys with program participants via a web survey. We drew our participating customer sample from PA tracking data and received contact information for 964 DAC-SASH/9,501 SASH program participants, for a response rate of 14%/4%.

We took measures to ensure a representative sample. We set soft targets for variables of interest, such as IOU, CARE/FERA status, Spanish-speaking, and Tribal. Table 1 shows the number of completes by each soft target.

Table 1: Customer Survey Soft Targets for Program Participants (DAC-SASH)

Customer Segment		Sample Size	Target	Completed	Response Rate
IOU	PG&E	654	69	73	11%
	SDG&E	25	3	1	4%
	SCE	285	54	60	21%
Tribal		22	1	3	14%
Any Spanish		193	34	19	10%
CARE/FERA	Enrolled	696	69	102	15%
	Not Enrolled	131	30	32	24%

Source: GRID DAC-SASH program tracking data provided on March 18, 2022.

Survey Approach

Most DAC-SASH contacts (99%) had an email address listed, but the outreach was conducted via mail and email to reach those that did not use their email regularly. We deployed a multi-modal approach with mailed postcards and email recruitment (see Appendix G for postcards and Appendix F for survey instruments). The survey invite was sent in both English and Spanish, and respondents could take it in either language, with an option to call in and take the survey over the phone in their preferred language. Eligible survey respondents also received an incentive of \$25 for completing the survey.

1.2.2 Program Non-Participants

We conducted a total of 121 surveys with eligible non-participants via a web survey. We drew our participating customer sample from PA tracking data and received contact information for 25,904

customers. Since we conducted the DAC-SASH and SASH evaluations simultaneously, we fielded the non-participant survey to customers and allowed respondents to screen into the survey whether they were eligible for DAC-SASH or SASH. In total, 773 customers responded to the survey; Table 2 shows the eligibility of survey respondents that we used for survey analysis and reporting in this report. Only DAC-SASH eligible respondents (n=121) were included in this DAC-SASH report, and SASH eligible respondents (n=154) were included in the SASH report.

Table 2: Eligibility of Non-Participant Survey Respondents

Assumed Sample	Sample Size	Completed Survey	Ineligible	DAC-SASH Eligible	SASH Eligible
DAC-SASH	24,480	654	470	116	68
SASH	1,424	118	27	5	86
Total	25,904	773	497	121	154

For non-participating customers, we targeted eligible, aware non-participants and eligible, unaware non-participants. Aware customers are households that have interacted with the PA and were deemed eligible but did not move forward with participation. Unaware customers are IOU customers that had never heard of the DAC-SASH program. We include both types of eligible non-participants to explore the full range of participant barriers (e.g., lack of awareness and issues with program requirements and the participation process).

We designed the non-participant survey so that responses from participants and eligible non-participants were comparable. Topics addressed include:

- Program marketing and enrollment barriers;
- Customer satisfaction (aware only);
- Effectiveness of programs in addressing barriers to participation (aware only);
- 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 such as storage; and
- Environmental/social benefits.

Survey Sample

For aware non-participants, we drew our sample from PA tracking data for customers deemed eligible but inactive. For unaware non-participants, we drew our sample from utility customer information system data (screening out the participating customers).

Determining eligibility for the program was the biggest barrier to collecting survey responses. Eligibility criteria, such as home type, income, and tenure, are not readily available in IOU CIS data. Evergreen used Census analysis to target regions with higher concentrations of eligible households

to encourage a higher eligibility rate than a random sample of all IOU customers. The sample requested was stratified by rural and urban customers and by selected and unselected tracts for high concentrations of eligible customers. Once we received IOU data, we set soft targets by IOU, CARE/FERA status, and language (Table 3).

Table 3: Unaware Non-Participant Customer Survey Soft Targets (DAC-SASH)

Customer Segment		DAC- SASH Target	Total Completed
IOU	PG&E	75	77
	SDG&E	13	1
	SCE	37	43
Any Spanish		45	10
CARE/FERA Enrolled		122	65
Total		125	121

Survey Approach

We used the same multi-modal approach as the participant survey, with slightly different language for aware and unaware customers (Appendix G: Survey Recruitment Postcards).² Additionally, we opened the survey with screening questions to identify the home type (i.e., single-family), homeownership, and income eligibility to ensure that our completed survey responses were from eligible non-participants. Eligible respondents received a \$25 incentive for participation.

1.2.3 Trainees and Volunteers

We fielded the trainee web survey in late September 2022. We received 1,637 contacts of trainees or volunteers who participated in either DAC-SASH or SASH solar installations. Of those contacts, 1,543 had email addresses, 1,332 were deliverable via email, and 114 completed the survey (9% response rate). Table 4 shows the sample frame received from the PA and the completions across the groups.

Table 4: Trainee Sample Frame

Group	Type	Count	% of Sample	Survey Respondents	% of Respondents
-------	------	-------	-------------	--------------------	------------------

²To protect against low response rates in the unaware population, we partnered with M. Davis and Company (MDAC) to conduct Computer-Assisted Telephone Interviewing (CATI) surveys. We initially planned to use the CATI surveys to supplement our web survey sample but ran into high costs per survey completed due to the low incidence rates. This provides an additional data point on the challenge of confirming eligibility using external data such as Census or IOU CIS data.

Trainee Type ³	Cohort (IBT)	246	15%	22	9%
	Intern	29	2%	3	3%
	SolarCorps	45	3%	5	4%
	None Listed	1,317	80%	84	74%
Project Region	Greater Los Angeles	486	30%	38	33%
	Bay Area	349	21%	22	19%
	Central Valley	336	21%	26	23%
	Central Coast	282	17%	18	16%
	North Valley	84	5%	5	4%
	Inland Empire	82	5%	3	3%
	San Diego	13	1%	1	0%
	Bay Area/North Coast	5	0%	1	0%
Number of Installations Attended	One	670	41%	48	42%
	Two – five	727	44%	38	33%
	More than five	240	15%	28	25%
Project Type	SASH Only	1,341	82%	90	79%
	DAC-SASH Only	136	8%	10	9%
	Both	160	10%	14	12%

Our survey instrument was designed with two tracts to capture the experiences of formal trainees who attended the PA’s curriculum (Install Basic Training (IBT)) and volunteers.

Topics addressed include:

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

Sample Design

We developed the sample using trainee tracking data from the PA. Most contacts (80%) did not have trainee type listed, as the field was added in 2019, so we could not stratify based on trainee type. Due to the low cost of distribution and expected low response rate, we emailed all viable contacts to recruit into the survey.

³ Respondents’ self-reported trainee type was often different than the program data. Here, we report the program data composition, and in the trainee findings section 4.10, we investigate the differences.

We initially targeted 50 completes from trainees who worked on DAC-SASH and 50 completes from trainees who worked on SASH projects, but after recruitment efforts, we could not reach more DAC-SASH trainees and were under target. In the analysis for the evaluation, we combine the DAC-SASH and the SASH samples and report on differences if applicable. Trainees who worked on DAC-SASH may have taken different training (IBT 200) than SASH trainees, but the curriculum was comparable, and the volunteer hour requirements for the two programs are the same. There were no significant differences in job outcomes (Figure 9) or distance required to travel to install sites between the groups (Figure 10). Additionally, trainees who worked on both DAC-SASH and SASH installations did not look significantly different from the SASH or DAC-SASH group.

Figure 9: Job Outcomes in Solar Industry by Program

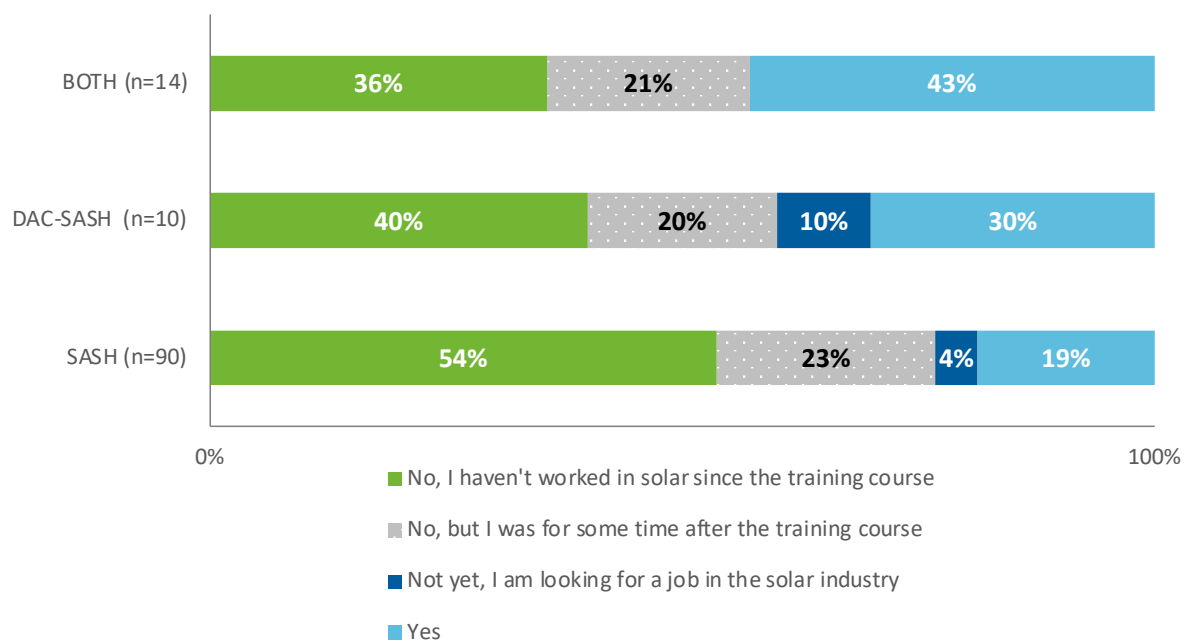
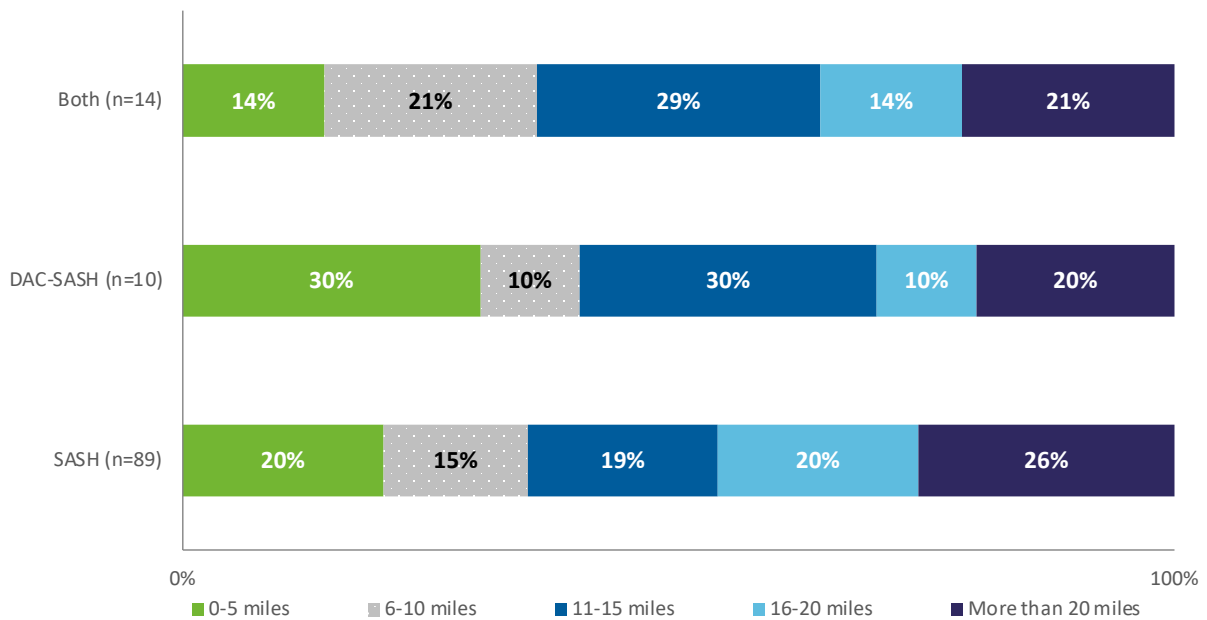


Figure 10: Travel to Installation Sites by Program



Survey Approach

Similar to the customer surveys, we distributed the survey via email with the option to call in to take the survey over the phone. Eligible respondents received a \$25 incentive for participation. The survey instrument is in Appendix F.

1.3 Qualitative Data Collection - Field Visits and In-Depth Interviews

We complemented the quantitative data collection with three qualitative data collection efforts to provide additional context and deeper insights into the issues highlighted by the survey data and market characterization. The qualitative data collection consisted of:

- Field visits to three different PA regional offices across California
 - Greater LA
 - Inland Empire
 - North Valley
- In-depth interviews with various stakeholders
 - IOU staff
 - PA staff
 - Executive Director
 - Regional Staff Members
 - Tribal Liaison

- CPUC tribal liaison
- M&O partners
- TPO partners

1.3.1 Field Visits

Evergreen completed in-person field visits to conduct research across three regions. The field visits covered observations of program processes and how the program is being implemented, customer interactions with PA outreach and installation staff, observations of solar installations, and training.

We selected three different regional offices for field visits with different activities planned for each. Table 5 details the dates and rationale for selection.

Table 5: Sites Selected for Field Visits

Site	Activities Planned	Rationale for Selection	Dates
North Valley – Sacramento	IBT Training Class, Onsite solar installation observations, in-person customer interaction observations and staff interviews	Large volume of projects in the Stockton area	May 23 – May 24, 2022
Greater Los Angeles	ME&O Event, in-person customer interactions	High cost of living area, unique construction barriers	July 20, 2022
Inland Empire – Riverside	Onsite solar installation observation, in-person customer contract signing, introductory customer onboarding	Subcontractor Program Participant (SPP) model, higher volume of tribal projects	Aug 16 – 18, 2022

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

SASH requires three volunteers from the Installer Basic Training Certificate Program to be involved in the solar installation process, and DAC-SASH requires at least one volunteer during an installation. Evergreen conducted in-person field visits to a solar installation to both observe and to interview the volunteers and the installers. On site, we interviewed the trainees on the following topics:

- Training experience
- Installation experience
- Program barriers and benefits

One resident was on-site during the visits and answered questions about their experience as well. This conversation covered:

- What customer expectations are as far as bill reductions
- How they heard about the program and why they decided to apply
- What barriers they might have faced before installation and any work they had to do to get their home ready

- What they understand about environmental benefits of the program
- If they have heard of or applied for any leveraged programs
- What they expect in terms of bill savings

Trainings (Trainers and Trainees)

We attended a full day of the Install Basics Training class and conducted mini-interviews with trainees. These discussions informed questions for the trainee web survey. The objectives for conversations with trainees were to:

- Understand how trainings fit into the trainee's broader career objectives
- Understand what installation experience they have
- Confirm that local volunteers and residents are trained in PV installations
- Confirm that residents in DACs are receiving green job training skills
- Understand the value of training materials and training sessions

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

Evergreen attended two M&O events with PA staff to observe customer interactions and M&O staff strategies and approaches. We also had discussions with staff members on marketing and outreach topics to inform other data collection efforts. These discussions asked:

- Which name is being used to market the program and are customers more familiar with GRID or the CPUC when discussing the program
- How marketing strategies are developed
- Partner views on needs of certain customer segments
- Concerns regarding consumer protection
- Barriers to and drivers of participation (geographic boundaries, program understanding, income levels)
- Co-enrollment in other programs
- Value of leads received from GRID, if any
- Suggestions for improving ME&O to increase participation

1.3.2 In-Depth Interviews

At the beginning of the project, Evergreen staff conducted telephone and online video interviews with eight PA staff members, including the executive director. These interviews covered the staff members' organizational and administrative background, their perspectives on evaluation topics and questions, and the progress and performance of the program to date. Takeaways from these interviews informed the design of the survey, other interviews with stakeholders, and other data collection efforts. Table 6 shows the stakeholders contacted for in-depth interviews.

Table 6: Stakeholder Interviews Conducted

Stakeholder	Contact Source	Interviews
GRID - 7 regional offices and 1 main point of contact	GRID	8
IOUs	CPUC	4
M&O Partners (CBOs)	GRID	3
CPUC Tribal Liaison	CPUC	1
Solar Companies (TPO partner/ Sunrun, and others)	GRID	1

The interviews gathered 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
- Use of gap funding
- Effectiveness in educational follow-up visit provided after installation
- Promotion of other related programs
- Customer awareness of environmental/social benefits

To develop topics for each interview, Evergreen referenced the research plan table that maps evaluation metric categories to data sources. Evergreen also reviewed the Research Plan for any additional research issues in-depth interviews could help to address. See Appendix E: In-Depth Interview Guides for more detail.

1.4 Eligibility and Program Penetration Analysis

The goal of this analysis was to create a general picture of the DAC-SASH eligible population in California. Analysis of these secondary data sources resulted in the following:

- Characterization of the DAC-SASH eligible population in California based on the most recent data available
- Geographic distribution of eligible households (IOU service territory, climate zone, disadvantaged community, PA regional office area, etc.)
- Program penetration rates for DAC-SASH
- Characterization of the underserved, eligible population (i.e., languages spoken at home)

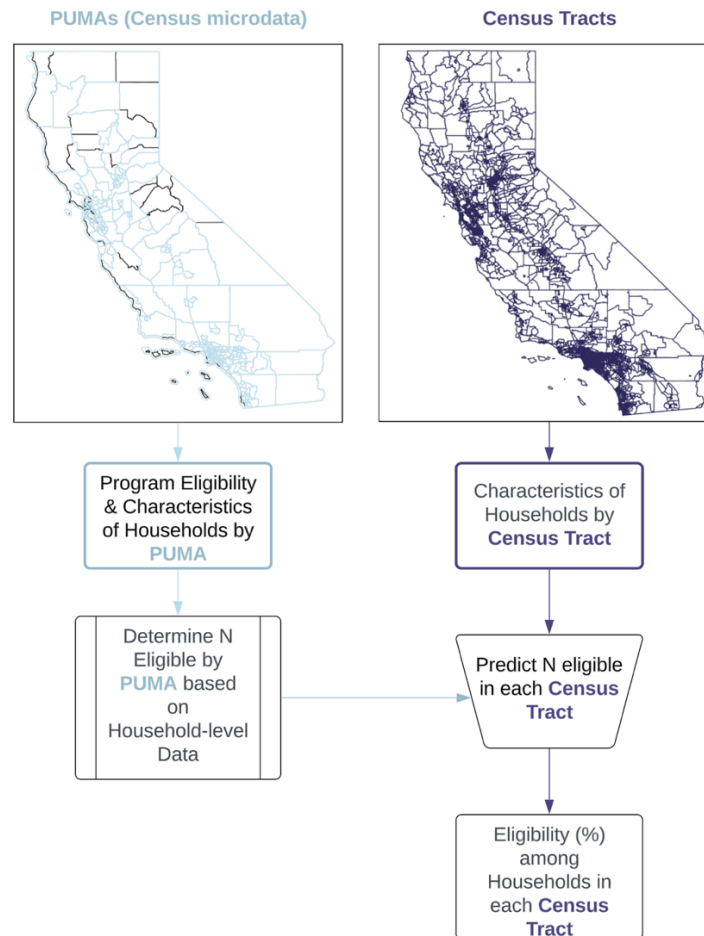
Evergreen utilized data from multiple existing sources to develop a statewide characterization of the DAC-SASH eligible population.

- 2019 US Census and American Community Survey (ACS) data by Census tract
- 2019 US Census Public Use Microdata Sample (PUMS) files

- 2022 IOUs' Customer Information System (CIS) data

Figure 11 provides a flow chart summarizing our approach, including the three distinct data sources (listed below the maps). The result of this analysis yielded estimates of the population of eligible households in the state of California by tract that receive electric service from one of the participating IOUs. In the remaining section, we detail how we calculated each step.

Figure 11: Flow Chart of Method for Estimating the Eligible Population



1.4.1 Eligibility for DAC-SASH

Evergreen used U.S. Census data to identify the eligible population within the state. While this public data source is only available aggregated or anonymized (with less geographic granularity), it provides the best available characterization of IOU customers in the absence of conducting costly primary customer research.

The American Community Survey (ACS) is conducted by the US Census Bureau on an annual basis and provides detailed statistics about the social and economic needs of local communities. The

ACS Public Use Microdata Sample (PUMS) files provide a wealth of information, with anonymized survey responses from individual housing units and weights to allow for custom tabulation.⁴ This trusted public data source provides an opportunity for Evergreen to clearly define and characterize the population of households eligible for participation in DAC-SASH in each region. However, the data has been anonymized, meaning that it is not possible to identify specific households that are eligible, and that should be targeted for participation.

Table 7 provides a list of specific fields available in the 2019 ACS PUMS files that we utilized for the analysis. We calculated each household's income as a percentage of the FPL, and then characterized the eligible population by filtering for owner-occupied, single-family housing units. Note that with PUMS data, we cannot determine if the sampled population identified as eligible resides within a DAC or not. In the next section, we explain the geographic adjustments we made to the sample to better estimate eligibility within the applicable geographies (DACs).

Table 7: Data Utilized from the ACS PUMS

Field	Description	Intended Use
TYPE	Type of unit (to exclude institutional and group housing)	Determine eligibility for DAC-SASH/SASH
TEN	Tenure (own vs. rent)	
SVAL	Specified owner unit	
BLD	Units in structure	
NP	Number of persons in housing unit	Calculate household income as a % of FPL
HINCP	Household income	
PAP	Presence of persons 60 years and over in household	Characterize the population
FS	Indicator for receiving food stamps/SNAP	
HHL, LINGI	Household language, limited-English speaking household, language spoken at home	
DIS	Indicator for disability in the household	
AGEP	Age	
FES	Family type	
HUPAC	Household presence and age of children	
ACCESS	Indicator for access to the Internet	
SSP	Social security income indicator	
YBL	Year when structure was first built	

⁴ US Census Bureau. *American Community Survey Public Use Microdata Sample (PUMS) Documentation*. Accessed October 2022. <https://www.census.gov/programs-surveys/acs/technical-documentation/pums.html>

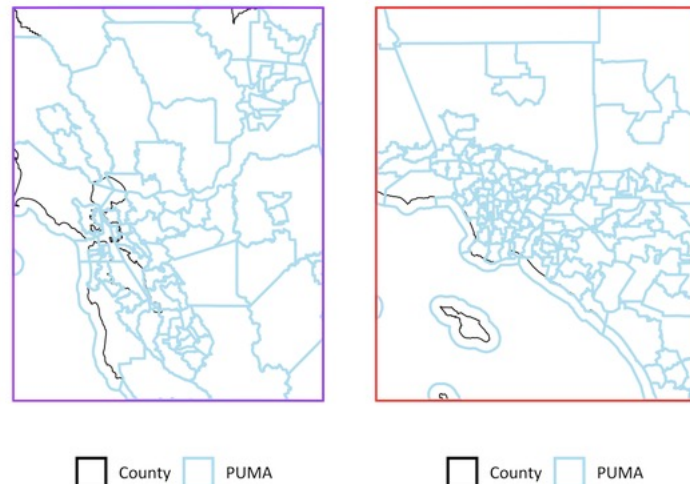
Geographic Adjustments

To maintain respondent privacy, the PUMS data extracts do not list Census tracts or block groups for each household; instead, the extracts list Public Use Microdata Areas (PUMAs). Figure 12 shows a map of the state of California with the ACS PUMAs outlined in blue and counties outlined in black. PUMAs are designed to follow county boundaries, with each area representing at least 100,000 people. In more densely populated areas, PUMAs are very small, as shown in the Bay Area (purple box) and Los Angeles (red box) cutouts in Figure 13.

Figure 12: California State Public Use Microdata Areas (PUMAs)



Figure 13: Bay Area and Greater LA Public Use Microdata Areas



Evergreen used R software to overlay the geographic boundaries of the California service territory with the sampling regions of the public data (i.e., Census tract, PUMA, county). This step is critical in tabulating the eligible population within comparable geographic regions.

After we adjusted our estimates of the total population to focus IOU service territory, we compared our estimates of the eligible households in each region against the number of program participants to determine the current program penetration.

1.4.2 Linear Regression Modeling

We developed and estimated statistical regression models to explain the variation in household income-eligibility across PUMAs and what characteristics (that we may also observe at the tract and county level) might predict higher or lower rates, holding all other variables constant. The final set of explanatory variables included in the regression models are a subset of the variables shared across data sources (i.e., PUMS vs. Census data at the tract level) and were selected based on their incremental relationship to the respective dependent variable.⁵ Many pairs of variables within the Census data sets were highly correlated—that is, they have a strong positive or negative linear relationship. Because of this, they have the same or very similar relationship with the dependent variable, which can lead to problems in the estimation of the econometric model. For this reason, the final model specification shown in Equation 1 is limited to

⁵ For instance, we tested a variation of the models to account for differences in urban vs. rural geography across PUMAs via the proportion of the population currently residing in metropolitan (as opposed to non-metropolitan) regions. This metric was developed by the U.S. Department of Agriculture Economic Research Services (USDA ERS) by PUMA. The coefficient on this variable was small and statistically insignificant for all eligibility models. Hence, it was not included in the final specification.

a subset of variables selected for their explanatory power and ease of interpretation. We explored a variety of model specifications, including the use of interaction terms.

Equation 1: Linear Regression Model of Eligibility in PUMAs

$$\ln(\text{Eligible}_i) = \alpha_i + \beta_1 \ln(\text{LT20}k_i) + \beta_2 \ln(\text{Inc35}k_i) + \beta_3 \ln(\text{Inc50}k_i) + \beta_4 \ln(\text{Inc100}k_i) + \beta_5 \ln(\text{GT100}k_i) + \beta_6 \ln(\text{Owner}_i) + \text{AvgSize}_i + \varepsilon_i$$

Where:

Eligible_i = Number of households eligible for assistance, in PUMA region i

$\text{LT20}k_i$ = Proportion of households with annual income less than \$20,000

$\text{Inc35}k_i$ = Proportion of households with annual income between \$20,000 and \$35,000

$\text{Inc50}k_i$ = Proportion of households with annual income between \$35,000 and \$50,000

$\text{Inc100}k_i$ = Proportion of households with annual income between \$50,000 and \$100,000

$\text{GT100}k_i$ = Proportion of households with annual income greater than \$100,000

Owner_i = Proportion of households that are owner occupied

AvgSize = Average number of people in each household

$\ln()$ = Natural logarithm transformation

α, β = Coefficients estimated

ε = Random error term

Next, we applied these coefficients (which were estimated in the model) to tract-level data from the ACS to estimate the number of eligible households within each Census tract in California, as shown in Equation 2.

Equation 2: Estimated Eligibility in Census Tracts

$$\ln(\text{Eligible}_c) = \hat{\alpha}_i + \hat{\beta}_1 \ln(\text{LT20}k_c) + \hat{\beta}_2 \ln(\text{Inc35}k_c) + \hat{\beta}_3 \ln(\text{Inc50}k_c) + \hat{\beta}_4 \ln(\text{Inc100}k_c) + \hat{\beta}_5 \ln(\text{GT100}k_c) + \hat{\beta}_6 \ln(\text{Owner}_c) + \text{AvgSize}_c$$

$$\text{Eligible}_c = e^{\ln(\text{Eligible}_c)}$$

Where:

Eligible_c = Number of households eligible for assistance, in Census Tract c

$\hat{\alpha}, \hat{\beta}$ = Coefficients estimated in the regression model (of PUMAs)

$\text{LT20}k_c, \text{Inc35}k_c, \dots$ = Characteristics of region c

e = Mathematical constant, the inverse of the natural log, $\ln()$

Our final estimates were at the Census tract level because DAC-SASH has a geographic eligibility component at the tract level.

1.4.3 Program Penetration

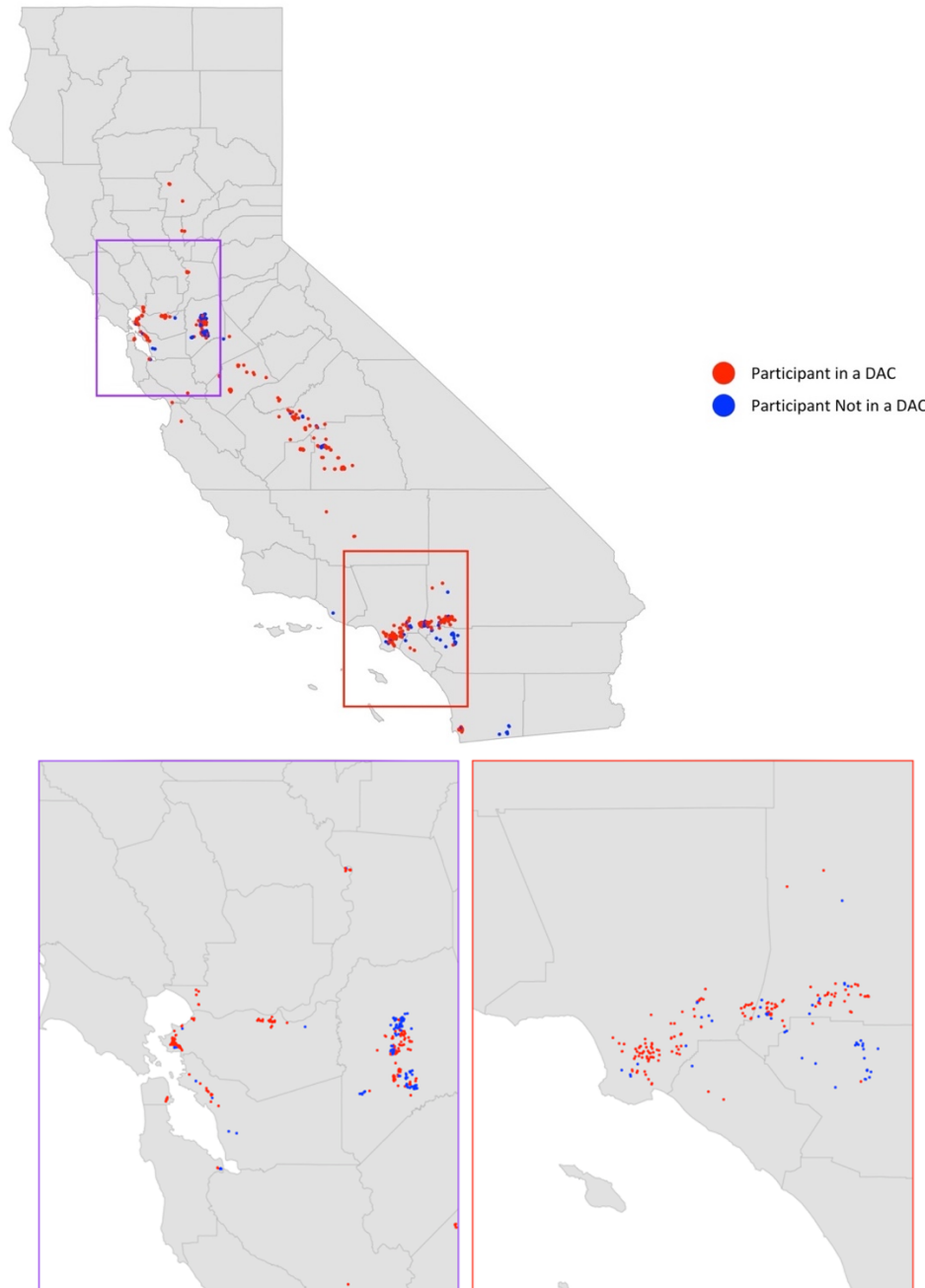
For this phase of the analysis, we defined “participants” as households that were marked as completed in the PA database of all DAC-SASH projects as of February 2022. Note that some households may have had a system installed by February 2022 but were not counted if the PA had not received the incentive from the IOU.

We compared the number of program participants to our estimates of the eligible households in each region to determine the current program penetration rate. Comparing this metric across

regions allowed us to compare characteristics of areas with low penetration with areas with higher penetration.

Figure 14 shows the location of every program participant in California. These data were used as the basis for our count of total participants to calculate penetration. The purple and red boxes are zoomed in to show more detail in the Bay Area and Greater LA Area.

Figure 14: All DAC-SASH Program Participants





1.5 Secondary Analysis – Billing and PV Impact Analysis

For the impact analysis, we used regression analysis to estimate the energy savings attributed to a solar panel installation above and beyond any natural change observed in a control group comprised of future participants (i.e., eligible households who later decided to install solar through the program).

1.5.1 Data Cleaning and Exclusion Criteria

Table 8 provides a summary of every data source we utilized for the impact evaluation, the fields provided, sample coverage (e.g., number of premises and range of dates), and how the data were used. After receiving each data source, we conducted data quality checks before preparing the data for analysis (e.g., flagging outliers and identifying and addressing missing values).

Table 8: Data Sources for the DAC-SASH Evaluation

Data Source	Unique Fields	Coverage	Intended Use
IOU CIS Data on Non-Participants	Service Account ID, rate code, and home location	n=11,736	Comparison group selection, segmentation (customer and home characteristics)
PA Program Tracking Database	Solar system details (program, year of participation, system size, TPO flag, and first completion date)	n=955	Install date for the regression models, segmentation (customer and solar system characteristics)
IOU Monthly Billing Data	Electricity costs, kWh usage, billing period start and end date	n=11,614 premises 2008-2022	Comparison group selection, monthly regression models for estimates of energy and cost savings
IOU Daily Advanced Metering Infrastructure (AMI) Usage Data	Daily electricity consumption	n=11,630 premises 2008-2022	Comparison group selection, daily regression models for estimates of energy savings
IOU Hourly Advanced Metering Infrastructure (AMI) Usage Data	Hourly electricity consumption	n=100 premises (includes some SASH participants) 2008-2022	Hourly regression models for estimates of energy and demand savings
National Oceanic and Atmospheric Administration (NOAA) Weather Data	Hourly interval outdoor air temperature	n=44 stations 2008-2022	Weather normalization (actual weather)
Typical Meteorological Year (TMY3) Weather Data	Typical weather conditions, based on historical outdoor air temperature	n=44 stations	Weather normalization (typical weather)

Participant Attrition

Table 9 shows the number of participants who were excluded from the impact analysis and the reason for their removal. Most notable were the records that did not have 8 months of pre-install or 8 months of post-install data (15% of participants), including those for which we did not receive any billing or AMI data at all (6% of participants).⁶

⁶ We loosened the restrictions from 12 months of usage and costs pre- and post-install to include more homes in the analysis, and specifically to include homes that participated in 2021. This change led to the retention of an additional 2 homes in 2019, 13 homes in 2020, and 216 homes in 2021 being included in the analysis. In other words, 2% of the 2019 homes, 3% of the 2020 homes, and

In the end, we were able to retain 77 percent of the DAC-SASH participant sites for the regression models.

Table 9: Participant Attrition Affecting the DAC-SASH Impact Analysis

Exclusion Criteria	Sites Dropped	Remaining Sites	%
In Tracking Database	-	955	100%
Missing Solar Install Date	7	948	99%
No Billing or AMI Data was Provided ⁷	54	894	94%
Less than 8 Months Pre- or 8 Month Post-Install	144	750	79%
No Bill Cost for Pre- or Post-Install Months	16	734	77%
In Regression Models	-	734	77%

Table 10 shows some of the home characteristics for the full list of homes found in the tracking database compared to the homes that were used for the impact analysis. The distribution by utility and owner, and the average PV size is similar for the two groups.

Table 10: Characteristics of Participating Homes

Source	Participating Homes	Percentage				Average Size
		TPO	PG&E	SCE	SDG&E	
Tracking Database	955	89%	68%	29%	3%	3.7
Impact Analysis	734	89%	68%	29%	2%	3.6

Identifying Outliers

Evergreen identified outliers in kWh energy consumption (i.e., individual observations) as well as customers with unusual energy consumption patterns. An outlier was defined as any individual kWh reading that was more than three times the distance of the interquartile range (IQR) from the

100% of the 2021 homes included in the analysis have fewer than 12 months of pre- and/or post-install energy usage and costs. Due to limitation in data availability, many sites are missing post-installation data from September to December. Our regression model attempts to correct for this imbalance by including calendar month as an explanatory variable. However, there is still a risk that the savings estimate for program year 2021 will be inflated due to this imbalance in months, with less generation in late fall and early winter (the missing months) due to having fewer hours of daylight.

⁷ Some of the data that was requested for this evaluation was archived or unavailable, leading to significant delays in obtaining the billing data for analysis. The evaluation team moved forward with the best available data from all three utilities.

median interval measurement for that customer.⁸ A little over 65 percent of the sites in the DAC-SASH analysis had at least one flagged outlier in the kWh data used for the regression models, with the most extreme site having 33 percent of its daily kWh data flagged in the data used for the models (this was still sufficient to proceed with modeling) and the average site in the DAC-SASH kWh datasets having less than 4 percent of its daily kWh data flagged.

We estimated baseline models with and without these flagged outliers to assess the relative model fit; we concluded that removing outliers (1% of the daily observations on the gross kWh regression models) led to a slight improvement in the model fit; for this reason, outliers were removed in the models presented in this report.

1.5.2 Billing Impacts

We conducted an analysis of pre and post participation billing data to:

- Estimate monthly bill reduction outcomes for program participants
 - Compare estimates across those who own their systems and those who are engaged in a TPO construct
- Estimate changes in post-participation customer energy usage patterns

DAC-SASH used a comparison group of customers in DACs who were enrolled in CARE. The only eligibility criteria that we were not able to filter on is home ownership, we believed this would have little to no impact on our ability to identify a strong matched comparison customer with similar energy usage and bill costs as the DAC-SASH program participants.

We requested monthly billed electricity usage (kWh) and charges (\$), daily interval AMI data (kWh), rate code, and some basic information from each customer account such as zip code, climate zone, home type, and tenure. We requested data for all participating customers that received incentives through the PA during all the study years (2019-2022) as well as a large random sample (10:1) of similar non-participating customers that had not received incentives through the programs. We used the comparison homes to measure any significant changes in energy consumption due to program participation, rather than external factors like changes in building codes or the COVID-19 pandemic shelter-in-place orders.

As a first step in this process, we created a matched comparison group of non-participants with similar energy consumption and bill costs as the participants before the solar installation. Each selected comparison customer came from a location that had similar cooling degree days as the matched participant. While it would have been preferable to limit the comparison group to eligible non-participants, IOU data do not reliably provide home ownership data. All we know is the average income and ownership rates within the region and whether the individual customer is

⁸ This definition of an outlier is based on CalTRACK rule 2.3.6. The IQR is a measurement of variability. The rank-ordered data are divided into four equal parts called quartiles. The IQR measures the distance between the first and third quartiles, corresponding to the 25th and 75th percentiles, containing the middle 50 percent of observations.

enrolled in CARE/FERA, which is available to everyone below 200 percent of the Federal Poverty Line (FPL). We prioritized finding a strong match on the two metrics we were attempting to measure: bill cost and fuel consumption, while only considering non-participants that had cooling degree days that were within 20% of the participants cooling degree days during the pre-period. Non-participants with self-funded solar and Net Energy Metering (NEM) were allowed to be selected into the comparison group, as solar adoption can occur without program assistance. The comparison group was used to help control for the impact of the COVID-19 pandemic and other external factors that changed over time.

Net Daily Regression Model

We used the model specification in Equation 3 to estimate the net daily savings impacts (kWh and \$ per day) for comparison homes. This model includes heating degree days (HDD) and cooling degree days (CDD) to control for variability in weather. The coefficients on $CDD * Treat$ and $Daylight * Treat$ control for any difference between the treatment and control groups prior to the installation of solar panels. The coefficients on $Post$, $CDD * Post$, and $Daylight * Post$ are intended to absorb the impact of the COVID-19 pandemic and any other changes over time that are shared across the treatment and control groups. The regression includes a series of monthly indicator variables to help control for variability in energy usage across the year that is seasonal but unrelated to temperature, such as energy usage for cooking and lighting. We tested the inclusion of additional interaction terms, dropping any that were not statistically significant and that did not improve the model fit.

Equation 3: Net Daily Fixed Effects Regression Model

$$\begin{aligned}
 kWh_{i,t} = \alpha_i + \sum_{Month=1}^{11} \beta_{Month} Month_t + \beta_C CDD_{i,t} + \beta_H HDD_{i,t} + \beta_D Daylight_{i,t} + \beta_P Post_{i,t} \\
 + \beta_{CP} CDD * Post_{i,t} + \beta_{DP} Daylight * Post_{i,t} + \beta_{CT} CDD * Treat_{i,t} \\
 + \beta_{DT} Daylight * Treat_{i,t} + \beta_{TP} Treat * Post_{i,t} + \beta_{CTP} CDD * Treat * Post_{i,t} \\
 + \beta_{DTP} Daylight * Treat * Post_{i,t} + \varepsilon_{i,t}
 \end{aligned}$$

Where:

- $kWh_{i,t}$ = Actual daily energy usage for customer i during time interval t ⁹
- α_i = Customer specific fixed effect (i. e., baseline consumption)
- $Month$ = Month of the year dummy variables (Feb to Dec, omitting Jan)
- CDD = Cooling degree days calculated from a baseline temperature of 65°F
- HDD = Heating degree days calculated from a baseline temperature of 65°F
- $Daylight$ = Hours of daylight (between dawn and dusk) during time interval t
- $Treat$ = Dummy variable (0, 1) for customers assigned to the treatment group

⁹ Actual daily costs for customers were also estimated using this model.

$$\begin{aligned}
 Post &= \text{Dummy variable (0, 1) for the period after the solar was functional}^{10} \\
 \beta_{TP}, \beta_{CTP}, \beta_{DTP} &= \text{Average impact post install for each additional CDD and daylight hour} \\
 \varepsilon &= \text{Random error assumed to be normally distributed}
 \end{aligned}$$

The resulting model fits are presented in Table 11. The table shows the sample size, number of observations, and R-squared values of the final daily kWh and daily cost net regression models.¹¹ The R-squared values of the daily models ranged from 0.30 to 0.47, which is in line with what we have seen for this type of program evaluation with diverse participants and a long study period. Despite the low R-squared values, nearly all coefficients and resulting estimates of the savings impacts were statistically significant. We estimated many variations of these models, and the R-squared values observed in these final model specifications were some of the highest that we observed. Removing daily outliers slightly improved the R-squared values but had no statistically significant impact on the coefficient estimates.

Table 11: Daily kWh Net Regression Model Fit by Program and Year of Participation

Model	Sample Size			N	R-sq
	Total	Treatment	Control	Observations	
Daily kWh	1,468	734	734	1,017,068	0.470
Daily Costs	1,468	734	734	1,006,784	0.304

Source: Evergreen analysis of energy consumption of program participants and matched comparison group.

The estimated regression coefficients from this model, combined with average weather conditions from the year of participation and number of daylight hours, produce estimates for electricity savings (kWh) that result from being treatment by the program (i.e., installing solar), as shown in Equation 4. These are net savings, impacts above and beyond any natural change observed in the matched comparison group.

Equation 4: Estimated Annual Net Savings Impact

¹⁰ A customized install date was used for customers in the treatment group and an assigned install date was used for the control group.

¹¹ An R-squared value is a statistical measure of how close the data are to the fitted regression line. The R-squared value can range from 0 to 1, where the value of 1 means the model exactly matches the data feeding into the model.

$$Savings_{ITT} = \hat{\beta}_{Treat*Post} * Days_{Year} + \hat{\beta}_{CDD*Treat*Post} \sum CDD_{Year} + \hat{\beta}_{Daylight*Treat*Post} \sum Daylight_{Year}$$

Where:

$$\begin{aligned} \hat{\beta} &= \text{Coefficients estimated in the regression model}^{12} \\ Days_{Year} &= \text{Count of days in the year of post participation} \\ \sum CDD_{Year} &= \text{Sum of cooling degree days during the year of post participation} \\ \sum Daylight_{Year} &= \text{Sum of daylight hours during the year of post participation} \end{aligned}$$

Gross Daily Regression Model

We used a similar model specification in Equation 5 to estimate the overall energy savings (kWh) and bill cost (\$) impacts for homes that participated under each program and year separately. Like the net impact model, we included a series of monthly indicators, HDD, CDD, and hours of daylight. A series of year indicator variables were included to help control for variability in energy usage over time (e.g., changes in appliance standards). We tested the inclusion of additional interaction terms, dropping any that were not statistically significant and that did not improve the model fit. The impact of solar is seen in the *Post* indicator and interactions between *Post*, *CDD*, and *Daylight*.

Equation 5: Gross Daily Fixed Effects Regression Model

$$kWh_{i,t} = \alpha_i + \sum_{Month=1}^{11} \beta_M Month_t + \sum_{Year=1}^{14} \beta_Y Year_t + \sum_{Year=1}^{13} \beta_I YearSince_t + \beta_V COVID_{i,t} + \beta_C CDD_{i,t} + \beta_H HDD_{i,t} + \beta_D Daylight_{i,t} + \beta_P Post_{i,t} + \beta_{CP} CDD * Post_{i,t} + \beta_{DP} Daylight * Post_{i,t} + \varepsilon_{i,t}$$

Where:

$$\begin{aligned} kWh_{i,t} &= \text{Actual daily energy usage for customer } i \text{ during time interval } t^{13} \\ \alpha_i &= \text{Customer specific fixed effect (i. e., baseline consumption)} \\ Month &= \text{Month of the year dummy variables (Feb to Dec, omitting Jan)} \\ Year &= \text{Year dummy variables (2009 to 2022, omitting 2008)} \\ YearSince &= \text{Number of years since install dummy variables (1 to 13, omitting 0)} \\ COVID &= \text{Dummy variable representing the period after March 15, 2020} \\ CDD &= \text{Cooling degree days calculated from a baseline temperature of } 65^\circ\text{F} \\ HDD &= \text{Heating degree days calculated from a baseline temperature of } 65^\circ\text{F} \\ Daylight &= \text{Hours of daylight (between dawn and dusk) during time interval } t \\ Post &= \text{Dummy variable (0, 1) for the period after the solar was functional} \\ \beta_P, \beta_{CP}, \beta_{DP} &= \text{Average impact post install for each additional CDD and daylight hour} \\ \varepsilon &= \text{Random error assumed to be normally distributed} \end{aligned}$$

¹²For participants from a specific program and year

¹³ The daily bill costs were estimated using the same model specification, with a different dependent variable.

The resulting model fit is presented in Table 12 **Error! Reference source not found.** and Table 13. These tables show the sample size, number of observations, and R-squared values of the final daily kWh and daily cost gross regression models by program and participation year.¹⁴ The R-squared values of the daily models ranged from 0.21 to 0.42, which is in line with what we have seen for this type of program evaluation with diverse participants and a long study period. Despite the low R-squared values, nearly all coefficients and resulting estimates of the savings impacts were statistically significant. We estimated many variations of these models, and the R-squared values observed in these final model specifications were some of the highest that we observed. Removing daily outliers slightly improved the R-squared values but had no statistically significant impact on the coefficient estimates.

Table 12: Daily kWh Gross Regression Model Fit by Program and Year of Participation

Program - Year	Sample Size			N Observations	R-sq
	Total	Treatment	Control		
DAC-SASH ('19-'21)	734	734	0	2,425,533	0.368
DAC-SASH - 2019	132	132	0	424,990	0.428
DAC-SASH - 2020	386	386	0	1,312,202	0.360
DAC-SASH - 2021	216	216	0	688,341	0.391

Source: Evergreen analysis of energy consumption of program participants for program years 2019-2021

Table 13: Daily Costs Gross Regression Model Fit by Program and Year of Participation

Program - Year	Sample Size			N Observations	R-sq
	Total	Treatment	Control		
DAC-SASH ('19-'21)	734	734	0	2,528,294	0.248
DAC-SASH - 2019	132	132	0	520,548	0.356
DAC-SASH - 2020	386	386	0	1,316,659	0.213
DAC-SASH - 2021	216	216	0	91,087	0.302

Source: Evergreen analysis of electricity costs of program participants for program years 2019-2021

The estimated regression coefficients from this model, combined with average weather conditions from the year of participation and number of daylight hours, produce estimates for electricity savings (kWh) that result from installing solar panels, as shown in Equation 6.

¹⁴ An R-squared value is a statistical measure of how close the data are to the fitted regression line. The R-squared value can range from 0 to 1, where the value of 1 means the model exactly matches the data feeding into the model.

Equation 6: Estimated Gross Savings in First Year

$$Savings_{ITT} = \hat{\beta}_{Post} * Days_{Year} + \hat{\beta}_{YearSince_1} * Days_{Year} + \hat{\beta}_{CDD*Post} \sum CDD_{Year} \\ + \hat{\beta}_{Daylight*Post} \sum Daylight_{Year}$$

Where:

$$\hat{\beta} = \text{Coefficients estimated in the regression model}$$

$$Days_{Year} = \text{Count of days in the year}$$

$$\sum CDD_{Year} = \text{Sum of cooling degree days during the year post participation}$$

$$\sum Daylight_{Year} = \text{Sum of daylight hours during the year post participation}$$

Hourly Regression Model

The hourly model uses an ordinary least squares (OLS) regression with time-of-week indicators, heating degree-hours (HDH) and cooling degree-hours (CDH) to explain the variability in energy usage in terms of the day-of-week, time-of-day, and outdoor air temperature, as shown in Equation 7.¹⁵ We tested additional interaction terms, and then dropped any that were not statistically significant and did not improve the model fit.

Equation 7: Hourly Regression Model

$$kWh_t = \sum_{TOW=1}^{47} \beta_{TOW} TOW_t + \sum_{S=1}^3 \beta_S Season_t + \sum_{Year=1}^{14} \beta_Y Year_t \\ + \sum_{Year=1}^{13} \beta_I YearSince_t + \beta_C CDH_t + \beta_H HDH_t + \beta_D Daylight_t + \beta_P Post_t \\ + \beta_{CP} CDH * Post_t + \beta_{DP} Daylight * Post_t + \varepsilon_{i,t}$$

Where:

$$kWh_t = \text{Energy consumption during time interval } t$$

$$TOW = \text{Indicator variables representing the time – of}$$

$$\quad \text{– week, 24 hours for two day types (weekdays vs. weekends)}$$

$$Season = \text{Season variable (spring, summer, and winter, omitting fall)}$$

$$Year = \text{Year dummy variables (2009 to 2022, omitting 2008)}$$

$$YearSince = \text{Number of years since install dummy variables (1 to 13, omitting 0)}$$

$$COVID = \text{Dummy variable representing the period after March 15, 2020}$$

$$CDH = \text{Cooling degree hours calculated from a baseline temperature of } 65^{\circ}\text{F}$$

$$HDH = \text{Heating degree hours calculated from a baseline temperature of } 65^{\circ}\text{F}$$

$$Daylight = \text{Dummy variable for daylight during time interval } t$$

$$Post = \text{Dummy variable (0, 1) for the period after the solar was functional}$$

$$\beta_P, \beta_{CP}, \beta_{DP} = \text{Average impact post install for each additional CDD and daylight hour}$$

¹⁵ Degree-day terms estimate a linear increase in energy usage for each additional degree below or above the baseline temperature (65 degrees Fahrenheit), when heating or cooling is likely required.

ε = Random error assumed to be normally distributed

The resulting model fit is presented in Table 14 below. This table shows the sample size, number of observations, and R-squared values of the final hourly regression model. The R-squared values of the hourly model was 0.30, which is somewhat similar to the daily models. We tested inclusion of additional variables and interaction terms but saw no additional improvement in the explanatory power. All coefficients were statistically significant, indicating that we were able to extract a signal for the key impacts that we were trying to measure amidst the noise in the data.

Table 14: Hourly Regression Model Fit

Analysis Group	Program	Sample Size			N Observations	R-sq
		Total	Treatment	Control		
Gross	SASH 1.0 (n=22), SASH 2.0 (n=25), DAC-SASH (n=53)	100	100	0	6,637,883	0.300

The estimated regression coefficients from this model, combined with average weather conditions from 2022, produce estimates for hourly gross electricity savings (kWh) for the year 2022, as shown in Equation 8.

Equation 8: Estimated Gross Hourly Savings in First Year

$$Savings_{ITT} = \hat{\beta}_{Post} * Hours_{2022} + \hat{\beta}_{YearSince_1} * Hours_{2022} + \hat{\beta}_{C*Post} \sum CDH_{2021} + \hat{\beta}_{D*Post} \sum Daylight_{2022}$$

Where:

$$\begin{aligned} \hat{\beta} &= \text{Coefficients estimated in the regression model}^{16} \\ Hours_{2022} &= \text{Count of days in 2022} \\ \sum CDH_{2022} &= \text{Sum of cooling degree days in 2022} \\ \sum Daylight_{2022} &= \text{Sum of daylight hours in 2022} \end{aligned}$$

1.5.3 PV Impacts

To determine PV system impacts and avoided GHG emissions, the Evergreen team conducted 54 desk reviews including review of program data, EPBB tool outputs, and field inspection reports, analyzed PV generation data for 53 systems, and observed six (6) systems in person. This analysis laid the groundwork for the population-level analyses for energy generation, demand reduction, and greenhouse gas (GHG) reductions.

¹⁶ For participants from a specific program and year.

Desk Review

We conducted fifty-six desk reviews to determine how projects perform compared to program expectations. As part of the reviews, we collected program data from the sources below:

- GRID's program tracking data
- Publicly available data from CalDGStats
- Expected Performance Based Buydown (EPBB) tool files stored by GRID
- Field Inspection Reports stored by GRID
- PV monitoring systems (Enphase & SolarEdge) generation data

We requested energy generation data from program-installed solar PV monitoring systems from GRID for the sampled projects. GRID granted the Evaluation Team Direct access was granted to the Enphase-Enlighten (Enphase) portal, which allowed the Evergreen team to review all available generation data for the Enphase systems in the sample. GRID also provided an extract of 13 months of generation data from a specific date range (June 2021 through June 2022) for projects with SolarEdge monitoring systems. Eight sampled Enphase projects had no available energy generation data so these samples were dropped from the analysis, resulting in sample distribution by program, IOU, and California Climate Zone as described in Table 15 and Table 16. Sampled project locations are shown Figure 15.

Table 15: Summary of Sampled Projects, by Program

Program	Dropped	Enphase	SolarEdge	Total Sample
DAC-SASH	1	36	17	53

Table 16: Summary of Sampled Projects by Climate Zone and IOU

California Climate Zone																	
IOU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
PG&E			7								2	15	4				28
SCE						2		3	3	11			5				24
SDG&E							1										1
TOTAL	0	0	7	0	0	2	1	3	3	11	2	15	9	0	0	0	53

Figure 15: Sampled Project Locations

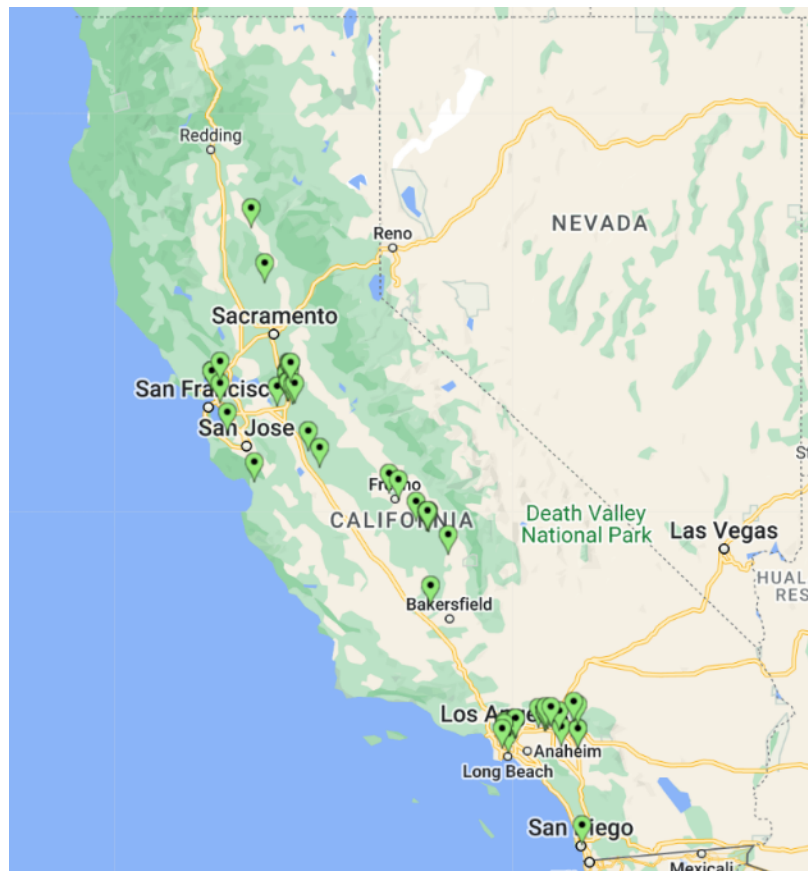


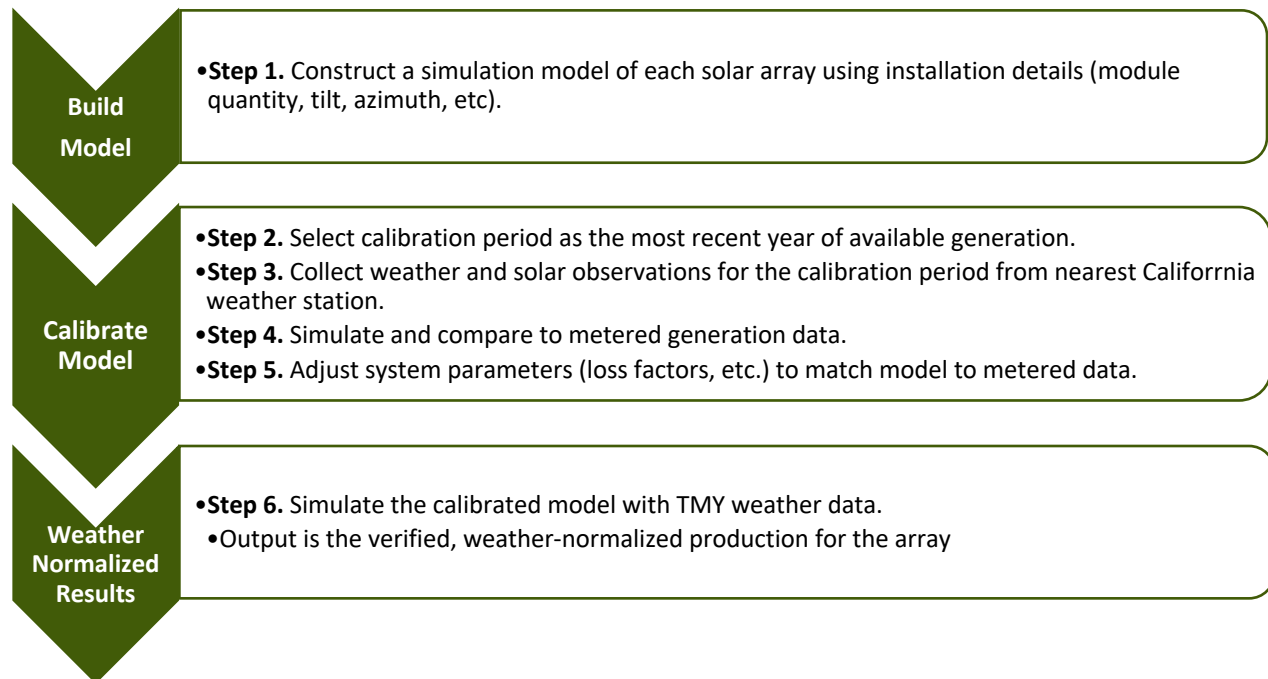
Table 17 describes the distribution of installed system kW-ratings by IOU within the population and sample. The last column indicates the percent of the population that was sampled for each IOU.

Table 17: Sample and Population Characteristics

IOU	Population		Sample		Sample Percent kW-Rating
	Installed Capacity [kW]	Distribution Percent	Installed Capacity [kW]	Distribution Percent	
PG&E	2,647	68%	123	55%	4.6%
SCE	1,170	30%	100	44%	8.5%
SDG&E	98.4	2.5%	1.6	0.7%	1.6%

Sample Analysis

We analyzed and evaluated each sampled PV system through the following phased process to determine the normalized hourly and annual generation. Subsequent sections describe each step of the process in more detail.



Step 1. System Modelling

We conducted the system modelling in the National Renewable Energy Laboratory’s (NREL’s) System Advisor Model (SAM) tool, using the Detailed Photovoltaic Model option.¹⁷ The CPUC’s EPBB tool calculation incorporates an earlier version of this model to estimate anticipated energy generation. We modeled each sampled project in SAM based on the PV system parameters within its respective EPBB file(s) and Field Investigation report(s).

We selected the PV panel model and the inverter model from the California Energy Commission (CEC) database in SAM. If either model were not listed in the CEC database, we manually entered specifications from the equipment datasheet into SAM.

Step 2. Calibration Period

We selected the most recent consecutive 12 months of metered generation data for the calibration period for each project. For projects with a complete data set, we used generation data from July 1, 2021 through June 30, 2022 as the calibration period. For projects missing data in that timeframe, we selected based on available data. For projects installed after July 1, 2021, we analyzed using all available generation data.

Step 3. Weather Files

We used California Measurement Advisory Council’s (CALMAC) weather files for both calibration and normalization.¹⁸ These weather files include historical single year observations beginning in 2014 as well as typical year files (CZ2022) for California weather stations. The analysis used

¹⁷ SAM Version 2021.12.02, available from <https://sam.nrel.gov/>

¹⁸ [California Measurement Advisory Council - California Weather Files \(calmac.org\)](https://calmac.org/)

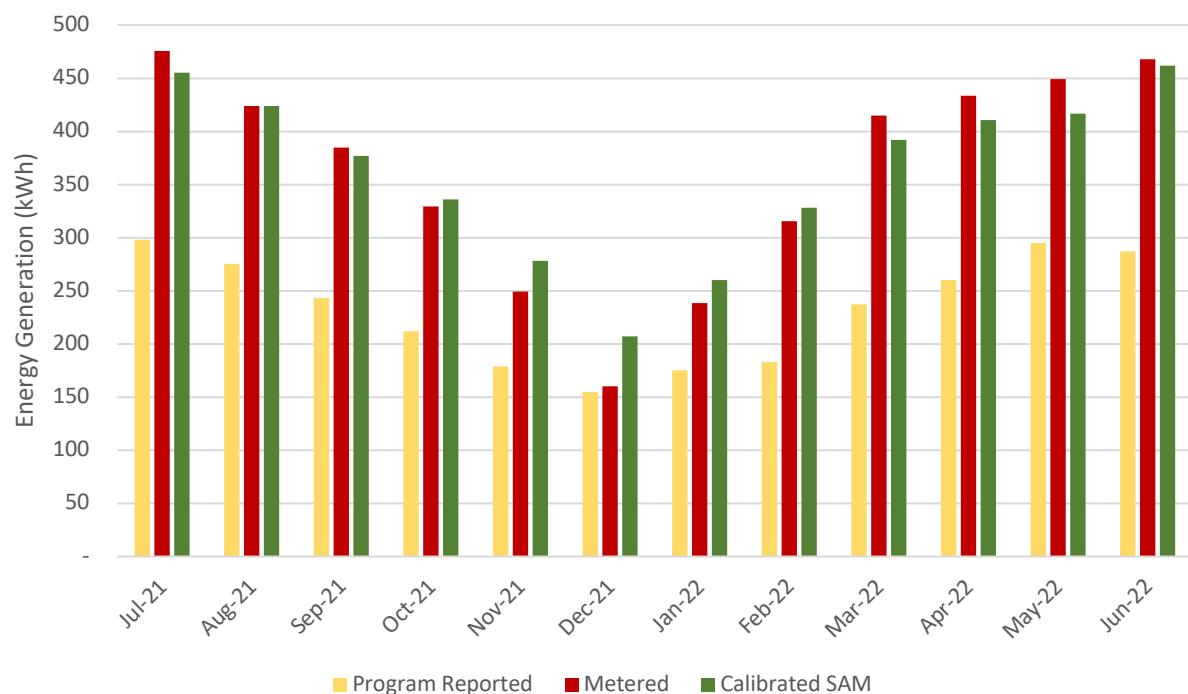
geographic coordinates of each project to select the nearest CALMAC weather file location and collected observed weather data for the calibration period for each project.

Steps 4 -6. Calibration and Normalized Production Results.

SAM models were calibrated to align with the annual metered energy generation with 0% difference. Calibration of individual SAM models was performed by adjusting system loss parameters including but not limited to Constant AC Losses, Nameplate, Module mismatch, and Direct Current (DC) wiring.

Figure 16 illustrates the calibration process for an example array. The figure compares program reported energy generation (based on the CPUC's EPBB calculation tool, using equipment specifications and geographic details) to metered generation. We developed the calibrated model to align with metered generation. In this example, the energy generation reported by the program was significantly less than the metered generation, so upwards adjustments were made to calibrate the SAM model for this system.¹⁹

Figure 16: Example Calibration Process



Step 6a. On-site Assessments

The evaluation team conducted on-site assessments to verify and confirm installation conditions for a subset of eight projects, which we selected based on the results of the initial desk review and availability of data. We selected projects for on-site assessment based on completeness of

¹⁹ This is an extreme example to clearly show the calibration process. Most sites did not require such a large calibration.

installation documentation and monitoring data (as data is necessary to make a comparison), and an initial realization rate less than 90% or more than 110% compared to the reported generation. Customers selected for on-site assessment were informed of the inspection prior to the field verification date and compensated for their time with \$50 electronic gift cards.

The Evergreen team used a pre-defined data collection protocol to ensure consistency and quality across visits. We designed the procedure to verify parameters submitted in the most recent EPBB file. We observed all parameters included in the EPBB tool, including tilt angle, azimuth angle, and shading factors. The on-site assessment template has been included in Appendix H.

Environmental Benefits

The Evergreen team used emissions data and emissions factors to quantify the avoided GHG emissions and criteria pollutants such as methane (CH₄) and nitrous oxides (NO_x) to estimate benefits associated with the energy generated by installed systems during a typical year (i.e., baseline emissions avoided). Hourly marginal emissions data published by WattTime were used to estimate avoided GHG emissions.²⁰

1.6 Cost Analysis

As part of the evaluation, Evergreen conducted a cost analysis for the DAC-SASH program for the program years 2019 – 2021. We gathered, summarized, and reported on program costs by category (e.g., program administration, marketing, and outreach), compared forecasted versus actual spending, and assessed any underutilization of program funding.

Evergreen used GRID-provided data, an export from the California Distributed Generation Statistics (CaliforniaDGStats) website, and budget allocations from the 2019 DAC-SASH Program Handbook to consider projected budget versus actual spending for the DAC-SASH program.²¹ To determine yearly budget projections by utility and program function (administration, ME&O, evaluation, and incentives), we divided the allotted annual budget of \$10M by the budget allocations from the handbook, as shown in Table 18 and Table 19 below.

Table 18: DAC-SASH Budget Allocation by IOU

IOU	Budget %
SDG&E	10.3%
PG&E	43.7%
SCE	46.0%

Table 19: DAC-SASH Budget Allocation by Program Function

Program	Budget %
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²⁰ Accessed via <https://www.watttime.org/>

²¹ Retrieved from

https://gridalternatives.org/sites/default/files/DACSASH%20Handbook_Final_Approved%20via%20Resolution%20E5020_9.12.19.pdf

Administration	10%
ME&O	4%
Evaluation	1%
Incentives	85%

We then used several datasets to obtain values for actual spending. GRID provided administrative and ME&O cost data aggregated across IOUs, so Evergreen calculated actuals by IOU based on budget allocations. GRID provided an additional “Direct Expense” field alongside administrative and ME&O costs, and this was also divided by utility budget allocation and included in the sum of total spending. Incentive values by IOU were obtained from the CaliforniaDGStats website, where GRID is required to report on a weekly basis. Filters were applied to pull incentive values for PV systems installed for DAC-SASH through 2021.²² For evaluation costs, which make up 1% of the overall budget, Evergreen assumed that costs were equal to budget projections because cost data are not yet available.

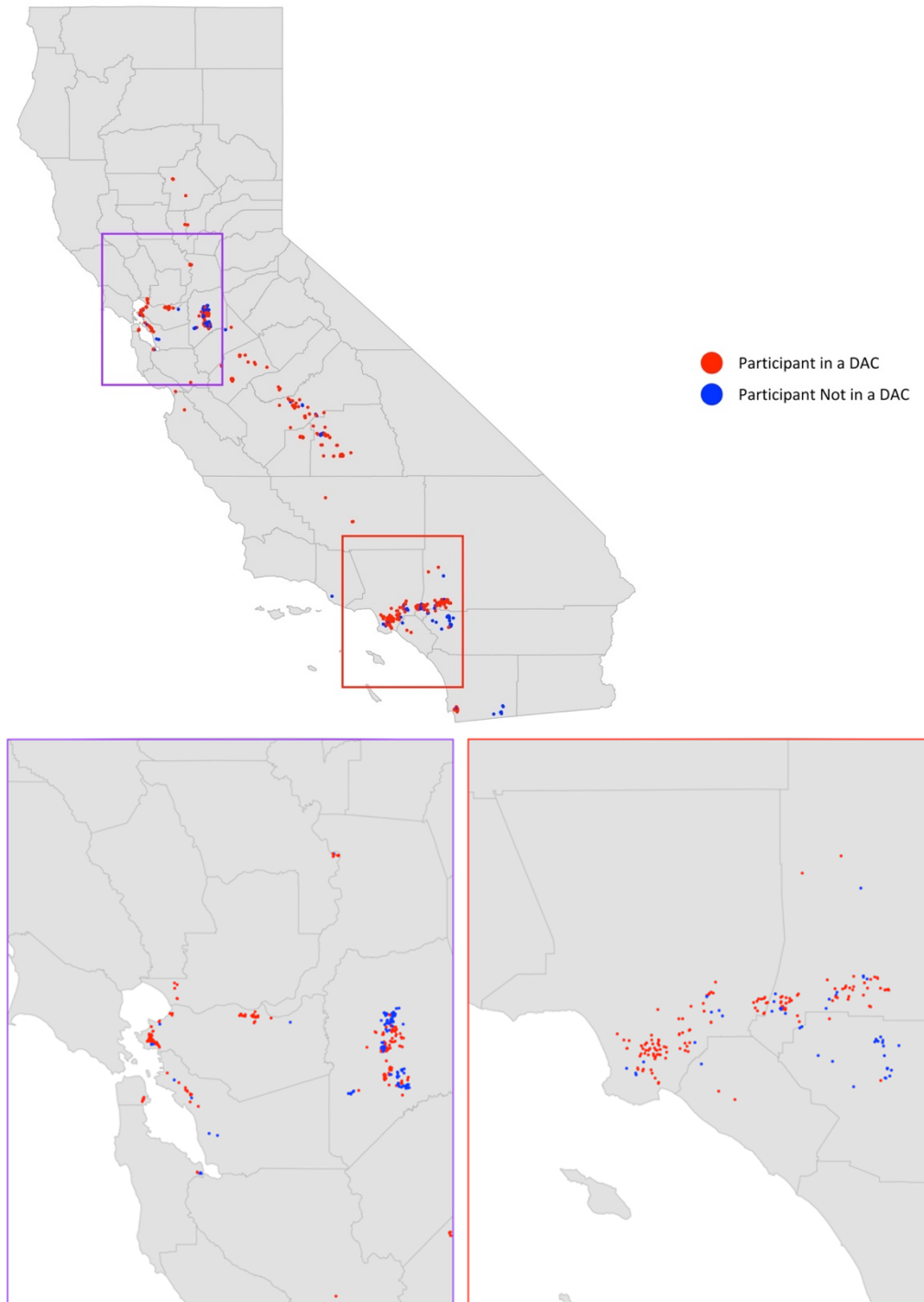
²² The “First Completed Date” field was filtered to exclude 2022 but include blanks. The “Current Application Status” field was left unfiltered and thus included “Completed,” “Confirmed Reservation,” “Incentive Claim Request Review,” and “Reservation Request Review” statuses.

Appendix C: Study Findings by Metric

Category	Metric	Section in Report
Program Marketing	Percent of customers aware of various marketing channels	4.4.2
	Customer opinions on clarity of marketing materials	4.4.2
Customer Participation	The program's geographic coverage across the state, including DACs	4.3.1
	Number and location of eligible customers and enrolled customers	4.3.1
	Number of eligible non-participants that the PA reached out to but did not recruit	4.3.1
	Total population estimates of eligible customers by different metrics	4.3.2
	Number and location of eligible customers not served	4.3.2
	Number of eligible non-participants that already have solar	4.3.3
	Number of installations completed and pending	4.1.2
	Overall participation levels in relation to customer segment size	4.3.2
	Number of eligible customers who have successfully enrolled in CARE/FERA in the process of signing up for the program	4.5.3
	Other clean energy programs that customers have participated in along with enrolling in the program	4.5.3
	Customers satisfaction with the program	4.5.1
	PA performance from perspective of participants	4.5.1
	Effectiveness of each program in addressing specific barriers to solar adoption facing low-income customers in DACs	4.5.2
	Perceptions of non-participants/exploration of program participation barriers among qualified customers	4.5.1, 4.5.2
PV System Performance	PV system performance, degradation - expected v metered performance	4.7
	Average system costs by equipment, installation, and other customer acquisition costs	4.2.1, 4.2.2
Customer Bill Impacts	Monthly bill reduction outcomes from program participants	4.8
	Changes in post-participation energy use patterns	4.8
Environmental Benefits	Program PV installation GHG and other emission impacts	4.7
	Participating and non-participating customer understanding and perception of the program's environmental and social benefits	4.9
Workforce Development and Job Training	Number of leveraged job training programs	4.10
	Number of local hires linked to the program	4.10.2
	Number of trainees and job outcomes	4.10.3

Appendix D: Participant Map

Figure 17: All DAC-SASH Participants





Appendix E: In-Depth Interview Guides

This appendix contains all in-depth interview guides used for this evaluation. Guides were approved by CPUC prior to fielding. Most interviews occurred via online video call, but some were in person.

Guides included below are:

- GRID Alternatives Staff
- IOU Staff
- ME&O Staff
- TPO Staff
- Tribal Liaison

1.7 GRID In-Depth Interview Guides

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Intro/Context	1	Can you tell me a bit about yourself and your role at GRID?	Can you tell me a bit about yourself and your role at GRID?
Intro/Context	1.1	<i>Probe</i> on how long they have been at GRID.	<i>Probe</i> on how long they have been at GRID.
Intro/Context	2	How have you been involved in both the SASH and DAC-SASH programs thus far?	How have you been involved in both the SASH and DAC-SASH programs thus far?
Intro/Context	2.1	<i>Probe as needed</i> on how that might have changed over the lifetime of the SASH program.	<i>Probe as needed</i> on how that might have changed over the lifetime of the SASH program.
Program Admin	4	<i>I would like to get a snapshot of the current progress of the DAC-SASH program.</i>	<i>I would like to get a snapshot of the current progress of the DAC-SASH program for your specific field office..</i>
Program Admin	4.1	Looking at your most recent semi-annual report, it looks like you have roughly 1,100 projects installed and 270 applications in process. How does this line up with your internal expectations for applications and installations?	Can you tell me a bit about DAC-SASH pending commitments, reservations, and expected demand over the next year?
Program Admin	4.2	<i>Probe</i> : is this slower than you would prefer? Faster? As expected?	<i>Probe</i> : is this slower than you would prefer? Faster? As expected?
Program Admin	4.3	<i>Probe</i> : how does this compare to the progress of the SASH program early on in its lifecycle?	<i>Probe</i> : how does this compare to the progress of the SASH program early on in its lifecycle?

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Program Admin	5	For SASH specifically, the program implementation plan we reviewed was from back in 2010. At a high level, can you describe how GRID's approach to program administration evolved from that point to now?	If contact also worked on SASH: Can you describe how the DAC-SASH program differs from the work you did on SASH?
Program Admin	5.1	<i>Probe</i> on learnings from SASH that influenced DAC-SASH program implementation.	<i>Probe</i> on learnings from SASH that influenced DAC-SASH program implementation.
Program Admin	6	How does the customer's experience change if they have a third-party owned system, if at all?	How does the customer's experience change if they have a third-party owned system, if at all?
Program Admin	6.1	<i>Follow up:</i> Do you notice one works better for certain customers than others?	<i>Follow up:</i> Do you notice one works better for certain customers than others?
			How much GRID admin time is spent on identifying and facilitating the relationship with TPOs? [looking for a monthly figure of dollars and hours]
Program Admin	7	I'm wondering how the program differs for certain populations such as new construction vs. retrofit, or for projects on federally recognized tribal lands.	I'm wondering how the programs differs for certain populations such as new construction vs. retrofit, or for projects on federally recognized tribal lands.
Program Admin	8	Has GRID done any forecasting of how you expect demand for DAC-SASH projects to projects over the coming years?	Has GRID done any forecasting of how you expect demand for DAC-SASH projects to projects over the coming years in this region?
Program Admin	8.1	<i>Follow up [if forecast]:</i> What trends does your team anticipate in program demand?	<i>Follow up [if forecast]:</i> What trends does your team anticipate in program demand?
Program Admin	8.2	<i>Probe as needed:</i> Do you anticipate any challenges in meeting program demand?	<i>Probe as needed:</i> Do you anticipate any challenges in meeting program demand?
Program Admin	9	Does GRID have targets for installations by geographies/specific DACs?	What specific targets has GRID set for DAC-SASH in this region? On what timeline?
Program Admin	10	What is the typical timeline from application to installation?	What is the typical timeline from application to installation?
Program Admin	10.1	<i>Probe</i> on how often project timelines exceed one year from application,	<i>Probe</i> on how often project timelines exceed one year from application, what

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
		what causes those delays, and how often projects are not completed because they exceed the maximum timeline.	causes those delays, and how often projects are not completed because they exceed the maximum timeline.
Program Admin	11	Can you walk me through the process that occurs between when an application is approved and the installation of the project? What steps occur during the reservation stage? What are GRID's responsibilities at that time, and what are the expectations of the customer?	Can you walk me through the process that occurs between when an application is approved and the installation of the project? What steps occur during the reservation stage? What are GRID's responsibilities at that time, and what are the expectations of the customer?
Program Admin	12	<i>Now I would like to think a bit through budgetary considerations.</i>	<i>Now I would like to think a bit through budgetary considerations.</i>
Program Admin	12.1	Are you in charge of/have a good sense of budgeting and spending for the SASH and DAC-SASH programs? Is this done at the statewide level or at the regional office level?	If budgets are handled regionally: Are you in charge of/have a good sense of budgeting and spending for the SASH and DAC-SASH programs?
Program Admin	13	Do you see areas of program administration where there is more budget is allocated than spent?	If budgets are handled regionally: Do you see areas of program administration where there is more budget is allocated than spent?
Program Admin	13.1	<i>If yes:</i> What areas are those? Do you anticipate that trend to continue?	<i>If yes:</i> What areas are those? Do you anticipate that trend to continue?
Program Admin	13.2	<i>If yes:</i> What do you think accounts for the gap between funding and spending?	<i>If yes:</i> What do you think accounts for the gap between funding and spending?
Program Admin	13.3	<i>Probe as needed:</i> Are there areas of program administration where you think that more budget is needed?	<i>Probe as needed:</i> Are there areas of program administration where you think that more budget is needed?
			How much administrator time is going towards identifying sources to fill incentive gaps needed to either cover the cost of installations or to cover the cost of repairs needed before installation? [Ideally, we get in monthly hours or dollars- could be per project]
Program Marketing	14	<i>Next I have a few questions about the marketing for the SASH and DAC-SASH programs.</i>	<i>Next I have a few questions about the marketing for the SASH and DAC-SASH programs.</i>

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Program Marketing	15	Thinking about the data you receive, how is it processed and prepared for outreach and marketing?	Do you do anything to process, filter or prioritize the data you receive for leads?
Program Marketing	16	Would you say the data sources you have are accurately identifying eligible households? If not, what would help? What is needed to better identify eligible households	Would you say the data sources you have are accurately identifying eligible households? If not, what would help? What is needed to better identify eligible households
Program Marketing	17	How often are contact lists updated or refreshed?	How often are contact lists updated or refreshed?
Program Marketing	18	How is the data we just discussed then used for marketing and outreach?	How is the data we just discussed then used for marketing and outreach?
Program Marketing	19	Based on the materials you provided to us, it looks like mail marketing and local events are major outreach strategies. Can you give me a sense of which outreach strategies are most effective in enrolling customers?	Based on the materials you provided to us, it looks like mail marketing and local events are major outreach strategies. Can you give me a sense of which outreach strategies are most effective in enrolling customers in your region?
Program Marketing	19.1	<i>Probe:</i> does this differ by program (SASH v DAC-SASH)? Or by customer profile?	<i>Probe:</i> does this differ by program (SASH v DAC-SASH)? Or by customer profile?
Program Marketing	20	How has the leveraging of local community events evolved over the course of the pandemic?	How has the leveraging of local community events evolved over the course of the pandemic?
Program Marketing	22	We talked earlier about third-party ownership. Can you talk me through how leasing arrangements with Sunrun are promoted to customers?	We talked earlier about third-party ownership. Can you talk me through how leasing arrangements with Sunrun are promoted to customers?
Customer Participation	23	<i>Now I have a few questions about customer participation and experience.</i>	<i>Now I have a few questions about customer participation and experience.</i>
Customer Participation	23.1	Do you find that certain customer segments are more or less likely to participate relative to the full population of eligible customers? [probe on differences between programs]	Do you find that certain customer segments are more or less likely to participate relative to the full population of eligible customers? [probe on differences between programs]
Customer Participation	23.2	<i>If yes, probe:</i> which segments are those? Why do you think they are more/less likely to participate?	<i>If yes, probe:</i> which segments are those? Why do you think they are more/less likely to participate?

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Customer Participation	23.3	<i>Probe</i> on geographic differences, demographics and what they based these observations on (anecdotes v. reviewing outreach data by demog data)	<i>Probe</i> on geographic differences, demographics and what they based these observations on (anecdotes v. reviewing outreach data by demog data)
Customer Participation	24	Do you find that there are segments of customers who are harder to reach and engage? If so, why?	Do you find that there are segments of customers who are harder to reach and engage? If so, why?
Customer Participation	25	For qualified customers who are harder to reach or convert, what barriers stand in the way of their participating?	For qualified customers who are harder to reach or convert, what barriers stand in the way of their participating?
Customer Participation	25.1	<i>Probe on</i> steps GRID takes to overcome those barriers, or resources needed to address them.	<i>Probe on</i> steps GRID takes to overcome those barriers, or resources needed to address them.
Customer Participation	26	Where customers were interested but ultimately ended up being unable to participate, what barriers did they face to participating?	Where customers were interested but ultimately ended up being unable to participate, what barriers did they face to participating?
Customer Participation	26.5	<p>Can you differentiate between what barriers you find out early on, when getting leads, and which barriers you run in to later in the process? We're curious which reasons are discovered on site, or before visiting, or at first outreach?</p> <p>At first glance for DAC-SASH it looks like most of the times things are identified at the "approve-outreach stage" but there are a few that are sometimes realized during the construction phase (not owner occupied, rented, HOA issues, zoning issues, code issues). Do you know why these sometimes aren't identified earlier? Are there any common hold ups that you think different data could help you screen for before doing outreach?</p>	<p>Can you differentiate between what barriers you find out early on, when getting leads, and which barriers you run in to later in the process? We're curious which reasons are discovered on site, or before visiting, or at first outreach?</p> <p>At first glance for DAC-SASH it looks like most of the times things are identified at the "approve-outreach stage" but there are a few that are sometimes realized during the construction phase (not owner occupied, rented, HOA issues, zoning issues, code issues). Do you know why these sometimes aren't identified earlier? Are there any common hold ups that you think different data could help you screen for before doing outreach?</p>

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
			do you use a checklist or some other questionnaire when verifying eligibility before going on site?
Customer Participation	26.1	A lot of different barriers were listed for people who were still active. Which ones are their workarounds for and which mean the project can't move forward? (if needed pull up list from Teams of different barriers) Probe on steps GRID takes to overcome those barriers, or resources needed to address them.	A lot of different barriers were listed for people who were still active. Which ones are their workarounds for and which mean the project can't move forward? (if needed pull up list from Teams of different barriers) Probe on steps GRID takes to overcome those barriers, or resources needed to address them.
Customer Participation	27	For customers who decide not to participate, why do you think they are not interested in the program? We saw that for DAC-SASH, 40% of active customers became uninterested during the construction visit and not before. Why do you think that is?	For customers who decide not to participate, why do you think they are not interested in the program? We saw that for DAC-SASH, 40% of active customers became uninterested during the construction visit and not before. Why do you think that is?
			It sounds like you're using an electronic application now. How much time do you think you're saving per site by using an electronic application? Do you have any examples of that? How much time do you think the customers save? [Probe to get examples to substantiate]
Customer Participation	28	Can you give me a snapshot of how many customers typically enrolled in CARE, FERA, or ESA during the application process for SASH and DAC-SASH? At what point does this come up with customers?	Can you give me a snapshot of how many customers typically enrolled in CARE, FERA, or ESA during the application process for SASH and DAC-SASH? At what point does this come up with customers?
Customer Participation	29	What about other program enrollments? Do you have any insights into, say, medical baseline customers or SJV DAC pilot participants who are engaging with SASH or DAC-SASH as well?	What about other program enrollments? Do you have any insights into, say, medical baseline customers or SJV DAC pilot participants who are engaging with SASH or DAC-SASH as well?
Customer Participation	30	We have gotten some information about how you collect customer feedback and complaints. Can you	We have gotten some information about how you collect customer feedback and complaints. Can you talk about some

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
		talk about some common feedback, positive or negative, you receive from customers?	common feedback, positive or negative, you receive from customers?
Customer Participation	31	Though complaints seem rare, are there common complaints you receive from customers? How do you work to address those?	Though complaints seem rare, are there common complaints you receive from customers? How do you work to address those?
Customer Participation	32	<i>If always an isolated case:</i> can you briefly walk me through those specific complaints you received?	<i>If always an isolated case:</i> can you briefly walk me through those specific complaints you received?
Customer Participation	33	I'm aware that GRID provides participants education about solar and energy efficiency training. Can you walk me through what this usually looks like?	I'm aware that GRID provides participants education about solar and energy efficiency training. Can you walk me through what this usually looks like?
Customer Participation	34	On a scale of 1 to 3 (1= not, 2= somewhat, 3=very), how satisfied do you think enrolled customers are with the program? Why? What positive feedback do you hear from customers about the program?	On a scale of 1 to 3 (1= not, 2= somewhat, 3=very), how satisfied do you think enrolled customers are with the program? Why? What positive feedback do you hear from customers about the program?
PV System Performance	35	<i>Moving on, I'd like to ask some questions regarding solar system performance.</i>	<i>Moving on, I'd like to ask some questions regarding solar system performance.</i>
PV System Performance	35.1	I am aware that DAC-SASH projects can range from capacities of 1-5 kW and meet certain performance standards. Can you talk me through what those standards are, and how often they are not met?	I am aware that DAC-SASH projects can range from capacities of 1-5 kW and meet certain performance standards. Can you talk me through what those standards are, and how often they are not met?
PV System Performance	35.2	<i>Probe on</i> how this is similar to or different from SASH	<i>Probe on</i> how this is similar to or different from SASH
PV System Performance	36	What is the process for determining solar system performance?	What is the process for determining solar system performance?
PV System Performance	36.05	What happens if a customer system stops working performing as expected after installation?	What happens if a customer system stops working performing as expected after installation?
PV System Performance	36.1	<i>Follow up:</i> I am aware that inspections occur for one in twelve installations. How often do inspectors find issues with solar systems? What	<i>Follow up:</i> I am aware that inspections occur for one in twelve installations. How often do inspectors find issues with solar

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
		kinds of issues do they encounter? How are these reported? Is this done evenly across the different geographic offices?	systems? What kinds of issues do they encounter? How are these reported?
PV System Performance	36.2	Beyond what you mentioned when we discussed inspections, have you had any challenges ensuring the quality of PV systems?	Beyond what you mentioned when we discussed inspections, have you had any challenges ensuring the quality of PV systems?
PV System Performance	37	How often, if ever, do customers add on to their solar system with onsite storage?	How often, if ever, do customers add on to their solar system with onsite storage?
PV System Performance	37.1	<i>Probe on</i> whether GRID ever pitches onsite storage to customers	<i>Probe on</i> whether GRID ever pitches onsite storage to customers
		How is equipment selected for a customers? How does cost play in to that? (<i>looking to understand price setting and total project costs, areas for program improvement</i>)	How is equipment selected for a customers? How does cost play in to that? (<i>looking to understand price setting and total project costs, areas for program improvement</i>)
		Are costs usually consistent across projects? If not, what would make a project more or less expensive?	Are costs usually consistent across projects? If not, what would make a project more or less expensive?
		What happens if a roof needs repair? Is there other work that comes up that needs to be done? How are those costs covered?	What happens if a roof needs repair? Is there other work that comes up that needs to be done? How are those costs covered?
PV System Performance	38	What typical funding sources does GRID provide in cases where the cost exceeds the incentive? How often is this extra gap funding needed? Are there specific types of customers that need this more than others?	What typical funding sources does GRID provide in cases where the cost exceeds the incentive? How often is this extra gap funding needed? Are there specific types of customers that need this more than others?
Environmental Benefits	40	How important do you think the environmental benefits of renewables are to the customers who enroll? How do you think that compares to the broader population of eligible customers?	How important do you think the environmental benefits of renewables are to the customers who enroll? How do you think that compares to the broader population of eligible customers?
Environmental Benefits	41	Does GRID educate customers on environmental benefits at any point in the process? What do you share with customers?	Does GRID educate customers on environmental benefits at any point in the process? What do you share with customers?

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Environmental Benefits	42	Do customers typically have an understanding of what kinds of environmental or social benefits come out of renewable energy? If so, what is that understanding?	Do customers typically have an understanding of what kinds of environmental or social benefits come out of renewable energy? If so, what is that understanding?
Workforce Development and Job Training	43	<i>I just have a few questions about workforce development and job training.</i>	<i>I just have a few questions about workforce development and job training.</i>
Workforce Development and Job Training	44	How do you design your workforce development and job training process? Do you leverage any other programs? What data do you use to determine how to design these programs?	How do you design your workforce development and job training process? Do you leverage any other programs? What data do you use to determine how to design these programs?
Workforce Development and Job Training	45	And as far as workforce development, how do you typically market your training programs? What marketing and outreach strategies have been most effective?	And as far as workforce development, how do you typically market your training programs? What marketing and outreach strategies have been most effective?
Workforce Development and Job Training	46	Can you talk me through the differences between the major job programs GRID offers (Solar corps, IBT, team leaders, etc.)? Is the same curriculum used for each? Is that curriculum the basics training?	Can you talk me through the differences between the major job programs GRID offers (Solar corps, IBT, team leaders, etc.)? Is the same curriculum used for each? Is that curriculum the basics training?
Workforce Development and Job Training	46.1	<i>If different curriculum: how does the content of the training courses differ?</i>	<i>If different curriculum: how does the content of the training courses differ?</i>
Workforce Development and Job Training	47	I'm interested in hearing more about the sub-contractor program. Do the trainees for that program participate in any GRID curricula? Or are they separate from GRID except for working on a GRID project?	I'm interested in hearing more about the sub-contractor program. Do the trainees for that program participate in any GRID curricula? Or are they separate from GRID except for working on a GRID project?
Workforce Development and Job Training	48	Does the workforce development/job training efforts roughly align for SASH and DAC-SASH? If not, how do they differ?	Does the workforce development/job training efforts roughly align for SASH and DAC-SASH? If not, how do they differ?

Category	Order	Question for Main GRID Contact	Question for Regional GRID Contact
Workforce Development and Job Training	48.1	<i>Probe on how workforce dev evolved for SASH.</i>	<i>Probe on how workforce dev evolved for SASH.</i>
Workforce Development and Job Training	49	How well do students generally perform in GRID's training courses? (i.e., assessments and learning outcomes) What data do you collect that tracks training performance?	How well do students generally perform in GRID's training courses? (i.e., assessments and learning outcomes) What data do you collect that tracks training performance?
Workforce Development and Job Training	50	Do you solicit feedback on your courses? What kind of feedback, positive or negative, does GRID commonly receive?	Do you solicit feedback on your courses? What kind of feedback, positive or negative, does GRID commonly receive?
Workforce Development and Job Training	51	Do job trainees work both on DAC-SASH and SASH projects? Or only one v. another?	Do job trainees work both on DAC-SASH and SASH projects? Or only one v. another?
Workforce Development and Job Training	52	How would you characterize the current range of approaches that GRID uses for solar project installation as far as which parties complete the installation work (such as the subcontractor partner program)? How do these approaches differ from an "open contractor" model?	How would you characterize the current range of approaches that GRID uses for solar project installation as far as which parties complete the installation work (such as the subcontractor partner program)? How do these approaches differ from an "open contractor" model?
Closing	53	<i>Wrapping up I want to take a step back and think more about the programs overall.</i>	<i>Wrapping up I want to take a step back and think more about the programs overall.</i>
Closing	53.1	Taking a broader view, the goal of the DAC-SASH program is to reduce barriers to renewable energy for DAC residents. In your view, how well is the program as designed meeting this goal? Where do you see room for growth or missed opportunities?	Taking a broader view, the goal of the DAC-SASH program is to reduce barriers to renewable energy for DAC residents. In your view, how well is the program as designed meeting this goal? Where do you see room for growth or missed opportunities?
Closing	54	Do you have any other program feedback you would like to share for either DAC-SASH or SASH?	Do you have any other program feedback you would like to share for either DAC-SASH or SASH?

1.8 IOU In-Depth Interview Guide

#	Question (note to interviewer to ask about DAC SASH and SASH)
1	Can you introduce yourself(f/ves) and your role(s) at [IOU]?
2	At a high level, can you give me a sense about what role(s) [IOU] plays in the administration of the SASH and DAC-SASH programs? I have questions about enrollment, customer feedback, interconnection, and incentives.
3	Did we miss any other ways in which [IOU] is involved with SASH and DAC-SASH?
4	What type of coordination do you do with GRID specifically on DAC-SASH or SASH and what you do independently of GRID?
	<i>I want to talk first about data sharing with GRID.</i>
5	We understand that the CPUC directed the IOUs to provide eligible customer data to GRID. Can you share some detail about how you determined which customers' data to share with GRID and what information was shared?
	Probe on if they were able to provide the data and what limitations their were. Were they able to identify who owned and who was in SF, if not what sources did they use? Are there any learnings from other programs like ESA for finding eligible customers (low income, owners, etc.)?
6	What was the process by which that data was delivered to GRID?
7	Were there any challenges in getting data prepped and ready for GRID? How frequently will this happen in the future?
	<i>We've heard that some utilities work to co-market the program. I'd like to discuss that next.</i>
8	First can you tell me about any co-marketing you've done and how that's gone? How do you help GRID with marketing and then what programs do you get referrals from GRID for customers that they interact with?
9	Assuming you get enrollments for CARE/FERA from GRID's outreach to customers, can you give me a snapshot of how many customers typically enrolled in CARE or FERA during the application process for SASH and DAC-SASH? This may be available in submitted customer data so just an estimate will do.
10	What about ESA, SJV, or other energy programs? Can you tell me how many referrals you've seen from GRID? This may be available in submitted customer data so just an estimate will do.
	Probe: Have you come across any barriers in collecting and processing referral data? Do you track leads after they get handed off to other programs?
11	Do you find that certain customer segments are more or less likely to participate in SASH / DAC-SASH relative to the full population of eligible customers? This may be something GRID has more insight into but we wanted to check with you as well.
	<i>If yes, probe: which segments are those? Why do you think they are more/less likely to participate?</i>
	<i>Probe on geographic differences, demographics</i>
12	<i>If questions about budget are relevant to IOUs ask:</i> Are you involved at all in overseeing the program budgets? If not, who should we talk to? Do you have any thoughts on the current budget allocations for the SASH or DAC-SASH programs for the IOUs?

#	Question (note to interviewer to ask about DAC SASH and SASH)
	Probe: How do allocations and expenditures compare. Do they seem to match the program accomplishments? [Evergreen to review budget and expenditures before interview]
13	Are you aware of any feedback that [IOU] has received from customers regarding their participation in the programs (SASH and DAC-SASH), whether positive or negative?
14	On a scale of 1 to 3 (1= not, 2= somewhat, 3=very), how satisfied do you think enrolled customers are with the program? Why?
15	Taking a broader view, the goal of the DAC-SASH program is to reduce barriers to renewable energy for DAC residents. In your view, how well is the program as designed meeting this goal? What are the biggest barriers for this population (probe on incentive amount and participation drivers)? Where do you see room for growth or missed opportunities?
16	Do you think the program as designed is reaching all the customers it is intended to serve? Probe on barriers faced with M&O, identifying customers, and customer conversion.
	<i>Finally, I would like to finish up with some questions about how you think the DAC-SASH program can improve moving forward.</i>
17	Do you have any thoughts on potential changes to program design regarding system installation? For example, an open contractor model? What are the pros and cons of an open contractor model in your opinion?
	Do you think that there are additional ways that the IOUs can support and facilitate the interconnection process?
18	Do you have any other thoughts on program administration and room for process improvement either at GRID, the IOUs? What additional support do you think is needed from the IOUs, if any?
19	Do you have any other program feedback you would like to share for either DAC-SASH or SASH?

1.9 ME&O In-Depth Interview Guide

#	Question
1	Can you tell me a bit about yourself and your role at [org]?
	<i>Probe on how long they have been at [org].</i>
2	In what way does [org] support GRID's work for DAC-SASH? How do you and GRID work together to determine what each organizations roles, rules and processes will be? How do you both decide which marketing strategies to use?
3	How long have you been working with GRID on DAC-SASH? How did you get started on the program?
4	In which areas or with what populations do you do marketing and outreach work for GRID? What type of marketing and outreach do you do?
	<i>Now I have a few questions about the customers you are engaging with for the program</i>
	When you talk about the program, do you call it "DAC-SASH" or "Energy for All." Do you mention GRID or the CPUC or a utility? What do customers recognize?
5	How do you identify customers to market the program to? Does GRID provide you referrals to eligible customers in your area?

#	Question
	<i>Probe:</i> How useful is the data / info you are provided with? What is working about this process and what could be improved? (how hard is it to locate eligible homeowners) How much time do you spend correcting the data if any?
	<i>Probe for DAC-SASH:</i> How easy or hard is it to work with the geographic boundaries? Do you think as designed that DAC-SASH is meeting its intent to serve DAC customers? If not, how do you think it could be better met?
	<i>Probe for DAC-SASH:</i> How easy or hard is it to work with the tribal regions? Do you think as designed that DAC-SASH is meeting its intent to serve tribal customers? If not, how do you think it could be better met?
6	Do you find that particular groups of people tend to show more interest or are more likely to enroll in DAC-SASH??
	<i>If yes:</i> Which groups are more receptive? Why do you think they show more interest?
7	Do you find that groups of people show more hesitance or skepticism toward the program?
	<i>Probe on</i> differences by geography, demographics.
	<i>Probe on</i> reasons for skepticism/hesitance if present.
8	<i>[If people are hesitant]</i> How much of the time would you say you are able to help overcome that hesitance? What strategies, if any, work best to gain customer trust?
9	Do you assist with their application, or does GRID primarily do that work? Can you walk me through how the application process goes for the customer after you perform marketing and outreach?
10	<i>[If assist with application]</i> What are some common barriers and issues, if any, that customers experience during the application process? <i>[Probe on incentive amount, eligibility requirements]</i>
10a	<i>[If barriers present]</i> What steps, if any, are you or GRID able to take to help alleviate these barriers?
10b	<i>[If assist with application]</i> Are there specific aspects of the application or application process that prove to be confusing for customers?
10c	<i>[If assist with application]</i> Do you assist in enrolling customers in other programs besides DAC-SASH?
10d	<i>If yes:</i> which programs are those? What share of customers do you enroll in each of those programs?
10e	<i>Probe on</i> SJV pilots, CARE, FERA, Medical Baseline, and NEM.
11	Do you hear from the people you reached out to about DAC-SASH as they progress through the program?
12	What type of feedback, if any, do you tend to get from customers as they go through the process to get solar installed?
13	On a scale of 1 to 3 (1= not at all, 2=somewhat, 3=very), how satisfied do you think people are who engage with DAC-SASH?
14	Do you assist at all in marketing GRID's workforce development and/or training programs?
14a	<i>If yes:</i> How do you provide support for those programs?
14b	<i>If yes:</i> How do you identify people to market the workforce programs to?

#	Question
14c	<i>If yes: What level of interest do you receive when you market these programs?</i>
	<i>I'd like to finish up by getting some feedback from you about the program.</i>
15	Do you have any other feedback on the program you would like to share? What changes might help increase participation and make M&O easier? [Probe on relationship with GRID, M&O strategies used, data availability and usability, plication process, workforce programs]

1.10TPO In-Depth Interview Guide

#	Question
	Note: Evergreen will review data before each TPO call to understand the flow of installs over time. We will also review the company's website and will look at the role and experience of the interviewee. We are targeting employees that work directly with GRID on setting up the partnership.
1	Can you tell me a bit about yourself and your role at [TPO name]?
2	When did [TPO] start working with GRID? How have the number of projects you've done through SASH and DAC-SASH changed over the years? [Probe on impacts of federal tax incentive changes, if percent of projects that are TPO vs. not mirror their non SASH DAC-SASH business, if income/region is a factor]
3	Can you tell me a bit about when [TPO] gets involved, and how you work with GRID to complete projects? Probe on timeline, use of trainees, who does the installations. Ask about: -Contracting the ownership models (covering consumer protection) -Budget negotiations - are they covering any of the costs with outside funds? -System arranged and installed using volunteers from GRID and trainees
4	Over the years you've worked with GRID, how has your process for installing solar for these programs changed? When would you work with GRID HQ vs a regional office? How has your role changed as TPO has become leveraged more and more often compared to ownership models? Does this mirror the trend in your broader business as well?
	Do you know of any customers who have been unable to complete their projects? Yes/no
5	[If yes] Does [TPO] get involved when customers are unable to complete projects due to issues with their home such as roof or electrical upgrades? If so, how?
6	What are the pros and cons to customers for using a TPO agreement vs an ownership model? [Probe on from their perspective vs. customer perspective]
7	I'd like to get some information about average costs in terms of equipment, installation, or any other costs. If you could share how these differ based on TPO model. Do customers have to pay anything out of pocket? If not, who pays?
8	How many of the completed installations come from [TPO] outreach or leads vs. outreach from GRID? Does how you get leads differ in DACs vs. non-DACs? [Probe on quality of leads from GRID]
9	What are the barriers that customers face in participating with this program? What are the main drivers? Does this differ for DACs or other types of customer/home structure characteristics? [Probe on incentives, work that has to be done before installation]

#	Question
10	Has the flow of projects been about the same, faster, or slower than you expected? Why do you think that is?
11	When it comes time for installation - what options do you have for staffing your projects? Can you tell me a bit about contractor requirements from GRID and how working with you fits into the process of the trainee's training? [Who pays them, how much, do they like this model]
12	What has your experience been with workers that come through GRID's training or volunteering programs?
13	What do you or your staff tell customers about the program's environmental benefits, if anything? When do you do this and how is it received by customers? Is this different for customers you work with through GRID and this program vs. outside of this program?
14	Do you hear from customers after installation? What have you heard from customers regarding their satisfaction or dissatisfaction?
15	Do you have any other feedback on the program you would like to share? What changes might help increase participation and installation easier? [Probe on trainings, working with GRID, customer interactions, incentive structure]

1.11 Tribal Liaison In-Depth Interview Guide

#	Question
1	Can you tell me a bit about yourself and your role at the CPUC? Can you tell me a bit about your background before you started working with the CPUC?
2	Can you give me some context about your involvement in the SASH and DAC-SASH programs, from the proceedings stage to implementation?
3	It looks like there are almost 30 completed projects in tribal lands for DAC SASH in Campo and Bishop in addition to the 10 done for SASH. Does this sound right to you? Is this what you were expecting by now or did you think there would be more or less? Why is that?
4	Can you speak to how recruitment and participation of tribal members residing on reservation land is similar or different to that of tribal residents in DACs that are not on reservation lands? Should outreach be varied when approaching tribal communities?
	Are some tribal communities or locations more difficult to serve than others, and if so, why?
6	Do you know if tribal communities are hearing about other programs when they hear about this one (such as CARE, FERA, medical baseline, SJV DAC) when they learn about SASH or DAC SASH? Do you know if they're enrolling in these programs? [Probe to ask if there is already awareness of these programs]
5	Are there certain tribal lands that benefit more or less from this program? Are there differences in levels of interest?
	Do you follow installations or have you heard about how installations have gone? If so, what are your impressions about how installations are going? How long does an installation typically take?
7	Do you have a sense about how satisfied tribal members who participated are with the program?

#	Question
	<i>Probe on</i> potential causes for dissatisfaction (such as application process, etc.)
8	Are you aware of barriers or difficulties that prevent tribal members from completing applications, or signing up for the program in the first place? Do you think these barriers are unique to members of tribal communities? [Probe on barriers related to housing repairs or siting issues.]
9	Have you received any feedback from tribal community members about SASH or DAC-SASH? (probe on incentive amount, etc.)
10	Do you have any thoughts on how this program could better serve tribal communities? [Probe on what would need to be done to serve more or different tribal communities that aren't being reached, and on quality of outreach]
11	Have you heard from any tribal members who are interested in the program but are not federally recognized?
12	Do you have any other feedback you would like to share about SASH or DAC-SASH?

Appendix F: Survey Guides

This appendix contains all survey guides used for this evaluation. Guides were approved by CPUC prior to fielding. Sections in blue are programming cues and are not shown to the respondent.

Guides included below are:

- Participant Survey
- Non-Participant Survey
- Trainee Survey

1.12DAC-SASH Participant Survey

Introduction



Thank you for taking the survey on GRID's Energy For All (SASH) Solar Program. Your feedback is vital to us. This survey will take approximately 10-15 minutes to complete, and all information collected is confidential. As a thank you for completing this survey, we will email you a \$25 Visa gift card within the next 3 to 4 weeks.

Marketing

1. Before we begin, can you confirm that you installed a solar system on your home's roof through the Energy for All (SASH) program?
 - a. Yes
 - b. No [\[Thank and terminate\]](#)
2. *First, we'd like to start with some questions about how you learned about the Energy for All (SASH) program. Where have you received information about the Energy for All (SASH) program? Please select all that apply.*
 - a. From my utility
 - b. From the city or county that I live in
 - c. From a friend/neighbor and/or family member
 - d. From a community organization
 - e. From GRID Alternatives
3. Did you receive information in any of the following ways? Please select all that apply.
 - a. I got something in the mail

- b. I looked up information online
- c. Someone talked to me about the program at an event
- d. Someone called me on the phone
- e. Someone came to my door to tell me about the program
- f. Through a discussion with a friend/neighbor and/or family member
- g. I heard about it through the TV
- h. Don't recall [exclusive answer] [skip to Q6]

Next, we would like to ask you some questions about how easy or difficult it was for you to understand the program based on the information you received.

4. [if 2=e] How clear would you say the information received from GRID about the program was?
 - a. Very clear
 - b. Somewhat clear
 - c. Neither clear nor unclear
 - d. Somewhat unclear
 - e. Very unclear
5. [if 2=a] How clear would you say the information received from your utility about the program was?
 - a. Very clear
 - b. Somewhat clear
 - c. Neither clear nor unclear
 - d. Somewhat unclear
 - e. Very unclear
6. Did you feel like you had the information you needed to make the decision to participate in the program?
 - a. Yes
 - b. No
 - c. Don't know
7. What concerns (if any) did you have as you made the decision to participate in the program?
 - a. I didn't have any concerns [if selected, no others can be selected]
 - b. The offer seemed too good to be true
 - c. I was worried it was a scam
 - d. I didn't think I would be eligible
 - e. I didn't think I would have time to participate
 - f. Other: My concerns were... _____ [force response if selected]

Customer Participation – Application Process

Next, we'd like to ask you about your experience with the application process for the Energy for All (SASH) program.

8. Are there any topics GRID Alternatives discussed that you're still not sure you understood correctly, or any that you thought you understood, but have been surprised about since installing your solar system?
 - a. Yes: _____
 - b. No
 - c. Don't know
9. How did you fill out the full application for submission? If someone else filled out the application for you, how did they do it?
 - a. Over the phone
 - b. Via email and/or DocuSign
 - c. Via a paper application by myself
 - d. Via a paper application with help from GRID
 - e. Don't know
10. [If 9 = a, b, or c] How easy or difficult would you say it was to complete your application for this solar project?
 - a. Very easy
 - b. Somewhat easy
 - c. Neither easy nor difficult
 - d. Somewhat difficult
 - e. Very difficult
11. [If 10 = d or e] Which of the following, if any, contributed to the application process being difficult? Please select all that apply.
 - a. Providing tax documents for proof of income
 - b. Providing proof of homeownership
 - c. Providing a recent utility bill
 - d. Understanding what the application was asking for
 - e. Managing revisions that were needed for my application
 - f. Other (please specify): _____
12. Which energy programs were you already enrolled in **before** applying for the Energy for All (SASH) program? Please select all that apply.
 - a. California Alternate Rates for Energy (CARE) - a bill discount based on income
 - b. Family Electric Rate Assistance (FERA) – reduces electric bills for qualified households
 - c. Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
 - d. Medical Baseline Rate - a bill discount to help with necessary medical equipment
 - e. San Joaquin Valley Energy Project - a program which swaps out propane and wood-burning appliances



- f. Self-Generation Incentive Program (SGIP) offers rebates for installing energy storage technology
 - g. Other energy assistance program (please specify): _____
 - h. None of the above
 - i. I'm not sure
13. Which energy programs did you enroll **in around the same time** as applying for the Energy for All (SASH) program? Please select all that apply. *[Survey will not ask about answers selected in prior question]*
- a. California Alternate Rates for Energy (CARE) - a bill discount based on income
 - b. Family Electric Rate Assistance (FERA)- reduces electric bills for qualified households
 - c. Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
 - d. Medical Baseline Rate - a bill discount to help with necessary medical equipment
 - e. San Joaquin Valley Energy Project - a program which swaps out propane and wood-burning appliances
 - f. Self-Generation Incentive Program (SGIP) offers rebates for installing energy storage technology
 - g. Other energy assistance program (please specify): _____
 - h. None of the above
 - i. I'm not sure

14. When did you apply for the programs? *[each answer from question above]*

	<i>Before enrolling in the Energy for All (SASH) program</i>	<i>During enrollment in the Energy for All (SASH) program</i>	<i>After enrollment in the Energy for All (SASH) program</i>
<i>Selected program #1</i>			
<i>Selected program #2</i>			
<i>Selected program #3</i>			

Financing and Installation

Now, we'd like to learn more about the financing options and installation process for the project.

15. Are you the owner of the solar system, or are you leasing it?
- a. I own the system
 - b. The system is leased (owned by a third party like Sunrun)
 - c. Not sure
16. *[If 15 = a]* Why did you select to own the system instead of lease?

- a. [free text]
17. Did your solar project require any additional things like roof repair, electrical upgrades, or tree trimming?
- a. Yes, there were additional things required
 - b. No
 - c. I'm not sure
18. [If 17 = a] Did GRID help connect you to funding needed for your project to pay for the additional things (roof repair, etc.)?
- a. Yes, GRID did help connect me to additional funding
 - b. No
 - c. Not sure
19. [If 18 = a] What type of additional funding help did GRID provide to make sure you could complete the installation?
- a. [free text]
20. [If 18 = a] How much additional funding did they provide?
- a. Amount in dollars: _____
 - b. Not sure
21. Did you have to pay anything yourself to get the system installed? This may have been on roof repairs, electrical upgrades, etc.
- a. Yes, I did have expenses
 - b. No
 - c. Don't know
22. [If 21 = a] Please tell us about what you had to pay yourself in order to get the system installed:
- a. How much did you have to pay (in dollars)? [required number]
 - b. What did you have to pay for? _____

Next, we want to ask about your overall experience with installation and participation.

23. How important was it to you that the contractors were arranged by GRID (instead of you having to find contractors yourself)?
- a. Extremely important
 - b. Very important
 - c. Somewhat important
 - d. A little important
 - e. Not at all important
24. How easy or difficult was it to schedule the installation?
- a. Very easy
 - b. A little easy
 - c. Neither easy nor difficult
 - d. Somewhat difficult
 - e. Very difficult

25. Overall, how easy or difficult would you say the installation went for your project?
- Very easy
 - A little easy
 - Neither easy nor difficult
 - Somewhat difficult
 - Very difficult
26. How satisfied or dissatisfied were you with... [grid with scale from Extremely satisfied to Extremely dissatisfied, and Not sure]?
- How long it took to complete the solar installation
 - The professionalism and courteousness of the installers
 - The overall functioning of your equipment
 - GRID Staff's ability to address my concerns
27. How did GRID Alternatives describe how the solar installation would affect your electric bill??
- GRID Alternatives said my bill would likely decrease.
 - GRID Alternatives said they could not predict the effects on my bill.
 - GRID Alternatives said my bill would likely increase.
 - GRID Alternatives did not describe the effects on my bill.
28. Have you had any issues with the solar system since it was installed?
- Yes, there have been issues with the solar system
 - No
29. [if 28 = a] Can you tell me a bit about the issue(s) you've had? If fixing the issues cost you money, please tell us how much.
- Cost of fixing the issue in dollars: [free text]
 - Description of the issues: [free text]
30. Have you done any maintenance for your solar panels?
- Yes, maintenance was needed for the solar panels
 - No
31. [if 29 = a] Can you tell me about the maintenance you had to do and how much it cost if you did it yourself?
- Cost of maintenance in dollars: [free text]
 - Description of the maintenance: [free text]

Customer Bill Impacts

32. Now, please tell us about your electric bills. Since the installation of solar on your rooftop, have your **monthly electric bills** gone up, gone down or stayed the same?
- Gone up
 - Gone down
 - Stayed the same
 - I don't know
33. [if 32 = a] Have your electric bills gone **up** a little, somewhat, or a great deal?

- a. A little
 - b. Somewhat
 - c. A great deal
34. [if 32 = b] Have your electric bills gone down a little, somewhat, or a great deal?
- a. A little
 - b. Somewhat
 - c. A great deal
35. Since installing solar, is your household using more electricity, less electricity, or about the same as before?
- a. More energy use
 - b. Less energy use
 - c. About the same energy use as before
 - d. Don't know
36. [if 35 = a] Can you tell me more about what you think caused your electricity usage to go up?
- a. [free text]
37. [if 35 = b] Can you tell me more about what you think caused your electricity usage to go down?
- a. [free text]

Q94. Do you know if you have access to your solar generation data?

- a. Yes
- b. No
- c. Don't know

Q95. [IF Q94 = A] Have you ever accessed your solar generation data?

- a. Yes
- b. No
- c. Don't know

Environmental Benefits

Now we want to talk to you about different environmental benefits.

38. The first is greenhouse gas emissions. Greenhouse gases trap heat and make the planet warmer. Greenhouse gases come from burning fossil fuels for electricity, heat and transportation. Do you think the rooftop solar program helps to reduce greenhouse gas emissions?
- a. Yes, a lot
 - b. Yes, somewhat
 - c. No, not very much
 - d. No, not at all
 - e. I'm not sure

39. How important is it to you that your rooftop solar helps to reduce greenhouse gas emissions?
- Extremely important
 - Very important
 - Somewhat important
 - Not very important
 - Not at all important
 - I'm not sure
40. Next is particulate matter. Particulate matter includes tiny bits of solid material that move around in the air and are produced by things like industrial processes, burning of diesel fuel, and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems. Do you think the rooftop solar program helps to reduce particulate matter?
- Yes, a lot
 - Yes, somewhat
 - No, not very much
 - No, not at all
 - I'm not sure
41. How important is it to you that your rooftop solar helps to reduce particulate matter?
- Extremely important
 - Very important
 - Somewhat important
 - Not very important
 - Not at all important
 - I'm not sure
42. Finally, nitrogen oxides. Nitrogen oxides are a family of gasses that form when fuel is burned at high temperatures in power plants, automobiles and turbines. These in part contribute to smog. Do you think the rooftop solar program helps to reduce nitrous oxide emissions?
- Yes, a lot
 - Yes, somewhat
 - No, not very much
 - No, not at all
 - I'm not sure
43. How important is it to you that your rooftop solar helps to reduce nitrogen oxide emissions?
- Extremely important
 - Very important
 - Somewhat important
 - Not very important
 - Not at all important

- f. I'm not sure

Customer Satisfaction

Next, we'd like to hear your insights and feedback about how to spread awareness and increase participation in the program.

44. What do you think would get in the way of someone in your community participating in the program? Please select all that apply.
- a. Don't think they'll save money
 - b. Don't have time to be around for installation
 - c. Don't want to share the required information for the application
 - d. Don't know how long they'll be in their home
 - e. Would consider solar but don't want incentives from this program
 - f. Would consider solar but don't want to use the installers from this program
 - g. Worried about disconnection from power during installation
 - h. Don't think their roof can support solar
 - i. Their home has outdated electrical wiring
 - j. Electric bill is already low
 - k. Don't trust that the offer is real
 - l. Don't want solar
 - m. Other: _____
 - n. None of the above
 - o. I don't know

45. How can the program better get the word out to your community about this program? Please select all that apply.
- a. Door to door outreach
 - b. Community event such as: _____
 - c. Mail
 - d. Word of mouth
 - e. Advertise in a magazine or newsletter: Which one(s) _____
 - f. Social media
 - g. Other: _____

46. Do you have any other feedback about the program?
- a. [\[free text\]](#)

Customer Information

47. Finally, we just have a few questions about yourself and your household. How many people live in your household full-time (i.e., for more than half of the year) including yourself?
- a. Drop down from 1 to 10
48. How many children (aged 0 - 17) live in your household?

- a. Drop down from 0 to 10
49. How many elderly people (aged 65 or older) live in your household?
- a. Drop down from 0 to 10
50. How much longer do you expect that you'll live in this home?
- a. 0 to 5 years
 - b. 6 to 10 years
 - c. 11 to 20 years
 - d. 21 years or more
 - e. Don't know
51. Thank you very much for completing our survey! **Please fill out the information below so that we can email you a \$25 online Visa card.** If you do not have an email address, please give us a call at 971-930-8686. [\[request response\]](#)
- a. Name: _____
 - b. Email: _____

Environmental Benefits

Now we want to talk to you about different environmental benefits.

38. The first is greenhouse gas emissions. Greenhouse gases trap heat and make the planet warmer. Greenhouse gases come from burning fossil fuels for electricity, heat and transportation. Do you think the rooftop solar program helps to reduce greenhouse gas emissions?
- a. Yes, a lot
 - b. Yes, somewhat
 - c. No, not very much
 - d. No, not at all
 - e. I'm not sure
39. How important is it to you that your rooftop solar helps to reduce greenhouse gas emissions?
- a. Extremely important
 - b. Very important
 - c. Somewhat important
 - d. Not very important
 - e. Not at all important
 - f. I'm not sure
40. Next is particulate matter. Particulate matter includes tiny bits of solid material that move around in the air and are produced by things like industrial processes, burning of diesel fuel, and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems. Do you think the rooftop solar program helps to reduce particulate matter?
- a. Yes, a lot
 - b. Yes, somewhat
 - c. No, not very much
 - d. No, not at all
 - e. I'm not sure
41. How important is it to you that your rooftop solar helps to reduce particulate matter?
- a. Extremely important
 - b. Very important

- c. Somewhat important
 - d. Not very important
 - e. Not at all important
 - f. I'm not sure
42. Finally, nitrogen oxides. Nitrogen oxides are a family of gasses that form when fuel is burned at high temperatures in power plants, automobiles and turbines. These in part contribute to smog. Do you think the rooftop solar program helps to reduce nitrous oxide emissions?
- a. Yes, a lot
 - b. Yes, somewhat
 - c. No, not very much
 - d. No, not at all
 - e. I'm not sure
43. How important is it to you that your rooftop solar helps to reduce nitrogen oxide emissions?
- a. Extremely important
 - b. Very important
 - c. Somewhat important
 - d. Not very important
 - e. Not at all important
 - f. I'm not sure

Customer Satisfaction

Next, we'd like to hear your insights and feedback about how to spread awareness and increase participation in the program.

44. What do you think would get in the way of someone in your community participating in the program? Please select all that apply.
- a. Don't think they'll save money
 - b. Don't have time to be around for installation
 - c. Don't want to share the required information for the application
 - d. Don't know how long they'll be in their home
 - e. Would consider solar but don't want incentives from this program
 - f. Would consider solar but don't want to use the installers from this program
 - g. Worried about disconnection from power during installation
 - h. Don't think their roof can support solar
 - i. Their home has outdated electrical wiring
 - j. Electric bill is already low
 - k. Don't trust that the offer is real
 - l. Don't want solar
 - m. Other: _____
 - n. None of the above
 - o. I don't know
45. How can the program better get the word out to your community about this program? Please select all that apply.
- a. Door to door outreach
 - b. Community event such as: _____
 - c. Mail
 - d. Word of mouth

- e. Advertise in a magazine or newsletter: Which one(s) _____
 - f. Social media
 - g. Other: _____
46. Do you have any other feedback about the program?
- a. [\[free text\]](#)

Customer Information

47. Finally, we just have a few questions about yourself and your household. How many people live in your household full-time (i.e., for more than half of the year) including yourself?
- a. Drop down from 1 to 10
48. How many children (aged 0 - 17) live in your household?
- a. Drop down from 0 to 10
49. How many elderly people (aged 65 or older) live in your household?
- a. Drop down from 0 to 10
50. How much longer do you expect that you'll live in this home?
- a. 0 to 5 years
 - b. 6 to 10 years
 - c. 11 to 20 years
 - d. 21 years or more
 - e. Don't know
51. Thank you very much for completing our survey! **Please fill out the information below so that we can email you a \$25 online Visa card.** If you do not have an email address, please give us a call at 971-930-8686. [\[request response\]](#)
- a. Name: _____
 - b. Email: _____

1.13DAC-SASH Non-Participant Survey

Aware Non-Participants

Below are the questions that we intend to include in the aware non-participant web survey. Skip logic, piped data, and conditions that end the survey are detailed in blue.

Introduction



Thank you for taking the survey on GRID's Energy For All (DAC-SASH and SASH) Solar Program. Your feedback is vital to us. This survey will take approximately 10-15 minutes to complete, and all information collected is confidential.

This will help an evaluation overseen by the California Public Utilities Commission (<https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/customer-generation-evaluation>).

Before we begin, we'd like to confirm you are eligible for this survey. If you are eligible and complete the survey, we will email you a \$25 Visa gift card within the next 3 to 4 weeks as a thank you.

Screening

52. Do you currently live at [embedded]?
- Yes
 - No [Termination message #1]
53. Do you own or rent your home?
- Own
 - Rent [Termination message #2]
54. GRID Alternatives offers no-cost solar installations on rooftops of single-family homes that meet certain income and location qualifications. Before taking this survey, had you heard of this program Energy for All program, also known as [embedded: program name with acronym]?
- Yes
 - No [SKIP to "unaware" survey]

Market Adoption

55. Since you moved into your home, have you installed solar panels on your roof?
- Yes
 - No
56. [IF 55= A] Have you installed solar panels on your roof through the GRID Alternatives Energy for All Solar Program?
- Yes [Termination message #2]
 - No
 - Not sure
57. [IF 56 = B | C] Did you or someone in your household pay to have solar panels installed on your roof, or did a program or other organization help pay for the installation?
- I paid for the solar panel installation
 - A program or other organization helped me pay for the solar panel installation
 - Something else: _____ [force response if selected]
58. [IF 55= A] Please choose the statement that best describes your solar system.
- I own the system
 - I have a Power Purchase Agreement (PPA) where I pay a certain amount for each kWh used each month

- b. I pay a flat monthly rate to the solar company for the solar energy
 - c. I have a different lease payment structure: _____ [force response if selected]
 - d. I lease but am not sure how my lease payments are set up
 - e. I am not sure
59. [IF 58 = B] What program or organization helped you pay for the solar panel installation?
- a. [Free text]
60. [IF 55 = A] How important were the following factors to your decision to install solar panels on your roof? [matrix with Extremely important, Very important, Somewhat important, A little important, and Not a factor]
- a. Use less energy
 - b. Lower energy bills
 - c. Help the environment
 - d. Concern about power outages
 - e. Other: _____ [force response if selected]

Marketing

61. How did you receive information about GRID Alternatives' Energy for All program that offers free solar panels for your home?
- a. From [embedded: utility]
 - b. From the city or county that I live in
 - c. From a friend/neighbor and/or family member
 - d. From a community organization
 - e. From GRID Alternatives
 - f. Other: _____ [force response if selected]
62. Do you remember receiving information about the Energy for All program in any of the following ways? Please select all that apply.
- a. I got something in the mail
 - b. I looked up information online
 - c. Someone talked to me about the program at an event
 - d. Someone called me on the phone
 - e. Someone came to my door to tell me about the program
 - f. Through a discussion with a friend/neighbor and/or family member
 - g. I heard about it through the TV
 - h. I saw an ad on social media (like Facebook)
 - i. I saw it in my utility bill
 - j. Other: _____ [force response if selected]
 - k. Don't recall [exclusive answer]

63. How can GRID Alternatives better get the word out to your community about the Energy for All program? Please select all that apply.
- a. Door to door outreach
 - b. Community event such as: _____
 - c. Mail
 - d. Word of mouth
 - e. Advertise in a magazine or newsletter: Which one(s) _____
 - f. Social media
 - g. Other: _____ [force response if selected]

Next, we would like to ask you some questions about how easy or difficult it was for you to understand the Energy for All program based on the information you received.

64. [if 61 = E] How clear was the information you received from GRID Alternatives about the program?
- a. Very clear
 - b. Somewhat clear
 - c. Neither clear nor unclear
 - d. Somewhat unclear
 - e. Very unclear

65. [if 61 = A] How clear was the information you received from [embedded: utility] about the program?
- a. Very clear
 - b. Somewhat clear
 - c. Neither clear nor unclear
 - d. Somewhat unclear
 - e. Very unclear

66. [if 64 = D, E | 5 = D, E] What was unclear about the program information you received?
- a. [free text]

Barriers

67. How interested were you in participating in the Energy for All program when you first learned about it?
- a. Extremely interested
 - b. Very interested
 - c. Somewhat interested

- d. A little interested
- e. Not at all interested

68. [IF 67= A|B|C] How important were the following factors to your interest in installing solar panels on your roof? [matrix of Extremely important, Very important, Somewhat important, A little important, and Not a factor]

- a. Use less energy
- b. Lower energy bills
- c. Help the environment
- d. Concern about power outages
- e. Other: _____ [force response if selected]

69. Which statements below describe why you did not move forward with the Energy for All program to install free solar panels on your roof? Please select all that apply.

- a. I am still interested and waiting to move forward
- b. I was told I was not eligible
- c. I would have needed to pay to improve my roof
- d. I would have needed to pay to upgrade my electrical panel
- e. I would have needed to pay for tree trimming
- f. I would have needed to pay for some other service before they could install solar panels: _____ [force response if selected]
- g. I did not want to get a permit
- h. I did not have time to participate
- i. [IF 55 = A] I did not want to wait for solar panels
- j. I was unsure of the benefits
- k. Some other reason: _____ [force response if selected]

70. What concerns, if any, did you have as you learned about the program?

- a. I didn't have any concerns [if selected, no others can be selected]
- b. The offer seemed too good to be true
- c. I was worried it was a scam
- d. I didn't think I would be eligible
- e. I didn't think I would have time to participate
- f. Other: My concerns were... _____ [force response if selected]

71. [IF 69 = A] When was the last time you talked to GRID Alternatives about participating in the program?



- a. Within the last month
- b. Within the last three months
- c. Within the last year
- d. I have not spoken with GRID in over a year
- e. I have never spoken with someone from GRID

72. [IF 69 = A] Can you tell me more about what you are waiting on to move forward with installing solar?

- a. [free text]

73. [IF 69 = B] Can you tell me more about why you were not eligible? Please select all that apply.

- a. I do not know why I am not eligible [exclusive answer]
- b. I was not able to provide all necessary documents
- c. I did not qualify because of income
- d. I did not qualify because of where my house is located
- e. I did not qualify because I do not own my home
- f. I did not qualify because of neighborhood restrictions
- g. I did not qualify because of my electricity usage
- h. I did not qualify for a different reason: _____ [force response if selected]

74. [IF 67 = C | D | E] Can you tell me how important each of the following factors were in why you were not interested in the program? [Matrix with scale Extremely important, Very important, Somewhat important, A little important, Not a factor]

- a. I did not have time to participate
- b. I did not trust the program
- c. I did not like solar panels
- d. My electricity bills were already low
- e. Some other reason: _____ [force response if selected]

75. [IF 69 = C | D | E | F] Did GRID Alternatives try to connect you to any organizations to try to help you find funding for...

Service	Yes	No	Don't know
[IF 69 = C] Roof Repair			



[IF 69 = D] Electrical
Panel

[IF 69 = E] Tree
Trimming

[IF 69 = F] Other
Service

76. [IF 75= YES for any] Was GRID successful in connecting you to any organizations to help you finding funding for the following?

Service	Yes	No	Don't know
---------	-----	----	------------

[IF 69 = C & 75 = YES]
Roof Repair

[IF 69 = D & 75 = YES]
Electrical Panel

[IF 69 = E & 75 = YES]
Tree Trimming

[IF 69 = F & 75 = YES]
Other Service

77. [IF 76 = YES for any] Was the funding offered enough to move forward with installing solar?

Service	Yes	No	Don't know
---------	-----	----	------------

[IF 69 = C & 76 = YES]
Roof Repair

[IF 69 = D & 76 = YES]
Electrical Panel

[IF 69 = E & 76 = YES]
Tree Trimming

[IF 69 = F & 76 = YES]
Other Service

78. [IF 69 = C|D|E|F] About how much would it have cost to upgrade your home to be ready for solar? An estimate is fine.

Service	Estimated Cost to Repair
[IF 69 = C] Roof Repair	
[IF 69 = D] Electrical Panel	
[IF 69 = E] Tree Trimming	
[IF 69 = F] Other Service	

79. Overall, how satisfied were you with your experience with GRID Alternatives?

- Extremely satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Extremely dissatisfied

80. Can you tell me why you answered that you were [ANSWER from 79] with GRID Alternatives?

- [free text]

Application Process

81. Did you ever submit an application for the Energy for All Program to install free solar panels?

- Yes
- No
- Don't know

82. [IF 81 = A] How did you fill out the full application for submission? If someone else filled out the application for you, how did they do it?

- Over the phone
- Via email and/or DocuSign
- Via a paper application by myself
- Via a paper application with help from GRID
- Don't know

83. [IF 82 != E] How easy or difficult would you say it was to complete your application for this solar project?
- Very easy to apply
 - Somewhat easy to apply
 - Neither easy nor difficult to apply
 - Somewhat difficult to apply
 - Very difficult to apply
84. [IF 10 = D | E] Which of the following, if any, contributed to the application process being difficult? Please select all that apply.
- Providing tax documents for proof of income
 - Providing proof of homeownership
 - Providing a recent utility bill
 - Understanding what the application was asking for
 - Making changes to my application
 - Other (please specify): _____ [force response if selected]
85. [IF 81 = A] Which energy programs were you already enrolled in **before** applying for the Energy for All program? Please select all that apply.
- California Alternate Rates for Energy (CARE) - a bill discount based on income
 - Family Electric Rate Assistance (FERA) – reduces electric bills for qualified households
 - Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
 - Medical Baseline Rate - a bill discount to help with necessary medical equipment
 - [IF embedded = SJV] San Joaquin Valley Energy Project - a program that swaps out propane and wood-burning appliances
 - Self-Generation Incentive Program (SGIP) – a program that offers rebates for installing energy storage technology like batteries
 - Other energy program (please specify): _____ [force response if selected]
 - None of the above
 - I'm not sure
86. [IF 81 = A] Which energy programs did you enroll **in around the same time** as applying for the Energy for All program? Please select all that apply. [Survey will not ask about answers selected in prior question]
- California Alternate Rates for Energy (CARE) - a bill discount based on income



- k. Family Electric Rate Assistance (FERA)- reduces electric bills for qualified households
- l. Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
- m. Medical Baseline Rate - a bill discount to help with necessary medical equipment
- n. [IF embedded = SJV] San Joaquin Valley Energy Project - a program that swaps out propane and wood-burning appliances
- o. Self-Generation Incentive Program (SGIP) – a program that offers rebates for installing energy storage technology like batteries
- p. Other energy program (please specify): _____ [force response if selected]
- q. None of the above
- r. I’m not sure

87. [IF 81 = A] When did you apply for the programs? [each answer from question above]

	<i>Before applying for the Energy for All program</i>	<i>While I applied for the Energy for All program</i>	<i>After applying for the Energy for All program</i>
<i>Selected program #1</i>			
<i>Selected program #2</i>			
<i>Selected program #3</i>			

88. [IF 81 = B | C] Which energy programs are you currently enrolled in? Please select all that apply.

- a. California Alternate Rates for Energy (CARE) - a bill discount based on income
- b. Family Electric Rate Assistance (FERA) – reduces electric bills for qualified households
- c. Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
- d. Medical Baseline Rate - a bill discount to help with necessary medical equipment
- e. [IF embedded = SJV] San Joaquin Valley Energy Project - a program that swaps out propane and wood-burning appliances
- f. Self-Generation Incentive Program (SGIP) – a program that offers rebates for installing energy storage technology
- g. Other energy program (please specify): _____ [force response if selected]
- h. None of the above

- i. I'm not sure

Environmental Benefits

Lastly we want to ask you about potential environmental benefits to using solar panels.

89. The first is greenhouse gas emissions. Greenhouse gases trap heat and make the planet warmer. Greenhouse gases come from burning fossil fuels for electricity, heat, and transportation. How much, if at all, do you think the rooftop solar program we've been asking about would help to reduce greenhouse gas emissions?

- a. A lot
- b. some
- c. Not very much
- d. Not at all
- e. I'm not sure

90. How important is reducing greenhouse gas emissions to you?

- a. Extremely important
- b. Very important
- c. Somewhat important
- d. Not very important
- e. Not at all important

91. Next is particulate matter. Particulate matter includes tiny bits of solid material that move around in the air and are produced by things like industrial processes, burning of diesel fuel, and operation of fireplaces and woodstoves. Particulate pollution can cause eye, nose and throat irritation and other health problems. Do you think the rooftop solar program we've been asking about would help to reduce particulate matter?

- a. Yes, a lot
- b. Yes, somewhat
- c. No, not very much
- d. No, not at all
- e. I'm not sure

92. How important is it to you that your rooftop solar helps to reduce particulate matter?

- a. Extremely important
- b. Very important
- c. Somewhat important
- d. Not very important
- e. Not at all important

f. I'm not sure

93. Finally, nitrogen oxides. Nitrogen oxides are a family of gasses that form when fuel is burned at high temperatures in power plants, automobiles, and turbines. These in part contribute to smog. Do you think the rooftop solar program we've been asking about would help to reduce nitrous oxide emissions?

- a. Yes, a lot
- b. Yes, somewhat
- c. No, not very much
- d. No, not at all
- e. I'm not sure

94. How important is it to you that your rooftop solar helps to reduce nitrogen oxide emissions?

- a. Extremely important
- b. Very important
- c. Somewhat important
- d. Not very important
- e. Not at all important
- f. I'm not sure

Customer Information

95. Finally, we just have a few questions about yourself and your household. How many total people live in your household full-time (i.e., for more than half of the year) including yourself?

b. [Drop down from 1 to 10](#)

96. How many of these people are children aged 0 - 17?

b. [Drop down from 0 to 10](#)

97. How many of these people are age 65 and older?

b. [Drop down from 0 to 10](#)

98. If you had to guess, how much longer do you think you will live in this home?

- f. 0 to 5 years
- g. 6 to 10 years
- h. 11 to 20 years

- i. 21 years or more
- j. Don't know

99. Thank you very much for completing our survey! **Please fill out the information below so that we can email you your \$25 online Visa card.** If you do not have an email address, please give us a call at 971-930-8686. [\[request response\]](#)

- c. Name: _____
- d. Email: _____

Termination Messages

1. Thank you for your interest in this survey. Unfortunately, we were trying to reach someone else. If you believe you received this message in error, please contact us at kirksey@evergreenecon.com or call (971) 930-8686.
2. Thank you for your interest in this survey. Unfortunately, you are not eligible for this survey.

Unaware Non-Participant Survey Instrument

Below are the questions that we intend to include in the aware non-participant web survey. Skip logic, piped data, and conditions that end the survey are detailed in blue. Embedded data will include address information to determine whether the address is located in a DAC or not, and what 80% AMI income should be used to determine eligibility based on their county.

Screening & Eligibility



Thank you for taking the survey on solar panel and energy usage in your community. Your feedback is vital to us. This survey will take approximately 10-15 minutes to complete, and all information collected is confidential. As a thank you, we will email you a \$25 Visa gift card if you are eligible and complete the survey.

Before we get started, we would like to confirm that you are eligible for this study. All of your information will be kept confidential.

[\[Programming note, questions 1 – 8 will force a response\]](#)

1. Do you currently live at [\[embedded: address\]](#)?
 - a. Yes
 - b. No [\[Termination Message #1\]](#)
2. Which best describes your home?
 - a. A single-family home

- b. A multi-family home with less than 4 units in the building [Termination Message #2]
 - c. A multi-family home with more than 4 units in the building [Termination Message #2]
 - d. Something else [Termination Message #2]
3. Do you own or rent your home?
 - a. Own
 - b. Rent [Termination Message #2]
 - c. Not sure [Termination Message #2]
4. Including yourself, how many people live in your home at least half of the time?
 - a. [drop down menu with 1 – 8+]
5. [IF DAC = TRUE] Is your annual household income above or below [Calculated 200% FPL based on 4]?
 - a. Above [Calculated 200% FPL based on 4]
 - b. Below [Calculated 200% FPL based on 4]
 - c. Not sure [Termination Message #2]
6. [IF (5 = A | DAC = FALSE) & (HUD = FALSE & 5 != B)] Does your home fall into any of the following categories? (Affordable housing, deed-restricted, purchased through a first-time homebuyer loan, etc.)
 - a. Yes
 - b. No [Termination Message #2]
 - c. Not sure
7. [IF HUD = TRUE | 6 = A] Is your annual household income above or below [embedded AMI amount]?
 - a. Above [embedded AMI amount] [Termination Message #2]
 - b. Below [embedded AMI amount]
 - c. Not sure [Termination Message #2]
8. GRID Alternatives offers no-cost solar installations on rooftops of single-family homes that meet certain income and location qualifications. Before taking this survey, had you heard of this program Energy for All, also known as the Single-family Affordable Solar Homes Solar Program (SASH)?
 - a. Yes [SKIP to “aware” survey]
 - b. No
 - c. Not sure

Thank you for completing the screening questions! You are eligible for this survey and will receive a \$25 visa gift card after you complete the following questions. Please click the next arrow to continue.

Existing Solar for Eligible Non-Parts

9. Do you have solar panels on your roof?
 - a. Yes, they were already installed when I purchased the home
 - b. Yes, I had them installed after I moved in
 - c. No

10. [IF 9 = A | B] Please choose the statement that best describes your solar system.
 - a. I own the system
 - b. I have a Power Purchase Agreement (PPA) where I pay a certain amount for each kWh used each month
 - c. I pay a flat monthly rate to the solar company for the solar energy
 - d. I have a different lease payment structure: _____ [force response if selected]
 - e. I lease but I am not sure how my lease payments are set up
 - f. I am not sure

11. [IF 9 = B] Next we would like to know if you received any assistance to help pay for the installation or cost of the solar panels.
 - a. Did you receive a tax credit? YES NO
 - b. Did you receive help from a program or organization? YES NO
 - c. Did you receive any other sort of assistance, such as a grant? YES NO

12. [IF 11b = YES] What program or organization helped you pay for the solar panel installation?
 - a. [Free text]

13. [IF 11c = YES] What assistance did you receive that helped you pay for the solar panel installation?
 - a. [Free text]

14. [IF 9 = B] How important were the following factors to your decision to install solar panels on your roof? [matrix with Extremely important, Very important, Somewhat important, A little important, and Not a factor]
 - a. Use less energy
 - b. Lower energy bills
 - c. Help the environment
 - d. Concern about power outages
 - e. Other: _____ [force response if selected]

Marketing

15. Have you ever been enrolled in any of the following energy programs? Please select all that apply.
- California Alternate Rates for Energy (CARE) - a bill discount based on income
 - Family Electric Rate Assistance (FERA) – reduces electric bills for qualified households
 - Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
 - Medical Baseline Rate - a bill discount to help with necessary medical equipment
 - [IF embedded = SJV] San Joaquin Valley Energy Project - a program that swaps out propane and wood-burning appliances
 - Self-Generation Incentive Program (SGIP) – a program that offers rebates for installing energy storage technology like batteries
 - Other energy program (please specify): _____ [force response if selected]
 - None of the above
 - I'm not sure
16. Are you **currently enrolled** in any of the following energy programs? Please select all that apply. [only display for those selected above]
- California Alternate Rates for Energy (CARE) - a bill discount based on income
 - Family Electric Rate Assistance (FERA) – reduces electric bills for qualified households
 - Energy Savings Assistance (ESA) - a program that does weatherization and includes faucet aerators and major appliances
 - Medical Baseline Rate - a bill discount to help with necessary medical equipment
 - [IF embedded = SJV] San Joaquin Valley Energy Project - a program that swaps out propane and wood-burning appliances
 - Self-Generation Incentive Program (SGIP) – a program that offers rebates for installing energy storage technology like batteries
 - Other energy program (please specify): _____ [force response if selected]
 - None of the above
 - I'm not sure
17. How do you typically receive information about energy programs for your home? Select all that apply.
- From [embedded: utility]

- b. From the city or county that I live in
 - c. From a friend/neighbor and/or family member
 - d. From a community organization
 - e. Other: _____ [force response if selected]
 - f. I have not received any information about energy programs
18. [IF 17 != F] Have you received information about energy programs in any of the following ways? Please select all that apply.
- a. I got something in the mail
 - b. I looked up information online
 - c. Someone talked to me about the program at an event
 - d. Someone called me on the phone
 - e. Someone came to my door to tell me about the program
 - f. Through a discussion with a friend/neighbor and/or family member
 - g. I heard about it through the TV
 - h. An ad on social media (like Facebook)
 - i. On a utility bill
 - j. Other: _____ [force response if selected]
 - k. Don't recall [exclusive answer]
19. How can energy companies better get the word out to your community about energy programs? Please select all that apply.
- a. Door to door outreach
 - b. Community event such as: _____
 - c. Mail
 - d. Word of mouth
 - e. Advertise in a magazine or newsletter: Which one(s) _____
 - f. Social media
 - g. Other: _____ [force response if selected]

Barriers

20. [IF 9 = C] Overall, how interested are you in having solar panels installed on your roof at no cost to you?
- a. Extremely interested
 - b. Somewhat interested
 - c. Neither interested nor disinterested
 - d. Somewhat disinterested
 - e. Extremely disinterested



21. [IF 9 = C] Can you tell me more about why you answered that you are [response from 20] in installing free solar panels on your roof?
- a. [Free text]
22. If there were a program that helped with installing free solar panels on communities like yours, how likely would you be to be interested in participating?
- a. Extremely interested
 - b. Somewhat interested
 - c. Neither interested nor disinterested
 - d. Somewhat disinterested
 - e. Extremely disinterested
23. Can you tell me why you would be [insert answer from above]?
- a. [Free text]

Customer Information

24. Finally, we just have a few questions about yourself and your household. How many of the people in your household are children aged 0 - 17?
- a. Drop down from 0 to 10
25. How many of the people in your household are aged 65 or older?
- a. Drop down from 0 to 10
26. If you had to guess, how much longer do you think that you will live in this home?
- a. 0 to 5 years
 - b. 6 to 10 years
 - c. 11 to 20 years
 - d. 21 years or more
 - e. Don't know
27. Thank you very much for completing our survey! **Please fill out the information below so that we can email you your \$25 online Visa card.** If you do not have an email address, please give us a call at 971-930-8686. [request response]
- e. Name: _____
 - f. Email: _____

Termination Messages



1. Thank you for your interest in this survey. Unfortunately, we were trying to reach someone else. If you believe you received this message in error, please contact us at kirksey@evergreenecon.com or call (971) 930-8686.
2. Thank you for your interest in this survey. Unfortunately, you are not eligible for this survey.

1.14 Trainee Survey

Thank you for taking our survey on volunteer and training opportunities with GRID. We will be asking about both solar installations and classroom trainings GRID Alternatives' Install Basic Training Course (IBT). Your feedback is vital to us. This survey will take approximately 15 minutes to complete, and all information collected is confidential.

As a thank you for taking our survey, we will send you a \$25 VISA gift card.

- Q1. First, can you confirm what GRID activities you've participated in? [\[Select all that apply\]](#)
 - a. I took the GRID installations basic training course [\[COURSE=1\]](#)
 - b. I helped (volunteered or trained) at one of GRID's rooftop solar installations **without taking GRID's broader training course** [\[COURSE=2\]](#)
 - c. None of the above [thank and terminate]

- Q2. Where do you remember first learning about [\[GRID's training course/the opportunity to help with a solar installation\]](#)?
 - a. Word of mouth
 - b. Community events/meetings
 - c. Job training organizations
 - d. Social media
 - e. Radio/TV advertisement
 - f. Local paper/Community Newsletter
 - g. Flyers
 - h. Community College
 - i. Local utility
 - j. GRID marketing materials or direct outreach
 - k. Other (please specify) _____

- Q3. Where did you attend [\[GRID's training course/the opportunity to help with a solar installation\]](#)? Select all that apply.
 - a. Bay area
 - b. Central Valley
 - c. North Coast
 - d. Los Angeles
 - e. Inland Empire
 - f. North Valley

- g. North Valley
 - h. San Diego
- Q4. On average, approximately how far did you need to travel roundtrip to attend the [GRID's training course/the opportunity to help with a solar installation]?
- a. 0-5 miles
 - b. 6-10 miles
 - c. 11-15 miles
 - d. 16-20 miles
 - e. More than 20 miles
- Q5. [if COURSE=1] On average, approximately how far did you need to travel roundtrip to attend the solar installation part of the training?
- a. 0-5 miles
 - b. 6-10 miles
 - c. 11-15 miles
 - d. 16-20 miles
 - e. More than 20 miles
- Q6. [if COURSE=1] How many weeks did you attend the GRID training course?
- a. Drop down of 0 – 50+
- Q7. About how many days did you go on-site to a solar installation?
- a. Drop down of 0 – 50+
- Q8. What made you interested in participating in [GRID's training course/the opportunity to help with a solar installation]? Select all that apply.
- a. Looking for a new career path
 - b. Looking for an introduction to the solar industry
 - c. Start a career in solar
 - d. Wanted to expand my knowledge of the solar industry
 - e. Other (please specify) _____
- Q9. [if COURSE=1] What are we hoping to get out of the trainings in terms of your career? [programmer note: program Q as optional]
- a. Free Response _____
- Q10. [if COURSE=2] What are we hoping to get out of the installation on-site visit(s) in terms of your career? [programmer note: program Q as optional]
- a. Free Response _____

- Q11. What best describes your employment status BEFORE participating in [GRID's training course/the opportunity to help with a solar installation]?
- Full-time (40 hours a week or more)
 - Part-time (less than 40 hours a week)
 - Unemployed/retired/not working
 - Other (please specify) _____
- Q12. [IF Q11 = Part-time] Was your **part-time** employment BEFORE participating in [GRID's training course/the on-site solar installation] a short-term contract, long-term contract, or was it not contract work?
- Yes, short-term contract (less than 6 months)
 - Yes, long-term contract (6 months or longer)
 - No, it was not a contract job
 - Don't know
- Q13. What best describes your employment status AFTER participating in the [GRID's training course/the on-site solar installation]?
- Same as before
 - Full-time (40 hours a week or more)
 - Part-time (less than 40 hours a week)
 - Unemployed/retired/not working
 - Other (please specify) _____
- Q14. [IF Q13 = Part-time] Was your **part-time** employment AFTER participating in [GRID's training course/the on-site solar installation] a short-term contract, long-term contract or was it not contract work?
- Yes, short-term contract (less than 6 months)
 - Yes, long-term contract (6 months or longer)
 - No, it was not a contract job
 - Don't know
- Q15. Before participating in [GRID's training course/the on-site solar installation], were you ever employed in the solar industry?
- Yes
 - No
- Q16. [IF Q15 = No AND Q11 \neq Unemployed] What best describes your work experience BEFORE participating in [GRID's training course/the on-site solar installation]?
- Construction
 - Finance
 - Agriculture

- d. Entertainment
- e. Education
- f. Health Care
- g. Food services
- h. Hotel services
- i. Legal services
- j. Military
- k. Other (please specify) _____

Q17. Are you currently employed in the solar industry?

- a. Yes
- b. Not yet, I am looking for a job in the solar industry
- c. No, but I was for some time after the training course
- d. No, I haven't worked in solar since the training course

Q18. [IF Q17 = a OR c] After attending the [GRID's training course/the on-site solar installation] how long did it take for you to obtain employment in the solar industry?

- a. _____ Years _____ Months

Q19. [IF Q17 = a OR c] What best describes your [current/previous] role(s) in the solar industry?
Select all that apply.

- a. Solar sales representative
- b. Solar PV installer
- c. Maintenance technician
- d. Solar fleet manager
- e. Solar service technician
- f. Solar site assessor
- g. Quality assurance specialist
- h. Other (please specify) _____

Q20. [IF Q17 = a OR b] About how long [have you/did you] [been working/work] for your [current/previous] employer?

- a. _____ Years _____ Months

Q21. [IF Q15 = Yes AND Q17 = No] Can you tell us why you no longer work in the solar industry?

- a. Free response _____

Q22. [IF COURSE=1] Did you obtain any professional certifications as part of the GRID training course?

- a. Yes

b. No

Q23. [If COURSE=1 and IF Q22 = Yes] What professional certifications did you receive as part of the GRID training course?

a. Free response _____

Q24. [IF Q22 = No] Do you currently plan to pursue any professional certifications in the solar industry?

a. Yes

b. No

c. Don't know

Q25. [If COURSE=1 and IF Q22 = Yes] Outside of what you received as part of the GRID training course, do you plan to pursue (or have you pursued) any other professional certifications in the solar industry?

a. Yes

b. No

c. Don't know

Q26. [If COURSE=1] Now going back to the on-site installation part of the class, was being in the field for on-site installations different from what you've learned in the class?

a. Text box _____

Q27. While on-site, were you ever able to interact with any of the residents of the homes that were getting the solar installed?

a. Yes

b. No

Q28. [IF Q27 = Yes] Did the residents have any questions about the installation or process?

a. Yes

b. No

c. Don't know

Q29. [IF Q28 = Yes] Did you feel that you had the knowledge necessary to answer the residents' questions?

a. Yes, I was able to answer all of their questions

b. Sort of, I was able to answer most of their questions

c. No, I wasn't able to answer any of their questions



- Q30. Do you believe your on-site installation time with the GRID project(s) improved your career opportunities in the solar industry?
- Yes
 - No
 - Don't know
- Q31. [If Q30 = Yes] Please describe in a couple sentences how you believe your on-site training created additional opportunities for you in the solar industry. [programmer note: program Q as optional]
- Text box _____
- Q32. [If COURSE=1] Do you feel that the on-site training you received through the GRID training course provided you with the knowledge and skills to be successful in the solar industry?
- The training prepared me well enough to get a job in the solar industry
 - The training prepared me fine, but I still needed some additional training to get a job in the solar industry
 - The training did not prepare me to get a job in the solar industry
- Q33. [If COURSE=1] Do you believe the training you received in the classroom provided you with the knowledge and skills to be successful in the solar industry?
- The training prepared me well enough to get a job in the solar industry
 - The training prepared me fine, but I still needed some additional training to get a job in the solar industry
 - The training did not prepare me well enough to get a job in the solar industry
- Q34. [If COURSE=1 and IF Q32 OR Q33 = b OR c] Can you please describe what else you feel you needed to know to be successfully employed in the solar industry?
- Text box _____
- Q35. [If COURSE=1] What networking and employment opportunities were provided to you as part of the GRID training course? Select all that apply.
- On-site networking opportunities with other participants and corporate sponsors
 - Referrals to companies who are hiring for installation and other positions in the solar field
 - Access to the GRID Alternative Resume Bank
 - Referrals through GRID's Sub-contractor Partnership Program (SPP) for paid short-term work as a SPP Job Trainee
 - Other (please specify) _____
 - None that I can think of

- Q36. [If COURSE=1] Overall, how well did the GRID training course do with providing you the opportunities and resources (training, job search assistance) you needed to obtain a job in the solar industry?
- Extremely well
 - Very well
 - Somewhat well
 - Not too well
 - Not at all well
- Q37. [IF Q36 = c, d, e] What else do you think the GRID training course could have provided you that would help obtain employment in the solar industry?
- Free response _____
- Q38. [If COURSE=1] If you were to have not participated in the GRID training course, do you think you would have known how to seek the skills necessary for employment in the solar industry?
- Yes
 - No
 - Don't know
- Q39. How much of a barrier are each of the following to getting hands-on experience in the solar industry? *Note to programmer – program as a matrix table with a scale of not at all a barrier, somewhat of a barrier, moderate barrier, extreme barrier.*
- Lack of financial resources
 - Lack of transportation
 - Distrust in the program
 - Lack of information (don't know how)
 - Lack of information (don't even know the option exists)
 - Time needed to get training
 - Training facility is too far away
 - Other (please specify) _____
- Q40. [IF COURSE=1 AND Q39 does not equal “not at all a barrier” for all response options] Do you have any suggestions for how programs might be developed to help overcome any of those barriers?
- Yes, please specify _____
 - No
 - Don't know

We have just a few more questions.

Q41. [If COURSE=1] Were you paid in some way for participating in the GRID training course?

- a. Yes
- b. No

Q42. Have you moved since you participated in [GRID's training course/the on-site solar installation]?

- a. Yes
- b. No

Q43. What is your age?

___ Years old.

Q44. What is the highest degree or level of school you have completed?

- a. No schooling completed
- b. Nursery school to 8th grade
- c. Some high school, no diploma
- d. High school graduate, diploma or the equivalent (for example: GED)
- e. Some college credit, no degree
- f. Trade/technical/vocational training
- g. Associate degree
- h. Bachelor's degree
- i. Master's degree
- j. Professional degree
- k. Doctorate degree

Q45. Which of these describes your personal income before taxes last year?

- a. \$0
- b. \$1 to \$9,999
- c. \$10,000 to \$24,999
- d. \$25,000 to \$49,999
- e. \$50,000 to \$74,999
- f. \$75,000 to \$99,999
- g. \$100,000 to \$149,999
- h. \$150,000 or greater
- i. Prefer not to say

Q46. Lastly, as mentioned we would like to provide you with a \$25 VISA gift card as a thank you for taking our survey. What is the best address to send the gift card to? Please note that we will not use your address for anything other than sending you the gift card.

- a. First Name _____
- b. Last Name _____



- c. Address _____
- d. City _____
- e. State _____
- f. Zip Code _____

Appendix G: Survey Recruitment Postcards

This section presents the postcards used in customer recruitment for both participants and non-participant survey recruitment. Each postcard had a unique tiny.url that directed them to the specific respondents' survey.

Postcard – Participants



Evergreen Economics is a research firm working with the California Public Utilities Commission and GRID Alternatives to evaluate the **Energy for All Program** (SASH and DAC-SASH).

We are asking for your help to improve this program. **We want to know about your experience. Our online survey will only take 10 minutes and we are offering \$25 as our thanks for your feedback.**

We want to know your thoughts!

We'll be following up with an email with a link to the survey soon. Or you can type in the link below to take it now!

[tiny.url]

If you have questions about this study, or would like to take the survey over the phone, please contact Stefan Rose at Evergreen Economics
 rose@evergreenecon.com
 (971) 930- 8686

Postcard – Aware Non-Participants



Evergreen Economics is a research firm working with your utility and GRID Alternatives to evaluate the **Energy for All Program** (SASH and DAC-SASH).

We are asking for your help to improve this program. **We want to know about your experience. Our online survey will only take 10 minutes and we are offering \$25 as our thanks for your feedback.**

* La encuesta también está disponible en español.

We want to know your thoughts!

We'll be emailing you with a link to the survey soon. Or you can type the link below into your browser to take it now!

[tiny.url]

If you have questions about this study, or would like to take the survey over the phone, please contact Kayla Kirksey at Evergreen Economics
 kirksey@evergreenecon.com
 (971) 930- 8686



Postcard – Unaware Non-Participants



Evergreen Economics is a research firm working with your utility to evaluate solar programs in California.

We want to hear your opinions about solar and energy usage in your community.

We are asking for your help! **Our online survey will only take 10 minutes and we are offering \$25 as our thanks for your feedback.**

* La encuesta también está disponible en español.

We want to know your thoughts!

We'll be emailing you with a link to the survey soon. Or you can type the link below into your browser to take it now!

[tiny.url]

If you have questions about this study, or would like to take the survey over the phone, please contact Kayla Kirksey at Evergreen Economics
kirksey@evergreenecon.com
(971) 930-8686

Postcard – Backside of all options



Evergreen Economics
1500 SW 1st Ave., Suite 1000
Portland, Oregon 97201

stamp

Name &
Address

Appendix H: Verification Visit Protocols

This appendix contains recruitment materials and forms used during the onsite field verification visits conducted to inform the PV impacts analyses. All highlighted fields were piped in during distribution to personalize the letter and email recruitment.

1.14.1 Authentication Letter



Dear <Program Name> Participant,

Thank you for participating in the <Program Name> program with GRID, and for completing a customer survey about the program recently.

I am contacting you to share that we are getting ready to begin conducting site visits with a small group of program participations. These will help us better understand the overall impact of the <Program Name> program.

This letter authenticates the request for a technical specialist to perform a visual verification of the solar array at your property. **These specialists will be from either Evergreen Economics or BrightLine Group.** This representative will not be requesting any personal information from you, but they may need access to part of your property, such as your back yard, to view your solar panels. They will **not** need access to the inside of your home, or on your roof, and you do not need to be home at the time of the visit.

If you have any questions or concerns, please use the contact information listed below to reach us directly. For verification of this evaluation, please follow this [link](#).

Thank you for helping to make California a leader in solar energy generation, and for your participation in this follow-up evaluation.

Sincerely,

Zoey Burrows
Program Manager, DAC-SASH/SASH
1171 Ocean Ave | Oakland, CA 94608
O: 510-646-8205
zburrows@gridalternatives.org





The **<Program Name>** program is funded through the California Public Utilities Commission (CPUC) and the CPUC has commissioned an evaluation to be conducted by Evergreen Economics and the BrightLine Group. If you have any questions for the CPUC about this study, please contact Sarah Lerhaupt, sarah.lerhaupt@cpuc.ca.gov.

1.14.2 Recruitment Email

Subject: **<Program Name>** Site Visit Scheduling

Dear **<Customer Name>**,

My company BrightLine Group is working with GRID to research how solar arrays installed through the **<Program Name>** are performing. **We will be sending a field specialist to your area on <Date> and would like your permission to visit your property. To thank you for your time, we will email you a \$50 gift card after the visit.** The specialist will visually observe your solar array and may take measurements or photos but will **not** need access to the inside of your home and you will not need to be home at the time of the visit. If your solar array is not visible from the street, the specialist will need to access the area behind your home. Only one visit ranging from 45 to 60 minutes is requested, and we are grateful for your participation.

Please reply to this email and tell us these two things:

- Is it ok for our specialist to come look at your solar arrays on **<Date>**?
- Any access issues that the specialist should be aware of? If the solar array is only accessible from an area that can't be seen from the front of your home, please note things like locked gates, backyard pets, etc. that the field specialist should be aware of. Note that we do not plan to go on your roof.

If you have any questions about the specialist's visit to look at your solar arrays or about this program, please feel free to contact us at **<BL contact>** or GRID Alternatives with any questions at **<GRID Contact>**. If you would like to verify this study, please see the attached letter and/or follow this [link](#) to the California Public Utilities Commission website.

Thank you!

<BrightLine Contact>

<Contact email>

BrightLine Group



The **<Program Name>** program is funded through the California Public Utilities Commission (CPUC) and the CPUC has commissioned an evaluation to be conducted by Evergreen Economics and the BrightLine Group. If you have any questions for the CPUC about this study, please contact Sarah Lerhaupt, sarah.lerhaupt@cpuc.ca.gov.

Learn more at: <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/customer-generation-evaluation>



1.14.1 Field Collection Form

SASH/DAC-SASH Data Collection Form									
Project ID					Field Engineer				
Customer Name									
Street Address									
City				Zip Code					
Phone Number									
Inspection Date & Time									
<i>Reported Values</i>					<i>Evaluation Values</i>				
Solar Panel Modules									
Module Quantity									
Manufacturer									
Model No.									
Mounting Method									
Tilt Angle									
Azimuth Angle									
Soiling Level									
Physical Condition									
Inverter(s)									
Quantity									
Manufacturer									
Model No.									
Distance Meter [ft, in]									
Vertical Distance (Tall)					Vertical Distance (Short)				
Horizontal Distance (Between Short & Tall)									
Estimated Solar Panel Tilt Angle [DEG]									0
Pitch Gauge App									
Measurement					Estimated Solar Panel Tilt Angle [DEG]			0	
Shading Factors									
JAN									
FEB									
MAR									
APR									
MAY									
JUN									
JUL									
AUG									
SEP									
OCT									
NOV									
DEC									
Photograph Checklist									
System Array(s)					Module Nameplate		Inverter Nameplate		
Shading					Physical Damage		Soiling Level(s)		
Additional Notes									



Appendix I: Additional Methods Detail

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.

**Table 20: 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	

