



California Solar Initiative— Biennial Evaluation Studies for the Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) Low-Income Programs

Market and Program Administrator Assessment

Program Years 2011–2013

Prepared for:
California Public Utilities Commission



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Reference No.: 170383
October 19, 2015



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Acknowledgements

This work would not have been possible without the efforts of Shannon O'Rourke of the CPUC, who from the project's conception ensured it was enriched by the participation of many valuable contributors. Chief among those who lent their time, data, and expertise were Cathleen Monahan from GRID Alternatives, Emrah Ozkaya from SCE, Aileen Lagbao from SCE, Richard Pulliam from SCE, Benjamin Airth and Ria Langheim from CSE, Jim Spurgeon from SDG&E, Elliana Spiegel from PG&E, and Derek Jones, formerly with PG&E. The authors would also like to thank Elizabeth Curran from the CPUC, Jason Perkins, formerly with the CPUC, and Carrie Brown of Resource Focus as a consultant to PG&E.

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List of Acronyms

AB	Assembly Bill
AMI	Area Median Income
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
CARE	California Alternative Rates for Energy
CATI	Computer-Assisted Telephone Interviewing
CCA	Community Choice Aggregator
CEC	California Energy Commission
CFL	Compact Fluorescent Lamp
CSE	Center for Sustainable Energy
CPUC	California Public Utilities Commission
CRM	Customer Relationship Management
CSI	California Solar Initiative
ESA	Energy Savings Assistance (Program)
E&W	Ewald and Wasserman
FAQ	Frequently Asked Question
FY	Fiscal Year
HUD	U.S. Department of Housing and Urban Development
IDI	In-Depth Interview
IOU	Investor-Owned Utility
kW	Kilowatt
kW-AC (CEC)	Kilowatts, Alternating Current (California Energy Commission-AC Rating)
kW-DC (PTC)	Kilowatts, Direct Current (Rated at PVUSA Testing Conditions)
LED	Light-Emitting Diode
LEED	Leadership in Energy & Environmental Design
LIHEAP	Low Income Home Energy Assistance Program
MASH	Multifamily Affordable Solar Housing
MW	Megawatt
M&E	Measurement and Evaluation
M&O	Marketing and Outreach
NABCEP	North American Board of Certified Energy Practitioners
NEM	Net Energy Metering
PA	Program Administrator
PACE	Property-Assessed Clean Energy
PG&E	Pacific Gas & Electric Company
PIER	Public Interest Energy Research
PPA	Power Purchase Agreement
PRC	Public Resources Code
PV	Photovoltaic

REN	Regional Energy Network
SASH	Single-Family Affordable Solar Homes
SB	Senate Bill
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric
SFC	Solar Finance Company
SPP	Sub-Contractor Partnership Program
TCAC	Tax Credit Allocation Committee (California)
TIGER	Topologically Integrated Geographic Encoding and Referencing (U.S. Census Bureau)
TPO	Third-Party Ownership
VNM	Virtual Net Energy Metering

Executive Summary

This Market and Program Administrator Assessment Report is one of three reports that the Navigant team is completing as part of the Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) evaluation effort:

- Market and Program Administrator Assessment
- Impact and Cost-Benefit Analysis
- Summary of Program Design Recommendations.

This report focuses on SASH and MASH PA effectiveness, job training, and energy efficiency program participation. In addition, the market assessment component describes the market context in which the SASH and MASH programs operate; understanding this market context provides PAs with information to better serve the low-income market in California.

BACKGROUND

The California Solar Initiative (CSI) provides solar incentives to customers of the investor-owned utilities (IOUs) in California to increase the adoption of solar energy. The CSI program set aside 10 percent of CSI program funds (\$216 million) for residential low-income single-family and multifamily solar projects through the SASH program and MASH program through the end of 2016.¹ The CPUC requires a biennial assessment of SASH and MASH program performance.

The SASH program, which provides financial assistance for the installation of solar photovoltaic (PV) generating systems on qualifying affordable single-family homes, began offering incentives in May 2009. GRID Alternatives (GRID), an Oakland-based nonprofit organization, administers the SASH program.²

In February 2009, the MASH program began providing financial assistance for the installation of solar PV on affordable multifamily housing. MASH is administered by three program administrators (PAs): Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), and the Center for Sustainable Energy (CSE) in San Diego Gas & Electric (SDG&E) territory.

In 2013, California legislature passed Assembly Bill (AB) 217, authorizing an additional \$108 million in funding for the SASH and MASH programs and extending the programs through the end of 2021, or until the programs exhaust the funds—whichever occurs sooner.³ Under AB 217, the SASH and MASH programs have a combined capacity target of 50 MW of solar PV for low-income residential housing.

¹ According to the CSI Program Handbook, the SASH and MASH programs are scheduled to end December 31, 2015. All SASH and MASH installations must be completed by September 30, 2016 to receive the program incentive payment. http://www.gosolarcalifornia.ca.gov/documents/CSI_HANDBOOK.PDF

² For more information on GRID Alternatives, see <http://www.gridalternatives.org/>

³ The full text of Assembly Bill No. 217, Chapter 609 is available at: http://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=201320140AB217

Other requirements include: the programs must maximize the overall benefit to ratepayers; participants who receive monetary incentives be enrolled in the Energy Savings Assistance (ESA) program, if eligible; and the programs provide job training and employment opportunities in the solar energy and energy efficiency sectors.

On January 29, 2015, the California Public Utilities Commission (CPUC or Commission) issued the Decision Extending the Multifamily Affordable Solar Housing and Single-Family Affordable Solar Housing Programs within the California Solar Initiative (D. 15-01-027).⁴ The decision allocates \$54 million in funding for each program and sets a target of 15 MW for SASH and 35 MW for MASH. The decision also includes guidance on program administration for each program.

EVALUATION APPROACH

The Navigant project team collected primary data on the programs through surveys and in-depth interviews (IDIs), as shown in Figure 1. The team also used secondary data to inform its research.

Figure 1. SASH and MASH Program Primary Data by the Numbers

SASH		MASH
Surveys		Surveys
100 SASH participants		73 MASH tenants
Interviews		Interviews
10 SASH job trainees	2	9 MASH installers and solar finance companies
9 SASH subcontractors	interviews with CPUC staff	6 MASH participant host-customers
6 SASH job training organizations	2	
3 GRID Alternatives staff	interviews with other market actors	

Source: Navigant Consulting, Inc.

⁴ <http://www.cpuc.ca.gov/NR/rdonlyres/D6EBBFCE-3C9D-4631-9F4E-94A58F765DF5/0/145938475.pdf>

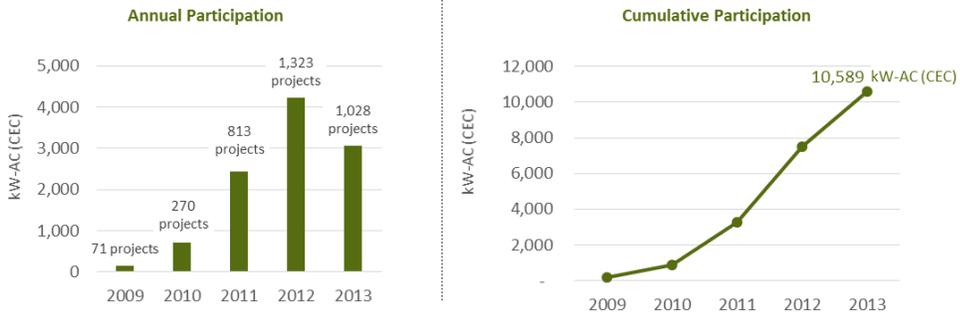
SASH PROGRAM ACCOMPLISHMENTS

From 2011 to 2013, the SASH program installed 3,164 solar PV systems comprising 9,731 kW-AC (CEC) of installed capacity, for a total installed capacity of 10,589 kW-AC (CEC) from program inception through 2013.

Figure 2. SASH Program Accomplishments

SASH: Program Accomplishments

The SASH program installed 3,505 systems between 2009 and 2013. These systems comprised 10,589 kW-AC (CEC) of installed capacity. From 2011 to 2013, the program installed 3,164 systems comprising 9,731 kW-AC (CEC) of installed capacity.



Participation by Office

GRID Alternatives' Office	% of total capacity (2009-2013)
Central Valley	21%
Bay Area	21%
Inland Empire	17%
Greater Los Angeles	13%
San Diego	12%
Central Coast	9%
North Valley	8%

Energy Efficiency

Status	% of total projects (2009-2013)
Enrolled in ESA Program	68%
ESA Program services completed	23%
Does not qualify for ESA Program	24%
Qualified for ESA Program	4%
Unable to contact client	3%
Client refused service	1%

Job Training

Subcontractor Partnership Program



Unique SPP trainees trained on SASH SPP projects



Average number of SPP projects per SPP trainee

GRID Alternatives Group Installations

Volunteers

17,314 Volunteers
1,377,560 Volunteer Hours

Job Trainees

3,645 Job Trainees
302,816 Job Trainee Hours



Job training organizations involved with SASH projects

Source: Navigant analysis of GRID Alternatives' Salesforce data
Note: Installed date is the Interconnection Utility Accepted Date; projects included if they have a valid Application Inspection Approved Date. All data for program years 2009 – 2013.

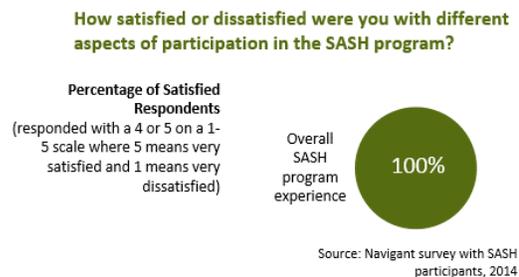
SASH FINDINGS

This section highlights the key findings for the SASH program. The findings are grouped by program administration, job training, energy efficiency participation, geographic assessment, and barriers to program participation.

- **Program Administration**

- GRID Alternatives is an effective PA of the SASH program.
 - SASH customers expressed extremely high levels of satisfaction with the program overall, with 100 percent rating their satisfaction at a four or five on a five-point scale, where five is “extremely satisfied.”
 - Customers report high levels of satisfaction with specific program components, including the program application process, the installation process for the PV system, the education received about the system, the performance of the system, and the ease of working with GRID Alternatives.
 - SASH Sub-Contractor Partnership Program (SPP) subcontractors and job training organizations believe that GRID Alternatives is doing a good job marketing and delivering the program.
- Having a single PA for the SASH program is beneficial for program administration because it streamlines communication and decision-making between the Commission and the PA.
- Both CPUC staff and GRID Alternatives reported being highly satisfied with the organizational structure.
- Funding and staffing levels are sufficient for program success.
- Subcontractor barriers include a lack of transparency about who gets assigned jobs from GRID Alternatives and slow payment from the program to subcontractors.

Figure 3. SASH Program Satisfaction



- **Job Training**

- GRID Alternatives has implemented an effective job training program.
 - Over 17,000 volunteers and 3,500 volunteer job trainees have completed GRID’s volunteer orientation and received hands-on solar training by participating in a SASH installation.
 - From 2009 through 2013, 143 trainees participated with SASH subcontractors on SASH projects through the SPP, with each trainee participating in an average of

10 projects. The majority of the trainees were active from 2011 to 2013, with 138 trainees averaging 7.1 projects during this period.

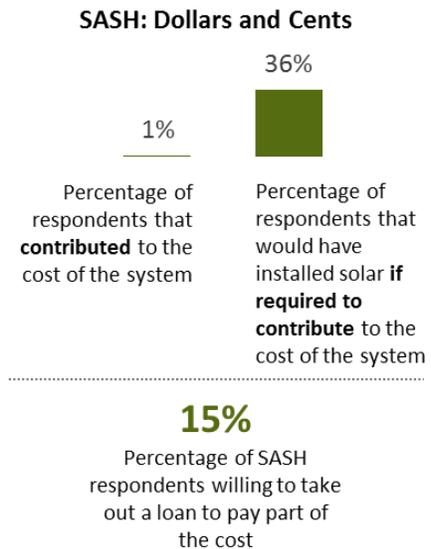
- All 10 interviewed trainees agreed that GRID Alternatives provided them with important skills and networking opportunities that helped them secure work in the industry. Additionally, in the absence of the SASH program, many agreed that the number of hands-on training opportunities would detrimentally decrease.
 - Of the nine SASH SPP subcontractors interviewed for this evaluation, six indicated that they had hired at least one SASH SPP job trainee as a full-time employee.
 - While there is no formal record of the number of SPP job trainees who later found employment in the solar sector, eight of the 10 SPP job trainees interviewed stated that they are still working in the solar industry after participating as an SPP job trainee between 2011 and 2013. Tracking these trainees is not required by the CPUC and remains a difficult task for GRID Alternatives staff.
 - Most GRID Alternatives staff referenced the organization’s job training efforts as a strength of the organization. This was supported by a number of representatives from job training organizations who commented on the high quality of GRID Alternatives’ programs in this area.
- **Energy Efficiency Participation**
 - GRID Alternatives has effectively increased program participants’ awareness of energy efficiency and participation in energy efficiency programs.
 - SASH program participants’ awareness of energy efficiency dramatically increased after program participation. Of respondents, 95 percent indicated that the program increased their awareness of energy efficiency.
 - Sixty-eight percent of SASH participants enrolled in the ESA program and 23 percent completed ESA program services.
 - GRID Alternatives sizes participants’ solar PV systems to account for and encourage further energy efficiency behaviors.
- **Geographic Assessment**
 - The SASH program installed projects across a relatively broad portion of California by 2013; however, installations were concentrated around metropolitan and coastal areas. Potentially, the SASH program has room to expand into rural areas, especially within Qualified Census Tracts.
 - Metropolitan areas have a high number of California Alternative Rates for Energy (CARE) accounts, which signifies a large number of lower-income residents that may

qualify for the program. Despite the relatively high concentration of SASH installations in metropolitan areas, GRID Alternatives can further target these areas going forward.

- **Barriers to Program Participation**

- According to CPUC staff and GRID Alternatives, eligibility requirements are the most significant barriers to program participation.
- Homeowner participation barriers include the initial perception that the program may be too good to be true, income eligibility requirements, and homes requiring structural repair before installation.
- In the future, requiring financial contributions from the homeowner could be a barrier to participation. However, 36 percent of respondents to the participant homeowner survey claim they would have installed solar if required to contribute to the cost of the system and 15 percent of respondents are willing to take out a loan to pay part of the cost.

Figure 4. SASH Dollars and Cents



Source: Navigant survey with SASH participants, 2014

PROGRESS TOWARD ACHIEVING SASH GOALS

The stated goals of the SASH program are to:⁵

- Decrease electricity usage by solar installation and reduce energy bills without increasing monthly expenses
- Provide full and partial incentives for solar systems for low-income participants
- Offer the power of solar and energy efficiency to homeowners
- Decrease the expense of solar ownership with a higher incentive than the CSI General Market Program
- Develop energy solutions that are environmentally and economically sustainable.

With respect to assessing the progress toward achieving the SASH program goals, note the following:

- **Decrease electricity usage by solar installation and reduce energy bills without increasing monthly expenses.** The SASH program installs solar PV systems that generate solar electricity which offsets electricity that was originally provided by the utility. Navigant was unable to quantify participant’s monthly expenses using SASH program data. However, 99% of the SASH

⁵ CSI Single-Family Affordable Solar Homes (SASH) Program, <http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm>.

customers interviewed believe that participation in the SASH program has made their monthly energy bill much more affordable. In addition, the vast majority of the solar systems installed were at no cost to the participants, indicating that, all else being held equal, the energy bills are reduced without increasing monthly expenses. Based on these findings, Navigant believes that the SASH program has been effective in meeting this goal.

- **Provide full and partial incentives for solar systems for low-income participants.** GRID Alternatives estimates that only roughly 1% of participants pay any out-of-pocket expenses for the solar PV systems installed under the SASH program. GRID Alternatives has developed external relationships to raise additional funds that leverage the SASH program incentives to provide solar PV systems at essentially no cost to low-income participants. Based on these findings, Navigant finds that the SASH program is meeting the goal of providing full and partial incentives for solar systems for low-income participants.
- **Offer the power of solar and energy efficiency to homeowners.** The SASH program has been effective in meeting the goal of offering the power of solar and energy efficiency to participating low-income homeowners based on several findings from the evaluation. First, the SASH program requires that all applicants receive an energy efficiency audit and enroll in the ESA program if they are eligible. To further promote energy efficiency, GRID Alternatives sizes the PV systems to account for and encourage energy efficiency. In addition, GRID Alternatives meets in person with all customers to discuss the impact that energy efficiency can have on utility bill savings. Ninety-five percent of respondents to the SASH customer participant survey indicated that the program increased their awareness of energy efficiency.⁶ Based on these findings, Navigant believes that GRID Alternatives has met the goal of offering solar and energy efficiency to homeowners.
- **Decrease the expense of solar ownership with a higher incentive than the CSI General Market Program.** The SASH program has higher incentives than the CSI General Market Program (see Table 3-3). Based on this finding, Navigant believes that the SASH program met the fourth goal to decrease the expense of solar ownership with a higher incentive than the CSI General market Program.
- **Develop energy solutions that are environmentally and economically sustainable.** Certainly, from the low-income customer's perspective, we believe that the SASH program has been effective in promoting energy solutions that are environmentally and economically sustainable, i.e., through the successful deployment of solar and facilitation of energy efficiency projects at low-income households.

SASH RECOMMENDATIONS

The Navigant team identified the following recommendations:

- **Utilize trusted messengers and customer testimonials.** GRID Alternatives could improve messaging and reduce customer concerns by conducting research (e.g., surveys or focus groups) to better understand the messaging that resonates with homeowners and builds trust with

⁶ Energy efficiency findings are presented in Section 3.3.

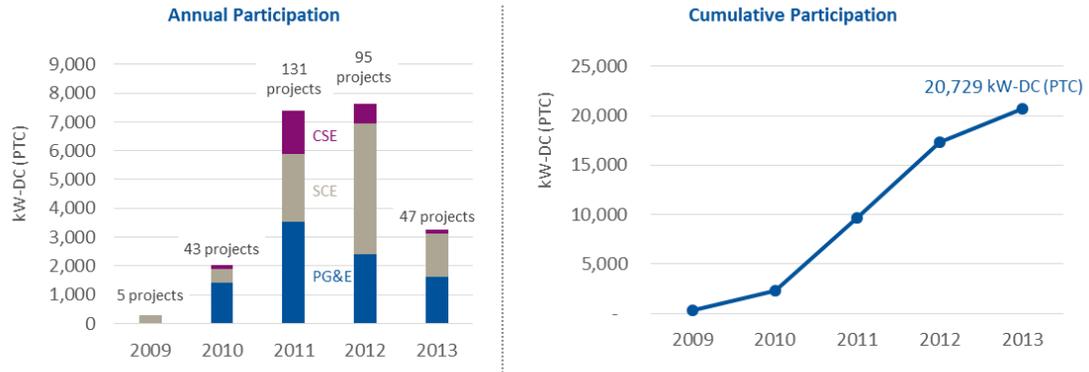
potential customers. GRID Alternatives should also consider offering customer testimonials to prevent disbelief from homeowners.

- **Track job placement for job trainees.** If job placement is an important metric to the CPUC, it should consider requiring that GRID Alternatives track job placement for job trainees in Salesforce as part of project tracking, potentially by requesting follow-up surveys from trainees in years after their training. Tracking job placement for job trainees would provide GRID Alternatives and the CPUC with a greater understanding of the impact of the job training program.
- **Provide a template to PAs for Data Annex requirements.** Navigant's evaluation found that reporting is not consistent across PAs for both SASH and MASH. A standard data template from the CPUC could ensure consistent reporting, streamline program evaluation, and simplify reporting for PAs. In addition, the IOUs should ensure that a structure is in place to communicate to GRID Alternatives the number of SASH participants that enroll in the ESA program after GRID Alternatives refers them.
- **Develop goals that are specific and measurable.** The CPUC's stated goals for the SASH program are difficult to evaluate against program performance because they lack specific quantitative targets. The CPUC should consider revising the goals of the SASH program using SMART criteria (i.e., Specific, Measurable, Achievable, Relevant, and Time-bound). Developing SMART goals would facilitate program evaluation and would allow GRID Alternatives to measure and track its performance over time against the CPUC goals.

MASH PROGRAM ACCOMPLISHMENTS

- From 2011 to 2013, the MASH program installed 273 solar PV systems comprising 18,400 kW-DC (PTC) of installed capacity, for a total installed capacity of 20,729 kW-DC (PTC) from program inception through 2013.
- From program inception through 2013, more than half of all MASH projects installed (62%) were net energy metered (NEM) and 38% were virtual net energy metered (VNM).

Figure 5. MASH Program Accomplishments



Project Type

Project Type	% of total capacity (2009-2013)	% of total installations (2009-2013)
Net energy metered	54%	62%
Virtual net energy metered	46%	38%

Source: Navigant analysis of CSI PowerClerk data and Track 2 project data
 Note: Installed date is the First Incentive Claim Request Review Date.
 Capacity is based on the CEC PTC rating (kW). All data for program years 2009 – 2013.

MASH FINDINGS

This section highlights the key findings for the MASH program. The findings are grouped by program administration, job training, energy efficiency participation, geographic assessment, and barriers to program participation.

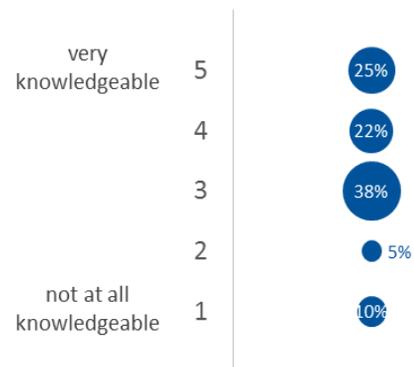
- **Program Administration**
 - Funding levels are sufficient to meet the needs of the program and the 10 percent administrative budget is sufficient to administer the program.
 - PAs could improve program administrator effectiveness by clarifying staff roles and communication channels and appointing a single point of contact to answer questions and make decisions when installers reach out with questions and requests.
 - Delays in rebate processing and a lack of transparency in program changes affect both the installers and the property owners.
- **Job Training**
 - Job training on MASH projects is not required but MASH installers occasionally use job trainees.

- Installers work with various job training programs, including but not limited to GRID Alternatives, and satisfaction with the job trainees varies.
 - Installers are generally in favor of job training for the MASH program. Above all, installers view safety as paramount for job trainees.
 - **Energy Efficiency Participation**
 - Energy efficiency was not strongly encouraged through the MASH program.
 - Energy efficiency participation is encouraged by the MASH program through a required online energy audit; however, property managers are not required to implement audit recommendations, and energy efficiency experience varies across customers.
 - MASH tenants indicated they were aware of energy efficiency opportunities, with 85 percent of respondents considering themselves to be average to very knowledgeable in energy efficiency.
 - Contrary to the SASH program, many do not credit the MASH program with their energy efficiency knowledge.
 - Roughly half of MASH tenants made behavioral changes to save energy; one-third of tenants installed energy efficiency products; and one-fifth participated in energy efficiency programs.

Figure 6. MASH Tenant Energy Efficiency Awareness

MASH: Tenant Energy Efficiency Awareness

How would you rate your KNOWLEDGE of energy efficiency and ways to save energy in your home?



Source: Navigant survey with MASH tenants, 2014

- **Geographic Assessment**

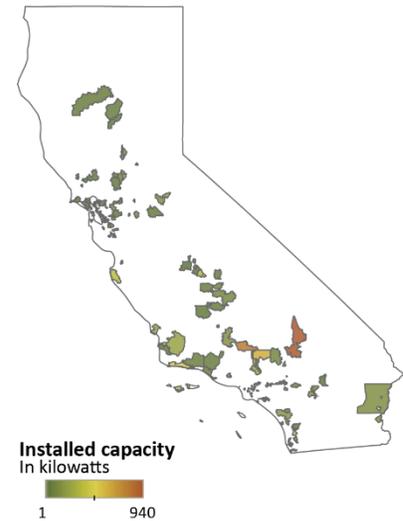
- MASH achieved a more limited geographic coverage than SASH. Still, many different regions in California now host a MASH installation. MASH also shows a higher concentration around metropolitan areas.
- The Greater Los Angeles and San Diego areas have the highest potential for future MASH projects based on numerous CARE accounts, indicating lower-income residents; however, the entire state has high potential based on the low overall coverage.

- **Barriers to Program Participation**

- Property owner participation barriers include the ability to identify favorable financing for the project, required electrical upgrades to the property, complex and time-consuming program applications. In addition, property owners noted that the success of the project is dependent on the solar installer.

Figure 7. MASH Installed Capacity

MASH: Installed capacity as of December 31, 2013



Source: Navigant analysis of CSI PowerClerk data

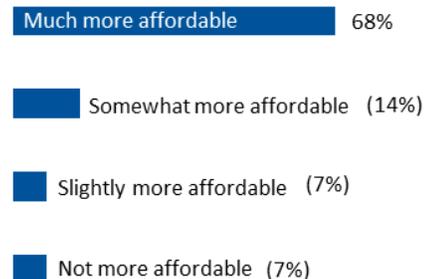
Tenant Benefits

- Tenants are generally satisfied with the solar PV system and had few concerns when the system was installed on their building.
- Nearly all (86 percent) of MASH tenant respondents would encourage their property manager to participate in the MASH program if they moved to another building that did not have solar; this is an indication of high program satisfaction from the tenant perspective.
- Interviews with affordable housing property owners indicate that affordable housing property owners are not changing the allocation of virtual net energy metering (VNM) benefits to tenants after setting the allocation at the time of interconnection.

Figure 8. MASH Tenant Benefits

MASH: Tenant Benefits

What impact has the solar installation had on your ability to afford your energy bill?



4% Don't know the impact

Source: Navigant survey with MASH tenants, 2014

- According to tenants, the primary, and often only mentioned, benefit from the installation of solar is savings on the energy bill.

PROGRESS TOWARD ACHIEVING MASH GOALS

The CPUC's goals for the MASH program are the following:⁷

- Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants
- Stimulate the adoption of solar power in the affordable housing sector
- Improve energy utilization and overall quality of affordable housing through the application of solar and energy efficiency technologies
- Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers.

MASH PAs, through interviews, described that the program's primary goal is to allocate incentives as effectively and efficiently as possible. The CPUC did not adopt explicit capacity goals for the MASH program when it authorized the MASH program in 2008. Other goals mentioned by the PAs include improving the quality of affordable housing and promoting the adoption of solar in low-income communities, which echo the CPUC's stated goals for the MASH program.

Navigant finds that the MASH program has met the four stated goals of the MASH program from 2011 to 2013. Details around each goal are provided below:

- **Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants.** VNM tenants that receive solar allocations see direct reductions in their utility bills at no cost to the tenant. On the other hand, NEM projects that offset common load may not directly impact the electricity use and cost for MASH participant building occupants. Therefore, research indicates that the MASH program met the goal of reducing electricity use and costs for affordable housing building occupants, but the achievement of this goal is primarily related to the VNM projects funded under the MASH program.
- **Stimulate the adoption of solar power in the affordable housing sector.** The MASH program stimulates the adoption of solar in the affordable housing sector through incentives that reduce the upfront cost of solar. Interviews with MASH property owners revealed that the MASH incentives often make the difference as to whether the affordable housing property owner can afford to install solar.
- **Improve energy utilization and overall quality of affordable housing through the application of solar and energy efficiency technologies.** Although bill savings from solar may not directly funnel back to the tenant if the project offsets common area load only, interviews with MASH property owners revealed other benefits stemming from solar and energy efficiency adoption

⁷ CSI Multifamily Affordable Solar Housing (MASH) Program, <http://www.cpuc.ca.gov/puc/energy/solar/mash.htm>.

that improve the overall quality of affordable housing. For example, reduced electricity bills for the affordable housing property owner allows the owner to provide other programs to their low-income tenants, improves the financial stability of the housing development, and frees up funds for other property improvements and services, such as free internet services. Some affordable housing property owners also reported an increased sense of pride in the low-income community and an increase in the availability of educational opportunities for tenants, especially for children living in the building.⁸ Similarly, an affordable housing developer described solar as a safeguard against future electricity price escalation, which in turn helps the residents because the property will not have to raise rent in the future. Based on these findings, Navigant believes that the MASH program met the goal of improving the quality of affordable housing through the application of solar and energy efficiency technologies. Navigant did not quantify the degree of improvement because the goal did not specify a target.

- Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers.** According to the MASH tenant survey, 79 percent of the respondents believed no drawbacks existed to living in a building with solar; 86 percent would encourage their property manager to participate in the MASH program if they moved to another building that did not have solar. These findings indicate high program satisfaction from the tenant perspective and suggest that the MASH program is increasing awareness and appreciation of the benefits of solar among affordable housing occupants. Regarding awareness and appreciation of solar among developers, Navigant learned through interviews with affordable housing property owners that MASH property owners believe that installing solar on their properties leads to favorable public relations and positive messaging about the organization, geared partly toward attracting more tenants. Several affordable housing property owners also described positive effects around personal environmental awareness, belief in renewable energy, doing the right thing, and giving back. These responses indicate that the MASH program is to some degree increasing the awareness and appreciation of the benefits of solar to developers.

MASH RECOMMENDATIONS

The Navigant team identified the following recommendations:

- Streamline the program application process.** Some MASH property owners found the program application process to be overly complex and time-consuming. MASH PAs should re-evaluate the program application process and documents with the goal of making them as streamlined as possible.
- Regularly communicate program updates to stakeholders.** MASH PAs should regularly communicate program updates in a timely manner through a publicly-available format such as the MASH website or an email listserv, or could host an information session to share program updates and answer questions before the PAs open the second round of funding.

⁸ See Section 4.4.1 and Section 4.5.1 for a discussion of benefits from the property owner and the tenant, respectively.

- **Provide objective information about MASH installers.** The CPUC, in concert with MASH PAs, should consider sharing objective information about installers to help affordable housing property owners identify and work with seasoned installers (e.g., create a website that shows data for the number of MASH projects by installer and when the projects were installed). The CPUC could also require that installers attend a short training seminar to review program rules.
- **Provide PAs with a data template to comply with Data Annex requirements.** Navigant's evaluation found that reporting is not consistent across PAs for SASH and MASH. A standard data template from the CPUC could ensure consistent reporting, streamline program evaluation, and simplify reporting for PAs.
- **Develop goals that are specific and measurable.** The CPUC's stated goals for the MASH program are difficult to evaluate against program performance. The CPUC should consider revising the goals of the MASH program using SMART criteria (i.e., Specific, Measurable, Achievable, Relevant, and Time-bound). Developing SMART goals would facilitate program evaluation and would allow the MASH PAs to measure and track their performance over time against the CPUC goals.

1 Introduction

This Market and Program Administrator Assessment Report is one of three reports that the Navigant team is completing as part of the Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH) evaluation effort:

- Market and Program Administrator Assessment
- Impact and Cost-Benefit Analysis
- Summary of Program Design Recommendations.

This report focuses on SASH and MASH PA effectiveness, job training, and energy efficiency program participation. In addition, the market assessment component describes the market context in which the SASH and MASH programs operate; understanding this market context provides PAs with information to better serve the low-income market in California.

This section presents context for this evaluation report, beginning with an overview of the evaluated programs and their status through 2013 followed by a summary of other relevant research and a discussion of this research effort's objectives and research questions. In addition, the section includes the structure for the remainder of this report. It is organized as follows:

- Section 1.1 – Program Overview
- Section 1.2 – Other SASH and MASH Evaluation Reports
- Section 1.3 – Research Objectives
- Section 1.4 – Report Organization

1.1 PROGRAM OVERVIEW

This section provides background information on the SASH program and MASH program. It also provides a discussion of recent changes to the program, as required by AB 217. This section is organized as follows:

- Section 1.1.1 – Background of the California Solar Initiative and SASH and MASH Programs
- Section 1.1.2 – AB 217 and New Program Rules

1.1.1 Background of the California Solar Initiative and SASH and MASH Programs

The California Solar Initiative (CSI) is one component of the Go Solar California! campaign.⁹ Overseen by the California Public Utilities Commission (CPUC or Commission), the CSI has a goal of installing 1,940 megawatts (MW) of distributed solar capacity in the investor-owned utility (IOU) service territories by the end of 2016. The program was established by California Senate Bill (SB) 1 in August 2006, and was initiated in January 2007; it has a \$2.167 billion budget over its 10-year period.¹⁰

SB 1 and Assembly Bill (AB) 2723 (Pavley, 2006) required the CPUC to set aside at least 10 percent of CSI funds to be used for installation of solar photovoltaic (PV) systems on low-income residential housing. Pursuant to this direction, in 2007, the CPUC authorized the SASH incentive program with \$108 million in funding for the installation of solar PV systems on single-family homes, and in 2008, authorized the MASH incentive program with \$108 million in funding for the installation of solar PV systems on multifamily housing. The CPUC did not adopt explicit capacity goals for either program at that time.

The SASH program offers fully or highly subsidized solar systems to qualified low-income homeowners. To qualify for a fully subsidized system, homeowners have to meet the legal definition of low-income residential housing in Public Utilities Code Section 2852. Eligibility is limited to owner-occupied households that receive electric service from the IOUs and whose household income is at or below 80 percent of the area median income (AMI) based on the most recent available income tax return. The residence must also meet an affordable housing requirement by being California Public Utilities Code Section 2852-compliant. GRID Alternatives (GRID), an Oakland-based nonprofit organization, was selected by the CPUC via a competitive solicitation to administer the SASH program.

From program inception through 2013, 3,505 PV systems had been installed for a total installed capacity of 10,589 kW-AC (CEC) in the SASH program. According to its database, GRID Alternatives allocated \$64.87 million in SASH incentives from program inception to the end of 2013. From 2011 to 2013, the SASH program installed 3,164 solar PV systems comprising 9,731 kW-AC (CEC) of installed capacity. At

SASH PROGRAM GOALS

- Decrease electricity usage by solar installation and reduce energy bills without increasing monthly expenses
- Provide full and partial incentives for solar systems for low-income participants
- Offer the power of solar and energy efficiency to homeowners
- Decrease the expense of solar ownership with a higher incentive than the CSI General Market Program
- Develop energy solutions that are environmentally and economically sustainable

Source:

www.cpuc.ca.gov/PUC/energy/Solar/sash.htm

⁹ The Go Solar California! campaign is a joint effort of the California Energy Commission (CEC) and the CPUC to encourage Californians to install 3,000 MW of solar energy systems on homes and businesses by the end of 2016. The program also has a goal to install 585 million therms of gas-displacing solar hot water systems by the end of 2017. <http://www.gosolarcalifornia.ca.gov/about/index.php>

¹⁰ SB 1 (Murray, Chapter 132, Statutes of 2006) and Public Resources Code (PRC) 25780.

the end of 2013, 262 additional projects were reserved and awaiting installation or interconnection¹¹ and another 682 applications statewide had been submitted and were under review.¹²

The MASH program administrators are Pacific Gas & Electric Company (PG&E), Southern California Edison (SCE), and the Center for Sustainable Energy (CSE) in San Diego Gas & Electric (SDG&E) territory. Prior to AB 217, which reauthorized funding for the MASH program and established new program rules¹³, the MASH program provided two types of incentives: Track 1A incentives for PV systems offsetting common area load and Track 1B incentives for PV systems offsetting tenant load. The program initially provided a Track 2 incentive for projects that proposed innovative approaches to providing tenant benefits, but the CPUC subsequently closed that portion of the program due to poor participation.¹⁴ To qualify for MASH Track 1A or Track 1B incentives, a property had to meet the definition of low-income residential housing per Public Utilities Code Section 2852 and have an occupancy permit.

As of June 9, 2009, the CPUC approved a virtual net metering (VNM) tariff for the IOUs to facilitate the provision of solar PV with tenant offsets. The VNM tariff directly allocates solar benefits to low-income tenants without requiring the system to physically connect to each tenant meter. VNM allows the owner to install one system and designate a set percentage of the solar output to the common area and to each tenant based on the relative tenant unit sizes. On the other hand, MASH projects that only serve common area load use net energy metering (NEM) tariffs that provide credit to properties for the excess generation that the PV systems export to the electric grid during times when it is not serving onsite load.¹⁵

MASH PROGRAM GOALS

- Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants
- Stimulate the adoption of solar power in the affordable housing sector
- Improve energy utilization and overall quality of affordable housing through the application of solar and energy efficiency technologies
- Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers

Source:
www.cpuc.ca.gov/PUC/energy/Solar/mash.htm

By the end of 2013, the MASH program had installed 321 PV systems, for a total installed capacity of 20,729 kW-DC (PTC) from program inception through 2013. According to PowerClerk data, the MASH program allocated \$70.96 million in incentives from program inception through the end of 2013. From

¹¹ Categorized as Approved-Construction in the SASH Salesforce database.

¹² Categorized as Approved-Outreach in the SASH Salesforce database.

¹³ AB 217 is discussed in more detail in Section 1.1.2.

¹⁴ For more information, see the full published decision at: http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/139683.htm. The Track 2 incentives decision is described in Section 7.3.

¹⁵ The CPUC NEM website contains more information on net energy metering (NEM): <http://www.cpuc.ca.gov/PUC/energy/DistGen/netmetering.htm>

2011 to 2013, the MASH program installed 273 solar PV systems comprising 18,400 kW-DC (PTC) of installed capacity. At the end of 2013, 55 additional projects reserved and awaiting installation¹⁶ and another 302 applications on the wait list.

1.1.2 AB 217 and New Program Rules

AB 217 (Bradford, 2013) extended the SASH and MASH programs, authorizing an additional \$108 million in funding, and extending the programs through the end of 2021, or until the funds are exhausted – whichever occurs sooner.¹⁷

Under AB 217, the SASH and MASH programs have a combined capacity target of 50 MW of solar PV for low-income residential housing. Other requirements include: (1) the program must be designed to maximize the overall benefit to ratepayers; (2) participants who receive monetary incentives be enrolled in the Energy Savings Assistance (ESA) Program, if eligible; and (3) the program must provide job training and employment opportunities in the solar energy and energy efficiency sectors.

On January 29, 2015, the CPUC issued the Decision Extending the Multifamily Affordable Solar Housing and Single-Family Affordable Solar Housing Programs within the California Solar Initiative (D. 15-01-027).¹⁸ The decision allocates \$54 million in funding for each program and sets a capacity target of 15 MW for SASH and 35 MW for MASH. The decision also includes guidance and program administration requirements including but not limited to:

- Enrollment in the ESA program for eligible MASH tenants
- Job training and employment opportunities on all solar PV systems installed
- GRID Alternatives as the PA for SASH and PG&E, SCE, and CSE as the PAs for MASH
- A confidential Data Annex to be submitted with the semi-annual SASH and MASH program reports that includes the number of job trainees, job type, and hours worked
- Request to GRID Alternatives to file a Tier 3 advice letter that proposes a third-party ownership (TPO) model for the SASH program

With the recent implementation of AB 217, this study may help inform the efforts of Commission staff and PAs tasked with implementing the new program requirements. Figure 1-1 presents a regulatory timeline for the SASH and MASH programs from 2006 through 2017.

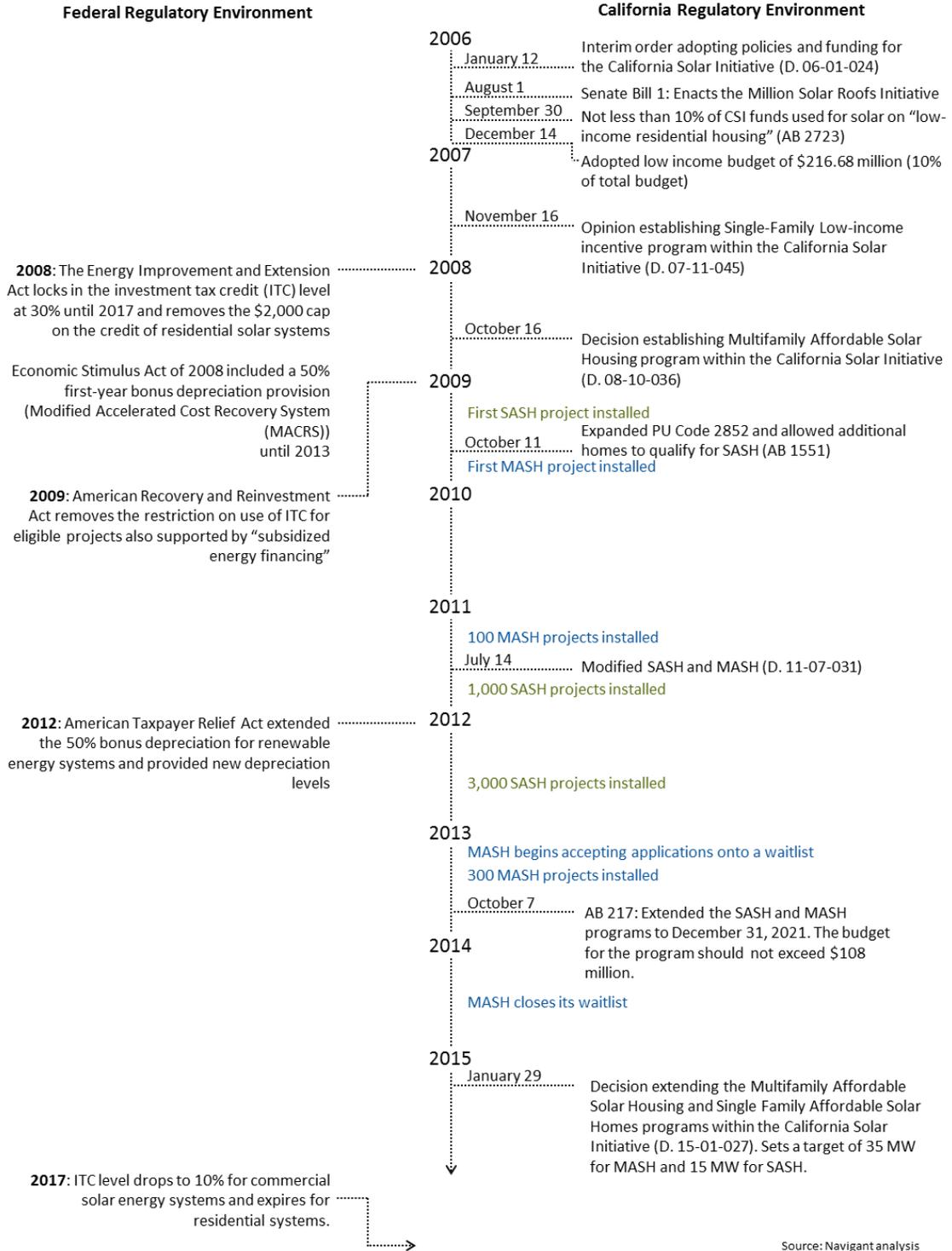
¹⁶ Categorized as Confirmed Reservation or Reservation Reserved in the PowerClerk database.

¹⁷ The full text of AB 217, Chapter 609 may be found here:

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

¹⁸ <http://www.cpuc.ca.gov/NR/rdonlyres/D6EBBFCE-3C9D-4631-9F4E-94A58F765DF5/0/145938475.pdf>

Figure 1-1. Regulatory Timeline



Source: Navigant analysis
 Note: This graphic is not intended to cover all solar activity during the timeframe.

1.2 OTHER SASH AND MASH EVALUATION REPORTS

This study builds upon previous SASH and MASH evaluation studies conducted by Navigant in 2011.¹⁹ The 2011 reports include:

- CSI SASH and MASH Program Administrator Performance Assessment Report²⁰
- CSI SASH and MASH Market Assessment Report²¹
- CSI SASH Biennial Report²²
- CSI MASH Biennial Report²³
- CSI SASH and MASH Impacts and Cost-Benefit Report²⁴

1.3 RESEARCH OBJECTIVES

The primary goal of this study is to inform future SASH and MASH program decision-making in light of previous CPUC decisions and the 2013 passage of AB 217. This evaluation includes both retrospective and prospective research objectives. In addition to looking backward to better understand if the programs are meeting their objectives, the Navigant project team assessed key barriers and opportunities to meeting the program’s updated goals and objectives.

Table 1-1 outlines the research objectives, divided into those that address PA effectiveness and those that address the market assessment.

¹⁹ The full reports are available on the CPUC website at:

http://www.cpuc.ca.gov/PUC/energy/Solar/CSI+sash_mash+li+evaluation.htm.

²⁰ Available at: http://www.cpuc.ca.gov/NR/rdonlyres/3A60572D-725B-434E-A525-077428DE4E5D/0/CSIMASHandSASHPAAssessmentReport_2011.pdf

²¹ Available at: <http://www.cpuc.ca.gov/NR/rdonlyres/EB601615-61B3-43B2-B034-EEC95AF46708/0/CSISASHandMASHMarketAssessmentReport.pdf>

²² Available at: <http://www.cpuc.ca.gov/NR/rdonlyres/FEDCFF17-1FCC-4E42-BE6D-AD8EC45838BD/0/CSISASHBiennialReport.pdf>

²³ Available at: <http://www.cpuc.ca.gov/NR/rdonlyres/BA047AB8-7EC3-4991-8DB5-FCE46CDDF5D1/0/CSIMASHBiennialReport.pdf>

²⁴ Available at: http://www.cpuc.ca.gov/NR/rdonlyres/13AAEDF8-BB7D-4FBD-AC05-3FC2B9CBF746/0/CSISASH_MASHImpact_and_Cost_Benefit_Report.pdf

Table 1-1. Task 1 Research Areas and Research Questions

Program Administrator Assessment
<p><i>PA Effectiveness and Opportunities</i></p> <ul style="list-style-type: none"> • What are the PA goals? Have they met them? • Is organizational structure limiting program success? • Are funding/staffing levels sufficient for success? • What are recommended program changes?
<p><i>Job Training Effectiveness and Opportunities</i></p> <ul style="list-style-type: none"> • What are the job training goals? • How many individuals have been trained? Are they still working in the solar industry? • How could the SASH/MASH program improve job training efforts? • What are recommended program changes?
<p><i>Barriers to Program Participation</i></p> <ul style="list-style-type: none"> • What are the barriers to participation? • What is recommended to overcome these barriers?
<p><i>Energy Efficiency Participation</i></p> <ul style="list-style-type: none"> • What is the level of energy efficiency program participation? • What energy efficiency tools and resources are being used prior to systems being installed? • How aware are MASH customers of energy efficiency opportunities? • To what extent are MASH customers already complying with AB 217's energy efficiency requirements? • What would the effect be of higher energy efficiency requirements?
<p><i>MASH Program Tenant Benefits</i></p> <ul style="list-style-type: none"> • Are low-income tenants benefitting (monetarily or non-monetarily) from MASH projects? • Are building owners changing their allocation of virtual net energy metering (VNM) benefits at some point following interconnection of MASH-supported systems?
Market Assessment
<p><i>Geographic Assessment</i></p> <ul style="list-style-type: none"> • What is the geographic distribution of participating SASH/MASH customers? • What is the geographic distribution of possible eligible participants for SASH/MASH?
<p><i>Assessment of Market Opportunities for PAs</i></p> <ul style="list-style-type: none"> • What steps can PAs take to help meet program capacity targets?

Source: Navigant Consulting, Inc.

1.4 REPORT ORGANIZATION

The remainder of this report is organized as follows:

- Section 2 presents the evaluation approach
- Section 3 presents the findings and recommendations for the SASH program
- Section 4 presents the findings and recommendations for the MASH program
- Appendix A provides detailed information on the data collection and sampling methodology
- Appendix B provides the data collection instruments used in the in-depth interview
- Appendix C provides the data collection instruments used in the SASH homeowner and MASH tenant surveys
- Appendix D provides the detailed results of the SASH homeowner and MASH tenant surveys

2 Evaluation Approach

This report focuses on SASH and MASH program activities and projects completed in program years 2011 through 2013. In 2011, Navigant completed an assessment for the CPUC on the SASH and MASH programs from program inception through 2010. The Navigant team collected primary and secondary data to inform the evaluation’s findings. This section is organized as follows:

- Section 2.1—In-depth Interviews
- Section 2.2—Participant Surveys
- Section 2.3—Secondary Data Sources
- Section 2.4—Geographic Assessment

2.1 IN-DEPTH INTERVIEWS

Navigant conducted qualitative in-depth interviews (IDIs) to capture data for this report. The interviews included:

- General interviews (PA staff and CPUC staff) that addressed both the SASH program and the MASH program
- SASH-specific interviews
 - SASH SPP job trainees
 - SASH subcontractors
 - SASH job training organizations
- MASH-specific interviews
 - MASH property owners
 - MASH participating installers and solar finance companies (SFCs).

The team used NVivo™, a qualitative data analysis platform, to analyze the interview findings.²⁵

²⁵NVivo is a qualitative data and mixed methods (i.e., able to incorporate statistical quantitative data) research software used to collect, organize, and analyze content from diverse sources, including but not limited to: interviews, surveys, web pages, and other literature in electronic or online formats. See:

http://www.qsrinternational.com/products_nvivo.aspx

Table 2-1 summarizes the interviews, including the estimated population size, target sample size, and number of completed interviews. Additional descriptions and details of each interview follow Table 2-1.

Table 2-1. Summary of Primary Data Collection: In-Depth Interviews

Primary Data Collection Effort	Estimated Population Size	Target Sample Size	Number of Completed Interviews
PAs	10 (GRID Alternatives for the SASH program (7 offices) and PG&E, SCE, and CSE for the MASH program)	6	6
CPUC staff	2	2	2
SASH SPP job trainees	130	10	10
SASH SPP subcontractors	47	8	9
SASH job training organizations	59	8	6
MASH participant property owners	163*	16	16
MASH participant installers and solar finance companies	40	10**	9
Other market actors (supplementary interviews)	N/A	N/A	2

*Approximate; naming conventions for “Host Customer Company” from PowerClerk data varied considerably by application.

**The evaluation plan target sample size for the MASH participant installers and SFCs was 14. The team reduced the target from 14 to 10 (with CPUC approval) due to difficulty recruiting 14 interviews after the team had exhausted the contact list for this group. The interview results at that point suggested that the range and representation of responses from installers was sufficient to address the research objectives for this group.

Source: Navigant Consulting, Inc.

2.1.1 General Interviews

Navigant conducted general interviews with the following:

- PA staff:** The team completed six interviews with PA staff, including one interview with each of the MASH PAs (PG&E, SCE, and CSE) and three interviews with GRID Alternatives staff. These interviews included topics such as the PA goals, the organizational structure, funding/staffing levels, the PAs’ understanding of the markets, barriers to participation as seen by the PAs, and thoughts on program changes.
- CPUC staff:** The team conducted two interviews with the CPUC staff involved with the SASH and MASH programs. The interviews covered the policy objectives of each program (including changes stemming from AB 217), the current status of the programs, and barriers to achieving the programs’ objectives.

2.1.2 SASH Market Actor Interviews

Navigant conducted interviews with the following market actors:

- **SASH Sub-Contractor Partnership Program (SPP) job trainees:** The team conducted 10 interviews with SASH job trainees in the SPP. These interviews informed multiple research areas, with a focus on understanding job training effectiveness and opportunities.
- **SASH SPP subcontractors:** The team conducted nine interviews with SASH subcontractors in the SPP. These interviews informed multiple research areas, with a focus on understanding job training effectiveness and opportunities.
- **SASH job training organizations:** The team conducted six interviews with SASH job training organizations. The organizations included community job training organizations or community colleges or vocational schools that send groups of students to GRID Alternatives' in-house installations. Interviewing these organizations helped the project team understand GRID Alternatives' broader job training efforts and potential opportunities for improvements.²⁶ These organizations, along with the other SASH market actors above, also added perspectives about the potential job training opportunities (or barriers) for the MASH program, a key aspect of the changes resulting from AB 217.

2.1.3 MASH Market Actor Interviews

The MASH market actor interviews consisted of the following:

- **MASH participant property owner:** The team completed 16 interviews with MASH participant property owners (i.e., building owners or managers). The interviews focused on opportunities to expand job training, recommendations for program modifications, energy efficiency participation, tenant benefits, and information about customers to inform marketing and outreach efforts for the MASH program.
- **MASH participant installers and SFCs:** The team completed nine interviews with MASH participant installers and SFCs. The interviews focused on job training opportunities, the barriers to program participation, and energy efficiency participation.
- **Other market actors:** The team completed two interviews with additional market actors (a California housing organization and a consulting firm) to gain additional understanding about the MASH program.

2.2 PARTICIPANT SURVEYS

This section presents the methodology for the SASH participant homeowner survey and the MASH tenant survey. Navigant designed and managed the data collection efforts, and the telephone market research firm Ewald and Wasserman (E&W) fielded the research.

²⁶ SASH SPP subcontractors have the option to hire SPP job trainees from any qualified job training organization in the state. In some cases, SASH subcontractors may hire from the subset of job training organizations that provide trainees for GRID Alternatives' in-house installations. There is no direct program connection between the SASH job training organizations and SASH SPP subcontractors.

2.2.1 SASH Participant Homeowner Survey Sampling Methodology

The team conducted 100 surveys with SASH participant homeowners in accordance with the sampling plan. Sub-targets were set by region to ensure that the survey results were geographically representative of the program participants. The targets were set proportionally to each region’s share of the total number of SASH participants in 2011 to 2013.

Table 2-2. SASH Participant Homeowner Survey Sample Design

Region/GRID Office	Completed SASH Projects 2011–2013	Percent of Total	Target Sample Size
Bay Area, Central Coast	903	30%	30
Central Valley, North Valley	759	25%	25
Greater LA, Inland Empire	952	32%	32
San Diego	377	13%	13
Total	2,991	100%	100

Source: Navigant Consulting, Inc.

Navigant obtained the 2011 to 2013 customer contact information from GRID Alternatives through a secure file transfer. Navigant randomly selected an appropriate number of participant contacts within each region and provided E&W with those contacts (also via secure file transfer). The random selection was done by assigning a random number to each contact in the region using Excel’s random number function, sorting the list by the random number, and selecting the desired number of contacts (15 times the desired sample size) starting at the top of the sorted list.

2.2.2 MASH Tenant Survey Sampling Methodology

The sampling plan called for 70 MASH tenant surveys, and the team completed 73 surveys. Navigant provided the IOUs with a list of meter and account numbers for participating virtual net energy metering (VNM) MASH host owners and requested contact information for the tenants associated with those MASH projects. The IOUs provided this information to Navigant via secure file transfer. The survey does not cover non-VNM MASH projects because those tenants do not directly receive energy bill savings from the solar installation. Navigant set sub-targets for each utility territory based on the proportion of VNM MASH projects completed in each territory, as shown in Table 2-3. The contacts

were randomly selected and delivered to E&W following the same procedure as described for the SASH survey sampling in Section 2.2.1.

Table 2-3. MASH Tenant Survey Sample Design

IOU	Completed VNM MASH Projects 2011–2013	Percent of Total	Target Sample Size
PG&E	9	21%	15
SCE	18	43%	30
SDG&E	15	36%	25
Total	42	100%	70

Source: Navigant Consulting, Inc.

2.2.3 SASH Participant Homeowner and MASH Tenant Survey Fielding

The SASH participant and MASH tenant surveys were conducted by E&W, a telephone market research firm with computer-assisted telephone interviewing (CATI) capabilities. E&W left scripted voicemails with respondents who did not answer.

The surveys required 10 to 14 minutes to complete and were conducted in English or Spanish according to the respondent’s preference. E&W translated the survey instruments into Spanish.

Table 2-4 and Table 2-5 present the sample dispositions for the SASH and MASH surveys, respectively.

Table 2-4. SASH Participant Homeowner Survey Sample Disposition

Status	Number of Contacts	Percent of Total
Completed survey	100	13%
Refusal	22	3%
Unable to contact (Answering machine, no answer, language barrier)	446	58%
Invalid number (Wrong number, fax line, disconnected number)	144	19%
Ineligible (Contact does not have solar)	52	7%

Source: Navigant Consulting, Inc.

Table 2-5. MASH Tenant Survey Sample Disposition

Status	Number of Contacts	Percent of Total
Completed survey	73	12%
Refusal	36	6%
Unable to contact (Answering machine, no answer, language barrier)	420	69%
Invalid number (Wrong number, fax line, disconnected number)	26	4%
Ineligible (Contact does not have solar)	51	8%

Source: Navigant Consulting, Inc.

2.3 SECONDARY DATA SOURCES

Secondary data sources provided necessary information for program evaluation as well as additional market context supporting the primary data collection activities and analysis. The team used the following secondary data sources for the project:

- Salesforce data:** Navigant used GRID Alternatives’ online Salesforce²⁷ database portal for application and installation data to summarize participation and installed SASH program capacity. Navigant also used the Salesforce data to design the SASH survey samples and answer key research questions.
- PowerClerk data:** Navigant used the online MASH database (PowerClerk) application and installation data to summarize participation and installed MASH program capacity. PowerClerk data was also used to design the MASH survey samples and answer key research questions.
- PA administrative, budgetary, and operational information:** This additional PA information provided insight into the PA effectiveness and opportunities task. Navigant obtained this data through a data request to the PAs.
- Utility California Alternative Rates for Energy (CARE) data:** The team used this data to help identify the general location of customers that may be eligible for both programs based solely on their income. Note that the provided data did not include any customer-identifiable information; rather it was limited to aggregate-level information (e.g., number of CARE rate customer accounts by ZIP code). SCE and PG&E provided CARE data classified by single-family and multifamily accounts, whereas SDG&E provided bundled CARE data for all residential accounts. Navigant obtained this data through a data request to the IOUs.

²⁷ Salesforce is a web-based customer relationship management (CRM) product. CRM allows organizations to store and manage prospect and customer information, such as contact info, accounts, leads, and sales opportunities, in one central location. <http://www.salesforce.com/>

- **Demographic data/geographic data:** The team used the U.S. Census Bureau Topologically Integrated Geographic Encoding and Referencing (TIGER) products to identify Qualified Census Tracts as part of the geographic assessment.²⁸
- **Other program reports:** The team reviewed the findings from previous SASH/MASH evaluations, the *CSI 2013 Annual Program Assessment*, and available quarterly reports.²⁹
- **Legislative and regulatory documents:** The team reviewed relevant legislative and regulatory documents, including those pertaining to AB 217.

2.4 GEOGRAPHIC ASSESSMENT

Navigant conducted a geographic assessment of the SASH and MASH programs to show program growth across California over time and to identify future areas of potential growth in the state. Specifically, the geographic assessment answers the following research questions:

- What is the geographic distribution of participating SASH/MASH customers?
- What is the geographic distribution of possible eligible participants for SASH/MASH?

Navigant utilized Tableau Software (Tableau) and ArcGIS to conduct the geographic assessment. Tableau is a visual analytics software platform that provides built-in geocoding to create maps based on common areas such as countries, states, or postal codes.³⁰ Similarly, ArcGIS is a mapping and data

²⁸ U.S. Census Bureau, "TIGER Products," <http://www.census.gov/geo/maps-data/data/tiger.html>.

²⁹ Quarterly and semi-annual progress reports available at www.cpuc.ca.gov/PUC/energy/Solar/sash.htm and www.cpuc.ca.gov/PUC/energy/Solar/mash.htm. Quarterly and semi-annual progress reports available at <http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm> and <http://www.cpuc.ca.gov/PUC/energy/Solar/mash.htm>.

³⁰ More information at www.tableau.com/solutions.

software platform by Esri.³¹ Using both programs, the team mapped the distribution of SASH/MASH customers at the ZIP code level to produce the maps listed in Table 2-6.

Table 2-6. List of Maps as a Product of the Geographic Assessment

SASH Geographic Analysis	MASH Geographic Analysis
<ul style="list-style-type: none"> • Installed capacity prior to January 1, 2011 • Installed capacity as of December 31, 2011 • Installed capacity as of December 31, 2012 • Installed capacity as of December 31, 2013 • Distribution of possible eligible participants based on the GRID Alternatives deed-restricted property data and/or utility data for customers on CARE rates • Count of installed projects as of December 31, 2013 overlaid onto the distribution of possible eligible participants 	<ul style="list-style-type: none"> • Installed capacity prior to January 1, 2011 • Installed capacity as of December 31, 2011 • Installed capacity as of December 31, 2012 • Installed capacity as of December 31, 2013 • Distribution of possible eligible participants based on utility data for customers on CARE rates • Count of installed projects as of December 31, 2013 overlaid onto the distribution of possible eligible participants

Source: Navigant Consulting, Inc.

Navigant used Salesforce data and PowerClerk data to calculate the SASH and MASH cumulative installed capacity, respectively, for each year through 2013. Each IOU provided data on the number of single-family and multifamily CARE accounts in its service territory by ZIP code.³² Navigant used this information to show the distribution of possible eligible participants. Additionally, Navigant represented possible eligible SASH participants with GRID Alternatives data on deed-restricted properties and Qualified Census Tract data. Appendix A.2 contains more information on these sources.

³¹ More information at www.esri.com/software/arcgis.

³² SCE and PG&E provided separate single and multifamily datasets, whereas SDG&E provided one combined dataset.

3 SASH Assessment

This section presents the research findings and recommendations for the SASH program and is organized as follows:

- Section 3.1—Program Administration
- Section 3.2—Job Training
- Section 3.3—Energy Efficiency
- Section 3.4—Customer Experience
- Section 3.5—Progress Toward Achieving Goals
- Section 3.6—Market Opportunities and Recommendations

3.1 PROGRAM ADMINISTRATION

This section discusses SASH program administration. This section is organized as follows:

- Section 3.1.1—Program Statistics
- Section 3.1.2—Organizational Structure
- Section 3.1.3—Funding and Staffing Sufficiency
- Section 3.1.4—Market Actor Feedback

To inform the research on program administration, Navigant interviewed two CPUC staff and three GRID Alternatives staff to understand GRID Alternatives’ organizational structure with respect to the SASH program, its goals, and its perceived effectiveness in light of its program administration budget. Navigant also surveyed SASH participant homeowners and interviewed SASH SPP subcontractors, SPP job trainees, and job training organizations to assess the effectiveness of GRID Alternatives as the SASH PA.

Through this evaluation, Navigant found that GRID Alternatives’ staffing is sufficient and the organizational structure is not limiting the SASH program’s success. In fact, having a single PA for the SASH program is beneficial for program administration because it streamlines communication and decision-making between the Commission and the PA. Both the CPUC staff and GRID Alternatives staff reported being highly satisfied with the organizational structure, and Navigant found no evidence through its evaluation of PA effectiveness that the organizational structure was limiting program success.

Secondly, Navigant concludes that funding and staffing levels from 2011 to 2013 were sufficient for meeting the goals of the SASH program. From 2011 to 2013, the program spent a total of \$66.1 million, or 61 percent of the total budget of \$108.3 million. Spending, along with program participation, was significantly higher than in preceding years as the program reached its peak in 2012. Through the end of

2013, the program spent 68.6 percent of its total budget, with \$34.1 million remaining for the rest of the first round of the SASH program.

3.1.1 Program Statistics

The SASH program offers fully or highly subsidized solar PV systems to qualified low-income homeowners. GRID Alternatives, an Oakland-based nonprofit organization, manages the SASH program. From program inception through the end of 2013, the SASH program had installed 3,505 PV systems, with 942 additional approved and in progress³³ and another 2,416 prospective applications under review.³⁴ According to Salesforce data, GRID Alternatives allocated \$64.87 million in incentives by the end of 2013.

Figure 3-1 displays the SASH program accomplishments. Participation increased dramatically from program inception through 2012, followed by a decrease in annual installed capacity in 2013. Program participation is distributed across the seven GRID offices, with the most installed capacity in the Bay Area and Central Valley.

Although nearly one-quarter of SASH participants did not qualify for the ESA program, 68 percent of participants with installed SASH projects enrolled in the ESA program by the end of 2013 and 23 percent of those completed ESA program services. This demonstrates a strong connection between the SASH and ESA programs. Section 3.3 provides additional information on energy efficiency requirements and participation.

From the start of the SASH program through 2013, 143 unique job trainees participated through the SPP. Individual SPP trainees worked on an average of 10 projects per trainee over the 2009 to 2013 period. Several trainees, however, worked on 50 or more projects, while many others worked on just one project. Fifty-one job training organizations were associated with the SPP trainees, so there appears to be a wide range of options for organizational participation and support. Section 3.2 contains additional information on job training requirements and participation.

³³ Categorized as Approved-Outreach and Approved-Construction in the SASH Salesforce database.

³⁴ Categorized as Prospective and Pre-Screened Qualified in the SASH Salesforce database.

Figure 3-1. SASH Program Accomplishments

SASH: Program Accomplishments

The SASH program installed 3,505 systems between 2009 and 2013. These systems comprised 10,589 kW-AC (CEC) of installed capacity. From 2011 to 2013, the program installed 3,164 systems comprising 9,731 kW-AC (CEC) of installed capacity.



Participation by Office

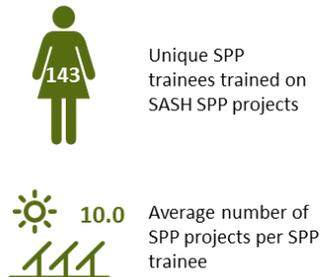
GRID Alternatives' Office	% of total capacity (2009-2013)
Central Valley	21%
Bay Area	21%
Inland Empire	17%
Greater Los Angeles	13%
San Diego	12%
Central Coast	9%
North Valley	8%

Energy Efficiency

Status	% of total projects (2009-2013)
Enrolled in ESA Program	68%
ESA Program services completed	23%
Does not qualify for ESA Program	24%
Qualified for ESA Program	4%
Unable to contact client	3%
Client refused service	1%

Job Training

Subcontractor Partnership Program



GRID Alternatives Group Installations

Volunteers	Job Trainees
17,314 Volunteers	3,645 Job Trainees
1,377,560 Volunteer Hours	302,816 Job Trainee Hours



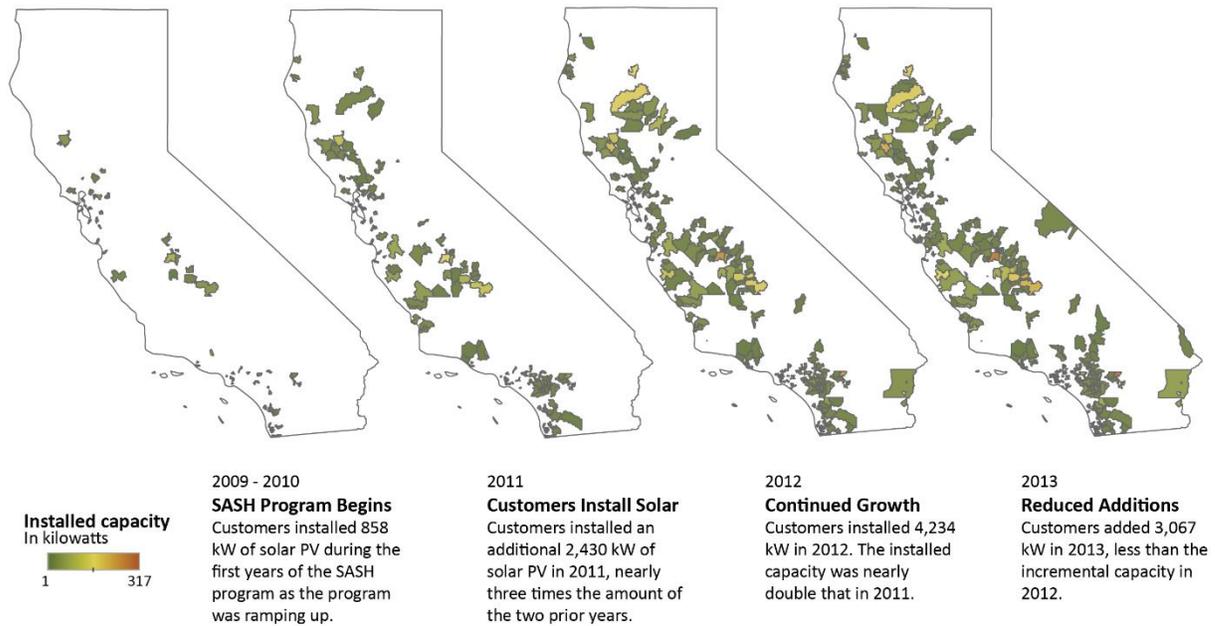
Source: Navigant analysis of GRID Alternatives' Salesforce data
 Note: Installed date is the Interconnection Utility Accepted Date; projects included if they have a valid Application Inspection Approved Date. All data for program years 2009 – 2013.

According to the data displayed in the geographic assessment in Figure 3-2, the SASH program achieved relatively broad coverage across the State of California within the three IOU service territories by the end of 2013. Installations were originally concentrated around major metropolitan areas and in the Central Valley, generally expanding outward. In addition to growing around the original areas over time, program participation increased significantly in Northern California. Predictably, there was more program participation nearer to the coast, coinciding with higher populations and the increased prevalence of SASH-qualified, deed-restricted properties in urban areas.

Figure 3-2. Cumulative Installed SASH Capacity³⁵

THE GROWTH OF THE SASH PROGRAM

The SASH program experienced rapid growth in 2011 and 2012 after a ramp up period. In 2013, the program saw less installed capacity than in 2012.



Navigant Consulting
 Sources: GRID Alternatives' Salesforce data
 Note: The maps show cumulative installed capacity.
 Five ZIP codes were unrecognized by the mapping software and excluded from the map. Less than 1% of the capacity installed in 2009-2013 did not have a ZIP code in the PowerClerk data and is not shown.

3.1.2 Organizational Structure

GRID Alternatives' organizational structure in California is a collection of seven regional offices—Oakland (PG&E), Carson (SCE), San Diego (SDG&E), Fresno (SCE/PG&E), Atascadero (SCE/PG&E),

³⁵ All kW values in the figure are kW-AC (CEC).

Riverside (SCE), and Chico (PG&E)— overseen by a headquarters office located in Oakland. Each GRID office has a similar staff organizational structure, as described below.³⁶

- **Regional Director:** Each office has a Regional Director. The Regional Director manages the regional office staff and programs, develops regional partnerships, and guides regional SASH implementation.
- **Outreach Coordinators:** The Outreach Coordinators are responsible for identifying applicants, guiding homeowners through the application process, solar education, and post-installation training. Each Outreach Coordinator is responsible for bringing an average of four to six clients per month through the SASH program process. They prescreen potential clients and present at community events to educate low-income communities about the importance of renewable energy and energy efficiency. Outreach Coordinators are also responsible for building relationships with partners and obtaining address lists of eligible households. The majority of the Outreach Coordinators are bilingual and many are residents of the neighborhoods that GRID serves.
- **Solar Installation Supervisors:** The Solar Installation Supervisors are responsible for system design and permitting and for ensuring that the quality of the installation meets GRID’s standards. They supervise onsite installations and train and oversee the work of volunteers and trainees.
- **Construction Staff:** The Construction Staff oversee installations, train job trainees and volunteers, and work on design and engineering. The majority of the construction staff have experience in the solar industry, however GRID provides in-house training for those who do not.
- **Volunteer Training Associates:** The Volunteer Training Associates train, prepare, and manage the volunteers and trainees.

GRID Alternatives staff reported that the organizational structure continues to evolve as the organization grows, but that the structure has worked well thus far. The staff described that regular communication across the organization ensures that offices are sharing best practices and successful marketing and outreach strategies. Because California is such a diverse state, GRID Alternatives has found that certain messages work well in different areas and sharing best practices helps improve targeted messaging.

GRID Alternatives’ headquarters coordinates much of the activity between GRID Alternatives and the IOUs, such as the processing and issuance of payments. GRID Alternatives’ headquarters also tracks program metrics across all offices on a quarterly basis and reports this information to the CPUC. Program metrics include expenditures for incentives and program administration, overall installation numbers, applications received, and maps showing system installation plans. Internally, GRID staff uses Salesforce to collect data, coordinate projects, organize financing, and manage job trainees and volunteers. GRID Alternatives’ staff reported that the headquarters role has worked well for the organization.

³⁶ Navigant Consulting, Inc. 2011 CSI SASH and MASH Program Administrator Performance Assessment Report. http://www.cpuc.ca.gov/PUC/energy/Solar/CSI+sash_mash+li+evaluation.htm

CPUC staff feel that there are many benefits from using GRID Alternatives as a single PA to carry out the program across all IOU service territories. In particular, CPUC staff believes that GRID Alternatives is able to deliver a consistent message across all territories and has successfully engaged with its participants.

Additionally, because there is a single entity administering the SASH program, CPUC staff finds it easier to coordinate with GRID Alternatives than with the three PAs for the MASH program. For example, a CPUC staff member cited the time required to reach consensus when there are four entities and a large legal staff involved. For SASH, the CPUC staff explained that, “it is much easier to make needed and common-sense program changes when you only have one PA, it is a bi-directional relationship between CPUC and PA.” While CPUC staff believe that communication and decision-making takes more time with MASH PAs than for SASH, they do not believe that the extended time has caused delays that have hurt the MASH program.

3.1.3 Funding and Staffing Sufficiency

According to the SASH program budget and spending data in Table 3-1, the SASH program spent 68.9 percent of its total budget by the end of 2013, or \$74.3 million of the \$108.3 million allocated to the program through 2016. GRID Alternatives spent 61 percent of the administrative budget and 71 percent of the incentive budget, suggesting that GRID is accomplishing SASH installations relatively efficiently with respect to its administrative budget.

Table 3-1. SASH Program Budget Actuals through 2013

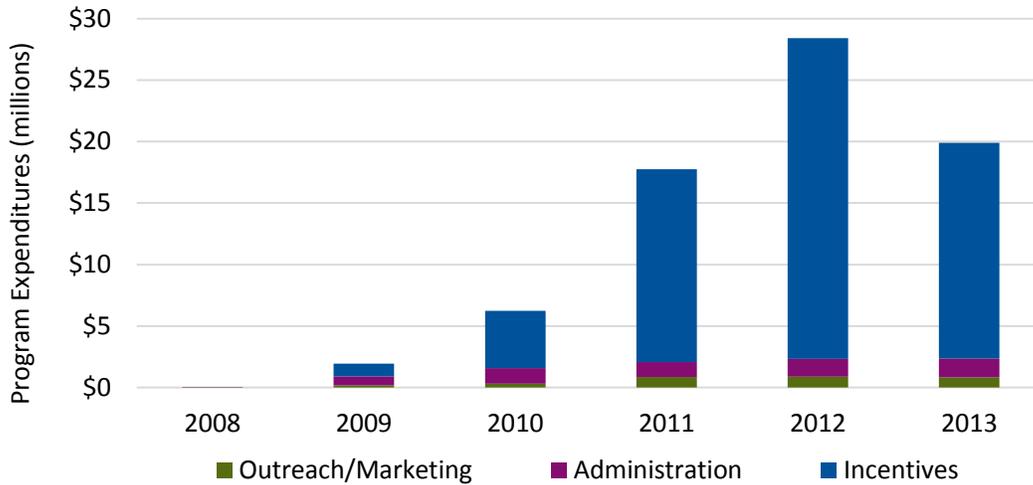
Budget Category	Amount Spent	Budget	Percent Spent
Total Administration	\$ 9,322,992.31	\$15,160,000.00	61.5%
Administration	\$ 6,267,738.54	-	-
Outreach/Marketing	\$ 3,055,263.78	-	-
Incentives	\$ 64,955,358.00	\$ 92,089,000.00	70.5%
Total	\$ 74,278,350.31	\$ 108,340,000.00	68.9%

Note: The budget excludes the evaluation budget of \$1,091,000 because the evaluation budget resides with the CPUC.

Source: Navigant analysis of GRID Alternatives program spending through December 31, 2013.

With five out of the eight program years completed (2009–2013) using 68.9 percent of the budget, GRID is on track to expend the remaining funds by the end of the first round of the SASH program. Figure 3-3 shows that SASH program spending, along with program participation, peaked in 2012.

Figure 3-3. SASH Program Budget Actuals by Spending Category: 2008-2013



Source: Navigant analysis of GRID Alternatives program spending through December 31, 2013.

In terms of regional program activity, the program is on track; installed capacity is relatively proportional to the budget breakdown by IOU service territory. Table 3-2 shows budget allocation by IOU service territory compared to the installed capacity of SASH projects by IOU service territory through 2013. The table shows that the percent of total installed capacity to date is proportionally lower in SCE territory than PG&E and SDG&E. This data suggests that there may be relatively more installations in SCE territory than the other IOUs during the last few years of the first round of funding for the SASH program. The CPUC and GRID Alternatives could re-evaluate regional spending versus program accomplishment as the program expends more of the first round of SASH funds.

Table 3-2. SASH Budget Allocations and Installed Capacity by IOU Service Territory: 2013

Metric	PG&E	SCE	SDG&E	Total
Total Budget (\$)	\$47,344,580	\$49,836,400	\$11,159,020	\$108,340,000
Total Budget (%)	43.7%	46%	10.3%	100%
Installed Capacity (kW-AC [CEC])	5,095 kW-AC (CEC)	4,214 kW-AC (CEC)	1,281 kW-AC (CEC)	10,589 kW-AC (CEC)
Percent of Total Capacity (%)	48.1%	39.8%	12.1%	100%

Source: Navigant analysis of GRID Alternatives program spending through December 31, 2013.

These results indicate that funding and staffing levels from 2011 to 2013 were sufficient for meeting the goals of the SASH program based on the spending figures above and the overall finding that GRID Alternatives has been managing the budget effectively for the SASH program.

3.1.4 Market Actor Feedback

This section describes these strengths and recommendations as reported by GRID Alternatives, CPUC staff, and SPP subcontractors.

Most GRID Alternatives staff first referenced the organization’s job training efforts as a strength of the organization. This was supported by a number of representatives from job training organizations who commented on the high quality of GRID Alternatives’ programs in this area. Many staff members also indicated that GRID Alternatives’ propensity for creating partnerships to build financial support for the program, outside of funding from the CPUC, is an area in which it excels. Other qualities mentioned by GRID Alternatives staff include its focus on educating homeowners on energy efficiency and solar, including homeowners in the installation process, advocating for strong consumer protection, and being a dominantly mission-focused organization.

Two CPUC staff described to Navigant that they believe GRID Alternatives has been successful at administering the SASH program. When asked how GRID Alternatives could improve its program marketing or delivery to help meet future program capacity requirements, CPUC staff stated that that GRID should continue to build trust and work closely with potential participants in its territories to foster relationships and an understanding of the program. This is consistent with strategies shared by GRID Alternatives staff when speaking about its marketing plans for the program moving forward. Many of the SPP subcontractors believe that GRID Alternatives has done a good job with the program and could not think of any improvements they would like to see. For example, one respondent stated, “Honestly, GRID is the single best operation from all around. Everyone is friendly, knowledgeable, nice, and professional. They are the best I ever had in my career.”

Despite the overall positive comments from SPP contractors about GRID Alternatives and the SASH program, several SPP contractors offered recommendations for the program related to:

- Timing of payment to the SPP subcontractors
- Allocation of jobs to the SPP subcontractors
- GRID Alternative practice to hand deliver contracts
- Incentive fund allocation
- Training of GRID Alternatives’ staff.

Regarding the timing of payments to the SPP subcontractors, two of eight subcontractors interviewed indicated that the program is slow to pay its subcontractors, which creates cash-flow issues for the contractor. Navigant reviewed the SPP Subcontractor Application Contract and found that the application outlines payment terms to subcontractors with respect to SASH project milestones.³⁷

³⁷ According to the SPP Application, “Payment for services will be issued to the sub-contractor according to the following payment schedule: eighty (80) percent of the total project cost will be paid within 15 days of the completed (passed) 3rd party SASH inspection and quality assurance inspection, and building permit inspection, and the remaining twenty (20) percent of the total project cost will be paid the earlier of (i) seven (7) days after GRID receives the SASH incentive payment from the respective utility company, or (ii) within forty five (45) days of notification of the confirmation of interconnection with the local electric utility.”

Navigant was unable to independently verify that GRID Alternatives issues payments according to this schedule because the payment data to subcontractors was not available in the SASH database. However, in a follow-up conversation with GRID Alternatives, the representative explained that GRID Alternatives pays the contractors with a line of credit before GRID Alternatives receives the rebate from the utility. Based on this information Navigant believes that GRID Alternatives is already doing all they can to pay its subcontractors as quickly as possible.

With respect to job allocation, two of eight subcontractors made comments related to how GRID Alternatives assigns jobs to the subcontractors. One subcontractor believes that GRID Alternatives should consider distance from subcontractors to project sites and should focus on assigning projects to the company located closest to the project. Another subcontractor sees a conflict of interest in SASH's model because, in addition to managing program funds, GRID Alternatives installs projects, decides which jobs to subcontract, selects the subcontractors, and disperses the money. However, it is important to note that the SPP subcontractor agreement clearly states that "GRID will install a project itself if it has the labor and equipment available to do so in the location of the installation site."

One subcontractor indicated that GRID has changed its practice of delivering contracts in person and instead is sending contracts to customers in the mail. This subcontractor noted that this has led to confusion on the part of the homeowner, as delivering the contracts in person gives homeowners the opportunity to ask questions and receive clarification on the document. The subcontractor indicated that they would like to see this practice resumed. Conversations with GRID Alternatives revealed that reviewing contracts in person is still the preferred approach for delivering contracts to participants and that when it is not possible to meet in person at the participant's home, GRID Alternatives' outreach staff organize group contract signings or group meetings in offices or community centers to minimize driving for participants.

One subcontractor expressed a desire for more transparency in GRID Alternatives' methods for allocating incentive dollars for the program. The respondent drew a comparison to the MASH program, which exhausts funds rapidly, and indicated that he feels that GRID Alternatives could meet more demand if they did not manage the money in a way that seeks to extend projects across a variety of geographies and for the full duration of the program. GRID Alternatives explained that it prefers to distribute incentive funds over the life of the program according to its implementation plan instead of exhausting all of the funds as soon as possible.

Finally, one subcontractor commented on a perceived lack of an effective training system for GRID Alternatives' internal employees. The subcontractor mentioned witnessing a high degree of disorganization during times of staff turnover and felt that GRID Alternatives should enact better standards to ensure higher consistency.

3.2 JOB TRAINING

This section discusses job training through the SASH program, including training through the SASH SPP and GRID Alternatives’ group installation volunteer job training, team leaders, and SolarCorps fellowships. This section is organized as follows:

- Section 3.2.1—GRID Alternatives Volunteer Training Programs
- Section 3.2.2—Job Training through SPP
- Section 3.2.3—Employment Results
- Section 3.2.4—Barriers to Job Training

GRID Alternatives staff expressed their passion and enthusiasm for job training in the interviews and described how job training efforts have grown and developed significantly over time. GRID Alternatives staff views its job training programs as highly successful. The CPUC staff shares this view, stating in interviews that it is impressed with the training model and referencing the new requirement for job training for the MASH program as a testament to the success of GRID Alternatives’ job training program.

One GRID Alternatives regional office noted that it has hired past volunteers into the team and they view this as another example of success for the program. The office noted that all five of its construction team members came to the program as volunteers.

The Navigant team asked GRID Alternatives staff, SPP job trainees, job training organizations³⁸, and SASH SPP subcontractors to share their opinions on the most valuable aspects of the job training program. The majority of respondents mentioned the practical application of solar installation skills as the best component of the job training, followed by networking opportunities that connect trainees with potential employers. Other positive aspects of job training from the job trainees’ perspective include opportunities to build leadership skills as a team leader, work on multiple installation projects, positively impact on the world, and learn from skilled instructors who lead the installations. Job training organizations also noted the added benefit that their students have the opportunity to develop their customer service skills by interacting directly with customers on GRID Alternatives projects.

3.2.1 GRID Alternatives Volunteer Training Programs

This section describes GRID Alternatives’ volunteer job training programs and activities. Section 3.2.1.1 presents an overview of volunteer job training through GRID Alternatives’ group installation projects. Section 3.2.1.2 presents job training organization and job trainee feedback and recommendations for improving training on GRID Alternatives’ group installation projects.

³⁸ The organizations included job training organizations or community colleges or vocational schools that send students to GRID’s in-house installation projects.

3.2.1.1 Overview of Volunteer Job Training

Job training occurs through GRID Alternatives' group installation projects with volunteer job training, team leader positions, and SolarCorps fellowships. Each GRID Alternatives group installation project includes a team of volunteers, team leader(s), and solar installer supervisor(s) who oversee the onsite installation and the volunteers and team leaders.

GRID Alternatives' volunteers include community volunteers and job trainees who are students from job training organizations. According to a representative from GRID Alternatives, the maximum number of volunteers allowed on a GRID job site is 10 to 12 volunteers³⁹ and two team leaders. In addition, the representative noted that there is always one to two paid professional PV installers from GRID on each volunteer-based installation. GRID Alternatives' website state that "for safety and workflow reasons, each site can accommodate 10 to 15 volunteers each day."⁴⁰ Navigant reviewed SASH program data in Salesforce and found that for the 2011 to 2013 timeframe, the 2,488 volunteer opportunities used an average of 8.4 volunteers per opportunity. The project data contained 82 opportunities (three percent) that reported more than 20 volunteers, but these opportunities may include events other than single-family home installations.

Team leaders are experienced volunteers who have completed training and have mastered a predefined set of key skills. To become a team leader, volunteers must complete at least 40 hours of volunteer jobs through GRID Alternatives and demonstrate competency for a checklist of skills related to solar installations. Team leaders may specialize in roof or ground work, or both.⁴¹ The North American Board of Certified Energy Practitioners (NABCEP)⁴² certification program recognizes GRID Alternatives' team leader program as one that gives individuals the necessary hands-on experience required to sit for the entry-level NABCEP exam. GRID Alternatives views this certification partnership as one of the successes of its job training program.

GRID Alternatives also offers opportunities for training and development through unpaid internships and year-long paid SolarCorps fellowships to recent college graduates. The SolarCorps positions can focus on project management, solar installation, marketing and outreach, and/or communication. GRID Alternatives modeled the program after the AmeriCorps and AmeriCorps Vista programs that also support the program.⁴³

Finally, GRID Alternatives offers solar workshops to help develop job skills and open pathways to employment for low-income communities. The skill-building workshops aim to provide interested volunteers and community members with the necessary skills for working on solar projects, including

³⁹ The number of volunteers depends on the size of the installation project.

⁴⁰ GRID Alternatives – Volunteer FAQs. <http://www.gridalternatives.org/volunteer/volunteer-faqs>

⁴¹ GRID Alternatives Team Leaders. <http://www.gridalternatives.org/volunteer/team-leader-program#sthash.hOipGcNj.dpuf>

⁴² The North American Board of Certified Energy Practitioners (NABCEP) offers entry-level knowledge assessment, professional certification, and company accreditation programs to professionals in the renewable energy field throughout the United States and Canada.

⁴³ GRID Alternatives SolarCorps Fellowship. <http://gridalternatives.org/learn/solarcorps-fellowship>

background knowledge of solar systems and installation techniques, and access to a network that can lead directly to jobs. Team leaders from GRID Alternatives' volunteer program lead many of these workshops.

3.2.1.2 Feedback and Recommendations for Volunteer Training

Job trainees shared suggestions for how to improve GRID Alternatives' volunteer job training program, including more stringent selection criteria for volunteers and more solar installation classes outside of GRID Alternatives' installations.

Two job trainees suggested that GRID Alternatives enact more stringent selection criteria for volunteers because the hands-on training opportunity is so valuable. The trainees felt that GRID should reserve the job training opportunity for those who are serious about using the opportunity to further their career or at least reserve it for those who are physically fit. Similarly, two trainees suggested reducing the number of volunteers at each installation in order to afford each participant more hands-on time with each component of the installation. This tactic, however, would further exacerbate the issue of a long wait list to participate in an installation.

Because job training is in such high demand, one trainee suggested offering additional installation classes to meet the demand. Another trainee suggested creating a spin-off organization specifically dedicated to training and education. One trainee suggested including demonstrational videos in volunteer registration packets to give trainees and volunteers a better sense for what their installation experience will entail.

Some trainees suggested that GRID Alternatives should allocate more time to safety training and procedures surrounding the installation and handling of the equipment, particularly because this is an aspect of installation that many people are hesitant to participate in due to safety concerns. In addition, trainees suggested that GRID should consider offering training on other aspects of solar projects beyond the installations, such as maintenance or back office work, sales, solar PV system design, and general training on energy efficiency concepts.⁴⁴

3.2.2 Job Training through SPP

GRID Alternatives developed the SASH Sub-Contractor Partnership Program (SPP) to bring in additional resources to increase the number of SASH projects than can be completed through GRID alone and install projects that are not safe for volunteers. To participate in the SPP, licensed California contracting companies agree to a reduced-cost model and commit to hiring and paying at least one eligible job trainee for each SASH installation. The subcontractor is responsible for identifying and hiring each installation's job trainee and is required to submit the name of the workforce development program and job trainee used for each SASH installation.⁴⁵

⁴⁴ A GRID Alternatives representative noted that GRID has several offices that offer design training, project management training, and resume skills training workshops.

⁴⁵ SASH Sub-Contractor Partnership Program (SPP) Subcontractor Application.

According to the SASH program Salesforce data, 143 trainees participated on SASH projects with SASH subcontractors through the SPP from 2009 to 2013, with each trainee participating in 10 projects, on average. Of the nine SASH SPP subcontractors interviewed for this evaluation, six indicated that they had hired at least one SASH SPP job trainee as a full-time employee.

Six out of the nine SPP subcontractors interviewed indicated that they would use a job trainee on future projects regardless of SASH requirements. Most indicated that using job trainees on projects is a good way to vet potential hires before offering a full-time position because employers are able to determine if the potential hire is able to handle basic safety and physical requirements. For those who indicated that they would not continue using trainees, safety and quality of work were the driving factors behind contractors' reticence to involve job trainees.

Navigant also asked SPP job trainees if they felt that participating in the SASH program provided them with additional opportunities in the solar industry. All 10 interviewed trainees agreed that the SASH program provided them with important skills and networking opportunities that helped them secure work in the industry. Additionally, in the absence of the SASH program, many agreed that the number of hands-on training opportunities would decrease. When asked to comment on other places to receive hands-on training, two respondents mentioned that Habitat for Humanity also provides training opportunities.

When asked to share the most challenging aspect of the SASH job training program, the most commonly mentioned barrier was that job sites can be far away and GRID Alternatives does not provide transportation for SPP job trainees. Several SPP subcontractors suggested that GRID Alternatives should explore partnerships with transportation agencies or directly facilitate trainee transportation to make the experience accessible to all.

3.2.3 Employment Results

The Navigant team sought to understand the extent to which trainees who have worked with the SASH program found employment in the solar industry. GRID Alternatives explained that it currently does not track these metrics but would like to devise a more rigorous system for tracking hiring in the future. The organization noted that tracking has not been a priority based on limited resources and because the CPUC has not required reporting of this information. GRID Alternatives did, however, note that previous trainees have occasionally reported to GRID when they have found a job in the solar industry. GRID Alternatives also reported conducting a survey of SASH subcontractors in 2012 that found about half of the respondents reported having hired a job trainee full-time after using that job trainee on a GRID Alternatives project to fulfill the SPP requirement.

While there is no formal record of the number of volunteers or SPP job trainees who have later found employment in the solar sector, eight of the 10 SASH SPP job trainees interviewed for this evaluation stated that they are still working in the solar industry after participating in SASH installations as a job trainee between 2011 and 2013. Several interviewees stated that they are now lead or senior installers for various solar companies. Of the 10 SPP trainees interviewed, over half have either received or are in the process of receiving professional certifications.

3.2.4 Barriers to Job Training

The high demand for volunteer job training on SASH projects demonstrates the SASH program’s success but also creates some challenges for the program. Navigant asked job training organizations and SPP job trainees about barriers to job training through SASH and about barriers to gaining experience in the solar industry.

The popularity of the program and the duration of the installations cause most of the barriers identified by trainees and job training organizations. For example, job training organizations explained that it has been difficult for volunteers to quickly join an installation team because GRID Alternatives usually places trainees on a wait list before assigning them to a project. Additionally, some job training organizations and trainees believe that it can be difficult for job trainees to gain experience on the entire installation process in two days, particularly if there are many people vying for the same experience at the same time. As one job training trainee stated, “You can’t expect to learn how to install a whole panel on your own in those two or three days.” On the other hand, one job training organization compared SASH projects to for-profit companies that complete their installations in a half day or one day. This organization explained that the faster jobs creates a lot of pressure on trainees to install the systems quickly. The job training organization applauded GRID Alternatives for “smartly insist[ing] on the two day approach.”

Other barriers mentioned by job training organizations include trainee/volunteer safety, particularly related to the significant physical demands placed on people working physical jobs outside for two days), technology and language barriers, idle time during an installation, and unskilled volunteers who can compromise the speed and quality of the installation. With respect to technology and language barriers, one organization commented that much of the SASH communication “is done through email access and computers and a lot of our students are poor and don't have this access” and for that some of its students, “just dealing with the computer interface not being in Spanish is one of the issues.”

One respondent from a job training organization commented that many of his students did not have the financial ability to drive to the site or to purchase a bus pass, and this presented a barrier to students getting hands-on experience on an installation project. Another job training organization mentioned that job quality is sometimes a concern because—from its perspective—GRID Alternatives’ priority for safety leads them to not be the highest caliber installer. The organization added that “because it is low stress and they take [their time], it is a much safer installation. So, I don't have a problem with that.”

3.3 ENERGY EFFICIENCY

This section discusses the SASH program’s efforts to promote energy efficiency and is organized as follows:

- Section 3.3.1—Energy Efficiency Overview
- Section 3.3.2—Energy Efficiency Awareness
- Section 3.3.3—Energy Efficiency Participation
- Section 3.3.4—Effect of Future Requirements

3.3.1 Energy Efficiency Overview

Energy efficiency is the number one priority in California’s loading order for electricity resources.⁴⁶ The implementation of energy efficiency measures prior to installing solar is important to minimizing building energy consumption and, hence, the size of the solar PV system needed to meet building load. Providing education, tools, and resources are important steps to increase homeowner awareness and to promote energy efficiency participation.

This section describes the SASH program energy efficiency requirements and ways in which GRID Alternatives promotes and increases energy efficiency in participating SASH homes. It describes SASH subcontractors’ perception of homeowner energy efficiency awareness as well as how SASH participants assess their awareness and engagement with energy efficiency.

According to the SASH Program Handbook, the SASH program requires that all applicants receive an energy efficiency audit.⁴⁷ In addition, applicants must enroll in the ESA program, if eligible, and have all feasible ESA measures installed or be on the waiting list for installation prior to receiving a SASH incentive. According to GRID Alternatives staff, the majority of SASH homeowners qualify for the ESA program⁴⁸ and those who do not are referred to the Low Income Home Energy Assistance Program (LIHEAP).⁴⁹

The Navigant team asked GRID Alternatives staff what type of energy efficiency tools and resources they use before installing solar systems. GRID explained that to further promote energy efficiency, GRID Alternatives sizes the solar PV systems to account for and encourage energy efficiency. According to GRID staff, GRID calculates the annual load at the house, subtracts assumed energy efficiency measure savings, designs the system, and then asks subcontractors to size to 70 percent to 85 percent of post-energy efficiency load. The GRID Alternative staff member said that GRID explains to customers that the program designs the solar PV system size according to their energy usage within the last 12 months after incorporating energy efficiency measures, so if the homeowners reduce their energy usage over the next 12 months, their savings could further improve.

In addition, GRID Alternatives reports that staff meet in person with all of its customers to discuss the impact energy efficiency can have on utility bill savings. From GRID Alternatives’ experience, homeowners “love that [education], believe me—when I do the workshop they are so eager to begin implementing things so they can see more savings.”

⁴⁶ State of California Energy Action Plan. http://www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF

⁴⁷ CSI Handbook. Appendix D: SASH Program Handbook. http://www.gosolarcalifornia.ca.gov/documents/CSI_HANDBOOK.PDF

⁴⁸ The ESA program provides no-cost weatherization services to low-income households that meet the CARE income guidelines. <http://www.cpuc.ca.gov/PUC/energy/Low+Income/liee.htm>

⁴⁹ LIHEAP assists families with energy costs by providing federally funded assistance in managing costs associated with home energy bills, energy crises, and weatherization and energy-related minor home repairs. <http://www.acf.hhs.gov/programs/ocs/programs/liheap/about>

One GRID Alternatives staff member described the value that GRID Alternatives provides as above and beyond the usual experience for a low-income energy efficiency program: “Homeowners are getting a lot of value in the way that GRID Alternatives is currently administering the client services piece [of the SASH program]; they are getting a lot of education that they wouldn’t be getting even if they worked with a [ESA] provider.”

According to GRID Alternatives, most customers are aware that by increasing the energy efficiency of their homes they can further reduce their electric bills since the system will not cover the entire electricity bill. As a GRID Alternatives staff member explained, “From our experience when our clients are getting a \$12 a month bill, there is a lot of incentive to reduce that to zero whereas the incentive to reduce \$100 to \$88 is not as strong. We find that a lot of homeowners are working on energy efficiency after the system is installed to see how low they can get their bill.”

3.3.2 Energy Efficiency Awareness

SASH participant survey results indicated that SASH program participants’ awareness of energy efficiency dramatically increased after program participation. Figure 3-4 shows that many respondents from the SASH participant survey expressed high awareness of, and engagement with, the energy efficiency components of the program. A majority of respondents, 89 percent, stated that GRID Alternatives spoke to them about ways to save energy in their home, and 64 percent stated that a GRID Alternatives representative spoke to them specifically about the ESA program. Furthermore, 62 percent of respondents had an energy audit conducted prior to the installation of their PV solar system.

Ninety-five percent of respondents indicated that the program increased their awareness of energy efficiency. Navigant asked respondents to rate their knowledge of energy efficiency before and after participating in the SASH program on a scale from one to five, with five being “very knowledgeable.”

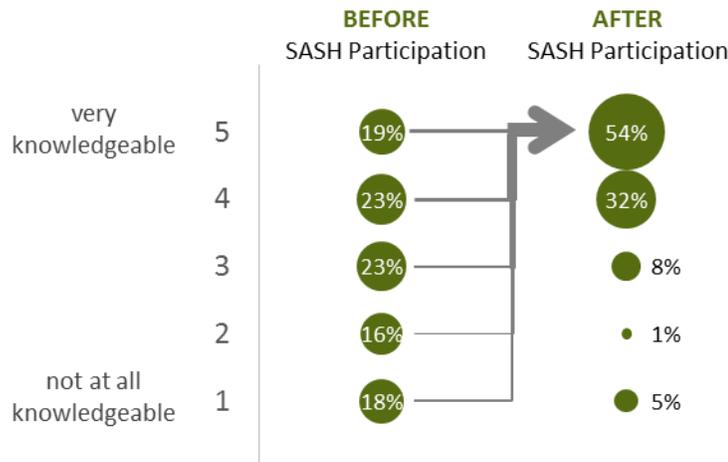
The percentage of respondents that classify themselves as “very knowledgeable” went from 19 percent to 54 percent after the program, showing a significant leap in awareness of energy efficiency.

Figure 3-4. SASH Energy Efficiency Awareness

SASH: Energy Efficiency Awareness

SASH participants were much more aware of energy efficiency after participation in the SASH program, likely due to information from GRID Alternatives.

How would you rate your KNOWLEDGE of energy efficiency and ways to save energy in your home?



89%

Percentage of SASH respondents who said GRID Alternatives spoke to them about ways to save energy in the home

Source: Navigant survey with SASH participants, 2014
 Note: See appendices for full survey results

3.3.3 Energy Efficiency Participation

Energy efficiency participation includes behavioral changes, the installation of energy efficiency measures, and participation in utility energy efficiency programs such as the ESA program. The ESA program provides qualifying low-income customers with weatherization services, energy education programs, and energy-efficient appliances.

Some SASH homeowners do not qualify for the ESA program because their income exceeds the program threshold, the home is less than five years old, or the home has received an energy efficiency audit in the past 10 years. Program data indicates that about 22 percent of SASH projects do not qualify for the ESA program.

Figure 3-5 summarizes energy efficiency participation in SASH and shows that, according to the SASH participating homeowner survey, 24 percent state that they have participated directly in an energy efficiency program, with 12 percent indicating that they participated in the ESA program. Although not every program mentioned by SASH participants in the survey is an energy efficiency program, other programs mentioned by SASH participants include CARE, the PG&E Carbon Credit program, AC Cycle, an Edison energy efficiency program, and a county weatherization program. Nearly half (48 percent) reported installing energy efficiency measures in their homes—including both program- and non-program-related measures, 55 percent made behavioral changes to save energy, and 40 percent are considering other energy-saving actions.

In contrast to the SASH participant survey, SASH Salesforce data showed that 68 percent of participants enrolled in the ESA program and that 23 percent of participants completed ESA program services. These results suggest that homeowners may participate in energy efficiency programs but may not be aware that they participated in the ESA program per se, or later forget that they had at one point participated. To bridge the gap in participation knowledge, GRID Alternatives could create communication materials in multiple languages (printed materials and/or website) that better explain the ESA program and other energy efficiency programs, or could adapt their initial homeowner consultations to include a time to focus on discussing these programs.

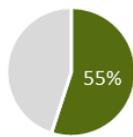
Navigant asked SPP subcontractors for their opinions on the effectiveness of the SASH program’s model for achieving energy efficiency savings. Most subcontractors supported the current model and felt that SASH customers were getting the information they needed regarding energy efficiency savings opportunities. As one subcontractor put it, “Everyone from GRID Alternatives is wonderful and works hard. So they try their best. Some people they get to but others they don’t. A majority of people are open to change and some change faster than others.”

Figure 3-5. SASH Energy Efficiency Participation

SASH: Energy Efficiency Participation

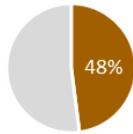
Sixty-two percent of respondents had an energy audit conducted prior to the installation of the solar system. Though only about a quarter of respondents said they participated in a utility energy efficiency program, about half of respondents have made behavioral changes or installed energy efficiency products.

Percent of respondents



Made behavioral changes

Behavioral Change	% of respondents
Wash laundry in cold water	10%
Use air conditioning for fewer hours	9%
Set heating to lower temperature	7%
Adjust water heater thermostat	6%
Use less air conditioning	6%
Other	35%

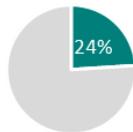


Installed energy efficiency products

Product	% installed	% considered
CFL bulbs	21%	3%
LED bulbs	19%	5%
Refrigerator	13%	3%
Clothes washer	7%	2%
Insulation	6%	2%
Other	22%	35%



Considered energy saving actions



Participated in an energy efficiency program

Program	% of respondents
Energy Savings Assistance Program	12%
CARE Rates	8%
Other	4%

Source: Navigant survey with SASH participants, 2014
 Note: See appendices for full survey results;
 Respondents could select more than one option so the sum of percentages in the table does not align with the overall percentage in the chart

3.3.4 Effect of Future Requirements

Navigant asked CPUC and GRID Alternatives staff what the effect would be of higher energy efficiency requirements on the SASH program's ability to meet its capacity goals. The question was open-ended and did not specify the details of the higher energy efficiency requirements.

The consensus across interviews with CPUC and GRID Alternatives staff was that the energy efficiency requirements should remain as they are currently set up under the SASH program. GRID Alternatives staff stated that a higher energy efficiency requirement for SASH would not make much sense because raising the requirement places an additional cost burden on families to qualify for the SASH program. In addition, GRID Alternatives explained that the ESA program already takes care of the most cost-effective energy efficiency measures without getting into major upgrades.

The evaluation team asked SASH customers how likely they would have been to participate in the program had GRID Alternatives required them to make energy efficiency upgrades prior to installing the solar system. One-fifth (20 percent) of respondents indicated that they are not at all likely to have installed their system if required to make these upgrades, while 27 percent indicated that they are very likely to have completed the install.⁵⁰

⁵⁰ The survey did not state who would pay for the energy efficiency measures, nor did the survey ask how the responses would change if the energy efficiency measures were free.

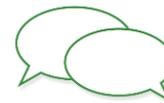
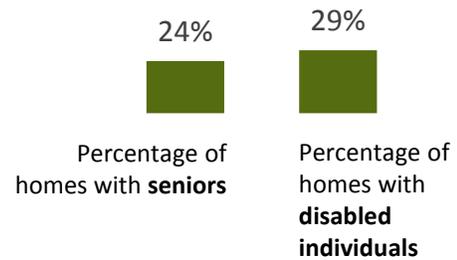
3.4 CUSTOMER EXPERIENCE

This section discusses several aspects of the SASH customer experience, and is organized as follows:

- Section 3.4.1 – Motivations and Attitudes
- Section 3.4.2 – Energy Awareness and Attitudes
- Section 3.4.3 – Customer Satisfaction
- Section 3.4.4 – Barriers to Participation

The SASH homeowner survey asked participants several questions about their household’s characteristics. As displayed in Figure 3-6, about one-quarter of SASH participant homes contain seniors (65-plus years old), and almost one-third (29 percent) contain at least one disabled individual. Forty percent of participants report that their household’s primary language is not English.

Figure 3-6. SASH Participant Demographics



40%
Percentage of SASH households speaking a **primary language** other than English



71%
Percentage of SASH households with **income** less than \$40,000/year

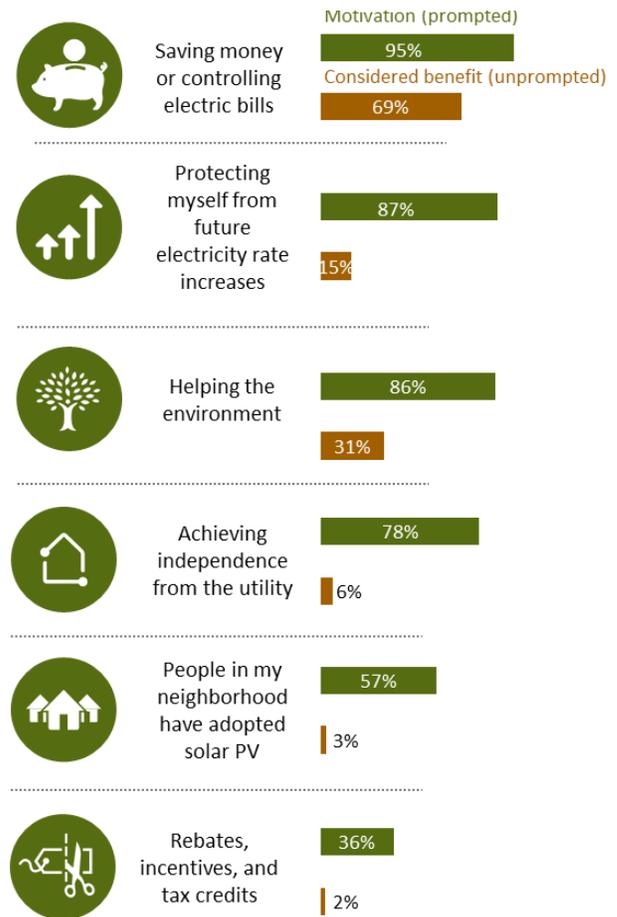
Source: Navigant survey with SASH participants, 2014
Note: See appendices for full survey results

3.4.1 Motivations and Attitudes

Navigant asked prompted (multiple choice) and unprompted (open-ended) questions to help understand customers’ motivations for participating in SASH (see Figure 3-7). When asked open-ended questions about motivations for participating in SASH before installing their solar systems, the majority of respondents indicated that they considered the benefit of saving money in the long run (69 percent). Additionally, 31 percent mentioned that they considered the benefit of helping the environment and reducing their personal carbon footprint. Few respondents considered the benefits of improving the value of their home, neighbors or friends going solar, or available rebates.

After these open-ended questions regarding the benefits discussed above, the surveyed SASH customers answered a series of prompted questions. The team asked customers to rate how motivational specific benefits were in their decision-making on a five-point scale. Few SASH customer survey respondents rated rebates, incentives, or tax credits⁵¹ as a motivational factor in their decision-making to participate, with only 36 percent giving a rating of four or higher, where five is “very motivational.” In contrast, 95 percent of respondents stated that saving money or controlling their electric bills was motivational in their decision to install solar (with a rating of four or five on a five-point scale).

Figure 3-7. SASH Motivations



Source: Navigant survey with SASH participants, 2014
 Note: See appendices for full survey results

⁵¹Due to the nature of the SASH program and the structure of the incentives that GRID Alternatives provides to their customers, homeowners receive a straight discounted solar system while GRID Alternatives works to take advantage of rebates and incentives associated with the installation. Therefore, it is not surprising that the majority of SASH customers did not account for these factors in their decision-making to participate in the program.

3.4.2 Energy Awareness and Attitudes

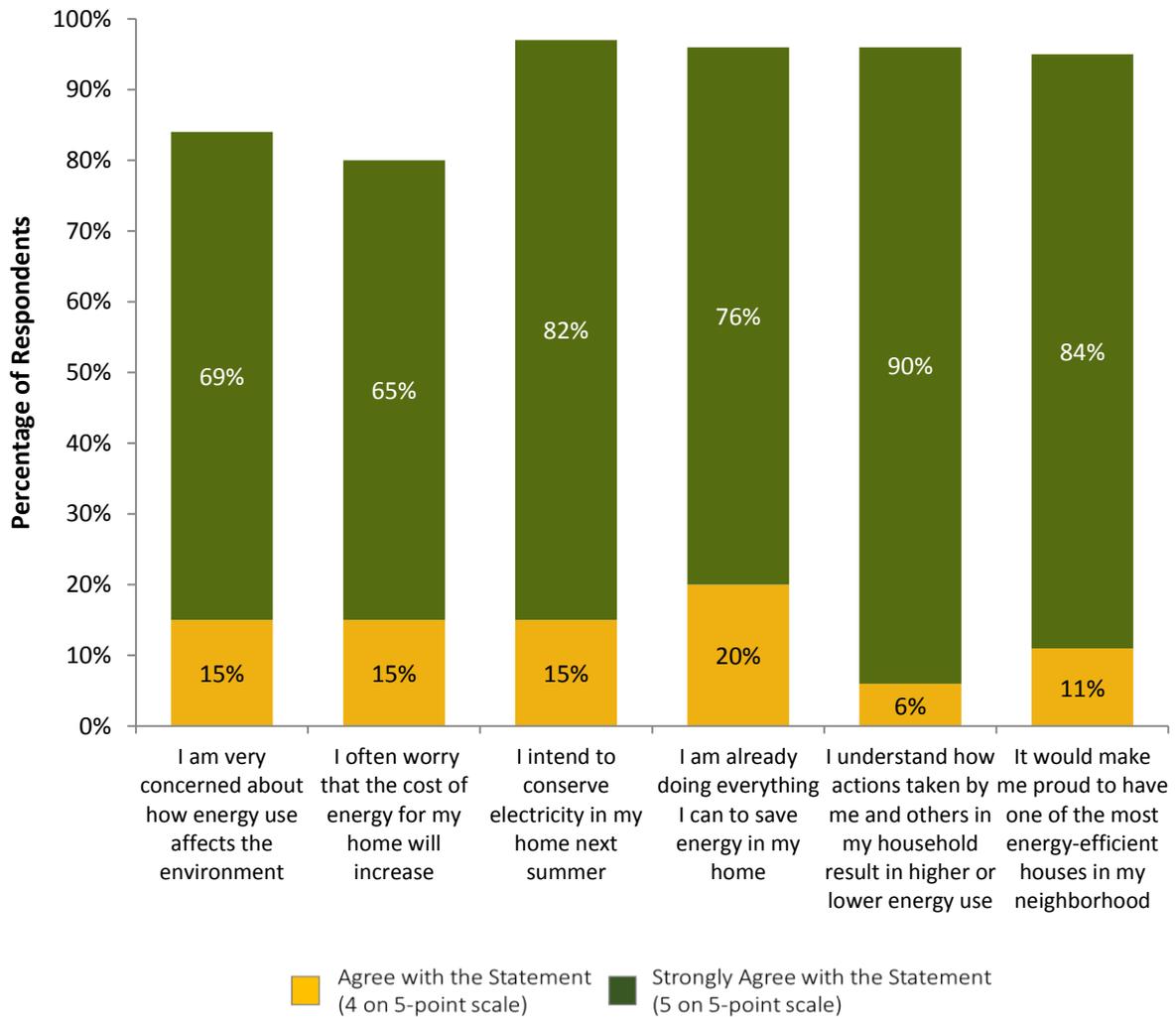
The evaluation team asked all SASH customer survey respondents a series of questions designed to gauge SASH participants' general energy-related attitudes. The survey asked respondents whether they agreed or disagreed with the following six statements by indicating their agreement on a five-point scale:

- I am very concerned about how energy use affects the environment.
- I often worry that the cost of energy for my home will increase.
- I intend to conserve electricity in my home next summer.
- I am already doing everything I can to save energy in my home.
- I understand how actions taken by me and others in my household result in higher or lower energy use.
- It would make me proud to have one of the most energy-efficient houses in my neighborhood.

Overall, respondents agreed with the six statements above. As noted in Figure 3-8, more than 80 percent of respondents ranked each statement as a four or a five, indicating they agree or strongly agree. The statement that received the least agreement was, "I often worry that the cost of energy for my home will increase," with 80 percent of respondents agreeing. This indicates that through the installation of solar PV systems that reduce customer bills, the SASH program could be helping some participants to worry less about electricity cost increases. Respondents most strongly agreed with the statement, "I understand

how actions taken by me and others in my household result in higher or lower energy use,” with 90 percent ranking it as a five.

Figure 3-8. SASH Customer Attitudes



Source: Navigant survey of SASH participants, 2014

3.4.3 Customer Satisfaction

SASH customers expressed extremely high levels of satisfaction with the program overall, with 100 percent rating their satisfaction at a four or higher, where five is “extremely satisfied.” Figure 3-9 displays the results of the customer satisfaction survey and shows that customers also report high levels of satisfaction with specific program components, including the program application process, the

installation process for the PV system, the education they received about their system, the performance of the system, and the ease of working with GRID Alternatives.

Overall, SASH customers state that participation in the program has made their monthly energy bill much more affordable. Only one out of 100 respondents indicated that their solar system has not made their energy bill more affordable, which could be due to a malfunctioning PV system or the respondent significantly increasing their energy use.

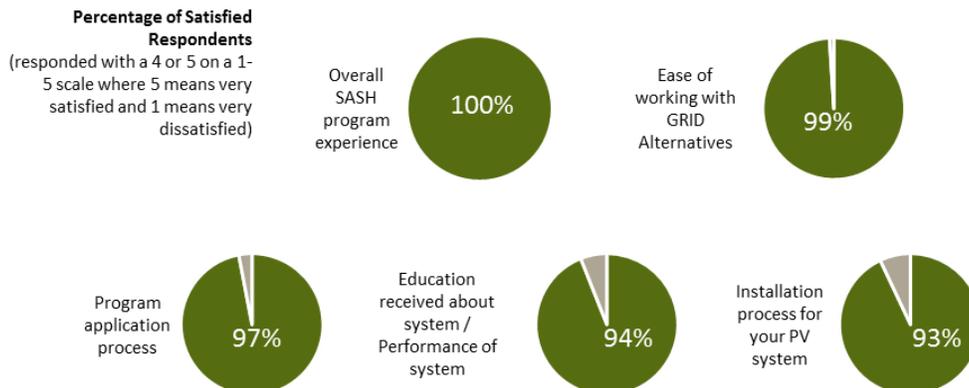
Figure 3-9. SASH Program Satisfaction

SASH: Program Satisfaction

When participants first heard about the program, approximately one third had concerns, though participants are satisfied with all aspects of the program.



How satisfied or dissatisfied were you with different aspects of participation in the SASH program?

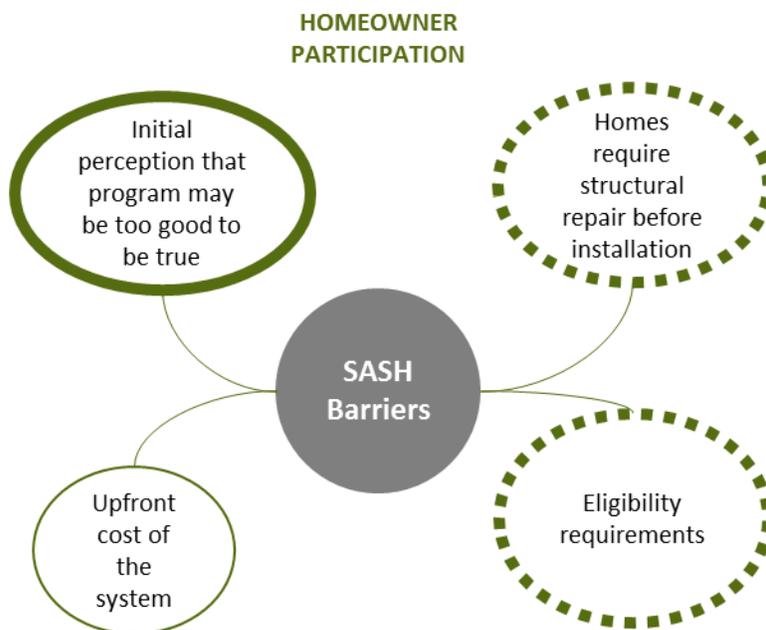


Source: Navigant survey with SASH participants, 2014
Note: See appendices for full survey results

3.4.4 Barriers to Participation

This section describes SASH customer barriers to program participation as discussed by SASH subcontractors, CPUC staff, and the GRID Alternatives staff through IDIs and by SASH participants through the participant survey. Figure 3-10 summarizes the barriers that the subsequent sections describe in more detail, including program eligibility requirements, the condition of the home for solar, and the initial perception that the program is too good to be true. In the future, requiring financial contributions from the homeowner could be an additional barrier to participation.

Figure 3-10. SASH Barriers Map



KEY

- Barrier was mentioned often; program can have an effect on the barrier
- Barrier was mentioned a few times; program can have an effect on the barrier
- Barrier was mentioned often; program does not have an effect on the barrier
- Barrier was mentioned a few times; program does not have an effect on the barrier

Source: Navigant analysis of interview and survey results

3.4.4.1 Eligibility Requirements

According to CPUC and GRID Alternatives staff, eligibility requirements are the most significant barriers to program participation. The eligibility requirements for SASH participants are as follows:⁵²

- Receive electrical service from PG&E, SCE, or SDG&E
- Own and live in their home
- Have a household income that is 80 percent or below the Area Median Income (AMI)
- Live in a home defined as affordable housing. Affordable housing is defined by California Public Utilities Code 2852 and is generally defined as a home that cannot be sold without restrictions on the real estate market. This can take many forms, which include the following:
 - Single-family home has a resale restriction or an equity sharing agreement with a public entity or nonprofit affordable housing provider
 - Single-family home is part of a multifamily complex supported by public funds to enable selling the home at an affordable cost to low-income families. Resale is restricted to selling the home to other low-income families
 - Single-family home was purchased through a first-time homebuyer program or loan program that uses state or federal home funding
 - Other: Implicit resale restrictions.

One GRID Alternatives staff member described eligibility barriers related to the affordable housing requirement, stating that “the number of homeowners who meet PU Code 2852 is much smaller than the millions who live in affordable housing,” and within the subset that meet the requirement: “There are issues surrounding whether their homes are conducive to solar, whether it is rented or not, whether there is a roof or shading issue... there are a lot of other requirements that kick folks out.”

Although GRID Alternatives understands that eligibility requirements were set by statute, GRID staff recommended that low-income eligibility requirements be more inclusive to other types of affordable housing. One GRID Alternatives staff member commented that a broader interpretation of 2852 to include other federal and state designations for disadvantaged communities “would be helpful for us in reaching our target audience.” Similarly, staff members indicated that they would like to see the program begin serving other groups that would benefit from reduced-cost solar, in particular veterans and senior citizens who may be “house rich but money poor.” After these interviews, Decision 15-01-027 expanded criteria for meeting the SASH resale restriction requirement to include eligible households located in Qualified Census Tracts because these tracts “provide the same level of assurance of a presumed resale restriction as Enterprise/Empowerment Zones for the purposes of determining SASH eligibility.”⁵³

⁵² GRID Alternatives. <http://www.gridalternatives.org/learn/sash/sash-eligibility-requirements>

⁵³ Decision Extending the Multifamily Affordable Solar Housing and Single Family Affordable Solar Homes Programs within the California Solar Initiative, D. 15-01-027.

3.4.4.2 Home Suitability for Solar

Another aspect that affects a homeowner’s ability to participate in SASH is work required on the home in order to install the solar PV system. This is particularly an issue with older housing stock. For example, many low-income customers’ homes suffer from roof damage and/or outdated electrical panels. In many cases, these issues may prove prohibitive to installing solar if financial resources from the homeowner, GRID Alternatives, or additional programs are not available to address the problem. In addition, changing municipal codes requires all homes to have a low-flow toilet and carbon monoxide detector when pulling a building permit; GRID Alternatives staff stressed that even relatively minor home improvement requirements can become a barrier to installing solar. GRID Alternatives views its efforts in addressing these issues as parallel to providing reduced-cost solar. In general, GRID Alternatives staff believes it is important to find new and enhanced means for funding projects. This will become particularly important for future SASH projects given the reduction in incentive levels brought by AB 217.

3.4.4.3 Financing and Incentives

When asked how low-income households finance costs not covered through program incentives, GRID Alternatives staff explained that in most cases GRID Alternatives finds a way to meet the financing gap without requiring homeowner contributions. One staff member indicated that there have been a few instances where GRID Alternatives contributed fundraising dollars to cover costs not met by SASH incentives, and once the customer began seeing savings, they started making monthly payments to pay back the cost. This arrangement was not noted by any of the SASH customers surveyed by Navigant, however. Another staff member indicated that in some instances the family covers the gap, and if not GRID Alternatives will try to find business sponsors from the local community to support the project. A third staff member indicated that homeowners in their region have not had to pay for anything since fundraising covers the cost not covered by incentives. In one instance, a customer who was saving hundreds of dollars monthly decided to donate a portion of their monthly savings back to GRID Alternatives so that GRID Alternatives could continue to provide these kinds of services to others.

In the SASH homeowner survey, only one of the 100 SASH customers reported that they contributed to the cost of their solar system. When asked if homeowners would have installed solar if required to contribute to the cost of the system, 56 percent of respondents said no, while an additional eight percent expressed uncertainty.

In addition, the majority of respondents indicated that they would not have been willing to take out a loan to pay part of the cost of the solar system they received through GRID Alternatives and the SASH program, with only 15 percent of respondents indicating they

GRID Alternatives staff described a multi-faceted strategy for reducing the installed cost of PV systems to homeowners, which includes:

- Establishing partnerships with manufacturing companies to bring down equipment costs
- Partnering with cities, foundations, local businesses, and other philanthropic organizations to offset the cost of the system to the homeowner
- Employing an organizational strategy that enables the organization to optimize processes within and among departments and regional offices

would be willing to do so. The evaluation team followed up on this question by asking whether respondents would have been willing to take out a loan if the amount of money saved each month more than covered their monthly loan amount. Under this revised scenario, 29 percent of respondents indicated they would be willing to take out a loan to contribute to the cost of their solar system. Despite this increase, survey results shown in reveal that few SASH participants were willing to take out a loan for a solar system.

Figure 3-11. SASH Dollars and Cents



Source: Navigant survey with SASH participants, 2014
Note: See appendices for full survey results

GRID Alternatives staff members believe that reducing incentives will reduce demand for solar, but the degree of reduction is unknown and will depend on GRID Alternatives' ability to adjust by offering other financing mechanisms.

One of the GRID Alternatives staff members stated that third-party ownership (TPO) and innovative financing mechanisms would be necessary to overcome that upfront cost hurdle for SASH homeowners. Another SASH staff member stated that it will be difficult to transition to the lower incentive amount and that GRID Alternatives will need to rely on regional offices to develop partnerships to bring in additional money.

Navigant asked GRID Alternatives staff if TPO financing could sufficiently overcome gaps in financing on its own or whether other sources of financing will be required. One GRID staff member indicated that, "We are focusing on every dollar we can find and we are looking at every [financing] opportunity." Another GRID regional office indicated that TPO will be instrumental as incentives are reduced. This office commented that, "TPO is going to benefit SASH in that we will continue to be able to shoulder the entire cost for the homeowners. It also expands the warranty of the system up to 20 years and provides an additional 10 years of maintenance on the system."

After these interviews, Decision 15-01-027 authorized GRID Alternatives to submit a proposal for a TPO model for the next round of SASH funding and the CPUC approved the proposal in June 2015.⁵⁴ GRID Alternatives recently became a channel partner to the solar finance company Clean Power Finance, enabling the organization to offer third-party financing to low-income homeowners outside of the SASH program.⁵⁵

3.4.4.4 Customer Engagement and Program Participation

Navigant asked GRID Alternatives staff about the challenges faced when selling solar PV systems to customers. All three GRID Alternatives offices described a lack of customer knowledge about solar PV due to homeowners' unfamiliarity

⁵⁴ Decision Extending the Multifamily Affordable Solar Housing and Single Family Affordable Solar Homes Programs within the California Solar Initiative, D. 15-01-027.

⁵⁵ "GRID Alternatives Joins CPF's Network of Channel Partners to Finance Solar Projects for Low-Income Homeowners." Reuters. March 5, 2015. <http://www.reuters.com/article/2015/03/05/ca-cpf-grid-idUSnBw055200a+100+BSW20150305>

with the technology. Customers often do not trust the offer, and as one GRID Alternatives staff member described, customers wonder, “What’s the catch?” Another barrier expressed by one staff member is developing a clear marketing platform for the program as confusion exists among customers, which may partly be attributed to language barriers. Another challenge identified was that GRID Alternatives has to find a financing solution on the customers’ behalf due to the inability of many customers to qualify for financing for various reasons, including credit score.

The evaluation team asked SASH customers to comment directly on the concerns they faced participating in the program. Of the 100 respondents, the majority indicated that they did not have any initial concerns about participating in the program (68 percent). Of the 31 respondents who did express initial concerns, the majority felt that the offer of free solar was too good to be true (58 percent, or 18 respondents). Others felt concern over the cost of the system (32 percent, or 10 respondents) and the safety of the system (13 percent, or four respondents).

According to GRID Alternatives, once past the initial customer engagement hurdle, drop-out rates for the SASH program are low. One staff member indicated that out of approximately 750 total participants, only three or four participants have dropped out since 2009. Once an applicant submits an application, it is almost certain that they finish the process. Another GRID Alternatives staff member explained that, “Our drop-out rate is really low. If I do my job in properly educating [customers] we really don’t have a drop-out problem.” Sometimes participants drop out early in the process because they fail to turn in the appropriate documentation or their homes have unsuitable roofs or too much shade.

3.5 PROGRESS TOWARD ACHIEVING SASH GOALS

The stated goals of the SASH program are to:⁵⁶

- Decrease electricity usage by solar installation and reduce energy bills without increasing monthly expenses
- Provide full and partial incentives for solar systems for low-income participants
- Offer the power of solar and energy efficiency to homeowners
- Decrease the expense of solar ownership with a higher incentive than the CSI General Market Program
- Develop energy solutions that are environmentally and economically sustainable.

With respect to assessing the SASH program’s progress toward achieving the goals, note the following:

- **Decrease electricity usage by solar installation and reduce energy bills without increasing monthly expenses.** The SASH program installs solar PV systems that generate solar electricity which offsets electricity that was originally provided by the utility. Navigant was unable to quantify participant’s monthly expenses using SASH program data. However, 99 percent of the SASH customers interviewed believe that participation in the SASH program has made their monthly energy bill much more affordable. In addition, the vast majority of the solar systems

⁵⁶ CSI Single-Family Affordable Solar Homes (SASH) Program, <http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm>.

installed were at no cost to the participants, indicating that – all else being equal – SASH reduces energy bills without increasing monthly expenses. Based on these findings, Navigant believes that the SASH program has been effective in meeting this goal.

- **Provide full and partial incentives for solar systems for low-income participants.** Navigant learned through interviews with GRID Alternatives that the organization has developed external relationships and raised additional funds that leverage the SASH program incentives to provide solar PV systems at essentially no cost to low-income participants. Navigant was unable to verify the average SASH customer’s out-of-pocket expense using program data, but GRID Alternatives estimates that a very small percentage, roughly one percent, of participants pay any out-of-pocket expenses for the solar PV systems. Based on the findings, Navigant believes that GRID Alternatives is meeting the goal of providing full and partial incentives for solar systems for low-income participants.
- **Offer the power of solar and energy efficiency to homeowners.** The SASH program has been effective in meeting the goal of offering the power of solar and energy efficiency to participating homeowners based on several findings from the evaluation. First, the SASH program requires that all applicants receive an energy efficiency audit and enroll in the ESA program if they are eligible. To further promote energy efficiency, GRID Alternatives sizes the PV systems to account for and encourage energy efficiency. In addition, GRID Alternatives meets in person with all customers to discuss the impact that energy efficiency can have on utility bill savings. Ninety-five percent of respondents to the SASH customer participant survey indicated that the program increased their awareness of energy efficiency.⁵⁷ Based on these findings, Navigant believes that GRID Alternatives has met the goal of offering solar and energy efficiency to homeowners.
- **Decrease the expense of solar ownership with a higher incentive than the CSI General Market Program.** Table 3-3 compares the CSI General Market Program incentives to the SASH program incentives and shows that in all scenarios the SASH program has a higher incentive than the CSI General Market Program. Based on this finding, Navigant believes that the SASH program met the fourth goal to decrease the expense of solar ownership with a higher incentive than the CSI General market Program.
- **Develop energy solutions that are environmentally and economically sustainable.** It is difficult to evaluate progress toward achieving this goal because it lacks specificity. Certainly, from the low-income customer’s perspective, we believe that the SASH program has been effective in promoting energy solutions that are environmentally and economically sustainable, i.e. through the successful deployment of solar and facilitation of energy efficiency projects at low-income households. From a programmatic perspective, Navigant concludes that funding and staffing levels from 2011 to 2013 were sufficient for meeting the goals of the SASH program.

In addition to the stated goals above, GRID Alternatives program staff stated that while SASH program goals are important components of GRID Alternatives’ overall strategy, the organization strives to meet additional goals such as providing job training opportunities. One GRID Alternatives staff member

⁵⁷ Energy efficiency findings are presented in Section 3.3.

added that the organization also strives to educate the community about solar and seeks to achieve this by offering comprehensive workshops and presentations to both homeowners and the general community in which it does solar PV installations. When asked if the program goals have changed over time, GRID Alternatives program staff explained that while the underlying goals of GRID Alternatives and SASH have remained consistent, some goals have expanded and evolved since 2011. Over time, GRID Alternatives and the SASH program have expanded their coverage to additional territories and GRID Alternatives has developed more partnerships with job training organizations to enhance its job training program. In addition, GRID Alternatives has worked at overcoming language barriers as it has expanded its community outreach.

Table 3-3. CSI General Market and SASH Program Incentives⁵⁸

CSI General Market Program										
Step	1	2	3	4	5	6	7	8	9	10
MW in Step	50	70	100	130	160	190	215	250	285	350
Residential EPBB (\$/W)	-	\$2.50	\$2.20	\$1.90	\$1.55	\$1.10	\$0.65	\$0.35	\$0.25	\$0.20
Residential PBI (\$/kWh)	-	\$0.39	\$0.34	\$0.26	\$0.22	\$0.15	\$0.09	\$0.05	\$0.03	\$0.03
CSI SASH Program										
Extremely or Very Low-Income	Fully subsidized 1 kW–1.2 kW system									
Other Low-Income (\$/W)	Tax Liability				\$0		\$1 to \$1,000		\$1,001+	
	CARE eligible				\$7.00		\$6.50		\$6.00	
	Not CARE eligible				\$5.75		\$5.25		\$4.75	

Source: Navigant analysis of www.gosolarcalifornia.ca.gov/csi/rebates.php, California Public Utilities Commission California Solar Initiative Program Handbook, August 2014

3.6 MARKET OPPORTUNITIES AND RECOMMENDATIONS

This section describes market opportunities for GRID Alternatives to help meet future program capacity targets. It is organized as follows:

- Section 3.6.1—Geographic Assessment
- Section 3.6.2—Recommendations

⁵⁸ Expected Performance-Based Buydown (EPBB) incentives are paid based on verified solar energy system characteristics. The performance-based incentive (PBI) is a flat cents per kWh payment for all output from a solar energy system over its initial five years of operation. Of the total SASH budget, 20 percent is reserved for fully subsidized systems; fully subsidized projects are capped at a maximum of \$10,000 per qualifying household.

3.6.1 Geographic Assessment

Navigant completed a geographic assessment to understand the distribution of program participation to date and to assess whether opportunities to expand geographic participation exist for the future. In order to do this, Navigant prepared the ZIP code level geographic assessment of potential eligible SASH participants by mapping the following parameters:

- Distribution of possible eligible participants based on utility data for customers on CARE rates (to help identify areas with low-income populations)
- Count of installed projects as of December 31, 2013, overlaid onto the distribution of possible eligible participants based on utility data for customers on CARE rates
- Qualified Census Tracts: According to Decision 15-01-027, eligible households located in Qualified Census Tracts in IOU territory may meet the SASH resale eligibility requirement for the program going forward⁵⁹ (to help identify areas that would meet this resale restriction requirement)

Customers enrolled in the CARE program are not automatically eligible for participation in the SASH program. However, CARE data illustrates the distribution of low-income customers in IOU territories, which serves as one useful proxy for SASH eligibility. Navigant found a reasonable match between the total number of total CARE accounts and the approximate number of families with incomes below 80 percent AMI on a county-level scale.⁶⁰ Although the CARE and SASH programs provide similar information on the income level of low-income households, SASH includes an additional property resale restriction requirement and homeownership requirement that the CARE data does not reflect. For the property resale restriction requirement, the Qualified Census Tract data helps illustrate regions of customers with resale restrictions. Because they address different SASH eligibility requirements, the two datasets and their resulting maps should be considered together to get a more complete picture of potential eligible SASH participants in IOU territory.

Further, the geographic analysis does not comprehensively address all SASH eligibility requirements due to scope and data constraints. For example, the assessment does not address home ownership, which is an important component for program eligibility. The areas identified by the assessment are illustrative, and targeted outreach will likely eliminate some potential participants in these areas that do not own their homes.

⁵⁹ Decision 15-01-027 “Proposed Decision Extending the Multifamily Affordable Solar Housing and Single-Family Affordable Solar Homes Programs within the California Solar Initiative.” California Public Utilities Commission, January 29, 2015. www.cpuc.ca.gov/NR/rdoonlyres/D6EBBFCE-3C9D-4631-9F4E-94A58F765DF5/0/145938475.pdf.

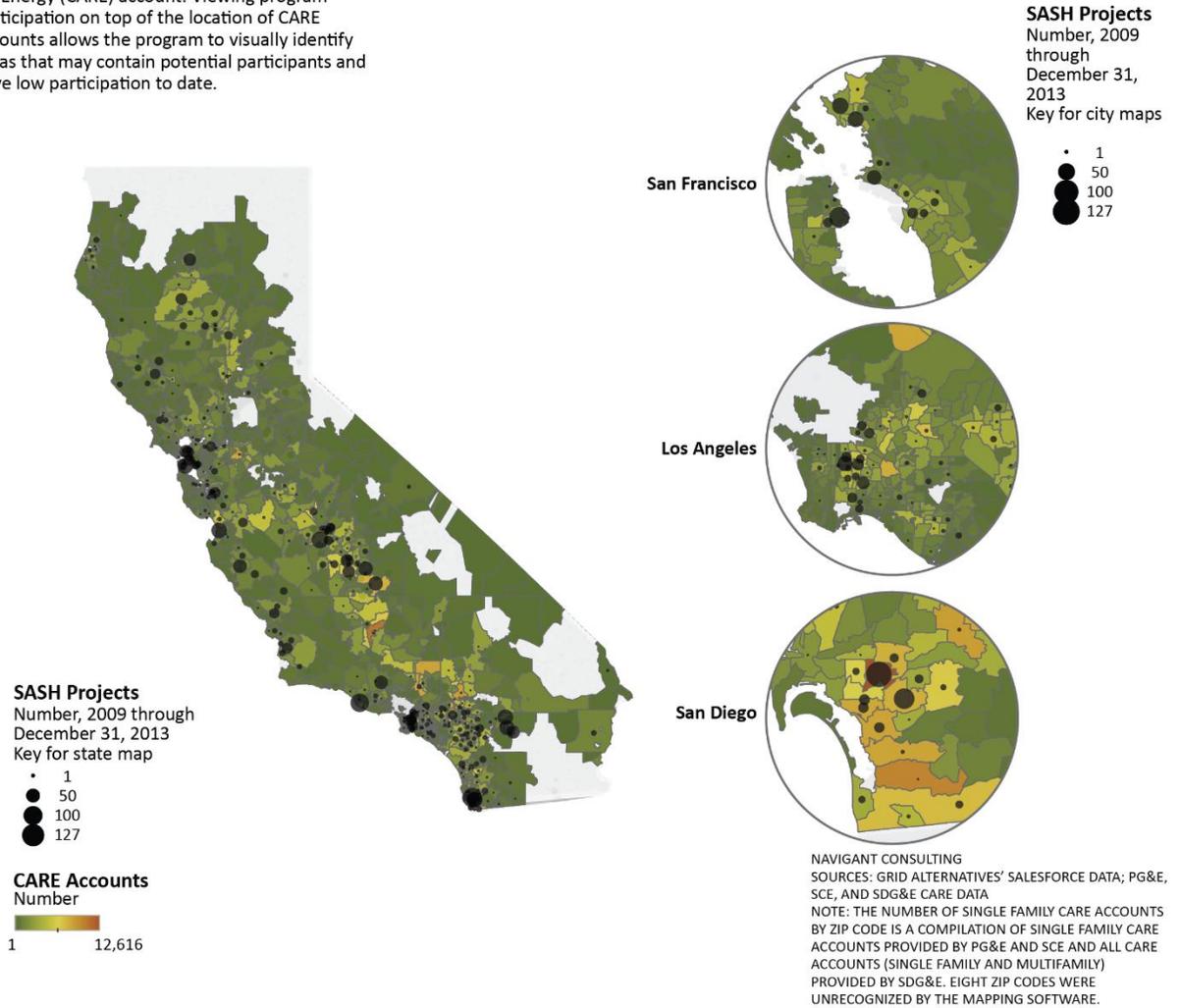
⁶⁰ U.S. Census American Community Survey five-year data (2008-2012) by California ZIP code (aggregated by county) and 80 percent of the median income by FY 2013 MTS Income Limit Area were used to estimate the number of families beneath the 80 percent AMI threshold.

Figure 3-12 and Figure 3-13 display the results of this analysis.

Figure 3-12. Distribution of SASH Projects Installed through 2013 vs. Customers on CARE Rates⁶¹

SASH and CARE

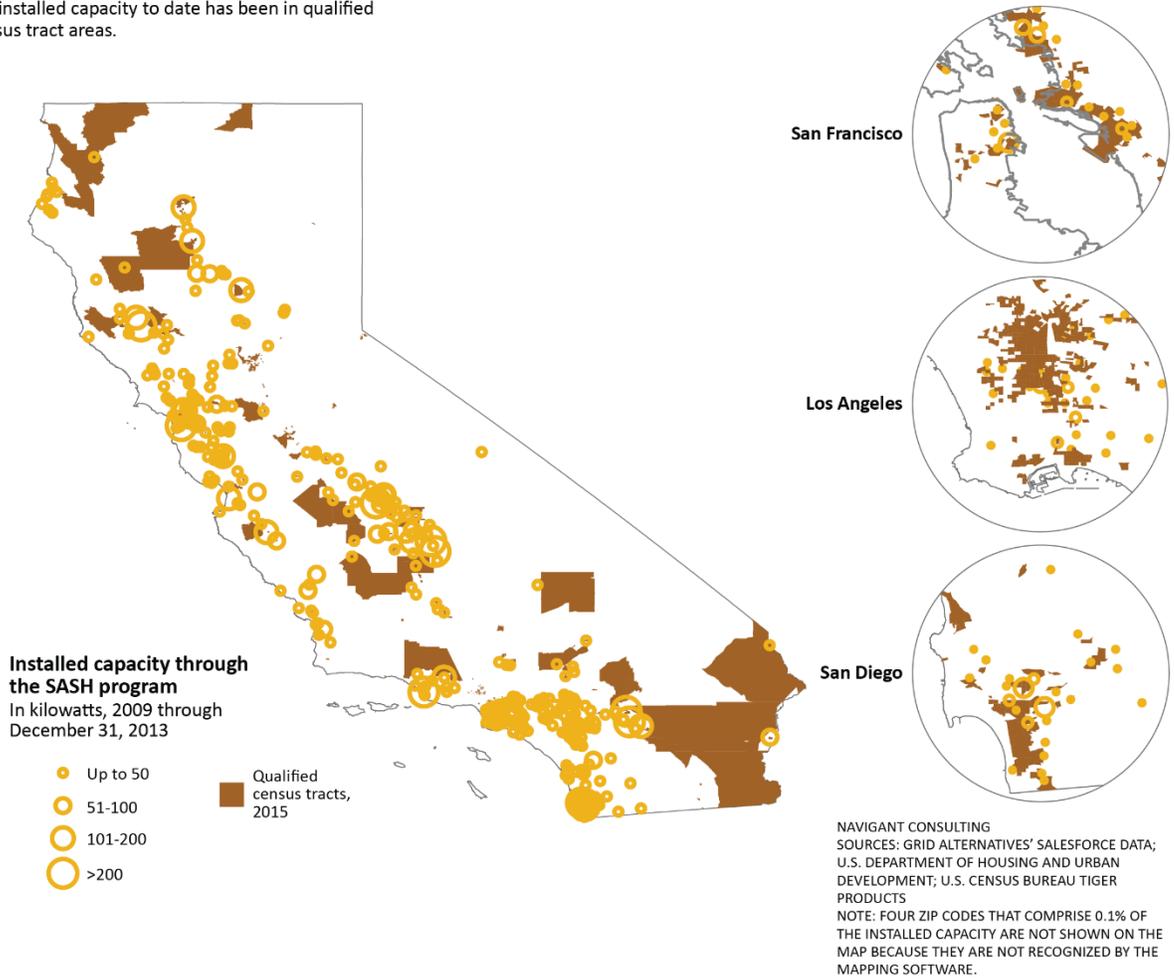
Almost every California ZIP code contains at least one customer with a California Alternative Rates for Energy (CARE) account. Viewing program participation on top of the location of CARE accounts allows the program to visually identify areas that may contain potential participants and have low participation to date.



⁶¹ SDG&E CARE rates include both single-family and multifamily accounts.

Figure 3-13. SASH Capacity Installed by December 31, 2013 vs. 2015 Qualified Census Tracts⁶²

QUALIFIED CENSUS TRACTS AND SASH
 The decision extending the SASH program within the California Solar Initiative (January 29, 2015) found that eligible households located in qualified census tracts may meet the SASH resale restriction eligibility requirement. About a third (29%) of the installed capacity to date has been in qualified census tract areas.



⁶² All kW values in the figure are kW-AC (CEC).

The top five areas with the highest potential for future SASH projects, based on the number of CARE accounts and SASH projects installed, are the following ZIP codes: 93307 (Bakersfield), 91911 (Chula Vista), 92335 (Fontana), 92020 (El Cajon), and 92345 (Hesperia). Broadly, Los Angeles and San Diego also have a high concentration of CARE accounts. This snapshot of high-potential areas could be useful for GRID Alternatives to target certain areas for future outreach efforts.

In addition, Navigant calculated the percentage of SASH projects (as of December 31, 2013) out of the number of CARE accounts, by ZIP code, for the entire CARE database.⁶³ Sixty-seven ZIP codes have one percent or more installed SASH projects to CARE accounts, while the remaining ZIP codes have less than one percent. Two hundred and thirty ZIP codes have over 1,000 CARE accounts and zero SASH installed projects. This indicates that there could be significant potential in most regions in California with utility CARE customers if they meet all of the SASH requirements.

Figure 3-13 shows that existing SASH installations generally follow the geographic coverage of Qualified Census Tracts. However, going forward GRID Alternatives may find more opportunities in rural areas with Qualified Census Tracts to the far north (some PG&E service territory⁶⁴) and south (some SCE service territory⁶⁵).

The SASH program could facilitate this expansion to rural areas by the inclusion of Qualified Census Tracts as depicted above. However, it is also important that the program continue to address needs in dense urban areas with a high concentration of low-income households (represented by utility CARE rates).

The geographic assessment may help address the eligibility requirement barriers discussed previously in Section 3.4.4.1, specifically, by identifying areas that have large populations of residents with a household income that is 80 percent of the AMI or below and areas that meet the affordable housing definition (e.g., Qualified Census Tracts meeting resale restrictions). Targeting these areas for future program outreach could result in more effective recruitment of eligible participants.

3.6.2 Recommendations

This section summarizes the key recommendations for the SASH Market and Program Administrator Assessment.

- **Utilize trusted messengers and customer testimonials.** One of the key concerns from low-income homeowners is that the SASH offer is too good to be true. Homeowners may find it difficult to trust that the GRID Alternatives offer is genuine in light of similar offers from solar contractors that turned out to be false. GRID Alternatives could improve messaging and reduce customer concerns by conducting research (e.g., surveys or focus groups) to better understand

⁶³ The highest percentage of SASH projects relative to number of CARE customers in any one ZIP code is 50 percent for a ZIP code with one project and only two CARE accounts.

⁶⁴ PG&E Service Territory map: www.pge.com/mybusiness/customerservice/otherrequests/treetrimming/territory

⁶⁵ SCE Service Territory map: www.sce.com/wps/portal/home/about-us/who-we-are/leadership/our-service-territory

the messaging that resonates with homeowners and builds trust with potential customers. In addition to continuing to partner with trusted community organizations, GRID Alternatives should consider offering customer testimonials to prevent disbelief from homeowners.⁶⁶

- **Track job placement for job trainees.** Tracking job placement for job trainees would provide GRID Alternatives and the CPUC with a greater understanding of the impact of the job training program. If job placement is an important metric to the CPUC, it should require that GRID Alternatives track job placement for job trainees in Salesforce as part of overall program administration and project tracking, potentially by conducting follow-up surveys with trainees in years after their training.
- **Provide a template to PAs for Data Annex requirements.** The recent Decision Extending the Multifamily Affordable Solar Housing and Single-Family Affordable Solar Housing Programs within the California Solar Initiative (D. 15-01-027) requires the SASH program to provide a confidential Data Annex that includes reporting on the number of customers the program has referred to the ESA program, the number of SASH participants enrolled in the ESA program, and the number of job trainees and hours worked for SASH installations. Navigant's evaluation found that reporting is not consistent across PAs for both SASH and MASH. A standard data template from the CPUC could ensure consistent reporting, streamline program evaluation, and simplify reporting for PAs. In addition, the IOUs should ensure that a structure is in place to communicate to GRID Alternatives the number of SASH participants that enroll in ESA after GRID Alternatives refers them.
- **Develop goals that are specific and measurable.** The CPUC's stated goals for the SASH program are difficult to evaluate against program performance because they lack specific quantitative targets. The CPUC should consider revising the goals of the SASH program using SMART criteria (i.e., Specific, Measurable, Achievable, Relevant, and Time-bound). Developing SMART goals would facilitate program evaluation and would allow GRID Alternatives to measure and track its performance over time against the CPUC goals. For example, the CPUC could modify the SASH goal to "Provide full and partial incentives for solar systems for low-income participants" to be a more specific and measurable goal such as: "From 2015 through 2017, provide full incentives for solar PV systems to 1,000 low income SASH participants." or "From 2015 through 2017, provide full and partial incentives such that the average annual out-of-pocket expense to low-income participants is 25 percent of the average annual cost of solar PV systems."⁶⁷

⁶⁶ Discussions with GRID Alternatives indicate that GRID currently relies on word-of-mouth from satisfied participants and tries to engage past participants to talk to potential participants. GRID Alternatives is also planning to add a potential client page to their website with customer testimonials. Navigant supports this plan.

⁶⁷ These goals are examples only, they do not represent Navigant's recommendations for explicit changes to the program goals.

4 MASH Assessment

This section presents the research findings and recommendations for the MASH program. The section is organized as follows:

- Section 4.1—Program Administration
- Section 4.2—Job Training
- Section 4.3—Energy Efficiency
- Section 4.4—Property Owner Experience
- Section 4.5—Tenant Experience
- Section 4.6—Progress Toward Achieving MASH Goals
- Section 4.7—Market Opportunities and Recommendations

4.1 PROGRAM ADMINISTRATION

This section describes the MASH program administration. It is organized as follows:

- Section 4.1.1—Program Statistics
- Section 4.1.2—Organizational Structure
- Section 4.1.3—Funding and Staffing Sufficiency
- Section 4.1.4—Market Actor Feedback

4.1.1 Program Statistics

The MASH program incents solar projects on multifamily affordable housing properties. At the end of 2013, the MASH program had installed 321 PV systems, with 55 additional projects reserved and awaiting installation⁶⁸ and another 302 applications on the wait list. Figure 4-1 summarizes MASH program accomplishments in terms of number and capacity of installations over time, as well as the split between properties that were net energy metered (NEM) and those that were virtual net energy metered (VNM).

The data shows that MASH capacity ramped up significantly in 2011 and 2012, and then dropped in 2013. While the number of annual installations peaked in 2011 at 131 projects, the MASH program installed the most capacity in 2012. The average project size was larger in 2012 than 2011, possibly suggesting that larger projects take longer to develop than smaller projects. PG&E comprised the greatest proportion of capacity in 2011 while SCE comprised the greatest share of capacity in 2012. In 2013, PG&E and SCE capacity was relatively equal. CSE's share of installed capacity was significantly smaller than PG&E and SCE and was highest in 2011.

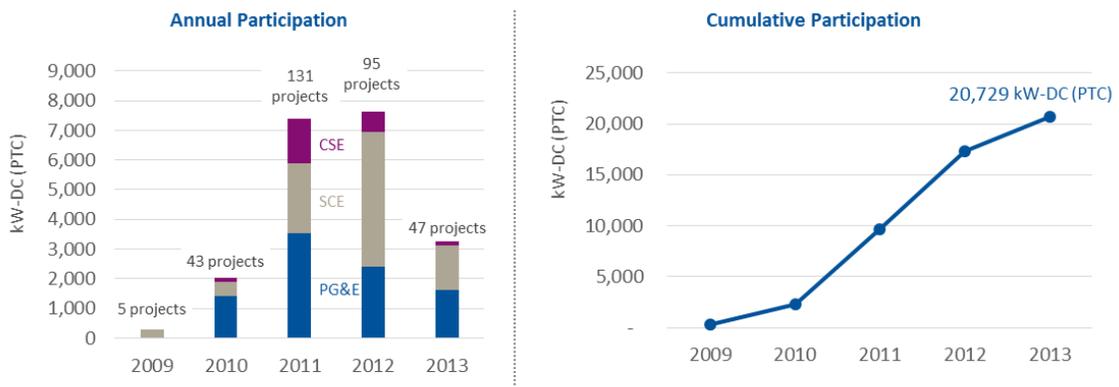
⁶⁸ Categorized as Confirmed Reservation or Reservation Reserved in the PowerClerk database.

For all MASH projects installed from program inception through 2013, more than half of the projects (62 percent) were net energy metered (NEM) and 28 percent were virtual net energy metered (VNM) projects. By the end of 2013, the MASH program installed 20,729 kW-DC (PTC) of capacity.

Figure 4-1. MASH Program Accomplishments

MASH: Program Accomplishments

The MASH program participants installed 321 systems between 2009 and 2013. These systems comprised 20,729 kW-DC (PTC) of installed capacity. From 2011 to 2013, the program participants installed 273 systems comprising 18,400 kW-DC (PTC) of installed capacity.



Project Type

Project Type	% of total capacity (2009-2013)	% of total installations (2009-2013)
Net energy metered	54%	62%
Virtual net energy metered	46%	38%

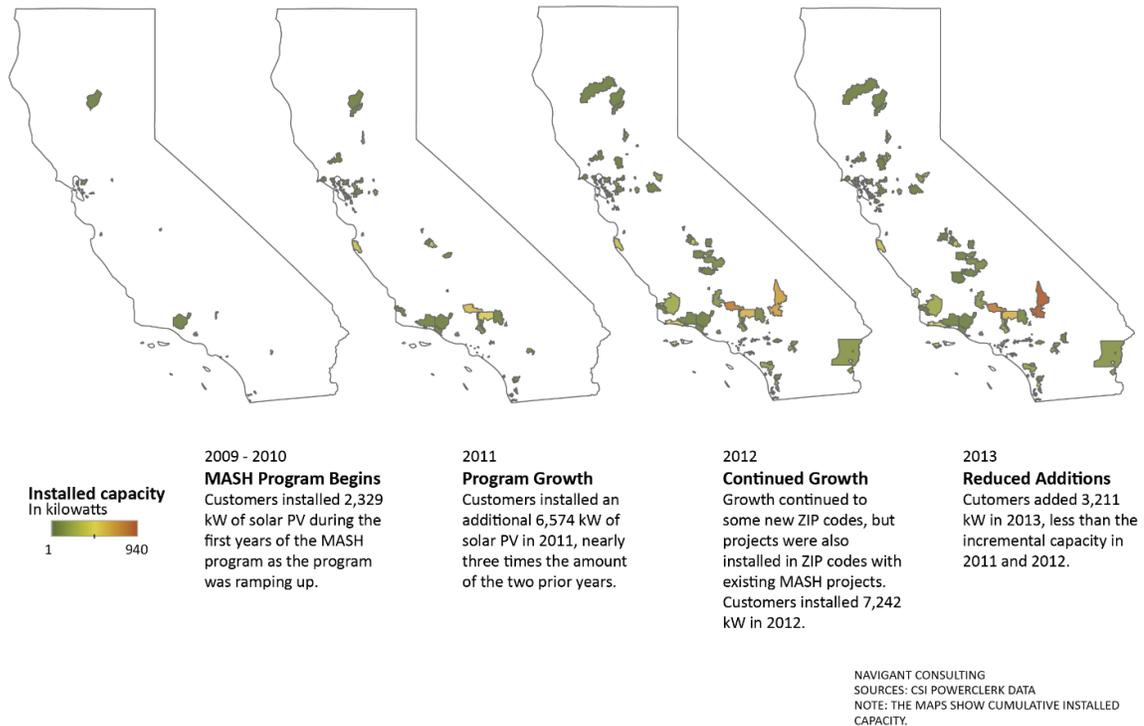
Source: Navigant analysis of CSI PowerClerk data and Track 2 project data
 Note: Installed date is the First Incentive Claim Request Review Date.
 Capacity is based on the CEC PTC rating (kW). All data for program years 2009 – 2013.

Figure 4-2 shows the incremental spread of MASH participation across the State of California. The results show that the MASH program has achieved a more limited geographic spread than the SASH program because there are far fewer individual projects (projects are of a much larger size). Many

different regions in California are now host to a MASH installation but program participation has mainly been concentrated near more populated areas.

Figure 4-2. Cumulative Installed Capacity (MASH)⁶⁹

THE GROWTH OF THE MASH PROGRAM
 The MASH program growth pattern shows more growth in ZIP codes with existing MASH participation rather than growth to new ZIP codes.



4.1.2 Organizational Structure

The PG&E and SCE PA teams are each part of the larger utility organizational structure. CSE is a nonprofit organization with broad-based activities related to sustainability, including managing the MASH program on behalf of SDG&E. For the most part, each MASH PA team includes one program manager and one analyst.

The PG&E and SCE MASH PAs explained that they also spend time on other CSI General Market program and have the flexibility to shift individuals around depending on which programs require the most work at a given point in time. Resources from other divisions of the organization, such as marketing, policy, or billing, are readily available and can be consulted or called upon as needed.

The CSE team described that coordination with the SDG&E office happens primarily for verification of

⁶⁹ All kW values in the figure are kW-AC (CEC).

usage data (i.e., to justify load calculations on potential projects), interconnection of installed systems, and VNM allocations. Navigant did not find any clear benefit or disadvantage to CSE operating independently from the utility.

The evaluation team asked the MASH PAs to share their perceived strengths. The consensus among the MASH PAs is that the PAs provide quality customer service to program participants and that they serve as a helpful resource throughout the program process. PAs described that complexities exist in the MASH program that often result in confusion among participants; having direct access to the administrators of the program helps to alleviate this and move the program along smoothly. As stated by one MASH PA, “Although [MASH] is similar to CSI General Market, there are some complexities to it and since it is a smaller component of the program we are able to do more one-on-one engagement with customers and can do more hand holding which is very convenient.”

In addition to sharing resources between programs within the PAs’ larger organizations, the MASH PAs claim that another advantage to their organizational structure is the ability to capitalize on knowledge and best practices gained from the CSI General Market program. In one case, a MASH program manager started out with the CSI General Market program before transferring to MASH, bringing experience and a familiarity with the CSI General Market program to the new role. Another PA transferred lessons learned regarding database management and has structured the MASH program to match the CSI General Market’s approach to data tracking and management. The sharing of knowledge allowed for a smooth process and improved data sharing capabilities between programs.

In contrast to the MASH PAs’ self-assessment, a number of MASH installers commented on the need for increased staffing, better organization, and a clear chain of command when it comes to dealing with the program and assisting with participant inquiries.

4.1.3 Funding and Staffing Sufficiency

According to the MASH program budget and spending data in Table 4-1, the MASH PAs spent a combined 66.7 percent of the total budget by the end of 2013, or \$72.3 million of the total budget of \$108.3 million (allocated through 2016); 26.8 percent of the overall administrative budget and 72.1 percent of the incentive budget were spent from the beginning of the program through 2013. This indicates that, for the most part, the PAs accomplished MASH installations efficiently with their administrative budgets. Additionally, at the end of 2013, with only three program years left, \$36.1 million (33.3 percent) of the budget remained for additional MASH projects. SDG&E had reached 93.6 percent of its overall budget by the end of 2013, so was not expected to be able to support much additional program activity after that time. PG&E and SCE each had over \$17 million remaining at the

end of 2013; however by April 2014 the MASH program had fully expended its incentive budget in all three territories and was closed to new applications.

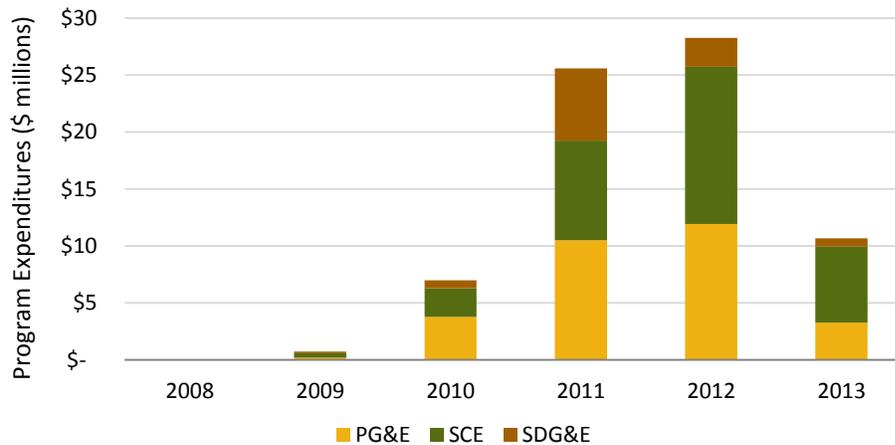
Table 4-1. MASH Program Budget Actuals through 2013

Budget Category	Amount Spent				Total Budget	Percent Spent
	PG&E	SCE	SDG&E	Total Spent		
Total Administration	\$1,603,822	\$1,188,366	\$697,986	\$3,490,174	\$13,000,800	26.8%
Administration	\$1,343,149	\$1,133,653	\$610,023	\$3,086,825	\$6,500,400	47.5%
Outreach/Marketing	\$17,704	\$46,075	\$77,422	\$141,201	\$4,333,600	3.3%
Evaluation	\$242,970	\$8,638	\$10,541	\$262,148	\$2,166,800	12.1%
Incentives	\$28,076,809	\$30,943,635	\$9,746,363	\$68,766,807	\$95,339,200	72.1%
Total	\$29,680,631	\$32,132,001	\$10,444,349	\$72,256,981	\$108,340,000	66.7%

Source: Navigant analysis of MASH PA program spending data through December 31, 2013

Figure 4-3 illustrates PA spending by year and shows that program expenditures increased exponentially from 2010 to 2011, increased slightly in 2012, and dropped to 2010 levels in 2013. SDG&E’s use of its allocated budget shows an especially marked increase in 2011 and decrease in 2013 compared to the other two PAs—the intensified program activity in 2011 appears to be the main reason that SDG&E’s budget has been mostly exhausted before the other PAs.

Figure 4-3. MASH Program PA Budget Actuals by IOU Territory through 2013

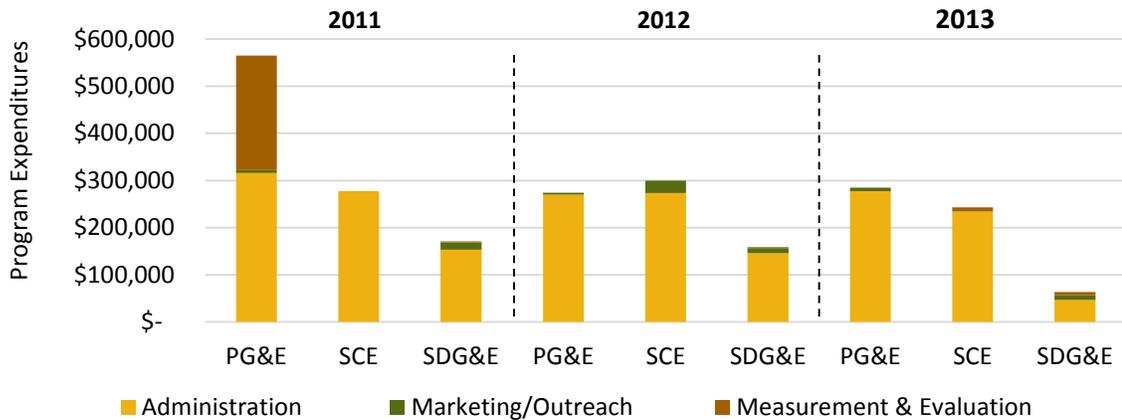


Source: Navigant analysis of expenditure data provided by PAs through a data request

Figure 4-4 details the administrative spending by each PA for program years 2011–2013. Over this period, PG&E spent significantly more on measurement and evaluation (M&E) activities than either of

the other PAs. SDG&E spent disproportionately more on marketing and outreach (M&O). Otherwise, administrative spending is in line with expectations.

Figure 4-4. MASH Administrative Expenditures: 2011–2013



Source: Navigant analysis of expenditure data provided by MASH PAs through a data request

All three MASH PAs agree that program funding levels are sufficient to meet the needs of the program and that the 10 percent administrative budget is sufficient to administer the program. Interviewees indicated that when staff is not processing applications, time is spent making necessary preparations for the next program period under AB 217.

Navigant reviewed spending and found that incentive funding and staffing levels are sufficient for program success, and that administration budgets are more than sufficient for the MASH program. The MASH PAs spent a combined 67 percent of the total budget by the end of 2013, or \$72.3 million of the total budget of \$108.3 million (allocated through 2016). The MASH program expended 27 percent of the administrative budget and 71 percent of the incentive budget from the beginning of the program through 2013. This data indicates that overall, the MASH program has an ample administrative budget. Note, however, that by the end of 2013, SDG&E administrative and incentive budgets were mostly exhausted which will decrease program activity going forward, while PG&E and SCE entered the final program years (2014-2016) with 38 percent and 36 percent of their budgets remaining, respectively.

4.1.4 Market Actor Feedback

This section presents program administration feedback from the perspective of installers (Section 4.1.4.1) affordable housing property owners (4.1.4.2), CPUC staff (Section 4.1.4.3) and the MASH PAs (Section 4.1.4.4).

4.1.4.1 *Installer Feedback*

The Navigant team asked MASH installers to discuss what they believe are the most significant program barriers, including:

- Lack of communication about MASH program status
- Long lead times to receive rebates
- Lack of clarity around who would be the primary point of contact at the utility or PA
- PA organizational structure

MASH installers offered several recommendations for improving communication on MASH program status and faster rebate payouts to the installers. One MASH installer stated that better information on eligibility for MASH rebates would be beneficial to the program. Two installers also requested more communication from the PAs about the MASH program status such as when the program will reopen the application period, what the MASH incentives will be, and whether the program keep the wait list.

One installer elaborated on the barrier of long lead time to receive rebates: “The long period of time for issuance of MASH funding creates financial difficulties and adds costs to projects. Often the owner cannot afford to wait the months it can take to recover the rebate, which means that owners must make other arrangements to cover the costs. If the contractor is required to assume the burden of ‘carrying’ the rebate, that adds to the contractor’s cost of doing business, which gets passed on to the owner. Since the rebate is a significant portion of the cost of a system, these carrying costs can be a huge burden on the contractor, who may not have access to those funds, and this likely keeps a lot of contractors out of the market. If the money were made available more quickly (under 30 days, consistently) it could remove a large barrier to participation.”

With respect to lack of clarity around who would be the primary point of contact at the utility or PA, three installers commented that they would like a “go-to” person at the PA who can answer questions from installers and has authority to make decisions. Additionally, two installers reported waiting a long time for utility staff to return their calls. “Once you get them on the phone it is pretty helpful,” explains an installer, “but in order to get a direct answer, if you need something answered right away, usually you have to wait a few days or more in order to get a response, and that is kind of frustrating. When a question is asked to move things forward, I don't have an answer, and I need an answer as soon as possible. And a lot of cases, the utility company doesn't get back to me at all.” Another installer described how it can be confusing when an issue arises and it is difficult to identify a point person to contact when multiple MASH staff have taken on various roles on a project. One installer elaborated on his request for dedicated or more staff because “We have had problems with things going into the system and we have to do a lot of follow-up ... So that can prolong the process. There's a number of things that have been dropped.”

One respondent mentioned how difficult it was working with all three PAs since each PA requires different things and does things in different ways. Two MASH installers recommended combining the three MASH PAs into one entity so that they did not have to communicate with each PA separately.

4.1.4.2 Affordable Housing Property Owner Feedback

Navigant asked MASH property owners for their feedback on confusing aspects of the program and how and from whom they sought clarification. Overall satisfaction with installers and MASH program staff was generally positive, but some MASH property owners described occasional issues dealing with uninformed or unreliable installers, a cumbersome application process, long utility approval times, and difficulty understanding program and regulatory requirements.

While some MASH property owners found the program application process to be overly complex and time-consuming, several of the issues mentioned by MASH customers are outside the MASH PAs' control. For example, affordable housing property owners reported difficulty working with the U.S. Department of Housing and Urban Development (HUD) on sharing benefits with tenants and setting utility allowances. Other confusing aspects of the process included understanding options for VNM—especially tenant benefits—and NEM billing for accounting departments that had trouble understanding billing energy true-ups. Some affordable housing property owners also reported experiencing issues with local agency approvals.

MASH property owners reiterated the importance of simple processes, clear communication, education, and a faster rebate payout. One customer who experienced difficulty recommended that other affordable housing property owners and managers work closely with the solar installer and program staff and be persistent in obtaining their help. Another MASH customer worked with an installer who lacked administrative experience and offered the following advice: “I would make sure to find a seasoned installer who clearly understands the need for quality drawings as well as a solid understanding of the administrative process for rebates.” Three MASH property owners also stressed the need for a competent, well-informed installer to help guide them through the process. “If [the installer] wasn't there, it would have been a disaster,” says one customer.

Those who chose an inexperienced installer often experienced more issues, and several customers strongly recommended finding a reliable and experienced partner and thoroughly vetting the solar company before starting the project. One affordable housing property owner felt like their solar finance company was taking advantage of them through the power purchase agreement (PPA) and stressed the need for property owner education. Property owners emphasized patience, persistence, and knowledge as key attributes for successfully participating in the MASH program.

4.1.4.3 CPUC Staff Feedback

CPUC staff members emphasized the importance of keeping the application process as simple as possible and making sure that the PowerClerk online application process continues to run smoothly.

Navigant asked CPUC staff their views on the greatest risk to the success of the MASH program. CPUC staff responded that the greatest risk was the uncertainty surrounding the future economics of solar projects. Specifically, a change in the solar investment tax credit could lower demand for PV installation.

4.1.4.4 PA Self-Assessment

The evaluation team asked PAs to describe any difficulties they have experienced in administering the

program. Interviewees shared a few administrative difficulties; however, for the most part, the PAs agree that problems have been minor. One PA brought up difficulties experienced by a delay in implementing PowerClerk to track and store their documents. Because MASH did not incorporate PowerClerk from the beginning of the program, many files remain in hard copy and some files have been scanned in the system. While the PA staff do not view this as a major issue, some affordable housing property owners expressed dissatisfaction with having to submit hard copies of the program application materials.

Another MASH PA described an early administrative challenge in regard to reviewing submissions to the Track 2 option for MASH. The Track 2 option allowed applicants to propose additional energy efficiency and job training components for the solar installation, as well as other project aspects that would directly benefit building tenants. MASH PAs indicated that it was challenging to measure potential end user benefits, which made it difficult to qualify the proposals. Ultimately the PAs recommended eliminating the Track 2 pathway. The MASH program removed the Track 2 option prior to 2012, with all remaining resources dedicated to Track 1.

One MASH PA agreed with CPUC staff’s recommendation to keep the application process simple, adding that an appropriate incentive rate is also a key to the continued success of the program. Another MASH PA recommended providing clear communication when AB 217 is finalized to help contractors and applicants understand the new requirements and ensure everyone is on the same page.

4.2 JOB TRAINING

The MASH program did not require job training as part of the program from 2011 to 2013. This section explores the extent to which job training occurred on MASH projects in the absence of program requirements and presents feedback from installers on including job training requirements for MASH in the future. It is organized as follows:

- Section 4.2.1—Job Training Overview
- Section 4.2.2—Feedback on Future MASH Job Training Requirements

4.2.1 Job Training Overview

The MASH PAs have not focused on job training because the CPUC did not require job training as part of the MASH program from 2011 to 2013. One PA explained that instead of focusing on job training, “Our focus has been on administering the program as efficiently as possible. Our contact is primarily with the solar contractor who then works with the property owner to get the installation completed.”

Despite the fact that there are no specific goals related to job training in the MASH program, the evaluation team spoke with MASH installers to explore the extent to which job training occurs on MASH installations. Five of the nine installers that spoke to the Navigant team reported having used job trainees on MASH installation jobs. One installer had used a trainee one time and another installer mentioned having worked with over 20 job trainees.

When asked what programs the installers use to identify trainees, one installer mentioned working with GRID Alternatives and the PV101 program that GRID uses to accredit volunteers on solar jobs. Another installer mentioned the GoSolarSF⁷⁰ program, elaborating that the quality of volunteers varies because some have very little to no background. Two installers indicated that they do not use trainees, while another two mentioned that instead of using trainees from a job training organization, their general practice is to hire and train installers on the job.

Although job training was not required on MASH projects in 2011 to 2013, MASH installers that used trainees expressed mixed levels of satisfaction with the job trainees that they used. Some installers qualified this statement by indicating their satisfaction with trainees depends on whether the trainee continues on with the installer for the duration of the program, suggesting that those who remain working for the installer are of better quality than those trainees who do not last. One installer described his satisfaction as “50-50,” indicating that some of his trainees came in with little knowledge, while others were focused: “They wanted to be there, they wanted to work, they wanted to learn.”

4.2.2 Feedback on Future MASH Job Training Requirements

This section describes the installer feedback regarding future requirements for job training. The Decision extending the MASH program (D. 15-01-027) requires that each MASH project provide at least one student or graduate of a job training program with at least one full paid day of work on either the MASH solar installation or in a support role on the MASH solar installation, unless no suitable job training program is in a reasonable proximity as determined by the program administrators.⁷¹

To get a better sense of where job trainees would best fit in the MASH program, the evaluation team asked MASH installers to indicate what areas within their business model would be appropriate for students studying solar to receive hands-on learning opportunities. Three installers responded positively, indicating that they believe there was space for job trainees within their business model but did not expand on where those opportunities lie. The most common response from installers was that back office jobs present good opportunities for students studying solar to get experience, while only one respondent indicated that their business model is conducive to allowing trainees up on the roof for hands-on experience. It is clear, based on several responses throughout conversations with MASH installers, that rooftop safety presents a considerable concern in the context of job trainees. A few installers also mentioned that trainees can pose a burden on smaller companies, and that the model for job training might not be appropriate in all cases. Two respondents mentioned that forming partnerships with low-income housing authorities would facilitate the job training process. Other suggestions included following GRID Alternatives’ model, moving to a single MASH PA to consolidate standards and rules, having accountability from contractors, using paid positions instead of volunteers, and using people who already have solar certifications. MASH PAs expressed a desire for a low-cost, simple model.

⁷⁰ GoSolarSF. <http://www.sfwater.org/index.aspx?page=133>

⁷¹ Decision Extending the Multifamily Affordable Solar Housing and Single Family Affordable Solar Homes Programs within the California Solar Initiative, D. 15-01-027.

4.3 ENERGY EFFICIENCY

As discussed in Section 3.3, energy efficiency is the priority in California’s loading order for electric resources. Incorporating energy efficiency measures prior to installing solar is important because it can reduce energy usage and therefore minimize the size of the solar PV system needed to meet building load. If a housing property completes energy efficiency improvements before installing solar, it may be able to install a smaller system than originally anticipated. With smaller system sizes, the MASH program would be able to reach more communities before reaching its program budget limit. This section discusses energy efficiency awareness and behaviors for MASH property owners and tenants and is organized as follows:

- Section 4.3.1—Energy Efficiency Overview
- Section 4.3.2—Energy Efficiency Awareness
- Section 4.3.3—Energy Efficiency Participation
- Section 4.3.4—Future Energy Efficiency Requirements

4.3.1 Energy Efficiency Overview

The MASH program encourages energy efficiency participation by requiring the completion of a property audit. The audit gives specific energy efficiency recommendations to the property managers. The MASH program does not require property managers to implement these recommendations in order to be eligible for the program.

Navigant asked MASH participant property owners and installers what type of energy efficiency tools and resources they used prior to installing solar PV systems. Property owners mentioned a wide variety of energy efficiency resources, including their utility, third-party energy efficiency companies, the housing authority, and the MASH solar installer. For one large building rehabilitation project, the affordable housing property owner also hired a GreenPoint energy rater⁷² who went through an energy efficiency checklist to assess all opportunities.

Some MASH property owners felt that the quality of energy efficiency information obtained from the MASH program was lower or more limited than other resources and generally not as helpful as other sources. Another customer shared that the online utility audit was not as comprehensive as the energy efficiency upgrades already underway at their property as part of a previous investment-grade energy efficiency audit.

Most MASH property owners reported sharing energy efficiency information with tenants, including: websites with energy-saving tips, in-person meetings with residents, written informational materials such as green guides for residents, annual reminders about weatherization, handouts from the utility, and Leadership in Energy & Environmental Design (LEED)⁷³ orientation manuals.

⁷² See <http://greenpointrated.com/>

⁷³ LEED is a green building certification program that recognizes best-in-class building strategies and practices. For more information on LEED, visit <http://www.usgbc.org/leed>.

With respect to the installer interviews, five installers mentioned working with their customers on energy efficiency, three installers reported using simple audits to evaluate energy efficiency opportunities, and two installers reported providing basic suggestions and education about energy efficiency. However, two installers explained that they do not offer energy efficiency tools and resources since energy efficiency is beyond the scope of their business. One MASH installer complained that they have tried to partner with the utility on energy efficiency activities through MASH but the utility has done a “horrible” job of partnering and educating the affordable housing property owners about energy efficiency opportunities. This implies that there may be opportunities for installers and PAs to collaborate more effectively on offering energy efficiency tools and resources to MASH customers.

4.3.2 Energy Efficiency Awareness

MASH PAs indicated that they believe that MASH property managers and installers are aware of energy efficiency opportunities. The PAs perceive affordable housing property owners to be cost-conscious and believe that the energy audit provides additional energy efficiency opportunities and resources for them. One MASH PA indicated that they would not always expect solar installers to inform affordable housing property owners about energy efficiency because “solar installers benefit from building the largest solar installation possible, so they do not have a lot of incentive to do energy efficiency and then have a smaller solar installation.”

MASH installers had mixed opinions on whether property managers were aware of energy efficiency opportunities, with half believing the awareness was limited while the other half felt that property managers were well-informed.

MASH property owners reported a high awareness of energy efficiency opportunities, but many did not credit the MASH program with that knowledge. Affordable housing property owners are often contacted by third-party energy efficiency companies working with the local utility, they participate in housing authority energy surveys, or they independently initiate large building projects with energy efficiency upgrade aspects. Some affordable housing property owners became aware of energy efficiency opportunities by the MASH solar installer. Additionally, to participate in the MASH program, affordable housing property owners must fill out energy efficiency disclosure forms indicating the measures they have previously installed and what they plan to do in the future to reduce their property’s energy consumption. Although they are not required to follow through with this plan, the activity reminds affordable housing property owners to think about the efficiency of their properties.

MASH property owners would like to have been made aware of how their electricity rates and tariffs would change after implementing energy efficiency measures. By providing clearer estimates of annual energy and dollar savings and outlining a comparison of near-term costs versus long-term savings, more MASH property owners would be inclined to implement energy efficiency measures that provide long-term bill savings.

Figure 4-5 shows that only 30 percent of the 73 MASH tenants surveyed indicated that they had knowledge of utility programs that provide assistance or rebates for energy efficiency product installation. However, 85 percent of tenants considered themselves to be average to very knowledgeable

in energy efficiency and ways to save energy in their home, ranking their knowledge three to five on a five-point scale. The lack of program awareness indicates that marketing and education to the tenant population could be improved.

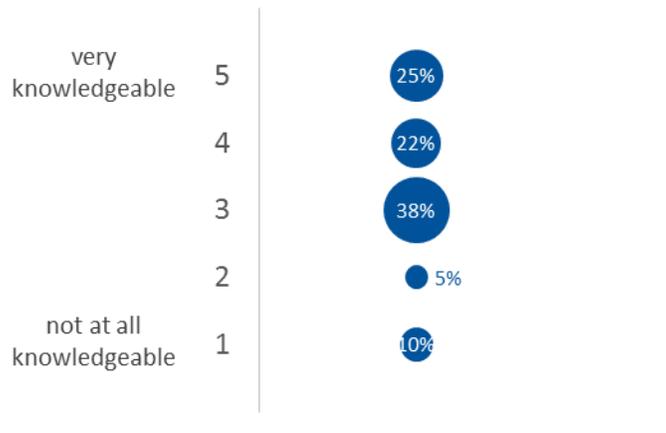
MASH tenant survey respondents overwhelmingly indicated that the utility should communicate information regarding energy efficiency programs through phone calls, mail, and email. Three respondents specified that education in other languages, specifically Spanish and Middle Eastern languages, would be helpful.

Figure 4-5. MASH Tenant Energy Efficiency Awareness

MASH: Tenant Energy Efficiency Awareness

An opportunity exists to increase the energy efficiency awareness among tenants.

How would you rate your KNOWLEDGE of energy efficiency and ways to save energy in your home?



30%

Percentage of MASH tenant respondents who are aware of utility programs that provide assistance or rebates for the installation of energy efficiency products

If your utility wanted to help you increase your knowledge of energy efficiency and programs that could help you save energy in your home, what would be the best way to COMMUNICATE with you?



Other: In person, mixed languages, text message, public presentation

Source: Navigant survey with MASH tenants, 2014
 Note: See appendices for full survey results

4.3.3 Energy Efficiency Participation

This section describes energy efficiency participation for MASH property owners (Section 4.3.3.1) and MASH tenants (Section 4.3.3.2).

4.3.3.1 Property Owner Efficiency

According to interviews with MASH property owners, affordable housing property owners are generally in favor of energy efficiency for their properties. About half of MASH property owners reported making changes to save energy, one-third of MASH property owners installed energy efficiency products, and one-fifth participated in energy efficiency programs.

The energy efficiency actions reported by MASH property owners were unrelated to the MASH program. Most affordable housing property owners had completed prior energy audits for various housing projects, including LEED and general building rehabilitation. Several affordable housing property owners had energy performance improvements completed through the housing authority. One respondent explained that, “We didn’t do it just because of the solar—it was something planned all along to upgrade our systems.” MASH property owners described energy efficiency upgrades including efficient lighting, dual-pane windows, domestic hot water boilers, radiators, efficient appliances, efficient faucets and showerheads, low-flow toilets, weatherization, and water-reduction landscaping.

Navigant sought to understand how the implementation of energy efficiency measures reduced the size of PV systems, but this was difficult to ascertain from the interviews with MASH PAs and participating property owners. According to one MASH PA, a property owner mentioned that he estimated savings from energy efficiency to be 10 percent in the two properties he upgraded. However, because the MASH program does not require that customers complete energy efficiency upgrades, the program does not track the extent to which installers design and install a smaller PV system after the property owner completes the upgrades. In the case where a MASH property owner performed an energy efficiency audit in addition to a solar installation as part of a whole-building rehabilitation, the solar installer analyzed energy usage based on past utility statements to size the system, apparently not counting current energy efficiency improvements.

According to MASH PAs, property owners typically only install energy efficiency measures when they positively impact their bottom line. However, one MASH property owner explained that they could not complete furnace upgrades in addition to other energy efficiency measures because of funding limitations, and another stated that sometimes the organization does not have the funding to do upgrades following an audit: “In affordable housing, it is always a matter of the resource available at the current time.” Several others mentioned grants and rebates for financing energy efficiency upgrades, but budget constraints seem to be limiting property owners’ ability to complete energy efficiency upgrades on their properties.

4.3.3.2 Tenant Energy Efficiency

Navigant surveyed MASH tenants about their participation in energy efficiency opportunities and found that 13 of the 73 MASH tenants (18 percent) reported participating in energy efficiency programs and activities. Of these participants, 33 percent of tenants installed energy efficiency measures, 45 percent

made behavioral changes, and 34 percent considered energy-saving actions that they had not yet implemented.

Among the 24 tenants who installed energy-efficient products in their properties within the last two years, the most common retrofits included light-emitting diode (LED) and compact fluorescent lamp (CFL) light bulbs, followed by refrigerators. Of the 73 survey respondents, 75 percent indicated that they installed energy-efficient products on their own, 21 percent utilized a utility energy efficiency program, and four percent installed some products through a program and some products on their own.

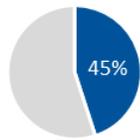
Of the half of tenant respondents who stated that they have made behavioral changes to reduce the amount of heating, air conditioning, or hot water that they used, respondents most frequently set their heating to a lower temperature or used their air conditioning for fewer hours. One-third of tenants considered other energy-saving actions, mostly related to efficient light bulbs and refrigerator replacement. Figure 4-6 summarizes energy efficiency findings for MASH tenants.

Figure 4-6. MASH Tenant Energy Efficiency Participation

MASH: Tenant Energy Efficiency Participation

Though only 18% of respondents participated in an energy efficiency program, a third of respondents installed energy efficiency products and nearly a half made behavioral changes.

Percent of respondents

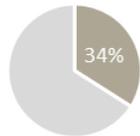


Made behavioral changes

Behavioral Change

% of respondents

Set heating to lower temperature	23%
Use air conditioning for fewer hours	12%
Use fans instead of air conditioning	7%
Wash laundry in cold water	7%
Take shorter showers	5%
Other	23%

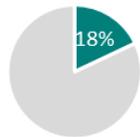


Considered energy saving actions

Product	% installed	% considered
LED bulbs	15%	8%
CFL bulbs	12%	8%
Refrigerator	7%	11%
TV	4%	1%
Showerhead	3%	0%
Other	4%	23%



Installed energy efficiency products



Participated in an energy efficiency program

Program

% of respondents

Energy Savings Assistance Program	12%
Home Energy Assistance Program	3%
CARE rates	1%

Source: Navigant survey with MASH tenants, 2014
 Note: See appendices for full survey results;
 Respondents could select more than one option so the sum of percentages in the table does not align with the overall percentage in the chart

4.3.4 Future Energy Efficiency Requirements

The 2015 CPUC decision reauthorizing the MASH program⁷⁴ established new energy efficiency requirements. MASH property owners will be required to either have:

- Energy efficiency walkthrough audit that meets American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)⁷⁵ Level I requirements or higher
- Enroll in either a utility, regional energy network (REN), community choice aggregator (CCA), or federally funded whole-building multifamily energy efficiency program
- Demonstrate that an energy efficiency walkthrough audit meeting the requirements was conducted within the last three years.

In addition, the Commission Decision required that all MASH tenants be referred to the ESA program to determine eligibility for participation in the program.

The California housing organization interviewed for this report stated that the menu of options available to comply with the walkthrough energy audit requirement seems reasonable and much more feasible than a mandatory ESA program enrollment. The housing organization also believes that the new menu, with the option to prove a previous energy efficiency audit, will meet the needs of most of their affordable housing property owners who are already engaging in significant energy efficiency work.

Navigant sought to understand the extent to which the MASH program is already complying with energy efficiency requirements of AB 217. The Navigant team asked MASH PAs whether they were referring eligible customers to the ESA program. According to one MASH PA, “The interplay between [the] ESA [program], MASH and the Energy Upgrade CA Whole Building Retrofit program has been fairly non-existent and [we] are trying to bring it closer in MASH 2.0.” All MASH PAs explained that this referral has not become part of the program yet because it is not required. Currently, PAs are simply trying to provide general ESA program education.

When asked about the impact of higher energy efficiency requirements, responses differed across organizations and between individual respondents. Some believed that additional requirements would act as a barrier and others indicated that there would be no impact to program participation.

One CPUC staff member explained they would not expect a large negative effect if MASH applicants were required to simply get involved with a multifamily energy efficiency program and consider the upgrade options for their properties. On the other side, one MASH PA expressed, “What we are hearing through the proceedings is the fewer requirements the better, which is unfortunate because we are missing the opportunity to put some of these good energy efficiency upgrades in some of these buildings.”

⁷⁴ Decision Extending the Multifamily Affordable Solar Housing and Single Family Affordable Solar Homes Programs within the California Solar Initiative, D. 15-01-027.

⁷⁵ For more information see www.ashrae.org.

Most MASH installers felt that requiring energy efficiency would be a burden to the program and would negatively influence participation. However, one installer disagreed with the majority, believing that energy efficiency requirements would have zero impact because program “funds were so good.”

Overall, not requiring MASH properties to complete energy efficiency upgrades has led to missed energy efficiency opportunities. However, most installers believe that additional requirements may impose a barrier to MASH program participation.

4.4 PROPERTY OWNER EXPERIENCE

This section discusses benefits of the MASH program for affordable housing property owners as well as barriers to MASH program participation. It also explores whether building owners are changing their allocation of VNM benefits at some point following the interconnection of MASH-supported systems. It is organized as follows:

- Section 4.4.1—Property Owner Benefits
- Section 4.4.2—Barriers to Participation
- Section 4.4.3—VNM Allocation

4.4.1 Property Owner Benefits

MASH property owners described a variety of benefits resulting from the solar installation. Affordable housing property owners benefit most directly from electricity savings for reduced common area load which reduces operating expenses. One MASH property owner cited savings of 67 percent after completing the solar installation. A for-profit affordable housing developer described solar as a safeguard against future electricity price escalation, which in turn helps the residents because the property will not have to raise rent in the future.

MASH property owners also said that installing solar on their properties leads to favorable public relations and positive messaging about the organization, geared partly toward attracting more tenants. Participating property owners also set an example for other housing developers: “We’ve done some attractive installations—they are a model for other agencies and organizations in similar circumstances.” Solar is particularly suited for green marketing because, “It’s something that is visible from the street, to show we are working toward it. When you change an aerator, it’s not visible to the public but solar projects are visible and help share the knowledge with others.”

Several affordable housing property owners also described positive effects regarding their personal environmental awareness, belief in renewable energy, and the sense that they are doing the right thing and giving back. Additionally, at least one housing developer had a corporate goal to reduce energy use throughout its properties, and another described a vision of green affordable housing throughout the Bay Area.

The recent CPUC decision implementing the requirements of AB 217⁷⁶ authorized the MASH program to establish a higher incentive for VNM systems that guarantee that tenants receive a direct economic benefit of at least 50 percent of total generation allocated to them. A lower incentive applies to systems that offset common area load, non-VNM tenant load or utilize VNM but tenants receive less than 50 percent of the economic benefit of the allocated generation.

The net impact of tenant bill reductions due to solar will depend on how the utility allowance for the property is calculated. The utility allowance is an estimate of a tenant’s utility expenses. In most affordable housing, rent and utility costs together cannot exceed 30 percent of a tenant’s total monthly income. Conventional methods of calculating the tenant utility allowance do not take energy efficiency or generation from the solar PV system into account. Recently, the California Tax Credit Allocation Committee (TCAC), a state agency that provide tax credits to affordable housing properties, released a directive that would allow affordable housing properties that receive their tax credits and participate in MASH and allocate solar credits through VNM to use a special utility allowance calculator, the California Utility Allowance Calculator (CUAC), to calculate utility allowances for their tenants. The CUAC does take the generation from the PV system into account in its calculation of the utility allowance, and would therefore produce a more accurate estimate of the tenant’s monthly expenses. Even with this tool, the California housing organization Navigant interviewed believes that some affordable housing property owners might not pursue the full allowable rent increase because it would be difficult to explain to tenants and requires additional paperwork.

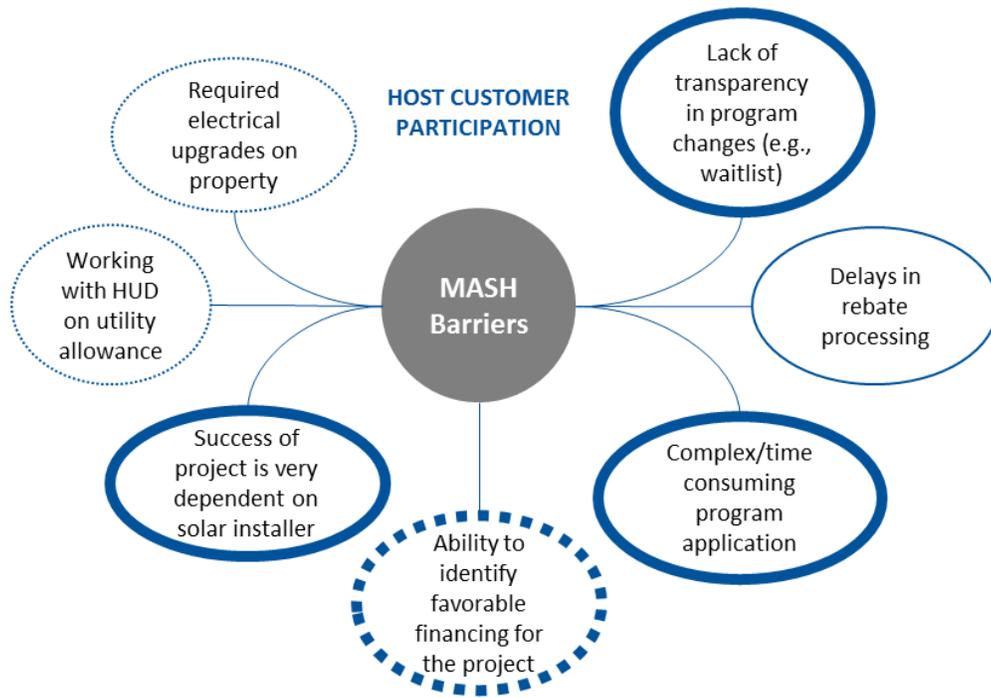
4.4.2 Barriers to Participation

Although barriers exist throughout the program and vary based on different perspectives, the high demand for the MASH program resonated throughout all market actor responses. The barriers map in

⁷⁶ Decision Extending the Multifamily Affordable Solar Housing and Single Family Affordable Solar Homes Programs within the California Solar Initiative, D. 15-01-027.

Figure 4-7 outlines the barriers and then Section 4.4.2.1 and Section 4.4.2.2 discuss financing and eligibility barriers in more detail.

Figure 4-7. MASH Barriers Map



KEY

- Barrier was mentioned often; program can have an effect on the barrier
- Barrier was mentioned a few times; program can have an effect on the barrier
- ■ ■ Barrier was mentioned often; program does not have an effect on the barrier
- ⋯ Barrier was mentioned a few times; program does not have an effect on the barrier

Source: Navigant analysis of interview and survey results

4.4.2.1 Financing

Seven of the nine installers interviewed believed initial system cost, limited MASH program funds, or availability of funding in general was the most significant barrier to affordable housing property owner participation in MASH. Installers who had worked with affordable housing property owners that later dropped out of the MASH program process indicated that it often had to do with a lack of financing or the PPA agreement.⁷⁷

⁷⁷ According to PowerClerk data out of the 593 MASH applications with a first reservation request review date between 2009 and 2013, 125 applications were cancelled (21 percent) and 79 applications were withdrawn (13 percent). In interviews the MASH installers reported a range of dropout rates from 0 percent to 90 percent.

All three MASH PAs also stressed the importance of incentive levels and the cost of the PV system in driving demand for program participation. Two PAs were uncertain, however, whether the \$1.80/watt incentive for the new MASH program is sufficient. The third PA reported that there is still significant interest from affordable housing property owners even at lower incentive levels (e.g., the MASH program wait list represents twice the megawatt goal of AB 217) and that the design of the incentive level under AB 217 does a good job of serving the market. One PA also commented that they would like to see the program continue to accept applications even after the MASH program allocates all of the program funds.

Some affordable housing properties require repairs and additional work before the installer can complete the PV installation. Interview respondents explained that the type of work frequently required before installing the PV system includes service panel upgrades and roof work or replacement. The expense involved in addressing these issues sometimes results in withdrawal of a reservation or the requirement of a project extension.

Navigant asked the MASH PAs how building owners finance their share of the cost not covered by program incentives. One PA explained that many low-income property owners enter into PPAs or lease agreements with third parties who receive the MASH incentive and also receive tax credits. For projects completed in the 2011–2013 timeframe, almost 75 percent (202 out of 273 projects) were financed by a third-party.⁷⁸ The other two PAs agreed that building owners are financing their share of the cost in various ways, including grants (e.g., HUD’s Community Development Block Grant) and through the acquisition rehab process. One PA commented that, “You could see TPO continuing to play a big role, or you might see PACE coming in and owners might choose to go that route and pay for the systems themselves.”⁷⁹

MASH property owners described financing their projects through solar rebates, grants, and third-party financing with the installer or an outside financier. An affordable housing property owner recommended that other interested affordable housing property owners be creative with their capital funding for the MASH project—look into refinancing, working with tax credits, and borrowing from reserves until the rebate is paid. Another recommended going to the local city government for a grant for upfront capital.

The Navigant team asked CPUC staff to comment on the role that innovative financing sources could play in the MASH program in the future. Both CPUC staff members agreed that third-party financing already plays a big role in the MASH program and is an essential mechanism for financing many of the MASH projects.

⁷⁸ Project data from PowerClerk.

⁷⁹ Property assessed clean energy, or PACE, financing allows property owners living within a participating district to finance up to 100 percent of their energy efficiency, water efficiency, or renewable energy project and pay it back over time as a voluntary property tax assessment through their existing property tax bill. <http://energycenter.org/policy/property-assessed-clean-energy-pace#PACE-FAQs>.

4.4.2.2 Program Eligibility

To be eligible to participate in MASH, multifamily residential projects must prove their low-income status per Public Utilities Code Section 2852, which requires applicants to provide documentation that meets one of the following:⁸⁰

1. For a multifamily residential complex that is financed with low-income housing tax credits; tax-exempt mortgage revenue bonds; general obligation bonds; or local, state, or federal loans or grants, one of the following signed and executed documents between the affordable housing property owner/developer and entity issuing financing as listed above must be submitted:
 - i. Deed restriction
 - ii. Regulatory agreement.
2. For a multifamily residential complex where at least 20 percent of the total units are sold or rented to lower-income households, one of the following signed and executed documents between the affordable housing property owner/developer and public entity or nonprofit housing provider under Internal Revenue Service Section 501(c)(3) must be submitted:
 - i. Deed restriction
 - ii. Affordability covenant.

Two of the MASH PAs explained that the program guidelines that generate the most difficulty for program participants include the proper documentation, specifically Public Utilities Code 2852 documentation.

Although the demand for the MASH program is already very strong, the Navigant team asked MASH PAs whether the CPUC should consider expanding program eligibility criteria. Two PAs stated that the current definition does not need to change. The third offered suggestions for some additional situations that could be included. For example, “orphan” properties that do not necessarily qualify as either single or multifamily but do fall under federal guidelines should qualify for the MASH program. This PA also believes that it may be beneficial to evaluate eligibility criteria for duplexes financed by low-income bonds and properties governed by low-income state or federal guidelines.

The California housing organization interviewed favors the perspective that the program should specifically serve the very low-income population; the current 80 percent AMI threshold “is quite high for a mission-driven nonprofit affordable housing developer — many are supporting 60 percent AMI or below.” The organization also believes that the requirement for 20 percent of units to qualify as low-income is on the low end.

⁸⁰ CSI Program Handbook. http://www.cpuc.ca.gov/NR/rdonlyres/89E2B291-2DB9-423B-9321-CE330E9EB2A0/0/201410CSI_Handbook.pdf

4.4.3 VNM Allocation

VNM allows a MASH property owner to install one solar PV system on the property and designate a set percentage of the solar output to each tenant based on the relative tenant unit sizes. As stated in PG&E's VNM MASH interconnection application,⁸¹ "Property owners that allocate a portion of the solar benefits to tenants using VNM may not reallocate the solar allocation percentages... for a period of five years after first being interconnected ...even if there is a change in Owner." Property owners may request a reallocation of the benefits after that five-year period. Navigant interviewed affordable housing property owners to understand if they were changing their VNM allocations during the five-year holding period.

Interviews with affordable housing property owners indicated that building owners are not changing their allocation of VNM benefits following the interconnection of MASH-supported systems. No MASH property owners reported definite plans to change tenant allocations under the VNM MASH arrangement. Several respondents were confident about the original allocations, having put a significant amount of thought into them while completing the project. One affordable housing property owner was not aware of the ability to change the allocation of VNM benefits following the five-year holding period, and several other affordable housing property owners were not sure or had not considered it deeply.

Of those considering changes, one affordable housing property owner had received complaints that one building on the property had a much higher load than the other building, so the affordable housing property owner is considering adjusting the allocation between the two buildings. Others indicated that future allocation changes would depend on changes to the property or utility costs and savings throughout their portfolio. Another affordable housing property owner commented that the five-year holding period is too long, and the property owner would appreciate having the opportunity to fine-tune allocations sooner, on the order of 12 to 18 months.

⁸¹ "Eligible Low Income Development Virtual Net Energy Metering Application and Interconnection Agreement for Multifamily Affordable Housing with Solar Generation Totaling 1 Megawatt or Less." PG&E. Appendix C. http://www.pge.com/tariffs/tm2/pdf/ELEC_FORMS_79-1124.pdf

4.5 TENANT EXPERIENCE

This section describes MASH tenant experience, including a discussion on tenant benefits and tenant satisfaction. The MASH tenant survey informed the tenant experience findings. It is organized as follows:

- Section 4.5.1—Tenant Benefits
- Section 4.5.2—Tenant Satisfaction

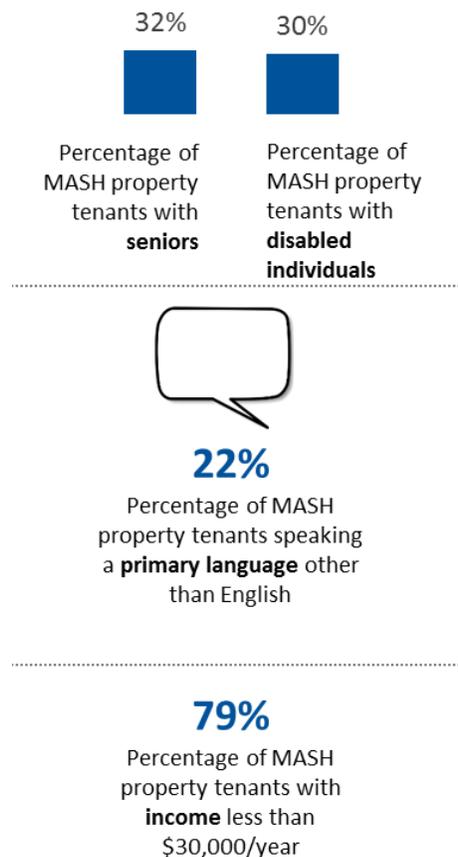
Figure 4-8 shows the results of the MASH tenant survey questions regarding the tenant’s household characteristics. The figure shows that almost one-third of MASH property tenant dwellings contain seniors (65-plus years old), and almost one-third (30 percent) contain at least one disabled individual. Almost one-quarter (22 percent) of participants report that their household’s primary language is not English, and 79 percent of households have an annual income less than \$30,000 per year.

4.5.1 Tenant Benefits

Monetary benefits for tenants vary by rent arrangements, tariff structures (VNM vs. NEM), and property organization types. Several MASH property owners have projects with no monetary benefits for tenants because the installations only impact the common area energy usage and tenants continue to pay a fixed rent. For others, deed-restricted properties can only charge tenants rent to cover operating expenses, so lowered operating expenses from the solar installation means that for NEM projects the affordable housing property owners can pass savings on to the tenants. For properties where tenants pay their own electricity bills, projects that allocate solar to tenants using VNM directly reduce the tenants’ utility bills.

Over two-thirds of MASH tenants indicate that the solar installation has made their electric bills much more affordable. However, 88 percent do not know how much of their electric bill is offset by the solar system. The survey respondents indicated mixed reviews about the usefulness of the information provided on the utility bill. Sixteen percent of respondents did not find the electricity bill very useful, rating the bill as a one or a two on a scale of five. In contrast, 53 percent found it useful or very useful (rating as a four or five on a scale of five). Eighteen percent did not know whether the bill provided useful information about the solar system or the amount of energy produced.

Figure 4-8. MASH Tenant Demographics



Source: Navigant survey with MASH tenants, 2014
 Note: See appendices for full survey results

When asked to describe the benefits of solar (without prompting with specific response choices), 78 percent of MASH tenants believed no benefits except energy cost savings existed, seven percent did not know, and the remaining 22 percent believed the MASH program resulted in benefits aside from energy cost savings. The MASH tenants listed seven different benefits, with environmental benefits being the most common after energy cost savings. When prompted, 68 percent of respondents believed that the MASH program benefits the environment. The most prominent benefits included cleaner air and avoiding fossil fuels.

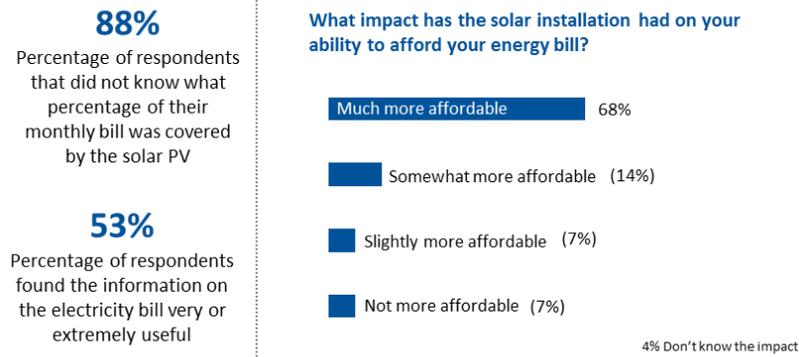
Seventy percent of MASH tenants surveyed believed that the program also provides economic benefits including more money for tenants to spend on other things, followed by job creation and learning opportunities. Eighteen percent indicated they were unsure of the economic benefits and only 10 percent

believed the program provided no economic benefit. Figure 4-9 describes the MASH tenant benefit results from the tenant survey.

Figure 4-9. MASH Tenant Benefits

MASH: Tenant Benefits

The primary, and often only mentioned, tenant benefit from the installation of solar is savings on the energy bill.



Have you noticed any other positive impacts or benefits resulting from the MASH program and the installation of solar on your building, including personal benefits?



Source: Navigant survey with MASH tenants, 2014
Note: See appendices for full survey results

Even tenants that do not benefit from lower electricity bills or rent may benefit indirectly from the savings achieved by the housing entity. For example, savings from the solar installation may provide the housing organization with an increased budget for tenant programs, property upgrades, and improvements and also contribute to its financial stability, which ensures affordable housing for tenants in the future. One MASH property owner explained that, “In a transitional housing program, where we continue to pay the utility bills on the units, I believe it is still an advantage to them because we are a private nonprofit service agency, and any measure that helps us reduce our operating costs helps sustain our ability to provide [services] to our clients.”

Additionally, affordable housing property owners have observed that tenants take pride in the solar installation and exhibit other positive psychological effects. They cited positive attitudes around helping the environment, participating in something, living somewhere that reflects their values, and being better educated on energy efficiency and solar energy. One affordable housing property owner respondent stated, “This was a building with formerly homeless individuals where the property pays for all of the utilities including electric, and lots of residents asked if we would be installing solar as part of the residence. Even if they were not paying bills it was important to them to live in a building with green features and that was environmentally friendly. They don’t have many choices about where they are living, so it felt good for them to live in a place that is environmentally friendly and reflected their values.”

4.5.2 Tenant Satisfaction

Overall program satisfaction was very high for the 73 tenants surveyed, as shown in Figure 4-10. Just 13 percent of respondents who lived in the building before solar had any concerns about the solar system before it was installed.

Seventy-nine percent of the 73 tenant respondents believed no drawbacks existed to living in a building with solar, one percent did not know, and the remaining 20 percent believed there were program drawbacks. Tenant respondents specified 12 different drawbacks, with panel aesthetics and unpredictable energy bills being the most common drawbacks stated (each cited by less than five percent of respondents).⁸²

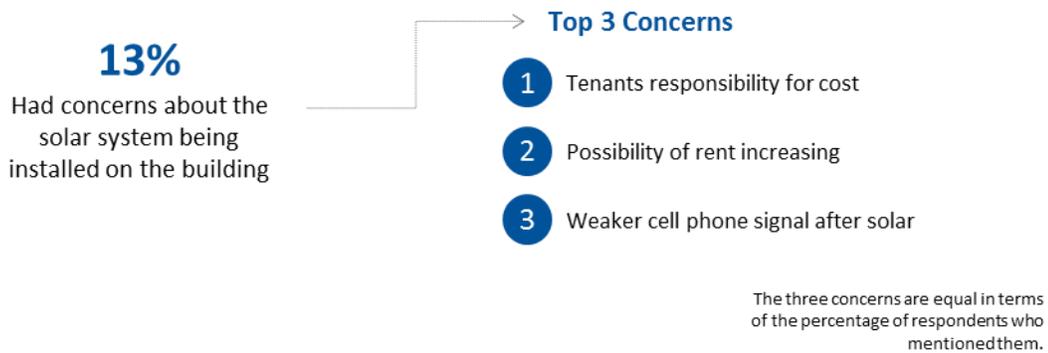
⁸² Other drawbacks mentioned once each included: installation length of time, noise, lack of info about installation process, regulating thermostat, removal of agriculture for solar, live in older building, not enough hot water, and poor cell phone reception.

Most of the MASH tenant respondents, 86 percent, would encourage their property manager to participate in the MASH program if they moved to another building that did not have solar; this is another indication of high program satisfaction from the tenant perspective.

Figure 4-10. MASH Tenant Satisfaction

MASH: Tenant Satisfaction

Tenants are generally satisfied with the solar PV and had few concerns when the system was installed on their building.



If you moved to a different building that did not have solar, would you encourage your property manager or landlord to participate in the MASH program?



Source: Navigant survey with MASH tenants, 2014
Note: See appendices for full survey results

4.6 PROGRESS TOWARD ACHIEVING MASH GOALS

The CPUC's goals for the MASH program are the following:⁸³

- Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants
- Stimulate the adoption of solar power in the affordable housing sector
- Improve energy utilization and overall quality of affordable housing through the application of solar and energy efficiency technologies
- Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers

MASH PAs, through interviews, described that the program's primary goal is to allocate incentives as effectively and efficiently as possible. The CPUC did not adopt explicit capacity goals for the MASH program when it authorized the MASH program in 2008. Other goals mentioned by the PAs include improving the quality of affordable housing and promoting the adoption of solar in low-income communities, which echo the CPUC's stated goals for the MASH program.

Navigant finds that the MASH program has met the four stated goals of the MASH program from 2011 to 2013. Details around each goal are below:

- **Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants.** VNM tenants that receive solar allocations see direct reductions in their utility bills at no cost to the tenant. On the other hand, NEM projects that offset common load may not directly impact the electricity use and cost for MASH participant building occupants. Therefore, research indicates that the MASH program met the goal of reducing electricity use and costs for affordable housing building occupants, but the achievement of this goal related primarily to the VNM projects funded under the MASH program.
- **Stimulate the adoption of solar power in the affordable housing sector.** The MASH program stimulates the adoption of solar in the affordable housing sector through incentives that reduce the upfront cost of solar. Interviews with MASH property owners revealed that the MASH incentives often make the difference as to whether the affordable housing property owner can afford to install solar.
- **Improve energy utilization and overall quality of affordable housing through the application of solar and energy efficiency technologies.** Although bill savings from solar may not directly funnel back to the tenant if the project offsets common area load only, interviews with MASH property owners revealed other benefits stemming from solar and energy efficiency adoption that improve the overall quality of affordable housing. For example, reduced electricity bills for

⁸³ CSI Multifamily Affordable Solar Housing (MASH) Program, <http://www.cpuc.ca.gov/puc/energy/solar/mash.htm>.

the affordable housing property owner allows the owner to provide other programs to their low-income tenants, improves the financial stability of the housing development, and frees up funds for other property improvements and services, such as free internet services. Some affordable housing property owners also reported an increased sense of pride in the low-income community and an increase in the availability of educational opportunities for tenants, especially for children living in the building.⁸⁴ Similarly, an affordable housing developer described solar as a safeguard against future electricity price escalation, which in turn helps the residents because the property will not have to raise rent in the future. Based on these findings, Navigant believes that the MASH program met the goal of improving the quality of affordable housing through the application of solar and energy efficiency technologies. Navigant did not quantify the degree of improvement because the goal did not specify a target.

- **Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers.** According to the MASH tenant survey, 79 percent of the respondents believed no drawbacks existed to living in a building with solar; 86 percent would encourage their property manager to participate in the MASH program if they moved to another building that did not have solar. These findings indicate high program satisfaction from the tenant perspective and suggest that the MASH program is increasing awareness and appreciation of the benefits of solar among affordable housing occupants. Regarding awareness and appreciation of solar among developers, Navigant learned through interviews with affordable housing property owners that MASH property owners believe that installing solar on their properties leads to favorable public relations and positive messaging about the organization, geared partly toward attracting more tenants. Several affordable housing property owners also described positive effects around personal environmental awareness, belief in renewable energy, doing the right thing, and giving back. These responses indicate that the MASH program is to some degree increasing the awareness and appreciation of the benefits of solar to developers.

4.7 MARKET OPPORTUNITIES AND RECOMMENDATIONS

This section presents findings from the market assessment, including the geographic assessment of participation and recommendations for the MASH program. It is organized as follows:

- Section 4.7.1—Geographic Assessment
- Section 4.7.2—Recommendations

4.7.1 Geographic Assessment

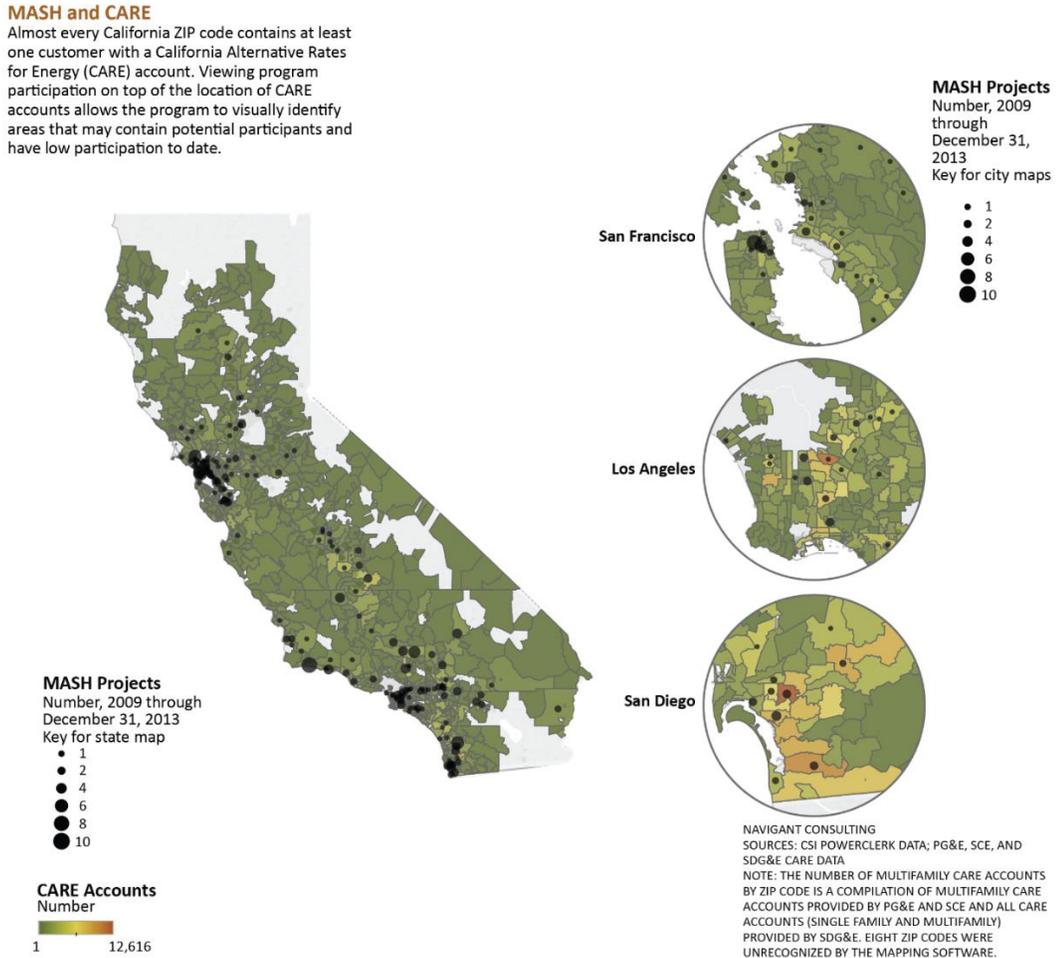
Navigant conducted a geographic assessment to map the geographic distribution of possible eligible participants for MASH. Navigant prepared the geographic assessment of potential eligible MASH property owners by mapping the following parameters:

- Distribution of possible eligible participants based on utility data for customers on CARE rates

⁸⁴ See Section 4.4.1 and Section 4.5.1 for a discussion of benefits from the property owner and the tenant, respectively.

- Count of installed projects as of December 31, 2013 overlaid onto the distribution of possible eligible participants

Figure 4-11. Distribution of MASH Projects Installed through 2013 vs. Multifamily Properties on CARE Rates⁸⁵



Based on Figure 4-11, the areas with the highest potential for future MASH projects, based on numerous CARE accounts and few MASH projects, are the following: 90250 (Hawthorne), 91950 (National City), 91910 (Chula Vista), 92021 (El Cajon), and 90813 (Long Beach). These areas are identified for having zero installed MASH projects, though there were four areas with a higher concentration of CARE accounts with several MASH projects (still only one to three projects). Overall, Los Angeles and San Diego appear to be areas with the highest potential for installing MASH projects. This snapshot of high-potential areas is intended to be useful for PAs to target certain areas during future outreach efforts.

⁸⁵ SDG&E CARE rates include single-family and multifamily accounts.

However, the highest percentage of projects in any one ZIP code was 5.26 percent for one MASH project in an area with only 19 CARE accounts. The vast majority of ZIP codes had less than one percent installed MASH projects to CARE accounts. This indicates that despite the relative concentrations of projects in Figure 4-11 there is significant potential in all areas.

4.7.2 Recommendations

This section summarizes the key recommendations for the MASH Market and Program Administrator Assessment.

- **Streamline the program application process.** While many affordable housing property owners reported no issues with the application and approval process, some MASH property owners found the program application process to be overly complex and time-consuming. MASH PAs should re-evaluate the program application process and documents with the goal of making them as streamlined as possible. A clear and efficient program application process could minimize customer service time for PAs, increase customer satisfaction, and potentially increase program participation.
- **Regularly communicate program updates to stakeholders.** Despite the availability of program updates on the California Solar Statistics website, MASH installers expressed some frustration with the lack of communication about MASH program status, including when the program application period will reopen, what incentives will be, and if people from the waitlist will be dropped or rolled over. Installers may not be aware of the updates posted online. MASH PAs should regularly communicate program updates in a timely manner through a publicly-available format such as the MASH website or an email listserv, or could host an information session to share program updates and answer questions before the PAs open the second round of funding. Maintaining regular communication with stakeholders could help the MASH program maintain its positive reputation.
- **Provide objective information about MASH installers.** MASH property owners stressed the need for a competent, well-informed installer to help guide them through the process. The CPUC, in concert with MASH PAs, should consider sharing objective information about installers to help affordable housing property owners identify and work with seasoned installers (e.g., create a website that shows data for the number of MASH projects by installer and when the projects were installed). The CPUC could require that installers attend a short training seminar to review program rules. These changes could improve contractor knowledge regarding the MASH program and could facilitate improved transparency regarding installer quality.
- **Provide PAs with a data template to comply with Data Annex requirements.** The recent Decision Extending the Multifamily Affordable Solar Housing and Single-Family Affordable Solar Housing Programs within the California Solar Initiative (D. 15-01-027) requires the MASH program to provide a confidential Data Annex that includes reporting on the number of customers the program has referred to the ESA program, the number of MASH participants enrolled in the ESA program, and the number of job trainees and hours worked for MASH

installations. Navigant's evaluation found that reporting is not consistent across PAs for SASH and MASH. A standard data template from the CPUC could ensure consistent reporting, streamline program evaluation, and simplify reporting for PAs.

- **Develop goals that are specific and measurable.** The CPUC's stated goals for the MASH program lack specificity and are difficult to evaluate against program performance. The CPUC should consider revising the goals of the MASH program using SMART criteria (i.e., Specific, Measurable, Achievable, Relevant, and Time-bound). Developing SMART goals would facilitate program evaluation and would allow the MASH PAs to measure and track performance over time against the CPUC goals. For example, the CPUC could modify the MASH goal to "Stimulate the adoption of solar power in the affordable housing sector" to be a more specific and measurable goal such as: "From 2015 through 2017, stimulate the adoption of solar power in the affordable housing sector by installing 35 MW of solar PV capacity."⁸⁶

⁸⁶ This goal is an example, it does not represent Navigant's recommendations for explicit changes to the goal.

Appendix A Data Collection and Sampling Approach

A.1 IN-DEPTH INTERVIEW SAMPLING PLAN

This section describes the IDI population sampling methodology for Task 1 of the CSI SASH/MASH program evaluation. The primary data collection effort targeted market actors that have interacted with either the SASH or MASH program for at least one completed installation from 2011 to 2013. The project work plan identifies population size, targeted sample size, and data frame for each market actor category, summarized in Table A-1.

Table A-1. Interview Primary Data Source, Population Size, and Target Sample Size

Primary Data Collection Effort	Estimated Population Size	Target Sample Size	Sample Frame Data Source
Program Administrators	10 (GRID Alternatives for the SASH program (7 offices) and PG&E, SCE, and CSE for the MASH program)	6	GRID Alternatives contact list; PA primary program contacts
CPUC staff	2	2	Shannon O'Rourke and Jason Perkins
SASH job trainees	130	10	GRID Alternatives program data and PowerClerk data
SASH subcontractors	47	8	GRID Alternatives list of subcontractors and PowerClerk data
SASH job training organizations	59	8	GRID Alternatives list of job training organizations and PowerClerk data
MASH participant host customer	TBD based on analysis of unique property owners and system owners (2011–2013 projects only)	16	PowerClerk data
MASH participant installers and SFCs	46	14	PowerClerk data (Solar Contractor Company)

Source: Navigant Consulting, Inc.

The definitions in Table A-1 provide the guidelines for determining sample frame populations and sample sizes of each target population. The primary data collection effort discussed here refers only to

the SASH job trainees, SASH subcontractors, SASH job training organizations, and MASH participant installers and SFCs.

A common sampling methodology is applied to the four targeted market actor categories. Interviewees in each category are selected to cover all geographic locations (GRID Alternatives offices for SASH and IOU territories for MASH) and levels of experience. Experience is measured by number of completed SASH or MASH installations. The sampling process proceeds as follows, with further explanation below:

1. Split the sample frame into thirds, based on installation experience (high, medium, or low).
2. Assign a random number to each sample frame data entry and sort from lowest to highest.
3. Select the top entry (assigned to the smallest random number) and then move down the list, selecting subsequent entries that satisfy the specific geographic location/experience-level requirements for that market actor group and skipping entries with redundant geographic locations and/or experience levels.

To categorize the sample frame into the top, middle, and bottom third based on experience, entries are first listed in order of most projects installed to least. Then, the cumulative number of projects completed is found by summing from the bottom of the list to the top. Using the cumulative total for each row, the percentage of the total number of installed projects is found for each entry. At this stage, the entry with the largest number of installed projects is at the top of the list with a cumulative 100 percent of the total. Using this percentage, the entries are labeled in thirds: the low sample group is less than 33 percent, the medium sample group is greater than 33 percent but less than 66 percent, and the high sample group is 66 percent and above.

The random number is generated by Excel's data analysis tool. After assigning a unique number to each entry, the list is ranked from smallest random number to largest. The first entry in the list is automatically selected for the interview sample, fulfilling one geographic requirement and one experience-level requirement. Moving down the list, remaining interviewees are selected to meet unfulfilled requirements. In an example list of three job trainees, the first job trainee is associated with the Central Valley GRID Alternatives office and has medium installation experience, the second job trainee is associated with the Bay Area office and has low installation experience, and the third job trainee is associated with the Central Valley office and has high installation experience. The job trainee sampling plan calls for one interviewee from the Central Valley office. In this case, the first two entries are selected but not the third because the Central Valley geographic requirement has already been fulfilled by the first. Selection down a list will continue until the target sample size is met.

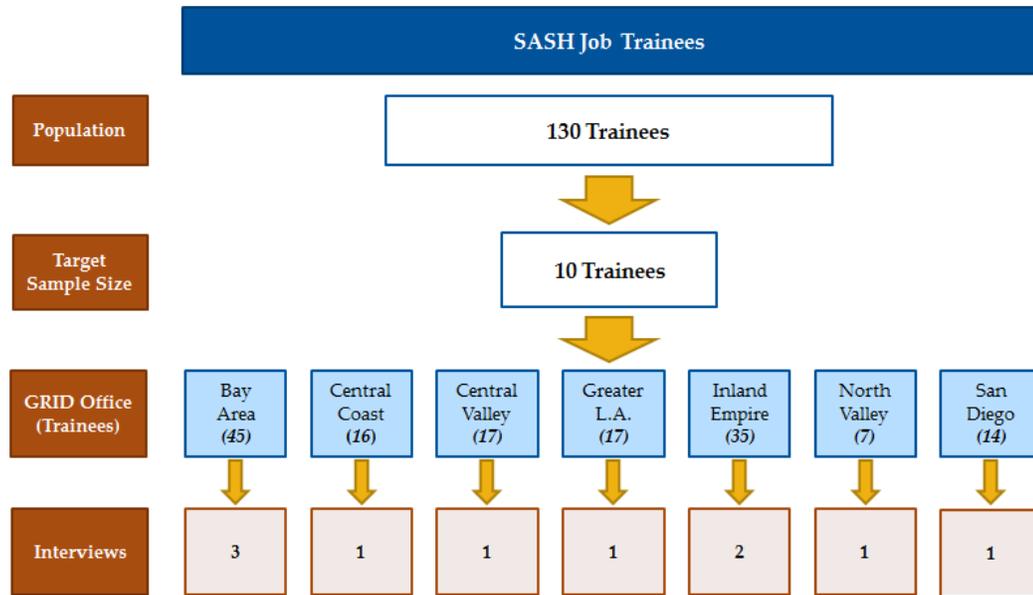
The subsequent sections describe the specific sampling plan for each market actor category and discuss modifications made to the plan during selection.

SASH Job Trainees

The SASH job trainee sampling plan covers all geographic regions (by GRID Alternatives office), various levels of participation and experience with the SASH program, and non-overlapping job training organizations. From the population of approximately 130 job trainees active during 2011–2013, the target

sample size is 10 job trainees. Within this sample, three trainees should be primarily active in the Bay Area, two in the Inland Empire, one in Central Coast, one in Central Valley, one in Greater Los Angeles, one in North Valley, and one in San Diego. This split is based on the number of trainees associated with each GRID Alternatives office overall, shown in Figure A-1.

Figure A-1. SASH Job Trainee Interviews by GRID Alternatives Office



Source: Navigant Consulting, Inc.

To achieve a variety of experience levels, the sampling plan calls for four job trainees with high experience, three trainees with medium experience, and three trainees with low experience, as determined by the method for splitting into thirds. Because the plan calls for three Bay Area office interviews, the Bay Area job trainees were split into thirds and randomly sorted separately, with one high experience, one medium experience, and one low experience job trainee selected. The other regions were sorted as a group.

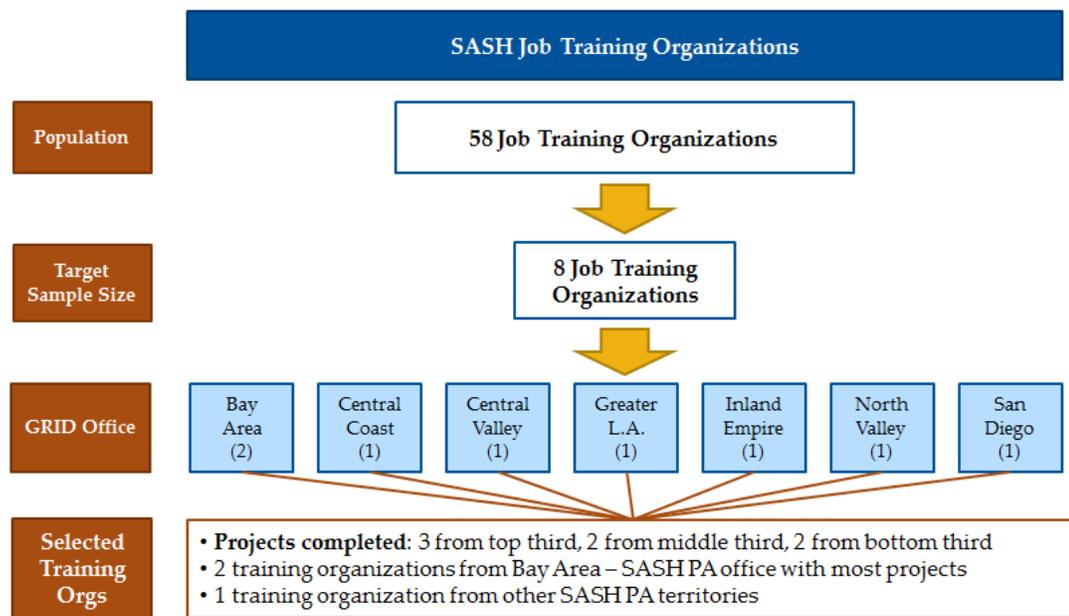
The initial sample group was modified during selection based on missing contact information. When possible, the next trainee on the list with the same combination of geographic location and experience level was selected. The final job trainee sample group resulted in one modification to the sampling plan: the North Valley/High job trainee had an incorrect phone number and was replaced by a North Valley/Medium job trainee, as the most similar replacement in the population. Job trainee contact information was obtained from GRID Alternatives through a secure file transfer.

SASH Job Training Organizations

The SASH job training organization sampling plan covers all geographic regions (by GRID Alternatives office), various levels of participation and experience with the SASH program, and non-overlapping SASH subcontractors. From the population of approximately 58 job training organizations active during

2011–2013, the target sample size is eight job training organizations. Within this sample, two organizations should be primarily active in the Bay Area, one in the Inland Empire, one in Central Coast, one in Central Valley, one in Greater Los Angeles, one in North Valley, and one in San Diego. To achieve a variety of experience levels, the sampling plan calls for three job training organizations with high experience, two job training organizations with medium experience, and three job training organizations with low experience, as determined by the method for splitting into thirds. The split is based on the number of interviews in each GRID Alternatives office region, shown in Figure A-2.

Figure A-2. SASH Job Training Organization Interviews by GRID Alternatives Office



Source: Navigant Consulting, Inc.

For some interviewees, contact information for the primary contact at the job training organization was provided by GRID Alternatives through a secure file transfer. Contact information for the job training organizations associated with subcontractors rather than GRID Alternatives directly was researched online.

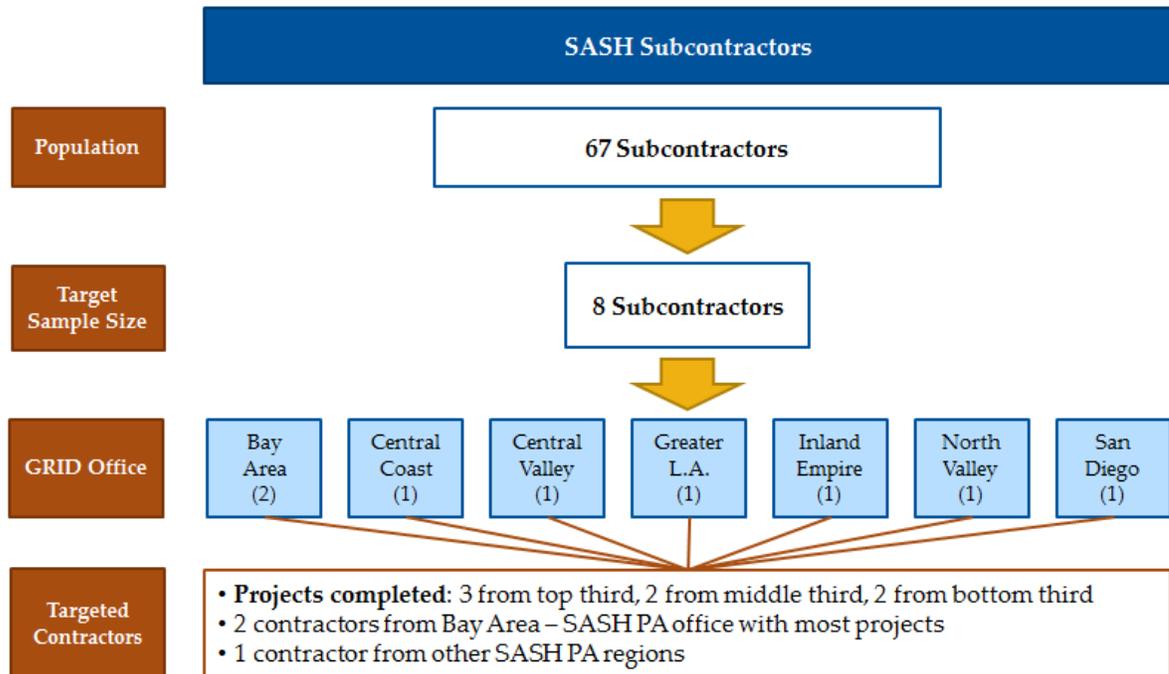
SASH Subcontractors

The SASH subcontractor sampling plan covers all geographic regions (by GRID Alternatives office), various levels of participation and experience with the SASH program, and non-overlapping SASH job training organizations. From the population of approximately 67 subcontractors active during 2011–2013, the target sample size is eight subcontractors. Within this sample, two subcontractors should be primarily active in the Bay Area, one in the Inland Empire, one in Central Coast, one in Central Valley, one in Greater Los Angeles, one in North Valley, and one in San Diego.

To achieve a variety of experience levels, the sampling plan calls for three subcontractors with high experience, two subcontractors with medium experience, and three subcontractors with low experience,

as determined by the method for splitting into thirds. The split is based on the number of interviews in each GRID Alternatives office region, shown in Figure A-3.

Figure A-3. SASH Subcontractor Interviews by GRID Alternatives Office



Source: Navigant Consulting, Inc.

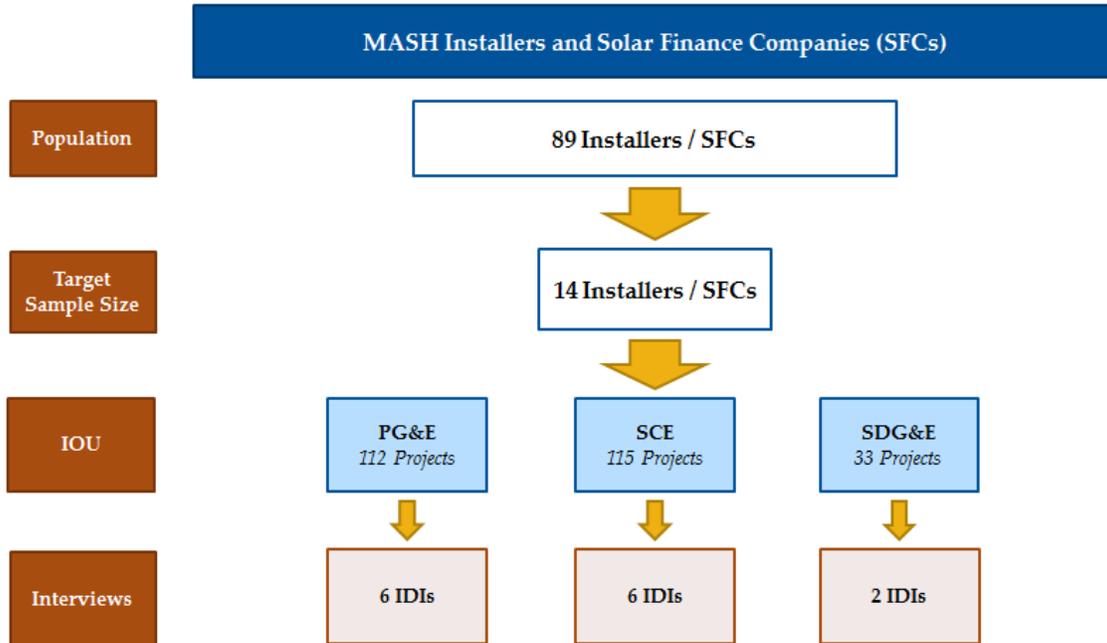
Subcontractor selection did not follow the exact methodology described previously because of a limited number of combinations of geographic region and experience level. Based on the first several entries chosen in the randomly ranked list, a Bay Area/Low subcontractor was skipped in order for a San Diego/Low subcontractor to be selected further down the list. This was necessary for including a San Diego interview. Additionally, one subcontractor was out of business and was skipped. Subcontractor contact information was obtained from GRID Alternatives through a secure file transfer.

MASH Participant Installers

The MASH installer sampling plan covers the three geographic regions (by IOU territory) and various levels of participation and experience with the MASH program. From the population of approximately 89 installers active during 2011–2013, the target sample size is 14 installers. Within this sample, six

installers should be primarily active in PG&E territory, six in SCE territory, and two in SDG&E territory. The split is based on the total number of installers associated with each IOU, shown in Figure A-4.

Figure A-4. MASH Installer Interviews by GRID Alternatives Office



Source: Navigant Consulting, Inc.

To achieve a variety of experience levels, the sampling plan calls for five installers with high experience, five installers with medium experience, and four installers with low experience, as determined by the method of splitting into thirds.

Several changes were made to the sampling plan because a small number of installers were responsible for a disproportionately large number of installations. Because of this, there are only two, and not five, unique installers with high experience. As there are only five unique installers with medium experience, the sample drew three additional installers with low experience, for a total of seven.

Some MASH installer contact information was provided by the associated IOU in a secure database; however, most installer contact information was researched online.

A.2 GEOGRAPHIC DATA COLLECTION

Navigant utilized Tableau Software (Tableau) to conduct the geographic assessment. Tableau is a visual analytics software that provides built-in geocoding to create maps based on common areas such as

countries, states, or postal codes.⁸⁷ In Tableau, the team mapped the distribution of SASH/MASH customers at the ZIP code level to produce the maps listed Table A-2.

Table A-2. List of Maps as a Product of the Geographic Assessment

SASH Geographic Analysis	MASH Geographic Analysis
<ul style="list-style-type: none"> • Installed capacity prior to January 1, 2011 • Installed capacity as of December 31, 2011 • Installed capacity as of December 31, 2012 • Installed capacity as of December 31, 2013 • Distribution of possible eligible participants based on the GRID Alternatives deed-restricted property data and/or utility data for customers on CARE rates • Count of installed projects as of December 31, 2013 overlaid onto the distribution of possible eligible participants 	<ul style="list-style-type: none"> • Installed capacity prior to January 1, 2011 • Installed capacity as of December 31, 2011 • Installed capacity as of December 31, 2012 • Installed capacity as of December 31, 2013 • Distribution of possible eligible participants based on utility data for customers on CARE rates • Count of installed projects as of December 31, 2013 overlaid onto the distribution of possible eligible participants

Source: Navigant Consulting, Inc.

Navigant used PowerClerk data to calculate the SASH and MASH cumulative installed capacity for each year listed in the Table A-2. Each PA also provided data on the number of single-family and multifamily CARE accounts in its service territory by ZIP code in order to show the distribution of possible eligible participants. Navigant also represented possible eligible SASH participants with GRID Alternatives data on deed-restricted properties and Qualified Census Tract data.

The SASH project maps represent data from the 3,496 SASH projects that were installed before December 31, 2013 and had a valid ZIP code; 3,505 SASH projects were installed before that date but did not have a valid ZIP code. The SASH installed date is the “Interconnection Utility Accepted Date,” as specified by GRID Alternatives. The SASH system capacity is the system’s CEC-AC rating (kilowatts). The MASH project maps represent data from the 308 total MASH projects that were installed before December 31, 2013. The “First Incentive Claim Request Review Date” is a proxy for overall installed date, as specified by the PAs. The MASH system capacity is the system’s CEC PTC rating (kilowatts). The ZIP code for mapping purposes is the “Host Customer Physical Address” entry in PowerClerk data.

Navigant used CARE rates as a proxy for families with incomes below 80 percent AMI—a requirement for CSI SASH/MASH program participation. Navigant found a reasonable match between the total number of CARE accounts and the approximate number of families with incomes below 80 percent AMI on a county-level scale.⁸⁸ Navigant was unable to split CARE account data from SDG&E into separate single-family and multifamily categories, so all SDG&E CARE accounts are in both SASH and MASH

⁸⁷ More information at www.tableau.com/solutions.

⁸⁸ U.S. Census ACS Five-year data (2008-2012) by California ZIP code (aggregated by County) and 80 percent of the median income by FY 2013 MTS Income Limit Area were used to estimate the number of families beneath the 80 percent AMI threshold.



analyses. The CARE account map overlay excludes five SASH projects because there is no CARE data for those ZIP codes (a total of 3,491 SASH projects).

GRID Alternatives provided its database of deed-restricted properties for an additional representation of possible eligible participants in the SASH program. GRID Alternatives contracted with a California housing organization in 2009 to compile the list of properties that was used to guide the original SASH outreach. GRID Alternatives considers the list to be a helpful starting place for outreach but does not guarantee that the properties otherwise meet SASH requirements. Navigant did not represent this data by a map in the geographic assessment because of the limited scope of properties identified.

Navigant examined the SASH/MASH maps with the count of installed projects as of December 31, 2013, overlaid onto the distribution of possible eligible participants, to create a list of ZIP codes with a visibly high concentration of possible eligible participants (based on CARE accounts) but low CSI SASH/MASH program participation (based on the count of installed projects by December 31, 2013). Navigant also used the ZIP code level data to calculate the percentage of SASH/MASH projects (as of December 31, 2013) out of the number of single-family and multifamily CARE accounts by ZIP code. The full list of ZIP codes with data on the number of CARE accounts, SASH/MASH projects, and percentages is provided in a separate spreadsheet.

Appendix B Interview Guides

B.1 SASH PROGRAM ADMINISTRATORS

- What are your office's goals for SASH? Have you been successful in meeting these goals?
- What statistics do you use to monitor program performance? Do you monitor those statistics on a regular basis?
- Have your goals changed over the course of your involvement with the SASH program?
- How is your office organized in terms of the managers, staff, etc. who work on SASH? How well do you feel this structure works for meeting your goals? Are there any aspects of the structure that could be improved?
- What coordination is required between GRID Alternatives and the utilities? How has this coordination worked?
- What is your current administrative budget, and do you feel it is sufficient for meeting your current goals?
- Does the program pay for operations and maintenance of the solar PV systems after the systems have been installed? If so, how does the program budget for these expenses? Does GRID Alternatives contact customers to check if they have completed required maintenance?
- What do you think your office does particularly well in implementing the SASH program?
- Are there any issues that your office has experienced with respect to program administration and if so, what has been done to address them?
- What changes do you recommend making to the program to improve its overall effectiveness?
- What are your goals in regard to job training? Have you been successful in meeting these goals?
- How many employees have been hired through the workforce component of the program? How many are still working in the solar industry?
- How could the SASH program improve recruiting and job training efforts? What are the barriers in improving the workforce component of the program?
- What challenges do you face when “selling” the solar PV systems to the customers?
- What concerns do potential participants have about participating in SASH? How often do these concerns cause the customer to drop out of the program?
- What do you believe are the most significant barriers to program participation?
- What percent of participants drop out at some point during the process? At what point in the process do customers typically drop out?
- How do low-income households finance costs not covered through program incentives?

- What changes in demand would you anticipate stemming from reduced incentive amounts?
- Should the CPUC consider changing or expanding eligibility criteria? If so, how could eligibility be expanded to achieve higher levels of demand?
- What are the program guidelines that cause the most difficulty for program participants?
- What other types of work is frequently required before the system can be installed? Are these issues a barrier to job completion?
- What is recommended to overcome the barriers to participation you've mentioned today?
- What other ideas do you have to address any gaps in financing? Has GRID Alternatives identified new private sector financing providers and packages or additional sources of funding for SASH customers?
- Are you considering inclusion of third-party owned (TPO) solar systems are part of the program?
- [If interviewee supports TPO] Will TPO financing be able to sufficiently overcome gaps in financing on its own or will other sources of financing be required?
- To what extent do energy efficiency measures reduce the PV system size that is needed?
- How is energy efficiency currently encouraged and implemented in the SASH program? Who pays for energy efficiency measures? Is the cost of energy efficiency for those not enrolled in the LIEE program a barrier to installing measures prior to solar?
- What types of energy efficiency tools and resources are being used prior to a system being installed?
- How aware are SASH participant of energy efficiency opportunities?
- What would be the effect of higher energy efficiency requirements? (Effect on meeting the AB 217 goal of 50 MW.)
- From the program data it appears that about 22% of all SASH projects (2011-2013) do not qualify for LIEE. What are the reasons that projects do not qualify?
- What efforts, if any, GRID has taken to reduce the installed cost of PV systems? Do you use a single supplier of materials for SASH? Has this enabled you to bring down the material cost of system installation? Do you receive discounted equipment, e.g. solar panels?
- "As part of this evaluation, Navigant is conducting an assessment of the non-energy benefits of the SASH/MASH program. An example of a non-energy benefit for an energy efficiency program would be improved comfort in the home.
- Can you describe what you believe are some likely non-energy benefits of the SASH/MASH program?
- Of these non-energy benefits, which do you think are the most significant (i.e., order of magnitude impact)?

- [Elaborate (if needed): Non-energy benefits tend to fall into categories such as utility benefits, societal/public benefits, and benefits to participant. For SASH/MASH, can you think of specific examples of...? Utility Benefits... Participant Benefits... Society & Environmental Benefits? "
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

B.2 MASH PROGRAM ADMINISTRATORS

- What are your office's goals for MASH? Have you been successful in meeting these goals?
- Have your goals changed over the course of your involvement with the MASH program?
- How is your office organized in terms of the managers, staff, etc. who work on MASH? How well do you feel this structure works for meeting your goals? Are there any aspects of the structure that could be improved?
- Are the same staff members responsible for the general market CSI program?
- What synergies exist between MASH and the existing CSI administrative structures?
- What is your current administrative budget, and do you feel it is sufficient for meeting your current goals?
- Does the program pay for operations and maintenance of the solar PV systems after the systems have been installed? If so, how does the program budget for these expenses?
- What do you think your office does particularly well in implementing the MASH program?
- Are there any issues that your office has experienced with respect to program administration and if so, what has been done to address them?
- What changes do you recommend making to the program to improve its overall effectiveness?
- From 2011-2013, have there been any job training efforts and initiatives offered through the MASH program?
- AB 217 includes a job training requirement. Do you think GRID Alternatives' SPP could be used as a model for MASH to meet the requirement to provide job training and employment opportunities? What other ideas would you have to meet the requirement?
- What concerns do potential participants have about participating in MASH? How often do these concerns cause the customer to drop out of the program?
- What do you believe are the most significant barriers to program participation?
- What percent of participants drop out at some point during the process? At what point in the process do customers typically drop out?
- How do building owners finance their share of the cost not covered through program incentives?
- What changes in demand would you anticipate stemming from reduced incentive amounts?

- Should the CPUC consider changing or expanding eligibility criteria? If so, how could eligibility be expanded to achieve higher levels of demand?
- What are the program guidelines that cause the most difficulty for program participants?
- What other types of work is frequently required before the system can be installed? Are these issues a barrier to job completion?
- What is recommended to overcome the barriers to participation you've mentioned today?
- To what extent do energy efficiency measures reduce the PV system size that is needed?
- How is energy efficiency currently encouraged and implemented in the MASH program? Who pays for energy efficiency measures? Is the cost of energy efficiency for those not enrolled in the LIEE program a barrier to installing measures prior to solar?
- What types of energy efficiency tools and resources are being used prior to a system being installed?
- How aware are MASH customers of energy efficiency opportunities? What about MASH installers - are they aware of energy efficiency opportunities (even though their focus is the solar PV installation)?
- To what extent is MASH already referring eligible customers to the Energy Savings Assistance Program (ESAP), a requirement of AB 217?
- What would be the effect of higher energy efficiency requirements? (Effect on meeting the AB 217 goal of 50 MW.)
- Are low-income tenants benefitting (monetarily or non-monetarily) from MASH projects? If so, how?
- Are building owners changing their allocation of VNM benefits at some point following interconnection of MASH-supported systems?
- "As part of this evaluation, Navigant is conducting an assessment of the non-energy benefits of the SASH/MASH program. An example of a non-energy benefit for an energy efficiency program would be improved comfort in the home.
- Can you describe what you believe are some likely non-energy benefits of the SASH/MASH program?
- Of these non-energy benefits, which do you think are the most significant (i.e., order of magnitude impact)?"
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

B.3 CPUC STAFF

Intro: Reminder that our evaluation of the SASH/MASH program applies to projects and the program from 2011-2013, so please focus your responses on that time frame.

Do you mind if we record, simply for note taking purposes?

Reminder that this phone call is scheduled for 90 minutes, but would like to know if you have any pressing time constraints right at 2:30 or beforehand that we should know about?

Do you have any questions before we get started?

- What are the goals for the PAs of the SASH and MASH programs? Have the PAs been successful in meeting these goals?
- What tools or metrics are used to monitor program performance?
- How well do you feel the PAs' organizational structure works for meeting the goals of the programs? Are there aspects of the structure that could be improved? [SASH: GRID Alternatives (statewide nonprofit), MASH: PG&E (IOU), SCE (IOU), and CSE (nonprofit)].
- Please provide an overview of the CPUC staff who have been responsible for oversight of each distributed generation program: SASH/MASH, general market CSI, CSI solar thermal, and SGIP from 2011 to today.
- What synergies exist between MASH/SASH and the existing CSI administrative structures? To what degree do the MASH and SASH programs not benefit from or align with the general market program (i.e., GRID tracks their data outside of PowerClerk).
- What are your views on coordination effectiveness within the PA offices and between the PAs and utilities (for GRID and CSE)?
- Does the CPUC feel that the SASH/MASH budget is sufficient for meeting the current program goals? What about the budget under AB 217?
- What changes (beyond the CPUC Staff Proposal to Implement AB 217, dated July 2, 2014) do you recommend making to the MASH and SASH programs to improve their overall effectiveness?
- What does the CPUC view as the goals in place in regard to job training for the SASH program? Do you think the program has been successful in meeting these goals?
- What recommendations do you have for improving job training efforts for the SASH program? Do you have any additional recommendations for job training for the MASH program beyond those in the CPUC Staff Proposal to Implement AB 217, dated July 2, 2014?
- What do you believe are the most significant barriers to program participation (for each program)?
- What changes in demand would you anticipate stemming from reduced incentive amounts (for each program)?
- Has the CPUC ever considered changing or expanding its eligibility criteria for either program? If so, how could eligibility be expanded to achieve higher levels of demand?

- What is recommended to overcome the barriers to participation you've mentioned today?
- In moving toward AB 217, how could innovative sources of financing such as TPO financing or PACE help meet program goals?
- What would be the effect of higher energy efficiency requirements? (Effect on meeting the AB 217 goal of an additional 50 MW.)
- In general, what are your thoughts on how the PAs can improve program marketing or delivery to help meet future program capacity requirements?
- What do you perceive as the greatest risks to each of the program's success? [Probe if needed...For example, policy or regulatory risk, lack of adoption/participation, failure on the part of the PAs, etc.?]
- As part of this evaluation, Navigant is conducting an assessment of the non-energy benefits of the MASH program. Non-energy benefits tend to fall into categories such as social, environmental, economic development, etc. Can you describe what you believe are the most important non-energy benefits of the SASH and MASH programs?

B.4 SASH SPP SUBCONTRACTORS

Respondent Name:

Respondent Title:

Company Name (if applicable):

Date and time of interview:

Interviewer:

Taped (Yes or No):

Notes to interviewers

This topic guide is designed to help you to complete an approximately 45-60 minute interview. Remember, the qualitative research process is about discovery, not coverage. As such, try to cover all areas of investigation but, if necessary, focus on those questions that seem most relevant to each respondent or those that develop new and/or useful information. Additionally, you are not required to ask questions in the order they are given herein; allow the flow of the conversation to dictate the order in which you ask them.

Background

A Navigant Consulting team is evaluating the California CSI Single-Family Affordable Solar Homes Program. The evaluation is focused on systems installed under the SASH in the service areas of PG&E, SCE, and SDG&E. The Energy Division of the California Public Utilities Commission, who oversees the program's administration, is interested in the understanding how the program activities support job training and job creation in the PV marketplace. Shannon O'Rourke is the CPUC's Project Manager for the SASH program. (NOTE TO INTERVIEWER: the Center for Sustainable Energy, or CSE, administers the program in SDG&E territory)



Confidentiality

If respondents ask, tell them yes, their answers will remain anonymous.

Introduction

Hello, my name is _____ and I work for Redhorse. I am calling on behalf of the California Public Utilities Commission. We are conducting an evaluation of the California CSI Single-Family Affordable Solar Homes Program, and I would like to interview you about your perspective on the SASH marketplace. This interview is for research purposes only.

NOTE: IF RESPONDENT QUESTIONS THE LEGITIMACY OF THE SURVEY, YOU MAY GIVE THEM THIS CONTACT INFORMATION:

Shannon O'Rourke
California Public Utilities Commission
Phone: 415.703.5574"

Taping (optional)

With your permission, I'll record the interview to avoid slowing down our conversation by taking all written notes. I will not use the tapes for anything other than note taking and analysis. (NOTE TO INTERVIEWER: Taping is optional, but you must obtain consent before doing so.)

IDI Questions: SASH Subcontractors

Please focus your responses on your work and your experiences as a contractor in the SASH Sub-Contractor Partnership Program and during SASH installation(s).

Screening question: "Are you aware of the SASH program and have you participated in at least one SASH project?"

Reminder that this phone call is scheduled for 45-60 minutes, but would like to know if you have any pressing time constraints that we should know about?

Do you have any questions before we get started?

- What is your role/title within your organization?
I am first going to ask you about your interaction with SASH program administrators in order to learn what is working well and how program administrators can be more effective. Please describe the degree of coordination that exists between your organization and GRID Alternatives.
- Is this degree of coordination sufficient?
- What do you believe are the benefits of being a contractor in SASH's Sub-Contractor Partnership Program?
- What recommendations, if any, do you have for improving communication and overall effectiveness between your organization and GRID Alternatives?

- *I am now going to ask some questions related to job training.* How many job trainees do you typically employ on a project carried out for SASH?
- Have you hired or considered hiring any of the job trainees? Why, or why not?
- On a scale from one to five, with one being extremely dissatisfied and five being extremely satisfied, how satisfied are you with the job training aspect of the Sub-Contractor Partnership Program?
- If not for SPP/SASH requirements, would you use a solar job trainee on future projects?
- Do you have any recommendations for how GRID Alternatives can improve their job training efforts?
- Now we'll move into some questions about the SASH program in general. From your perspective, what do you believe are the most significant barriers to participating in the SASH program?
- Do you have any recommendations to overcome the barriers to participation you've mentioned today?
- As a contractor, do you think the third-party financing model would work well with SASH projects? Would it help your business? If so, how?
- *Now I am going to ask some questions related to energy efficiency.* How aware are your SASH customers of energy efficiency opportunities?
- What energy efficiency tools and resources are being used prior to systems being installed? If no energy efficiency tools are used, why not? [Why is energy efficiency not promoted?]
- What is the level of participation in energy efficiency programs among your customers?
- We understand that GRID is educating customers on behavior changes as well as installing measures as a way for their customers to achieve energy efficiency. What are your opinions on this model? Do you think this approach has been successful in achieving savings from energy efficiency?
- Do you have any recommendations for how GRID Alternatives can better meet the needs of the low-income market and install more solar projects on qualifying low-income homes?
- *As part of this work, Navigant is trying to assess the overall benefits of the SASH program to participants, the utilities, society and the environment, beyond just the value of the energy generated by the solar PV systems.*
- *I'd like to provide an example of the types of benefits that have been realized from energy efficiency programs to help explain the types of things we are trying to assess for the benefits of the SASH program.*
For energy efficiency programs, an example of an added benefit might be improved comfort in the home when an old heating or air conditioning system is replaced with a new efficient system.
Another example is that schools designed with increased natural light (and reduced light from overhead fixtures) often experience the added benefit of improved test scores.

The SASH program installs solar power panels on low-income homes / apartments, so this assessment is about the benefits that SASH solar installations have on the low-income community and anyone who may be affected by the program.

- In addition to energy savings, have you noticed any other positive impacts/benefits resulting from the SASH program and the installation of solar on low-income homes?
- How do you think the program has benefitted you? *

[Note to interviewer: For this question and similar questions following, may want to probe on any specific sources or examples of benefits listed, depending on time. Do not ask questions for benefits that the interviewee has already answered.]

**Note to interviewer: For example, Instead of only reporting “the energy efficiency upgrades lead to a decrease in my asthma attacks”, it could be valuable if respondents would be more precise and say “the energy efficiency upgrades lead to a decrease in my asthma attacks. I only use my inhaler 10 times a week now compared to 20 times a week when the building had not been upgraded yet.” Or when the interviewer asks about benefits in the community, the survey could ask: Do you think the program has benefitted the community somewhat/or a lot? If respondent says “a lot”: the interviewer can probe why they said a lot and not just a little.*

- How do you think the program has benefitted the environment?
- How do you think the program has benefitted the electric grid?
- How do you think the program has benefitted low-income homeowners?
- How do you think the program has benefitted your utility?
- How do you think the program has benefitted low-income communities?
- How do you think the program has benefitted the economy?
- For everything that you’ve just listed, which of these benefits do you think are most significant or important?
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

B.5 SASH SPP JOB TRAINEES

Respondent Name:

Respondent Title:

Company Name (if applicable):

Date and time of interview:

Interviewer:

Taped (Yes or No):

Notes to interviewers

This topic guide is designed to help you to complete an approximately 30-45 minute interview. Remember, the qualitative research process is about discovery, not coverage. As such, try to cover all areas of investigation but, if necessary, focus on those questions that seem most relevant to each respondent or those that develop new and/or useful information. Additionally, you are not required to ask questions in the order they are given herein; allow the flow of the conversation to dictate the order in which you ask them.

Background

A Navigant Consulting team is evaluating the California CSI Single-Family Affordable Solar Homes Program. The evaluation is focused on systems installed under the SASH in the service areas of PG&E, SCE, and SDG&E. The Energy Division of the California Public Utilities Commission, who oversees the program's administration, is interested in the understanding how the program activities support job training and job creation in the PV marketplace. Shannon O'Rourke is the CPUC's Project Manager for the SASH program. (NOTE TO INTERVIEWER: the Center for Sustainable Energy, or CSE, administers the program in SDG&E territory)

Confidentiality

If respondents ask, tell them yes, their answers will remain anonymous.

Introduction

Hello, my name is _____ and I work for Redhorse. I am calling on behalf of the California Public Utilities Commission. We are conducting an evaluation of the California CSI Single-Family Affordable Solar Homes Program, and I would like to interview you about your perspective on the SASH marketplace. This interview is for research purposes only.

NOTE: IF RESPONDENT QUESTIONS THE LEGITIMACY OF THE SURVEY, YOU MAY GIVE THEM THIS CONTACT INFORMATION:

Shannon O'Rourke
California Public Utilities Commission
Phone: 415.703.5574

Taping (optional)

With your permission, I'll record the interview to avoid slowing down our conversation by taking all written notes. I will not use the tapes for anything other than note taking and analysis. (NOTE TO INTERVIEWER: Taping is optional, but you must obtain consent before doing so.)

IDI Question: SASH Job Trainees

Please focus your responses on your work and your experiences during SASH installation(s).

Screening question: "Are you aware of the SASH program and have you participated in at least one SASH project?"

Reminder that this phone call is scheduled for 30-45 minutes, but would like to know if you have any pressing time constraints that we should know about?

Do you have any questions before we get started?

- How did you learn about the opportunity to participate on a SASH project?
- What was your skill level going in to the hands-on job training program?
- What was most valuable about your experience on the SASH project? [Can probe for working with contractor, working with GRID staff]
- What was most challenging about your experience on the SASH project? [Can probe for working with contractor, working with GRID staff]
- What recommendations do you have for SASH to address these challenges?
- Have you obtained any professional certifications in the solar industry (for example, the North American Board of Certified Energy Practitioners (NABCEP) certification)? If so, do you feel that your participation on a SASH project helped achieve that certification?
- Do you believe your hands-on job training with the SASH project(s) created additional opportunities for you in the solar industry? If so, how?
- Are you still working in the solar industry? [prompt to learn current job/position, or reason for no longer working in the industry]
- From your perspective, what are the barriers to getting hands-on experience in the solar industry?
- Do you have any suggestions for reducing or overcoming those barriers?
- Based on your experience, what changes can you recommend making to the SASH hands-on job training program?
- As part of this work, Navigant is trying to assess the overall benefits of the SASH program to participants, the utilities, society and the environment, beyond just the value of the energy generated by the solar PV systems.

I'd like to provide an example of the types of benefits that have been realized from energy efficiency programs to help explain the types of things we are trying to assess for the benefits of the SASH program.

For energy efficiency programs, an example of an added benefit might be improved comfort in the home when an old heating or air conditioning system is replaced with a new efficient system.

Another example is that schools designed with increased natural light (and reduced light from overhead fixtures) often experience the added benefit of improved test scores.

The SASH program installs solar power panels on low-income homes, so this assessment is about the benefits that SASH solar installations have on the low-income community and anyone who may be affected by the program."

- In addition to energy savings, have you noticed any other positive impacts/benefits resulting from the SASH program and the installation of solar on low-income homes?

- How do you think the program has benefitted the environment? *

[Note to interviewer: For this question and similar questions following, may want to probe on any specific sources or examples of benefits listed, depending on time. Do not ask questions for benefits that the interviewee has already answered.]

*Note to interviewer: For example, Instead of only reporting “the energy efficiency upgrades lead to a decrease in my asthma attacks”, it could be valuable if respondents would be more precise and say “the energy efficiency upgrades lead to a decrease in my asthma attacks. I only use my inhaler 10 times a week now compared to 20 times a week when the building had not been upgraded yet.” Or when the interviewer asks about benefits in the community, the survey could ask: Do you think the program has benefitted the community somewhat/or a lot? If respondent says “a lot”: the interviewer can probe why they said a lot and not just a little.

- How do you think the program has benefitted the electric grid?
- How do you think the program has benefitted low-income homeowners?
- How do you think the program has benefitted your utility?
- How do you think the program has benefitted low-income communities?
- How do you think the program has benefitted the economy?
- For everything that you’ve just listed, which of these benefits do you think are most significant or important?
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

B.6 SASH JOB TRAINING ORGANIZATIONS

Respondent Name:

Respondent Title:

Company Name:

Date and time of interview:

Interviewer:

Taped (Yes or No):

Notes to interviewers

This topic guide is designed to help you to complete an approximately 60 minute interview. Remember, the qualitative research process is about discovery, not coverage. As such, try to cover all areas of investigation but, if necessary, focus on those questions that seem most relevant to each respondent or those that develop new and/or useful information. Additionally, you are not required to ask questions in the order they are given herein; allow the flow of the conversation to dictate the order in which you ask them.



Background

A Navigant Consulting team is evaluating the California CSI Single-Family Affordable Solar Homes Program. The evaluation is focused on systems installed under the SASH in the service areas of PG&E, SCE, and SDG&E. The Energy Division of the California Public Utilities Commission, who oversees the program's administration, is interested in the understanding how the program activities support job training and job creation in the PV marketplace. Shannon O'Rourke is the CPUC's Project Manager for the SASH program. (NOTE TO INTERVIEWER: the Center for Sustainable Energy, or CSE, administers the program in SDG&E territory)

Confidentiality

If respondents ask, tell them yes, their answers will remain anonymous.

Introduction

Hello, my name is _____ and I work for Redhorse. I am calling on behalf of the California Public Utilities Commission. We are conducting an evaluation of the California CSI Single-Family Affordable Solar Homes Program, and I would like to interview you about your perspective on the SASH marketplace. This interview is for research purposes only.

NOTE: IF RESPONDENT QUESTIONS THE LEGITIMACY OF THE SURVEY, YOU MAY GIVE THEM THIS CONTACT INFORMATION:

Shannon O'Rourke
California Public Utilities Commission
Phone: 415.703.5574

Taping (optional)

With your permission, I'll record the interview to avoid slowing down our conversation by taking all written notes. I will not use the tapes for anything other than note taking and analysis. (NOTE TO INTERVIEWER: Taping is optional, but you must obtain consent before doing so.)

IDI Questions: SASH Job Training Organizations

Please focus your responses on your work and your experiences with the SASH program.

Reminder that this phone call is scheduled for 45-60 minutes, but would like to know if you have any pressing time constraints that we should know about?

Do you have any questions before we get started?

- What is your role within your organization?
- How did you first learn out about SASH and hands-on training opportunities with the SASH program?
- Is SASH the only organization that offers hands-on training for your trainees, or do you work with other organizations to offer hands-on job training opportunities for your students? If others, what percent of the hands-on projects are SASH?

- What do you believe are the strongest elements of the job training component of the SASH program?
- What do you believe are the weaknesses or problems associated with the SASH job training program?
- Are there specific barriers to your students participating in the SASH program?
- What do you recommend to overcome these barriers?
- In the absence of the SASH program, how would the number of on-the-job training opportunities change? Would they increase, decrease or stay the same? By what %?
- How many hands-on projects are required for trainees as part of your training program?
- How many of your program's graduates have participated as a solar job trainee in the SASH program?
- How many of your graduates have gone on to get hired by a contractor who participated in the SASH Sub-Contractor Partnership Program?
- How many (%) of your graduates get a job in the solar field within 6 months of graduation? Within one year?
- What has it been like working with subcontractors in the SASH Sub-Contractor Partnership Program? [Probe for whether their experience has been smooth and positive, or if they have experienced any issues]
- What has your experience been like working with GRID Alternatives as part of the SASH program? [Probe for whether their experience has been smooth and positive, or if they have experienced any issues]
- Do you see a need for the SASH program to expand into hands-on job training for other types of jobs besides installers, such as back office personnel or maintenance positions?
- Do you have any suggestions for how the SASH program could improve hands-on job training opportunities for solar job trainees through the SASH program?
- Do you have any suggestions for expanding hands-on job training opportunities from single family to the multifamily housing sector?
- Do you have any suggestions for enabling more low-income individuals to enter the solar industry?
- I'd like to ask you to think about the solar market in general for this next question. Do you have any recommendations for expanding access to solar among low-income single-family households and multifamily properties?

As part of this work, Navigant is trying to assess the overall benefits of the SASH program to participants, the utilities, society and the environment, beyond just the value of the energy generated by the solar PV systems.

I'd like to provide an example of the types of benefits that have been realized from energy efficiency programs to help explain the types of things we are trying to assess for the benefits of the SASH program.

For energy efficiency programs, an example of an added benefit might be improved comfort in the home when an old heating or air conditioning system is replaced with a new efficient system.

Another example is that schools designed with increased natural light (and reduced light from overhead fixtures) often experience the added benefit of improved test scores.

The SASH program installs solar power panels on low-income homes / apartments, so this assessment is about the benefits that SASH solar installations have on the low-income community and anyone who may be affected by the program.

- In addition to energy savings, have you noticed any other positive impacts/benefits resulting from the SASH program and the installation of solar on low-income homes?
- How do you think the program has benefitted you? *

[Note to interviewer: For this question and similar questions following, may want to probe on any specific sources or examples of benefits listed, depending on time. Do not ask questions for benefits that the interviewee has already answered.]

**Note to interviewer: For example, Instead of only reporting "the energy efficiency upgrades lead to a decrease in my asthma attacks", it could be valuable if respondents would be more precise and say "the energy efficiency upgrades lead to a decrease in my asthma attacks. I only use my inhaler 10 times a week now compared to 20 times a week when the building had not been upgraded yet." Or when the interviewer asks about benefits in the community, the survey could ask: Do you think the program has benefitted the community somewhat/or a lot? If respondent says "a lot": the interviewer can probe why they said a lot and not just a little.*

- How do you think the program has benefitted the environment?
- How do you think the program has benefitted the electric grid?
- How do you think the program has benefitted low-income homeowners?
- How do you think the program has benefitted your utility?
- How do you think the program has benefitted low-income communities?
- How do you think the program has benefitted the economy?
- For everything that you've just listed, which of these benefits do you think are most significant or important?
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?



B.7 MASH INSTALLER AND SOLAR FINANCE COMPANIES

Respondent Name:

Respondent Title:

Company Name:

Date and time of interview:

Interviewer:

Taped (Yes or No):

Notes to interviewers

This topic guide is designed to help you to complete an approximately 60 minute interview. Remember, the qualitative research process is about discovery, not coverage. As such, try to cover all areas of investigation but, if necessary, focus on those questions that seem most relevant to each respondent or those that develop new and/or useful information. Additionally, you are not required to ask questions in the order they are given herein; allow the flow of the conversation to dictate the order in which you ask them.

Background

A Navigant Consulting team is evaluating the California CSI Multifamily Affordable Solar Homes Program. The evaluation is focused on systems installed under the MASH in the service areas of PG&E, SCE, and SDG&E. The Energy Division of the California Public Utilities Commission, who oversees the program's administration, is interested in the understanding barriers and opportunities to expanding the PV marketplace for multifamily affordable homes. Shannon O'Rourke is the CPUC's Project Manager for the SASH program. (NOTE TO INTERVIEWER: the Center for Sustainable Energy, or CSE, administers the program in SDG&E territory)

Confidentiality

If respondents ask, tell them yes, their answers will remain anonymous.

Introduction

Hello, my name is _____ and I work for Redhorse. I am calling on behalf of the California Public Utilities Commission. We are conducting an evaluation of the California CSI Multifamily Affordable Solar Homes Program, and I would like to interview you about your perspective on the MASH marketplace. This interview is for research purposes only.

NOTE: IF RESPONDENT QUESTIONS THE LEGITIMACY OF THE SURVEY, YOU MAY GIVE THEM THIS CONTACT INFORMATION:

Shannon O'Rourke

California Public Utilities Commission

Phone: 415.703.5574

Taping (optional)

With your permission, I'll record the interview to avoid slowing down our conversation by taking all written notes. I will not use the tapes for anything other than note taking and analysis. (NOTE TO INTERVIEWER: Taping is optional, but you must obtain consent before doing so.)

IDI Questions: MASH Installers and SFCs

Please focus your responses on your work and your experiences during MASH installation(s).

Screening question: "Are you aware of the MASH program and have you installed and/or financed at least one MASH project?"

Reminder that this phone call is scheduled for 45-60 minutes, but would like to know if you have any pressing time constraints that we should know about?

Do you have any questions before we get started?

- What is your role/title within your organization?
- *I am first going to ask you about your interaction with MASH program administrators in order to learn what is working well and how program administrators can be more effective. Could you please describe the degree of coordination that exists between your organization and the MASH Program Administrator(s)?*
- Is this degree of coordination sufficient?
- What recommendations, if any, do you have for improving the overall effectiveness of the MASH program administrators?
- *I am now going to ask some questions related to job training. Have you used any job trainees to help staff your MASH projects? If yes, how many solar job trainees have you used to date?*
- If Yes, on a scale from one to five, with one being extremely dissatisfied and five being extremely satisfied, how satisfied are you with the job trainees overall?
- AB 217 extends funding for the MASH program and includes a new requirement that MASH projects include a job training component similar to an existing requirement for the single family affordable solar housing program. For example, the SASH program requires contractors to hire at least one eligible job trainee for at least one full day of work on every SASH installation as a condition for participating in the program. What, if any, concerns do you have regarding adding a job training requirement to MASH installations?
- Do you see any areas within your business model where students studying solar could receive hands-on learning opportunities.
- *Now I am going to ask for your views on demand for solar in the multifamily housing sector and barriers to program participation. From your perspective, what do you believe are the most significant barriers to owners of multifamily buildings participating in the MASH program?*

- What percent of multifamily building owners drop out at some point during the program process? At what point in the process do customers typically drop out?
- Do you have any recommendations to overcome the barriers to participation you've mentioned today?
- *Now I am going to ask some questions related to energy efficiency.* How aware are your MASH customers of energy efficiency opportunities?
- What energy efficiency tools and resources do you offer and use with MASH customers prior to systems being installed? If no energy efficiency tools are used, why not? [Why is energy efficiency not promoted?]
- What is the level of participation in energy efficiency programs among your customers?
- What would be the effect on participation if energy efficiency requirements would be added to the MASH program? Specifically, what would be the effect on participation if building owners had to provide a list of tenants that are eligible for the Energy Savings Assistance Program?
- From your perspective, are low-income tenants benefitting (monetarily or non-monetarily) from MASH projects? If so, how?
- Following interconnection of MASH-supported systems and the five-year holding period, how likely is it that building owners will change their allocation of virtual net metering benefits, if the system is under a virtual net metering arrangement?
- Do you have any recommendations for how program administrators can better meet the needs of the market and how the program can install more solar on multifamily buildings?

As part of this work, Navigant is trying to assess the overall benefits of the MASH program to participants, the utilities, society and the environment, beyond just the value of the energy generated by the solar PV systems.

I'd like to provide an example of the types of benefits that have been realized from energy efficiency programs to help explain the types of things we are trying to assess for the benefits of the MASH program.

For energy efficiency programs, an example of an added benefit might be improved comfort in the home when an old heating or air conditioning system is replaced with a new efficient system.

Another example is that schools designed with increased natural light (and reduced light from overhead fixtures) often experience the added benefit of improved test scores.

The MASH program installs solar power panels on low-income homes/apartments, so this assessment is about the benefits that MASH solar installations have on the low-income community and anyone who may be affected by the program.

- In addition to energy savings, have you noticed any other positive impacts/benefits resulting from the MASH program and the installation of solar on low-income homes?

- How do you think the program has benefitted you?

[Note to interviewer: For this question and similar questions following, may want to probe on any specific sources or examples of benefits listed, depending on time. Do not ask questions for benefits that the interviewee has already answered.]

- How do you think the program has benefitted the environment?
- How do you think the program has benefitted the electric grid?
- How do you think the program has benefitted your utility?
- How do you think the program has benefitted low-income communities?
- How do you think the program has benefitted the economy?
- For everything that you've just listed, which of these benefits do you think are most significant or important?
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

B.8 MASH PROPERTY OWNERS

Respondent Name:

Respondent Title:

Company Name:

Date and time of interview:

Interviewer:

Taped (Yes or No):

Notes to interviewers

This topic guide is designed to help you to complete an approximately 30 minute interview. Remember, the qualitative research process is about discovery, not coverage. As such, try to cover all areas of investigation but, if necessary, focus on those questions that seem most relevant to each respondent or those that develop new and/or useful information. Additionally, you are not required to ask questions in the order they are given herein; allow the flow of the conversation to dictate the order in which you ask them.

Background

A Navigant Consulting team is evaluating the California CSI Multifamily Affordable Solar Homes Program. The evaluation is focused on systems installed under the MASH in the service areas of PG&E, SCE, and SDG&E. The Energy Division of the California Public Utilities Commission, who oversees the program's administration, is interested in the understanding barriers and opportunities to expanding the PV marketplace for multifamily affordable homes. Shannon O'Rourke is the CPUC's Project Manager for the MASH program. (NOTE TO INTERVIEWER: the Center for Sustainable Energy, or CSE, administers the program in SDG&E territory)

Confidentiality

If respondents ask, tell them yes, their answers will remain anonymous.

Introduction

Hello, my name is _____ and I work for Navigant Consulting. I am calling on behalf of the California Public Utilities Commission. We are conducting an evaluation of the California CSI Multifamily Affordable Solar Homes Program, and I would like to interview you about your perspective on the MASH marketplace. This interview is for research purposes only.

NOTE: IF RESPONDENT QUESTIONS THE LEGITIMACY OF THE SURVEY, YOU MAY GIVE THEM THIS CONTACT INFORMATION:

Shannon O'Rourke
California Public Utilities Commission
Phone: 415.703.5574

Taping (optional)

With your permission, I'll record the interview to avoid slowing down our conversation by taking all written notes. I will not use the tapes for anything other than note taking and analysis. (NOTE TO INTERVIEWER: Taping is optional, but you must obtain consent before doing so.)

IDI Questions: MASH Property owners

- In what capacity were you involved in a MASH project between the years 2011-2013?
- Have you participated in NEM projects, VNM projects, or both?
- How did you learn about the opportunity to participate in the MASH program? [Probe for specifics]
- What about the program appealed to you?
- Were there any aspects about the program that were confusing to you? If yes, were you able to seek clarification from program staff or from your solar contractor?
- What do you see as the main barriers to participating in the program, both for yourself or for other property owners/managers?
- [If participant mentioned that they faced barriers] How did you overcome these barriers? Do you have any recommendations for how other property owners/managers could overcome similar barriers?
- Now I am going to ask some questions related to energy efficiency. Did you receive information about energy efficiency opportunities for your building prior to installing solar? If yes, from whom?
- Did you have an onsite energy audit prior to installing solar? If yes, was the audit completed before the solar system was sized for your building?

- [If yes] Did the energy efficiency information or the audit compel you to make energy-efficient upgrades at your property to increase the effectiveness of your solar system? If no, why?
- [If respondent made upgrades] What kind of upgrades did you make? Do you think these upgrades have been effective in reducing your property's overall energy demand?
- Did you share any information with your tenants about how your tenants can increase the energy efficiency of their individual units at the time solar was being sized and installed?
- [If yes] To your knowledge, have your tenants taken any action in regard to their personal energy efficiency?
- What kind of energy-saving information would you have liked to see prior to installing your solar system?

As part of the new rules under AB 217, the CPUC is considering adding a requirement that tenants in MASH properties enroll in the Energy Savings Assistance Program (only if eligible) in order for the property to be eligible for MASH. What would be the impact of a requirement like this in terms of practicality of enrollment and your decision to enroll in MASH?

[Note to interviewer: The AB 217 Implementation - Energy Division Staff Proposal notes that "All customers taking service under the CARE program are automatically eligible for ESAP.]"

- From your perspective, are your low-income tenants benefitting (monetarily or non-monetarily) from MASH projects? If so, how?
- [Interviewer should probe on specifics]"
- [If VNM] I understand that you are under a virtual net metering arrangement for your MASH-supported system(s). What is the likelihood that you will change your allocation of VNM benefits at some point following the 5 year holding period?
- [If VNM] Do you feel VNM is a good system for sharing benefits with your tenants?

As part of this work, Navigant is trying to assess the overall benefits of the MASH program to participants, the utilities, society and the environment, beyond just the value of the energy generated by the solar PV systems.

I'd like to provide an example of the types of benefits that have been realized from energy efficiency programs to help explain the types of things we are trying to assess for the benefits of the MASH program.

For energy efficiency programs, an example of an added benefit might be improved comfort in the home when an old heating or air conditioning system is replaced with a new efficient system.

Another example is that schools designed with increased natural light (and reduced light from overhead fixtures) often experience the added benefit of improved test scores.

The MASH program installs solar power panels on low-income homes/apartments, so this assessment is about the benefits that MASH solar installations have on the low-income community and anyone who may be affected by the program."

- In addition to electric bill savings, have you noticed any other positive impacts/benefits resulting from the MASH program and the installation of solar on your property?

- How do you think the program has benefitted you?

[Note to interviewer: For this question and similar questions following, may want to probe on any specific sources or examples of benefits listed, depending on time. Do not ask questions for benefits that the interviewee has already answered.]

- How do you think the program has benefitted the environment?
- How do you think the program has benefitted the electric grid?
- How do you think the program has benefitted your utility?
- How do you think the program has benefitted low-income communities?
- How do you think the program has benefitted the economy?
- For everything that you've just listed, which of these benefits do you think are most significant or important?
- Finally, is there anything that you expected me to ask that I did not ask, or anything that you would like to add before we end our discussion today?

Appendix C Survey Guides

C.1 CSI SASH EVALUATION – PARTICIPANT SURVEY

Contents

- Project Indicators and Survey Questions
- Screener
- Program Participation (5-9 questions)
- Attitudes & Awareness (3 questions)
- Program Satisfaction (2 questions)
- Energy Efficiency (10-14 questions)
- Participant Characteristics (7 questions)
- Wrap-Up (1 question)

Table C-1. Project Indicators and Survey Questions

Project Indicator	Survey Questions
Screener questions (non-indicators)	1 – 5
1.3.1 What are the barriers to participation?	6-7, 17, 18
1.3.2 What is recommended to overcome these barriers?	8-20 (from a survey perspective, all of these indicators have to do with process improvements and impacts of possible changes to program, including participants' perceived benefits, motivations, satisfaction, willingness to participate under different circumstances, etc.)
1.7.1 What steps can PAs take to help meet program capacity targets?	
1.1.4 What are recommended program administrator changes?	
1.4.3 How aware are SASH customers of energy efficiency opportunities?	
1.4.2 What energy efficiency tools and resources are being used prior to systems being installed?	21-23, 34
1.4.1 What is the level of energy efficiency program participation?	24-26
1.4.5 What would be the effect of higher energy efficiency requirements?	27-29, 32-33
1.8.1 What types of customers participate in the SASH program?	30-31
	35-42

Source: Navigant Consulting, Inc.



Screener

Hello. This is (INTERVIEWER) from Ewald & Wasserman, calling for (NAME).

[Interviewer Note: The goal is to conduct the survey with either (NAME) or that person's spouse/partner. If (NAME) is not home / unavailable, politely ask, "May I speak with the spouse or partner of (NAME)".]

I'm calling to ask you about your experiences with California Solar Initiative's Single-Family Affordable Solar Housing Program, often abbreviated as "the SASH program." The SASH program is administered by GRID Alternatives, and is overseen by the Energy Division of the California Public Utilities Commission. E&W is conducting this survey on behalf of Navigant Consulting for an evaluation of the SASH program.

I expect that my questions will take about 12 to 15 minutes to answer, and your responses will help us improve the SASH program. All your responses will be kept confidential.

[If respondents question the legitimacy of the survey, interviewer should provide them with Shannon O'Rourke's contact information: Shannon O'Rourke, California Public Utilities Commission, Phone: 415.703.5574]

Q1. {Interviewer: DO NOT READ, Whom are you speaking to?}

1. (NAME)
2. SPOUSE/PARTNER OF (NAME)
3. CARETAKER/GUARDIAN OF (NAME)
4. OTHER/DON'T KNOW

Q2. [ASK if Q1=4, else skip to Q3] When can I call back to speak with (NAME) or the spouse or partner of (NAME)?

[RECORD DATE & TIME FOR CALLBACK]

Q3. Would you prefer to answer my questions in English or Spanish?

1. English [switch to English-speaking interviewer if necessary]
2. Spanish [switch to Spanish-speaking interviewer if necessary]

Q4. Have you participated in the Single-Family Affordable Solar Housing Program, also known as SASH, a program delivered by GRID Alternatives that installs free or reduced-cost solar PV systems on your roof to produce electricity?

1. YES
2. NO [THANK AND TERMINATE]
98. REFUSED [THANK AND TERMINATE]
99. DON'T KNOW [THANK AND TERMINATE]

[If Q4=2, 98, 99, THANK AND TERMINATE]

- Q5. Are you currently living in the same home where the solar PV system was installed?**
1. YES
 2. NO
 98. REFUSED [THANK AND TERMINATE]
 99. DON'T KNOW [THANK AND TERMINATE]

[If Q5=98, 99, THANK AND TERMINATE]

Program Participation (5-9 questions)

- Q6. When you first heard about the SASH program, did you have any concerns about participating in the program? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know

- Q7. [ASK if Q6=1, else skip to Q8] What were your greatest concerns? [DO NOT READ; SELECT ALL THAT APPLY]**
1. Cost of the system
 2. Appearance / how the system would look
 3. Roof / would it cause damage or leaks
 4. Homeowners' association
 5. Maintenance
 6. Safety
 7. Offer is "too good to be true"
 8. Other (SPECIFY: _____)
 98. Refused
 99. Don't know

- Q8. Did you contribute to the cost of the solar PV system? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know

- Q9. [ASK if Q8=1, else skip to Q10] How much did you contribute?**
- [RECORD DOLLAR AMOUNT, DK, REF]

- Q10. [ASK if Q8=2, 98, or 99, else skip to Q14] Would you have installed solar if you were required to contribute to the cost? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q11. [ASK if Q10=1, else skip to Q12] How much would you have been willing to contribute to the cost?**
- [RECORD DOLLAR AMOUNT, DK, REF]
- Q12. [ASK if Q8=2, 98, or 99, else skip to Q14] Would you have been willing to take out a loan to pay part of the cost? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q13. [ASK if Q8=2, 98, or 99, else skip to Q14] Would you have been willing to take out a loan if the amount of money you saved each month from installing the solar PV system more than covered the monthly loan amount? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q14. What impact has the solar installation had on your ability to afford your energy bill? Has it made your bill much more affordable, somewhat more affordable, slightly more affordable, or has it not made your bill more affordable? [DO NOT READ; SELECT ONE]**
1. Much more affordable
 2. Somewhat more affordable
 3. Slightly more affordable
 4. Not more affordable
 98. Refused
 99. Don't know

Q15. Besides making your energy bills more affordable, have you noticed any other positive impacts or benefits resulting from the installation of solar on your home? [DO NOT READ; SELECT ALL THAT APPLY]

1. Environmental benefits/going green/reducing pollution
2. Learning opportunity for kids
3. Pride in our home
4. No benefits
5. Other (SPECIFY: _____)
98. Refused
99. Don't know

Attitudes & Awareness (3 questions)

Q16. What benefits of solar PV did you consider when deciding whether or not to install a system on your home? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Helping the environment/reducing personal carbon footprint/reducing pollution
2. Save money in the long run
3. Protection against future electric utility rate increases
4. Self-sufficiency/going "off the grid"/independence from electric utility
5. My friends/neighbors/people I admire are going solar
6. Available rebates
7. Tax credits/tax benefits
8. To improve the value of my home
9. Investment in the future for my family/children/grandchildren
10. Other (SPECIFY: _____)
98. Refused
99. Don't know

Q17. I am going to read you a list of factors that may have motivated you to install solar PV; please tell me how motivational each of these factors was in your decision-making on a scale of 1 to 5, where 1 is not at all motivational and 5 is very motivational. [RANDOMIZE ORDER OF LIST]

- a. Helping the environment [RECORD 1-5, DK, REF]
- b. Saving money or controlling electric bills [RECORD 1-5, DK, REF]
- c. Achieving self-sufficiency or independence from the utility [RECORD 1-5, DK, REF]
- d. Protecting myself from future electricity rate increases [RECORD 1-5, DK, REF]
- e. People in my neighborhood have adopted solar PV. [RECORD 1-5, DK, REF]
- f. Rebates, incentives, and tax credits [RECORD 1-5, DK, REF]

Q18. What do you think prevents other customers from participating in a program like this one?
[OPEN-ENDED]

Program Satisfaction (2 questions)

Q19. I would like to ask you a few questions about how satisfied or dissatisfied you were with different aspects of participation in the SASH program. I will read you a list, and for each item, please rate your satisfaction on a 1 to 5 scale where 5 means very satisfied and 1 means very dissatisfied.

- a. The program application process [RECORD 1-5, DK, REF]
- b. The installation process for your solar PV system [RECORD 1-5, DK, REF]
- c. The education you received about your solar PV system and how to maintain it [RECORD 1-5, DK, REF]
- d. The performance of your solar PV system [RECORD 1-5, DK, REF]
- e. The ease of working with GRID Alternatives [RECORD 1-5, DK, REF]
- f. The overall SASH program experience [RECORD 1-5, DK, REF]

Q20. What changes would you recommend to the program, if any?

[OPEN-ENDED, None, DK, REF]

Energy Efficiency (10-14 questions)

My next few questions will focus on energy efficiency, including energy-efficient products or equipment you may have installed in your home as well as behaviors or actions you may have taken to save energy.

[If Q5=2, READ THIS STATEMENT: “For these next few questions, please focus your answers on any energy efficiency actions you may have taken in your previous home, where the solar PV system was installed.”]

Q21. Prior to your participation in the SASH program, how would you rate your knowledge of energy efficiency and ways to save energy in your home, on a scale of 1 to 5 where 5 means very knowledgeable and 1 means not at all knowledgeable?

[RECORD 1-5, DK, REF]

Q22. Has participation in the SASH program increased your awareness of energy efficiency and ways to save energy in your home? [DO NOT READ; SELECT ONE]

- 1. Yes
- 2. No
- 98. Refused
- 99. Don't know

Q23. [ASK if Q22=1, else skip to Q24] How would you rate your knowledge of energy efficiency and ways to save energy in your home now, on a scale of 1 to 5 where 5 means very knowledgeable and 1 means not at all knowledgeable?

[RECORD 1-5, DK, REF]

- Q24. Prior to the installation of your solar PV system, did you have an energy audit conducted? An energy audit is when a contractor or technician comes into your home and looks for ways in which your home's energy efficiency could be improved. [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q25. Did someone from GRID Alternatives speak to you about how to reduce the amount of energy that you use in your home? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q26. Did someone from GRID Alternatives speak to you about the Energy Savings Assistance Program, a separate program that provides energy efficiency services to reduce the amount of energy that your home uses? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q27. Since learning about the SASH program, have you participated in the Energy Savings Assistance Program or any other utility energy efficiency program? [DO NOT READ; SELECT ONE]**
1. Yes – Energy Savings Assistance Program
 2. Yes – other program (SPECIFY: _____)
 3. Yes – both Energy Savings Assistance Program and another program (SPECIFY: _____)
 4. No
 98. Refused
 99. Don't know
- Q28. [ASK if Q27=4, 98, or 99, else skip to Q29] Since learning about the SASH program, have you installed any energy-efficient products in your home? [DO NOT READ LIST, SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know

Q29. [ASK if Q27<4 or Q28=1, else skip to Q30] What type of energy-efficient products did you install? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. CFL/compact fluorescent light bulbs
2. LED light bulbs
3. Programmable thermostat
4. Refrigerator
5. Freezer
6. Dishwasher
7. Clothes washer
8. Clothes dryer
9. Water heater
10. Pipe wrap on water heater pipes
11. Furnace
12. Furnace fan
13. Air conditioner
14. Insulation
15. Windows
16. Other (SPECIFY: _____)
98. Refused
99. Don't know

Q30. If the SASH program had required you to make more energy efficiency upgrades to your home before you could have solar panels installed, how likely would you have been to participate in SASH? Please rate on a 1-5 scale, where 5 is very likely to participate and 1 is not at all likely to participate.

[RECORD 1-5, DK, REF]

Q31. Why did you give that rating?

[OPEN-ENDED]

Q32. Since participating in the SASH program, have you made any behavioral changes to reduce the amount of heating, air conditioning, or hot water that you use? [DO NOT READ; SELECT ONE]

1. Yes
2. No
98. Refused
99. Don't know

Q33. [ASK if Q32=1, else skip to Q34] What specific changes have you made to reduce the amount of heating, air conditioning, or hot water that you use? [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. Use air conditioning for fewer hours
2. Use fans instead of air conditioning
3. Set air conditioner to higher temperature
4. Use less air conditioning (general)
5. Set heating to lower temperature
6. Program thermostat
7. Wash laundry in cold water
8. Adjust water heater thermostat
9. Change furnace filter
10. Other (SPECIFY: _____)
98. Refused
99. Don't know

[If Q5=2, READ THIS STATEMENT: "For the rest of my questions, please answer about the home that you're currently living in."]

Q34. Are there any other energy savings actions which you're considering but have not yet taken? These could include installation of energy efficiency products or behavioral changes. [DO NOT READ LIST, SELECT ALL THAT APPLY]

1. CFL/compact fluorescent light bulbs
2. LED light bulbs
3. Programmable thermostat
4. Refrigerator
5. Freezer
6. Dishwasher
7. Clothes washer
8. Clothes dryer
9. Water heater
10. Pipe wrap on water heater pipes
11. Furnace
12. Furnace fan
13. Air conditioner
14. Insulation
15. Windows
16. Use air conditioning for fewer hours
17. Use fans instead of air conditioning
18. Set air conditioner to higher temperature
19. Use less air conditioning (general)
20. Set heating to lower temperature
21. Program thermostat
22. Wash laundry in cold water
23. Adjust water heater thermostat
24. Change furnace filter
25. Other (SPECIFY: _____)
98. Refused
99. Don't know

Participant Characteristics (7 questions)

We're almost done with the survey. I just have a few more questions about you and your household. I also want to take a moment to remind you that your responses are completely confidential and will not be linked to you personally in any way.

- Q35. I'm going to read you a short series of statements about energy use and your energy bills. Please tell me how much you agree or disagree with these statements on a scale from 1 to 5, where 1 means you strongly disagree and 5 means you strongly agree. [RANDOMIZE ORDER OF LIST]**
- a. I am very concerned about how energy use affects the environment. [RECORD 1-5, DK, REF]
 - b. I often worry that the cost of energy for my home will increase. [RECORD 1-5, DK, REF]
 - c. I intend to conserve electricity in my home next summer. [RECORD 1-5, DK, REF]
 - d. I am already doing everything I can to save energy in my home. [RECORD 1-5, DK, REF]
 - e. I understand how actions taken by me and others in my household result in higher or lower energy use. [RECORD 1-5, DK, REF]
 - f. It would make me proud to have one of the most energy-efficient houses in my neighborhood. [RECORD 1-5, DK, REF]
- Q36. How many people live in your home year-round, including yourself?**
[RECORD NUMBER, DK, REF]
- Q37. How many of your household's residents are children aged 18 or younger?**
[RECORD NUMBER, DK, REF]
- Q38. How many of your household's residents are aged 65 or older?**
[RECORD NUMBER, DK, REF]
- Q39. Are there any disabled individuals in your household? [DO NOT READ; SELECT ONE]**
1. Yes
 2. No
 98. Refused
 99. Don't know
- Q40. What is the primary language spoken in your home? [DO NOT READ; SELECT ONE]**
1. English
 2. Spanish
 3. Other (Specify: _____)
 98. Refused
 99. Don't know



Q41. What is your annual household income? Just stop me when I get to the right category. [READ CATEGORIES; SELECT ONE]

- 1. Less than \$10,000
- 2. \$10,000 to just under \$20,000
- 3. \$20,000 to just under \$30,000
- 4. \$30,000 to just under \$40,000
- 5. \$40,000 to just under \$50,000
- 6. \$50,000 to just under \$60,000
- 7. \$60,000 to just under \$70,000
- 8. \$70,000 to just under \$80,000
- 9. \$80,000 to just under \$90,000
- 10. \$90,000 to just under \$100,000
- 11. \$100,000 or more?
- 98. (Refused)
- 99. (Don't know)

Q42. {Interviewer: DO NOT READ, What is the gender of the respondent?}

- 1. Male
- 2. Female

Wrap-Up (1 question)

Q43. Those are all of our questions. Do you have any other comments you'd like to add about your experiences with the SASH program?

[OPEN-ENDED]

Thank you very much for your time.

C.2 CSI MASH EVALUATION—TENANT SURVEY

EWID: _____ Interviewer: _____ Date: _____

Respondent name: _____ Utility: SCE PGE SDG&E

Hello. This is _____ from Ewald & Wasserman, may I speak to _____

I'm calling to ask you about your experiences with California Solar Initiative's Multifamily Affordable Solar Housing Program, "the MASH program." This program helps install solar on the roofs of apartment buildings, condominiums, and other multifamily homes. This will take less than 10 minutes of your time and your answers will be confidential and help us improve the MASH program.

Q3. Are you currently living in a building with a solar system?

- 1. YES
- 2. NO [THANK AND TERMINATE]
- 98. REFUSED [THANK AND TERMINATE]
- 99. DON'T KNOW [THANK AND TERMINATE]

Q5. Was the solar PV system installed on your building before or after you moved in?

- 1. Before
- 2. After (SKIP TO Q9)
- 98. Refused (SKIP TO Q11)
- 99. Don't know (SKIP TO Q11)

Q6. When you were considering moving into this building, did the landlord, property manager, or someone else discuss the solar system with you?

- 1. Yes
- 2. No (SKIP TO Q9)
- 98. Refused (SKIP TO Q9)
- 99. Don't know (SKIP TO Q9)

Q7. Do you recall what they told you?

Q8. On a scale of 1 to 5, where 5 means very influential and 1 means not at all influential, how influential was the presence of the solar system in your decision to move into this building?

_____ (enter a number 1 through 5, or 98=Refused, 99=Don't Know)

Q9. When you first heard about the solar system being installed on your building, did you have any concerns about it?

- 1. Yes
- 2. No (SKIP TO Q11)
- 98. Refused (SKIP TO Q11)
- 99. Don't know (SKIP TO Q11)

Q10. What was your greatest concern? [DO NOT READ; SELECT ALL THAT APPLY]

- 1. Possibility of rent increasing
- 2. Possibility of energy costs increasing
- 3. How much of the cost I would be responsible for
- 4. Appearance / how the system would look
- 5. Roof / would it cause damage or leaks
- 6. Other, SPECIFY: _____
- 98. Refused
- 99. Don't know

Q11. How useful is the information provided on your electricity bill regarding the solar system and the amount of energy it is producing? Please rate on a scale of 1 to 5, where 5 is extremely useful and 1 is not at all useful.

_____ (enter a number 1 through 5, or 98=Refused, 99=Don't Know)

Q12. Do you know approximately what percent of your monthly electricity bill is covered by the solar system credit?

_____ [RECORD %, DK, REF]

Q13. What impact has the solar installation had on your ability to afford your energy bill? Has it made your bill much more affordable, somewhat more affordable, slightly more affordable, or has it not made your bill more affordable?

- 1. Much more affordable
- 2. Somewhat more affordable
- 3. Slightly more affordable
- 4. Not more affordable
- 98. Refused
- 99. Don't know

Q14. Aside from energy cost savings, have you noticed any other positive impacts or benefits resulting from the MASH program and the installation of solar on your building? How do you think the program has benefitted you personally? [DO NOT READ; SELECT ALL THAT APPLY]

- 1. Lower energy bills
- 2. Environmental benefits/going green/reducing pollution
- 3. Learning opportunity for kids
- 4. Pride in our building
- 5. No benefits
- 6. Other, SPECIFY: _____
- 98. Refused
- 99. Don't know

**Q15. Can you tell me more about those benefits that you personally have experienced?
Probe for details. For example, Instead of only reporting “the energy efficiency upgrades lead to a decrease in my asthma attacks”, probe for more precise answer: I only use my inhaler 10 times a week now compared to 20 times a week when the building had not been upgraded yet.”]**

Q16. How do you think a program such as MASH, which provides rebates to install solar at a reduced rate, benefits the environment? [PROBE FOR MULTIPLE RESPONSES; DO NOT READ; SELECT ALL THAT APPLY]

1. Avoiding use of fossil fuels/coal
2. Cleaner air
3. Preventing global warming/climate change
4. Increasing awareness of renewable energy/solar options
5. No benefits
6. Other, SPECIFY: _____
98. Refused
99. Don't know

Q17. How do you think a program such as MASH benefits your community and the economy? [PROBE FOR MULTIPLE RESPONSES; DO NOT READ; SELECT ALL THAT APPLY]

1. More money to spend on other things
2. Job creation for solar installers
3. Learning opportunities/raising awareness
4. Pride in our community
5. No benefits
6. Other, SPECIFY: _____
98. Refused
99. Don't know

Q18. What are the drawbacks of living in a building that has a solar system? [PROBE FOR MULTIPLE RESPONSES; DO NOT READ; SELECT ALL THAT APPLY]

1. Unpredictable energy bills
2. Concerns about reliability
3. Aesthetics/look of the panels
4. Other, SPECIFY: _____
5. No drawbacks (SKIP TO Q20)
98. Refused
99. Don't know

Q19. Is there anything that your utility could do to improve the MASH program to counteract those drawbacks? [DO NOT READ; SELECT ONE]

- 1. Nothing they could do
- 2. Other, SPECIFY: _____
- 98. Refused
- 99. Don't know

Q20. If you moved to a different building that did not have solar, would you encourage your property manager or landlord to participate in the MASH program?

- 1. Yes
- 2. No
- 98. Refused
- 99. Don't know

My next few questions will focus on energy efficiency, including energy-efficient products or equipment you may have installed in your home as well as behaviors or actions you may have taken to save energy.

Q21. Are you aware of any utility programs that provide assistance or rebates for the installation of energy efficiency products?

- 1. Yes
- 2. No (SKIP TO Q25)
- 98. Refused (SKIP TO Q25)
- 99. Don't know (SKIP TO Q25)

Q22. Have you ever participated in any of these energy efficiency programs? [DO NOT READ; SELECT ONE]

- 1. Yes
- 2. No (SKIP TO Q25)
- 98. Refused (SKIP TO Q25)
- 99. Don't know (SKIP TO Q25)

Q23. Do you recall the names of the program or programs that you participated in? [DO NOT READ; SELECT ALL THAT APPLY]

- 1. Energy Savings Assistance Program (SKIP TO Q25)
- 2. Other, SPECIFY: _____
- 98. Refused
- 99. Don't know

Q24. Did you participate in a program called the Energy Savings Assistance Program?

- 1. Yes
- 2. No
- 98. Refused
- 99. Don't know

Q25. How would you rate your knowledge of energy efficiency and ways to save energy in your home, on a scale of 1 to 5 where 5 means very knowledgeable and 1 means not at all knowledgeable?

_____ (enter a number 1 through 5, or 98=Refused, 99=Don't Know)

Q26. If your utility wanted to help you increase your knowledge of energy efficiency and programs that could help you save energy in your home, what would be the best way to communicate with you?

Q27. Have you installed any energy-efficient products in your home within the past two years?

1. Yes
2. No (SKIP TO Q30)
98. Refused (SKIP TO Q30)
99. Don't know (SKIP TO Q30)

Q28. What type of energy-efficient products did you install? [DO NOT READ, SELECT ALL THAT APPLY]

1. CFL/compact fluorescent light bulbs
2. LED light bulbs
3. Programmable thermostat
4. Refrigerator
5. Freezer
6. Dishwasher
7. Clothes washer
8. Clothes dryer
9. Water heater
10. Pipe wrap on water heater pipes
11. Furnace
12. Furnace fan
13. Air conditioner
14. Insulation
15. Windows
16. Other, SPECIFY: _____
98. Refused
99. Don't know

Q29. Were these energy-efficient products installed through a utility energy efficiency program or on your own, without a program rebate? [DO NOT READ, SELECT ALL THAT APPLY]

- 1. A utility energy efficiency program
- 2. On my own, without a program rebate
- 3. Varies; some products installed through program and some on own
- 98. Refused
- 99. Don't know

Q30. In the past two years, have you made any behavioral changes to reduce the amount of heating, air conditioning, or hot water that you use?

- 1. Yes
- 2. No (SKIP TO Q32)
- 98. Refused (SKIP TO Q32)
- 99. Don't know (SKIP TO Q32)

Q31. What specific changes have you made to reduce the amount of heating, air conditioning, or hot water that you use? [DO NOT READ, SELECT ALL THAT APPLY]

- 1. Use air conditioning for fewer hours
- 2. Use fans instead of air conditioning
- 3. Set air conditioner to higher temperature
- 4. Use less air conditioning (general)
- 5. Set heating to lower temperature
- 6. Program thermostat
- 7. Wash laundry in cold water
- 8. Adjust water heater thermostat
- 9. Change furnace filter
- 10. Other, SPECIFY: _____
- 98. Refuse /
- 99. Don't know

Q32. Are there any other energy savings actions which you're considering but have not yet taken? These could include installation of energy efficiency products or behavioral changes. [DO NOT READ, SELECT ALL THAT APPLY]

- 1. CFL/compact fluorescent light bulbs
- 2. LED light bulbs
- 3. Programmable thermostat
- 4. Refrigerator
- 5. Freezer
- 6. Dishwasher
- 7. Clothes washer
- 8. Clothes dryer
- 9. Water heater
- 10. Pipe wrap on water heater pipes
- 11. Furnace
- 12. Furnace fan
- 13. Air conditioner

- 14. Insulation
- 15. Windows
- 16. Use air conditioning for fewer hours
- 17. Use fans instead of air conditioning
- 18. Set air conditioner to higher temperature
- 19. Use less air conditioning (general)
- 20. Set heating to lower temperature
- 21. Program thermostat
- 22. Wash laundry in cold water
- 23. Adjust water heater thermostat
- 24. Change furnace filter
- 25. Other, SPECIFY: _____
- 98. Refused
- 99. Don't know

We're almost done with the survey. I just have a few more questions about you and your household. I also want to take a moment to remind you that your responses are completely confidential and will not be linked to you personally in any way.

Q33. I'm going to read you a short series of statements about energy use and your energy bills. Please tell me how much you agree or disagree with these statements on a scale from 1 to 5, where 1 means you strongly disagree and 5 means you strongly agree. {RECORD 1-5, DK, REF}

- _____ a. I am very concerned about how energy use affects the environment.
- _____ b. I often worry that the cost of energy for my home will increase.
- _____ c. I intend to conserve electricity in my home next summer.
- _____ d. I am already doing everything I can to save energy in my home.
- _____ e. I understand how actions taken by me and others in my household result in higher or lower energy use.
- _____ f. It would make me proud to have one of the most energy-efficient houses in my neighborhood.

Q34. How many people live in your home year-round, including yourself?

_____ [RECORD NUMBER, DK, REF]

Q35. How many of your household's residents are children aged 18 or younger?

_____ [RECORD NUMBER, DK, REF]

Q36. How many of your household's residents are aged 65 or older?

_____ [RECORD NUMBER, DK, REF]

Q37. Are there any disabled individuals in your household?

- 1. Yes
- 2. No
- 98. Refused
- 99. Don't know

Q38. What is the primary language spoken in your home?

1. English
2. Spanish
3. Other, Specify: _____
98. Refused
99. Don't know

Q39. What is your annual household income? Just stop me when I get to the right category. Is it...

1. Less than \$10,000
2. \$10,000 to just under \$20,000
3. \$20,000 to just under \$30,000
4. \$30,000 to just under \$40,000
5. \$40,000 to just under \$50,000
6. \$50,000 to just under \$60,000
7. \$60,000 to just under \$70,000
8. \$70,000 to just under \$80,000
9. \$80,000 to just under \$90,000
10. \$90,000 to just under \$100,000
11. \$100,000 or more?
98. Refused
99. Don't know

Those are all my questions. Thank you very much for your time.

Q4. {Interviewer: DO NOT READ, What is the gender of the respondent?}

1. Male
2. Female

Q5. {Interviewer: DO NOT READ, Whom are you speaking to?}

1. (RESPONDENT NAME ON LIST)
2. SPOUSE/PARTNER
3. CARETAKER/GUARDIAN
4. OTHER/DON'T KNOW

Appendix D Survey Frequency Tables

D.1 SASH PARTICIPANT HOMEOWNER SURVEY FREQUENCIES

All (n=100)			
Q#	Question	Count	Percent
Q1	{Interviewer: DO NOT READ, Whom are you speaking to?}		
	[Names omitted for confidentiality]		
Q3	Would you prefer to answer my questions in English or Spanish?		
	English	70	70.0%
	Spanish	30	30.0%
	Total	100	100.0%
Q4	Have you participated in the Single-Family Affordable Solar Housing Program, also known as SASH, a program delivered by GRID Alternatives that installs free or reduced-cost solar PV systems on your roof to produce electricity?		
	Yes	100	100.0%
	No	0	0.0%
	Don't know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q5	Are you currently living in the same home where the solar PV system was installed?		
	Yes	100	100.0%
	No	0	0.0%
	Don't know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q6	When you first heard about the SASH program, did you have any concerns about participating in the program? [DO NOT READ; SELECT ONE]		
	Yes	31	31.0%
	No	68	68.0%
	Don't know	1	1.0%
	Refused	0	0.0%
	Total	100	100.0%
Q7	What were your greatest concerns? [DO NOT READ; SELECT ALL THAT APPLY]		
	Cost of the system	10	32.3%
	Roof / would it cause damage or leaks	1	3.2%

All (n=100)			
Q#	Question	Count	Percent
	Maintenance	2	6.5%
	Safety	4	12.9%
	Offer is "too good to be true"	18	58.1%
	Other specified	4	12.9%
	Total	31	100.0%
Q8	Did you contribute to the cost of the solar PV system? [DO NOT READ; SELECT ONE]		
	Yes	1	1.0%
	No	98	98.0%
	Don't know	1	1.0%
	Total	100	100.0%
Q9	How much did you contribute? [RECORD DOLLAR AMOUNT, DK, REF]		
	Don't know	1	100.0%
	Total	1	100.0%
Q10	Would you have installed solar if you were required to contribute to the cost? [DO NOT READ; SELECT ONE]		
	Yes	36	36.4%
	No	55	55.6%
	Refused	0	0.0%
	Don't know	8	8.1%
	Total	99	100.0%
Q11	How much would you have been willing to contribute to the cost? [RECORD DOLLAR AMOUNT, DK, REF]		
	\$100/month	1	2.8%
	\$500	2	5.6%
	\$750	1	2.8%
	under \$1000	1	2.8%
	\$1,000	4	11.1%
	\$2,000	3	8.3%
	\$2,500	1	2.8%
	\$10,000	1	2.8%
	\$15,000	1	2.8%
	25%	2	5.6%
	Don't Know	18	50.0%
	Refused	1	2.8%
	Total	36	100.0%
Q12	Would you have been willing to take out a loan to pay part of the cost? [DO NOT READ; SELECT ONE]		

All (n=100)			
Q#	Question	Count	Percent
	Yes	15	15.2%
	No	82	82.8%
	Don't know	2	2.0%
	Total	99	100.0%
Q13	Would you have been willing to take out a loan if the amount of money you saved each month from installing the solar PV system more than covered the monthly loan amount? [DO NOT READ; SELECT ONE]		
	Yes	29	29.3%
	No	64	64.6%
	Don't know	6	6.1%
	Total	99	100.0%
Q14	What impact has the solar installation had on your ability to afford your energy bill? Has it made your bill much more affordable, somewhat more affordable, slightly more affordable, or has it not made your bill more affordable? [DO NOT READ; SELECT ONE]		
	Much more affordable	87	87.0%
	Somewhat more affordable	8	8.0%
	Slightly more affordable	2	2.0%
	Not more affordable	1	1.0%
	Don't know	2	2.0%
	Total	100	100.0%
Q15	Besides making your energy bills more affordable, have you noticed any other positive impacts or benefits resulting from the installation of solar on your home? [DO NOT READ; SELECT ALL THAT APPLY]		
	Environmental benefits/going green/reducing pollution	19	19.0%
	Pride in our home	3	3.0%
	No benefits	69	69.0%
	Other specified	6	6.0%
	Don't Know	5	5.0%
	Total	100	100.0%
Q16	What benefits of solar PV did you consider when deciding whether or not to install a system on your home? [DO NOT READ LIST, SELECT ALL THAT APPLY]		
	Helping the environment/reducing personal carbon footprint/reducing pollution	31	31.0%
	Save money in the long run	69	69.0%

All (n=100)			
Q#	Question	Count	Percent
	Protection against future electric utility rate increases	15	15.0%
	Self-sufficiency/going "off the grid"/independence from electric utility	6	6.0%
	My friends/neighbors/people I admire are going solar	3	3.0%
	Available rebates	2	2.0%
	To improve the value of my home	4	4.0%
	Other specified	6	6.0%
	Don't know	1	1.0%
	Total	100	100.0%
Q17	I am going to read you a list of factors that may have motivated you to install solar PV; please tell me how motivational each of these factors was in your decision-making on a scale of 1 to 5, where 1 is not at all motivational and 5 is very motivational. [RANDOMIZE ORDER OF LIST] [RECORD 1-5, DK, REF]		
Q17a	How motivational was saving the environment on your decision-making?		
	1	3	3.0%
	2	4	4.0%
	3	6	6.0%
	4	13	13.0%
	5	73	73.0%
	Don't Know	1	1.0%
	Refused	0	0.0%
	Total	100	100.0%
Q17b	How motivational was saving money or controlling electric bills on your decision-making?		
	1	1	1.0%
	2	1	1.0%
	3	3	3.0%
	4	5	5.0%
	5	90	90.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q17c	How motivational was achieving self-sufficiency or independence from the utility on your decision-making?		
	1	5	5.0%
	2	3	3.0%

All (n=100)			
Q#	Question	Count	Percent
	3	12	12.0%
	4	19	19.0%
	5	59	59.0%
	Don't Know	1	1.0%
	Refused	1	1.0%
	Total	100	100.0%
Q17d	How motivational was protecting yourself from future bill increases on your decision-making? [RECORD 1-5, DK, REF]		
	1	1	1.0%
	2	5	5.0%
	3	6	6.0%
	4	11	11.0%
	5	76	76.0%
	Don't Know	1	1.0%
	Refused	0	0.0%
	Total	100	100.0%
Q17e	How motivational was people in your neighborhood having adopted solar PV on your decision-making? [RECORD 1-5, DK, REF]		
	1	24	24.0%
	2	5	5.0%
	3	10	10.0%
	4	11	11.0%
	5	46	46.0%
	Don't Know	4	4.0%
	Refused	0	0.0%
	Total	100	100.0%
Q17f	How motivational was rebates, incentives, or tax credits on your decision-making? [RECORD 1-5, DK, REF]		
	1	46	46.0%
	2	2	2.0%
	3	5	5.0%
	4	5	5.0%
	5	31	31.0%
	Don't Know	11	11.0%
	Refused	0	0.0%
	Total	100	100.0%

All (n=100)			
Q#	Question	Count	Percent
Q18	Q18. What do you think prevents other customers from participating in a program like this one? [OPEN-ENDED]		
	A lady down the road had solar and seems to think her bill is the same so she told other people and I told other people there maybe something wrong with her panels because mine is less	1	1.0%
	A lot of people think they won't qualify based on the income or they have to pay out of pocket and I had people ask me about the panels but they say I have to pay it back for a lot of years	1	1.0%
	Amount	1	1.0%
	Area where you live	1	1.0%
	Awareness of the program and misconception of how it works	1	1.0%
	Because there are a lot of requirements that people can't meet. Only owners can participate.	1	1.0%
	Because they don't know how much it will cost.	1	1.0%
	Cost	8	8.0%
	Distrust of authority of the utility distrust of political institutions	1	1.0%
	Doubt	1	1.0%
	Doubt: Too good to be true	1	1.0%
	Eligibility	1	1.0%
	Everyone thinks differently	2	2.0%
	Fear of hidden costs. Roofs being repaired.	1	1.0%
	Fear of the unknown	1	1.0%
	hard to use	1	1.0%
	How much money they are going to spend	1	1.0%
	I don't know, some people don't know.	1	1.0%
	In my area people were shy about it because most people are marijuana growers	1	1.0%
	Income requirements	1	1.0%
	Information	2	2.0%
	Just the requirements are too strict.	1	1.0%
	Lack of awareness about the program and how to apply to the program	1	1.0%
	Lack of belief	1	1.0%

			All (n=100)
Q#	Question	Count	Percent
	lack of information about the program	1	1.0%
	Lack of knowledge	1	1.0%
	Lack of knowledge and qualifications	1	1.0%
	Lack of knowledge or education	1	1.0%
	Lack of money	1	1.0%
	Low-income	1	1.0%
	Money	2	2.0%
	Money and "it's too good to be true."	1	1.0%
	Money. The initial outlay.	1	1.0%
	Money/Knowledge of the product	1	1.0%
	more information they just need to know that its saving money I wanted to save bills	1	1.0%
	Not being able to reach program administrators.	1	1.0%
	Not enough information	1	1.0%
	Not everyone qualifies	1	1.0%
	Not knowing about it	3	3.0%
	Not knowing if they qualified	1	1.0%
	Not knowing if they speak their language	1	1.0%
	Not qualified	2	2.0%
	Not sure that they want to commit to the installation	1	1.0%
	Not trusting people	1	1.0%
	Not trusting the cost benefits	1	1.0%
	Nothing.	1	1.0%
	People already have money. Installation problems.	1	1.0%
	People are scared they will pay in the long run for the solar system	1	1.0%
	People's roofs are not up to par and people being distrustful.	1	1.0%
	Qualifying issues	3	3.0%
	Qualifying/ money in case they don't qualify	1	1.0%
	Roof are old and not enough money for the roof	1	1.0%
	Scared of change	1	1.0%
	Scared they might break the roof	1	1.0%
	Some don't qualify	1	1.0%
	Some people make more than other people some of the requirements	1	1.0%

			All (n=100)
Q#	Question	Count	Percent
	Some people rent	1	1.0%
	The cost - my mom lives in Los Angeles and she said its pricey	1	1.0%
	The cost they may have to pay.	1	1.0%
	The costs. The installation costs a lot	1	1.0%
	They are afraid that the program is not real	1	1.0%
	They are afraid they might get in over their heads.	1	1.0%
	They are not aware that the program exists.	1	1.0%
	They are scared they might have to pay too much in the end.	1	1.0%
	They are worried about hidden costs. "It's too good to be true."	1	1.0%
	They don't know about it or they don't qualify	1	1.0%
	They don't know about it they are expensive	1	1.0%
	They don't know how much they will be saving in the long run	1	1.0%
	They don't know that it's free or that they qualify.	1	1.0%
	They don't understand the program and the income is too high they don't qualify and it costs too much	1	1.0%
	They have to pay for it the government put it down for low-income	1	1.0%
	They probably don't believe it and also location	1	1.0%
	They think it's a catch to it because it was too good to be true maybe laziness not calling for it some people don't know about it they should reach others who are not low-income maybe some mailing or advertisements or web ads	1	1.0%
	They think you guys lie to good to be true	1	1.0%
	They would be weary too good to be true I talked to a lot of people they have to pay so I don't know how it works	1	1.0%
	Too good to be true	1	1.0%
	Unaware of it	1	1.0%
	Word of mouth and they don't believe it people think it's a catch too good to be true	1	1.0%
	Don't Know	7	7.0%

All (n=100)			
Q#	Question	Count	Percent
	Total	100	100.0%
Q19	I would like to ask you a few questions about how satisfied or dissatisfied you were with different aspects of participation in the SASH program. I will read you a list, and for each item, please rate your satisfaction on a 1 to 5 scale where 5 means very satisfied and 1 means very dissatisfied. [RECORD 1-5, DK, REF]		
Q19a	The program application process		
	1	0	0.0%
	2	0	0.0%
	3	2	2.0%
	4	15	15.0%
	5	82	82.0%
	Refused	1	1.0%
	Total	100	100.0%
Q19b	The installation process for your PV system		
	1	1	1.0%
	2	2	2.0%
	3	3	3.0%
	4	8	8.0%
	5	85	85.0%
	Refused	1	1.0%
	Total	100	100.0%
Q19c	The education you received about your solar PV system and how to maintain it		
	1	0	0.0%
	2	0	0.0%
	3	6	6.0%
	4	19	19.0%
	5	75	75.0%
	Don't Know	0	0.0%
	Total	100	100.0%
Q19d	The performance of your solar PV system		
	1	0	0.0%
	2	1	1.0%
	3	4	4.0%
	4	9	9.0%
	5	85	85.0%
	Refused	1	1.0%

			All (n=100)
Q#	Question	Count	Percent
	Total	100	100.0%
Q19e	The ease of working with GRID Alternatives		
	1	0	0.0%
	2	0	0.0%
	3	0	0.0%
	4	10	10.0%
	5	89	89.0%
	Refused	1	1.0%
	Total	100	100.0%
Q19f	The overall SASH program experience		
	1	0	0.0%
	2	0	0.0%
	3	0	0.0%
	4	14	14.0%
	5	86	86.0%
	Don't Know	0	0.0%
	Total	100	100.0%
Q20	What changes would you recommend to the program, if any?		
	A little more education about maintenance to let you know if it's still working.	1	1.0%
	Better communication about what is going on during the period between submitting the application and hearing if you were approved for the program.	1	1.0%
	Change the installation they should hide the box it should be someplace where it can't be seen	1	1.0%
	Don't lie about the permits that we need	1	1.0%
	Due to the configuration of the house they put in a small set of panels I wanted to put some on my car port I wanted to get the maximum	1	1.0%
	Explanation that people know its free from the government we have a small town	1	1.0%
	Fix it so that black outs happen in the city my house won't be affected too	1	1.0%
	Have more people apply	1	1.0%
	Have more people come and talk to people and explain the system to them and how it helps the environment	1	1.0%

			All (n=100)
Q#	Question	Count	Percent
	Have more Spanish speakers and have their ID badges showing more	1	1.0%
	Have someone talk to them after the installation\	1	1.0%
	Have the program offer more free services.	1	1.0%
	Have the program people explain the program better.	1	1.0%
	Having a toll free number to call if we have questions	1	1.0%
	Having different tiers of qualification. For some people it's too much to pay out of pocket.	1	1.0%
	Having more representatives for the applicants people who are devoted to the applications not the installers there was only one person who did everything	1	1.0%
	I wasn't that big on the closing out of the program. It could have been organized better	1	1.0%
	I would say making the hidden cost issue clearer to the public that there aren't hidden costs.	1	1.0%
	I would say that after they put the system up they hose the panels and check for leaks	1	1.0%
	It could be cheaper	1	1.0%
	Lower the income level to qualify for the program.	1	1.0%
	Maintenance maybe the education maybe additional resources to make sure how to maintain a more clear resource	1	1.0%
	Make it available to people who don't own their homes.	1	1.0%
	Make it more efficient less overall cost of the system better publicize	1	1.0%
	Make more people aware of the program.	1	1.0%
	More advertisement	1	1.0%
	More affordable	1	1.0%
	More for low income people	1	1.0%
	More information about how solar works and the financial savings and guarantees	1	1.0%
	More outreach in multiple languages.	1	1.0%

			All (n=100)
Q#	Question	Count	Percent
	More panels per house	1	1.0%
	More public outreach to low income	1	1.0%
	More publicity about thing they are not aware	1	1.0%
	More time devoted to promoting the program in general	1	1.0%
	Offer to more people to allow down payments	1	1.0%
	Pay every month or three months instead of every year	1	1.0%
	Pigeon control	1	1.0%
	Publicize it online more.	1	1.0%
	Put out more advertising and information. I didn't find out about it until one relatives told me.	1	1.0%
	Send more fliers	1	1.0%
	Tell more people I tell people I have solar send mailers or email	1	1.0%
	The contractors they were over-scheduled they didn't respond and didn't book us for a long time they were confused disorganized they didn't call us they just came out so I was glad I was home	1	1.0%
	There are a lot of people on the roof at one time when you put the solar on its more traffic than necessary other people were on the roof for nothing	1	1.0%
	They need to improve their marketing of the program	1	1.0%
	They should check it every year to make sure it's alright and also to check the roof if rain damaged	1	1.0%
	To make the process a little faster, because I waited over a year.	1	1.0%
	When we receive a bill the overage should be on the front page.	1	1.0%
	None	51	51.0%
	Don't Know	2	2.0%
	Total	100	100.0%

All (n=100)			
Q#	Question	Count	Percent
Q21	Q21. Prior to your participation in the SASH program, how would you rate your knowledge of energy efficiency and ways to save energy in your home, on a scale of 1 to 5 where 5 means very knowledgeable and 1 means not at all knowledgeable? [RECORD 1-5, DK, REF]		
	1	18	18.0%
	2	16	16.0%
	3	23	23.0%
	4	23	23.0%
	5	19	19.0%
	Don't Know	0	0.0%
	Refused	1	1.0%
	Total	100	100.0%
Q22	Has participation in the SASH program increased your awareness of energy efficiency and ways to save energy in your home? [DO NOT READ; SELECT ONE]		
	Yes	95	95.0%
	No	5	5.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q23	How would you rate your knowledge of energy efficiency and ways to save energy in your home now, on a scale of 1 to 5 where 5 means very knowledgeable and 1 means not at all knowledgeable? [RECORD 1-5, DK, REF]		
	1	5	5.0%
	2	1	1.0%
	3	8	8.0%
	4	32	32.0%
	5	54	54.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q24	Prior to the installation of your solar PV system, did you have an energy audit conducted? An energy audit is when a contractor or technician comes into your home and looks for ways in which your home's energy efficiency could be improved. [DO NOT READ; SELECT ONE]		
	Yes	62	62.0%
	No	34	34.0%
	Don't Know	4	4.0%

All (n=100)			
Q#	Question	Count	Percent
	Refused	0	0.0%
	Total	100	100.0%
Q25	Did someone from GRID Alternatives speak to you about how to reduce the amount of energy that you use in your home? [DO NOT READ; SELECT ONE]		
	Yes	89	89.0%
	No	8	8.0%
	Don't Know	3	3.0%
	Refused	0	0.0%
	Total	100	100.0%
Q26	Did someone from GRID Alternatives speak to you about the Energy Savings Assistance Program, a separate program that provides energy efficiency services to reduce the amount of energy that your home uses? [DO NOT READ; SELECT ONE]		
	Yes	64	64.0%
	No	22	22.0%
	Don't Know	14	14.0%
	Refused	0	0.0%
	Total	100	100.0%
Q27	Since learning about the SASH program, have you participated in the Energy Savings Assistance Program or any other utility energy efficiency program? [DO NOT READ; SELECT ONE]		
	Yes – Energy Savings Assistance Program	9	9.0%
	Yes – other program specified	12	12.0%
	Yes – both Energy Savings Assistance Program and another program specified	3	3.0%
	No	74	74.0%
	Don't Know	2	2.0%
	Refused	0	0.0%
	Total	100	100.0%
Q28	Since learning about the SASH program, have you installed any energy-efficient products in your home? [DO NOT READ LIST, SELECT ONE]		
	Yes	44	48.4%
	No	45	49.5%
	Refused	1	1.1%
	Don't Know	1	1.1%
	Total	91	100.0%
Q29	What types of energy-efficient products did you install? [DO NOT READ LIST, SELECT ALL THAT APPLY]		

			All (n=100)
Q#	Question	Count	Percent
	CFL	21	39.6%
	LED light bulbs	19	35.8%
	Freezer	2	3.8%
	Dishwasher	2	3.8%
	Refrigerator	13	24.5%
	Clothes washer	7	13.2%
	Clothes dryer	5	9.4%
	Water heater	3	5.7%
	Furnace	1	1.9%
	Insulation	6	11.3%
	Windows	5	9.4%
	Other specified	11	20.8%
	Don't know	1	1.9%
	Total	53	100.0%
Q30	If the SASH program had required you to make more energy efficiency upgrades to your home before you could have solar panels installed, how likely would you have been to participate in SASH? Please rate on a 1-5 scale, where 5 is very likely to participate and 1 is not at all likely to participate. [RECORD 1-5, DK, REF]		
	1	20	20.0%
	2	7	7.0%
	3	14	14.0%
	4	18	18.0%
	5	27	27.0%
	Don't Know	14	14.0%
	Refused	0	0.0%
	Total	100	100.0%
Q31	Why did you give that rating?		
	Anything they wanted too, I was going to be benefit from them	1	1.0%
	Anything to save money	1	1.0%
	As long as it was affordable	1	1.0%
	Because I couldn't afford it.	1	1.0%
	Because I didn't know all the information I know now	1	1.0%
	Because I don't make a lot of money	1	1.0%
	Because I have financial issues, it would be difficult to cover the costs.	1	1.0%

All (n=100)			
Q#	Question	Count	Percent
	Because I wouldn't sure if I could it.	1	1.0%
	Because it saves energy	1	1.0%
	Because the amount of time and effort is too much.	1	1.0%
	Because you're telling me to do something, but I couldn't afford it.	1	1.0%
	Before they installed my home was already energy-efficient	1	1.0%
	Brand new house	1	1.0%
	Depending on the cost of the program.	1	1.0%
	Depends on the cost the house I am in is brand new all the appliances are new	1	1.0%
	Depends on the income	1	1.0%
	Depends on what they need us to do if it's expensive not going to do it but if they want to change lights its ok but larger appliances high cost items I would not do it	1	1.0%
	Didn't have money to spend	1	1.0%
	Didn't know at the time/also house is new	1	1.0%
	Don't know	7	7.1%
	Don't understand	1	1.0%
	House is brand new	1	1.0%
	How much it will cost	1	1.0%
	I did put a roof on it as is.	1	1.0%
	I feel that it's important to do the upgrades.	1	1.0%
	I just purchased my house so I'm okay	1	1.0%
	I like to watch TV, and other appliances, refrigerators. I used a lot of energy.	1	1.0%
	I probably wouldn't have the money to make upgrades	1	1.0%
	I really wanted solar. I like the feeling of being independent from energy companies	1	1.0%
	I still would have installed it	1	1.0%
	I think everyone should be able to afford and have solar.	1	1.0%
	I think it's a great program.	1	1.0%
	I think that the benefits of solar are worth it	1	1.0%

All (n=100)			
Q#	Question	Count	Percent
	I want to save more energy or gas or water I want to save the world going green is what I want to do	1	1.0%
	I was always interested in doing.	1	1.0%
	I would consider it but it would all depend on the cost	1	1.0%
	I would do everything I could for the environment.	1	1.0%
	I wouldn't have been able to afford it	1	1.0%
	I wouldn't have been able to afford it.	1	1.0%
	I'd like the solar	1	1.0%
	If it cost too much then no	1	1.0%
	If not cost prohibited I would	1	1.0%
	If they pay, then yes	1	1.0%
	If they would have pay for it	1	1.0%
	I'm very satisfied with solar and I am not worried about the electric bill	1	1.0%
	It depends on the cost	1	1.0%
	It depends on the type of upgrades.	1	1.0%
	It depends on what they want me to install	1	1.0%
	It is beneficial	1	1.0%
	It save energy in the long run	1	1.0%
	It saves energy and they explained it all good covered all the questions we asked overall we will save money	1	1.0%
	It saves me electricity	1	1.0%
	It was worth it	1	1.0%
	It would depend on what sort of upgrades they wanted. If they were very costly I probably would have declined	1	1.0%
	It would depend on what they were and what the cost impact would have been	1	1.0%
	It would have cost too much.	1	1.0%
	It would have increased my awareness of how to be more efficient in energy use around the house	1	1.0%
	It would reduce the cost.	1	1.0%

All (n=100)			
Q#	Question	Count	Percent
	its less expensive to change light bulbs than solar	1	1.0%
	It's very helpful and necessary	1	1.0%
	It's well worth it	1	1.0%
	Just remodel the home	1	1.0%
	Makes house more efficiently	1	1.0%
	Maybe have to see how much we to pay	1	1.0%
	Maybe if we could save money	1	1.0%
	Money	1	1.0%
	My home is already energy-efficient	1	1.0%
	My home is new so it's up to date	1	1.0%
	No brand new phone	1	1.0%
	No loans	1	1.0%
	No money	2	2.0%
	Not enough money	1	1.0%
	Prior to learning about the program I was not as knowledgeable about different energy-efficient products	1	1.0%
	Probably not	1	1.0%
	Save the environment	1	1.0%
	Sometimes I don't have the money for changes	1	1.0%
	The cost of replacing the appliances already have ee appliances	1	1.0%
	The cost would have been my worry.	1	1.0%
	The roof might have some leaks	1	1.0%
	The savings in the long run	1	1.0%
	There comes a time that you have to become energy-efficient.	1	1.0%
	They would have to pay for it	1	1.0%
	To get the panels I would try to work something out I would get credit for appliances like maybe trade in	1	1.0%
	To have better appliances change my dryer	1	1.0%
	To see	1	1.0%
	Very important	1	1.0%
	We already us little energy	1	1.0%
	We did it to my house	1	1.0%

All (n=100)			
Q#	Question	Count	Percent
	Would have been later to install more ee products	1	1.0%
	Would not be able to afford the other purchases	1	1.0%
	Yes	1	1.0%
	Yes, is beneficial in the long run	1	1.0%
	Total	99	100.0%
Q32	Since participating in the SASH program, have you made any behavioral changes to reduce the amount of heating, air conditioning, or hot water that you use? [DO NOT READ; SELECT ONE]		
	Yes*	57	57.0%
	No	43	43.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
	* Two respondents that said "Yes" only mentioned equipment changes.		
Q33	What specific changes have you made to reduce the amount of heating, air conditioning, or hot water that you use? [DO NOT READ LIST, SELECT ALL THAT APPLY]		
	Use air conditioning for fewer hours	9	15.8%
	Use fans instead of air conditioning	6	10.5%
	Use less air conditioning	6	10.5%
	Set heating to lower temperature	7	12.3%
	Program thermostat	5	8.8%
	Wash laundry in cold water	10	17.5%
	Adjust water heater thermostat	6	10.5%
	Change furnace filter	2	3.5%
	Other specified	28	49.1%
	Don't Know	1	1.8%
	Total	57	100.0%
Q34	Q34. Are there any other energy savings actions which you're considering but have not yet taken? These could include installation of energy efficiency products or behavioral changes. [DO NOT READ LIST, SELECT ALL THAT APPLY]		
	CFL	3	3.0%
	LED light bulbs	5	5.0%
	Clothes washer	2	2.0%
	Clothes dryer	1	1.0%
	Air conditioner	2	2.0%

All (n=100)			
Q#	Question	Count	Percent
	Refrigerator	3	3.0%
	Freezer	1	1.0%
	Water heater	4	4.0%
	Furnace	3	3.0%
	Insulation	2	2.0%
	Windows	4	4.0%
	Other specified	26	26.0%
	Refused	7	7.0%
	Don't know	49	49.0%
	Total	100	100.0%
Q35	I am going to read you a short series of statements about energy use and your energy bills. Please tell me how much you agree or disagree with these statements on a scale from 1 to 5, where 1 means you strongly disagree and 5 means you strongly agree. [RANDOMIZE ORDER OF LIST] [RECORD 1-5, DK, REF]		
Q35a	I am very concerned about how energy use affects the environment.		
	1	3	3.0%
	2	2	2.0%
	3	10	10.0%
	4	15	15.0%
	5	69	69.0%
	Don't Know	0	0.0%
	Refused	1	1.0%
	Total	100	100.0%
Q35b	I often worry that the cost of energy for my home will increase.		
	1	6	6.0%
	2	4	4.0%
	3	10	10.0%
	4	15	15.0%
	5	65	65.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q35c	I intend to conserve electricity in my home next summer.		
	1	0	0.0%
	2	0	0.0%
	3	3	3.0%
	4	15	15.0%

All (n=100)			
Q#	Question	Count	Percent
	5	82	82.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q35d	I am already doing everything I can to save energy in my home.		
	1	0	0.0%
	2	1	1.0%
	3	3	3.0%
	4	20	20.0%
	5	76	76.0%
	Don't Know	0	0.0%
	Refused	0	0.0%
	Total	100	100.0%
Q35e	I understand how actions taken by me and others in my household result in higher or lower energy use.		
	1	0	0.0%
	2	0	0.0%
	3	3	3.0%
	4	6	6.0%
	5	90	90.0%
	Don't Know	0	0.0%
	Refused	1	1.0%
	Total	100	100.0%
Q35f	It would make me proud to have one of the most energy-efficient houses in my neighborhood.		
	1	0	0.0%
	2	1	1.0%
	3	2	2.0%
	4	11	11.0%
	5	84	84.0%
	Don't Know	0	0.0%
	Refused	2	2.0%
	Total	100	100.0%
Q36	How many people live in your home year-round, including yourself?		
	1	10	10.0%
	2	17	17.0%
	3	12	12.0%
	4	30	30.0%

All (n=100)			
Q#	Question	Count	Percent
	5	16	16.0%
	6	11	11.0%
	7	3	3.0%
	8	1	1.0%
	Total	100	100.0%
Q37	How many of your household's residents are children aged 18 or younger?		
	0	42	42.0%
	1	19	19.0%
	2	23	23.0%
	3	7	7.0%
	4	8	8.0%
	5	1	1.0%
	Total	100	100.0%
Q38	How many of your household's residents are aged 65 or older?		
	0	76	76.0%
	1	15	15.0%
	2	9	9.0%
	Total	100	100.0%
Q39	Are there any disabled individuals in your household?		
	Yes	29	29.0%
	No	71	71.0%
	Total	100	100.0%
Q40	What is the primary language spoken in your home?		
	English	60	60.0%
	Spanish	36	36.0%
	Other specified	4	4.0%
	Total	100	100.0%
Q41	What is your annual household income? Just stop me when I get to the right category.		
	Less than 10k	24	24.0%
	10k to 20k	14	14.0%
	20k to 30k	17	17.0%
	30k to 40k	16	16.0%
	40k to 50k	8	8.0%
	50k to 60k	4	4.0%
	60k to 70k	2	2.0%
	70k to 80k	2	2.0%

All (n=100)			
Q#	Question	Count	Percent
	80k to 90k	0	0.0%
	90k to 100k	0	0.0%
	100k or more	1	1.0%
	Refused	5	5.0%
	Don't Know	7	7.0%
	Total	100	100.0%
Q42	What is the gender of the respondent?		
	Male	60	60.0%
	Female	40	40.0%
	Total	100	100.0%

D.2 MASH TENANT SURVEY FREQUENCIES

Q#	Question	Count	Percent
Q1	{Interviewer: DO NOT READ, Whom are you speaking to?}		
	[Names omitted for confidentiality]		
Q3	Are you currently living in a building with a solar system?		
	Yes	73	100.0%
	Total	73	100.0%
Q5	Was the solar PV system installed on your building before or after you moved in?		
	Before	20	27.4%
	After	50	68.5%
	Don't know	3	4.1%
	Total	73	100.0%
Q6	When you were considering moving into this building, did anyone discuss the solar system with you?		
	Yes	4	20.0%
	No	15	75.0%
	Don't know	1	5.0%
	Total	20	100.0%
Q7	Do you recall what they told you?		
	Only to install the system and will save money and energy	1	25.0%

Q#	Question	Count	Percent
	Save money on the bill	1	25.0%
	They told us we have solar panels and payments are due at the end of the year	1	25.0%
	Unsure, bill would be cheaper	1	25.0%
	Total	4	100.0%
Q8	How was the presence of the solar system in your decision to move into this building, on a scale of 1-5?		
	1	1	25.0%
	2	0	0.0%
	3	0	0.0%
	4	1	25.0%
	5	2	50.0%
	Total	4	100.0%
Q9	When you first heard about the solar system being installed on your building, did you have any concerns about it?		
	Yes	9	12.9%
	No	59	84.3%
	Don't know	2	2.9%
	Total	70	100.0%
Q10	What was your greatest concern? (Select all that apply)		
	Possibility of rent increasing	2	16.7%
	How much of the cost I would be responsible for	2	16.7%
	Appearance / how the system would look	1	8.3%
	Roof / would it cause damage or leaks	1	8.3%
	Other specified	6	50.0%
	Total	12	100.0%
Q11	How useful is the information provided on your electricity bill regarding the solar system and the amount of energy it is producing?		
	1	9	12.3%
	2	3	4.1%
	3	9	12.3%
	4	14	19.2%
	5	25	34.2%
	Don't know	13	17.8%
	Total	73	100.0%
Q12	Do you know approximately what percent of your monthly electricity bill is covered by the solar system credit?		

Q#	Question	Count	Percent
	25-30	1	1.4%
	30	1	1.4%
	30-40	1	1.4%
	50	1	1.4%
	75	1	1.4%
	75-80	1	1.4%
	85-95	1	1.4%
	95	1	1.4%
	100	1	1.4%
	Don't know	64	87.7%
	Total	73	100.0%
Q13	What impact has the solar installation had on your ability to afford your energy bill?		
	Much more affordable	50	68.5%
	Somewhat more affordable	10	13.7%
	Slightly more affordable	5	6.8%
	Not more affordable	5	6.8%
	Don't know	3	4.1%
	Total	73	100.0%
Q14	Aside from energy cost savings, have you noticed other benefits resulting from the MASH program and the installation of solar? How do you think the program has benefitted you personally? (Select all that apply)		
	Lower energy bills	26	33.8%
	Environmental benefits/going green/reducing pollution	10	13.0%
	Learning opportunity for kids	1	1.3%
	Pride in our building	1	1.3%
	No benefits	31	40.3%
	Other specified	3	3.9%
	Don't know	5	6.5%
	Total	77	100.0%
Q15	Can you tell me more about those benefits that you personally have experienced?		
	Refused	6	8.2%
	A couple times a year is free so it is good for us	1	1.4%
	Before the panels my bill was up at least 35%	1	1.4%
	Better to pay my bill, and money for my kids	1	1.4%
	Bills are down	1	1.4%

Q#	Question	Count	Percent
	DK	1	1.4%
	Don't know	1	1.4%
	Don't know, maybe helps with my bill	1	1.4%
	Don't pay as much, pay half of what I used to pay	1	1.4%
	Helps me pay for it better since I am on a budget	1	1.4%
	Helps me save money	1	1.4%
	I have lung disease so it helps me	1	1.4%
	I hope it is helping the environment but I'm not sure	1	1.4%
	I like that it's ecofriendly	1	1.4%
	I signed up for the CARE program and it's really low	1	1.4%
	I went shopping for clothes with the money I saved	1	1.4%
	I'm still paying the same amount	1	1.4%
	Instant hot water	1	1.4%
	It helps the environment and helps our family save money	1	1.4%
	Make your energy bill more affordable	1	1.4%
	Much easier to pay bill	1	1.4%
	My monthly bill was 75 dollars before but now with solar it's 20 dollars	1	1.4%
	Nice not to have a low bill	1	1.4%
	No	2	2.7%
	No benefits	1	1.4%
	No other benefits than paying lower the bills	1	1.4%
	None	32	43.8%
	Nothing else	4	5.5%
	Pay less money for bill	1	1.4%
	Really helps the people who have low income	1	1.4%
	The bill is cheaper and keeps me from using too much electricity	1	1.4%
	The rent going down was part of the plan to install the solar. I am unsure of the exact cost	1	1.4%
	There's not a whole lot of pollution in our area	1	1.4%
	Total	73	100.0%

Q#	Question	Count	Percent
Q16	How do you think a program such as MASH, which provides rebates to install solar at a reduced rate, benefits the environment? (Select all that apply)		
	Avoiding use of fossil fuels/coal	23	21.1%
	Cleaner air	33	30.3%
	Preventing global warming/climate change	15	13.8%
	Increasing awareness of renewable energy/solar options	10	9.2%
	No benefits	2	1.8%
	Other specified	5	4.6%
	Refused	1	0.9%
	Don't know	20	18.3%
	Total	109	100.0%
Q17	How do you think a program such as MASH benefits your community and the economy?		
	More money to spend on other things	43	45.3%
	Job creation for solar installers	17	17.9%
	Learning opportunities/raising awareness	11	11.6%
	No benefits	5	5.3%
	Other specified	6	6.3%
	Don't know	13	13.7%
	Total	95	100.0%
Q18	What are the drawbacks of living in a building that has a solar system? (Select all that apply)		
	Unpredictable energy bills	3	4.0%
	Concerns about reliability	2	2.7%
	Aesthetics/look of the panels	3	4.0%
	Other specified	8	10.7%
	No drawbacks	58	77.3%
	Don't know	1	1.3%
	Total	75	100.0%
Q19	Is there anything that your utility could do to improve the MASH program to counteract those drawbacks?		
	Nothing they could do	3	20.0%
	Other specified	7	46.7%
	Don't know	5	33.3%
	Total	15	100.0%

Q#	Question	Count	Percent
Q20	If you moved to a different building that did not have solar, would you encourage your property manager or landlord to participate in the MASH program?		
	Yes	63	86.3%
	No	5	6.8%
	Don't know	5	6.8%
	Total	73	100.0%
Q21	Are you aware of any utility programs that provide assistance or rebates for the installation of energy efficiency products?		
	Yes	22	30.1%
	No	51	69.9%
	Total	73	100.0%
Q22	Have you ever participated in any of these energy efficiency programs?		
	Yes	13	59.1%
	No	9	40.9%
	Total	22	100.0%
Q23	Do you recall the names of the program or programs that you participated in?		
	Energy Savings Assistance Program	1	7.7%
	Other specified	4	30.8%
	Don't know	8	61.5%
	Total	13	100.0%
Q24	Did you participate in a program called the Energy Savings Assistance Program?		
	Yes	8	61.5%
	No	2	15.4%
	Don't know	3	23.1%
	Total	13	100.0%
Q25	How would you rate your knowledge of energy efficiency and ways to save energy in your home?		
	1	7	9.6%
	2	4	5.5%
	3	28	38.4%
	4	16	21.9%
	5	18	24.7%
	Total	73	100.0%

Q#	Question	Count	Percent
Q26	If your utility wanted to help you increase your knowledge of energy efficiency and programs that could help you save energy in your home, what would be the best way to communicate with you?		
	(Spanish) letter, by phone	1	1.4%
	By phone	3	4.1%
	By phone, letter	1	1.4%
	Call or email	1	1.4%
	Call, letters	1	1.4%
	Don't know	1	1.4%
	Email	13	17.8%
	Email or mail	1	1.4%
	Email or mail or phone	1	1.4%
	Email, phone, letters	1	1.4%
	Espanol by phone, letters	1	1.4%
	In person or in a public place	1	1.4%
	Letter, phone	1	1.4%
	Letters	3	4.1%
	Letters, someone coming to explain to my house how to save more energy	1	1.4%
	Mail	10	13.7%
	Mail or in person	1	1.4%
	More languages to be sent home. Live person, or other Middle Eastern languages	1	1.4%
	Newsletter or ads in the mail	1	1.4%
	Ontinel letters, have some come by and let us know for free	1	1.4%
	Phone	4	5.5%
	Phone and email	1	1.4%
	Phone call	7	9.6%
	Phone or mail	2	2.7%
	Phone, letters	2	2.7%
	Phone, letters, have someone come by and explain the system	1	1.4%
	Phone, letters. Come by and explain	1	1.4%
	Text or phone call	1	1.4%
	Through a letter or an email	1	1.4%
	Through email	1	1.4%
	Through the mail	6	8.2%
	We get to have people talk to us	1	1.4%

Q#	Question	Count	Percent
	Total	73	100.0%
Q27	Have you installed any energy-efficient products in your home within the past two years?		
	Yes	24	32.9%
	No	49	67.1%
	Total	73	100.0%
Q28	What type of energy-efficient products did you install? (Select all that apply)		
	CFL	9	28.1%
	LED light bulbs	11	34.4%
	Refrigerator	5	15.6%
	Other specified	7	21.9%
	Total	32	100.0%
Q29	Were these energy-efficient products installed through a utility energy efficiency program or on your own, without a program rebate?		
	A utility energy efficiency program	5	20.8%
	On my own, without program rebate	18	75.0%
	Varies, some products installed through program and some on own	1	4.2%
	Total	24	100.0%
Q30	In the past two years, have you made any behavioral changes to reduce the amount of heating, air conditioning, or hot water that you use?		
	Yes	33	45.2%
	No	40	54.8%
	Total	73	100.0%
Q31	What specific changes have you made to reduce the amount of heating, air conditioning, or hot water that you use? (Select all that apply)		
	Use air conditioning for fewer hours	9	15.8%
	Use fans instead of air conditioning	5	8.8%
	Set air conditioner to higher temperature	2	3.5%
	Use less air conditioning	6	10.5%
	Set heating to lower temperature	17	29.8%
	Wash laundry in cold water	5	8.8%
	Change furnace filter	1	1.8%
	Other specified	12	21.1%
	Total	57	100.0%
Q32	Are there any other energy savings actions which you're considering but have not yet taken? (Select all that apply)		

Q#	Question	Count	Percent
	CFL	6	7.0%
	LED light bulbs	6	7.0%
	Refrigerator	8	9.3%
	Dishwasher	2	2.3%
	Clothes dryer	1	1.2%
	Water heater	1	1.2%
	Furnace	2	2.3%
	Insulation	1	1.2%
	Windows	2	2.3%
	Use fans instead of air conditioning	1	1.2%
	Set air conditioner to higher temperature	1	1.2%
	Adjust water heater thermostat	1	1.2%
	Other specified	6	7.0%
	Don't know	48	55.8%
	Total	86	100.0%
Q33	I am going to read you a short series of statements about energy use and your energy bills. Please tell me how much you agree or disagree with these statements on a scale from 1 to 5, where 1 means you strongly disagree and 5 means you strongly agree.		
Q33a	I am very concerned about how energy use affects the environment.		
	1	2	2.7%
	2	4	5.5%
	3	17	23.3%
	4	16	21.9%
	5	34	46.6%
	Don't Know	0	0.0%
	Total	73	100.0%
Q33b	I often worry that the cost of energy for my home will increase.		
	1	8	11.0%
	2	8	11.0%
	3	13	17.8%
	4	18	24.7%
	5	26	35.6%
	Don't Know	0	0.0%
	Total	73	100.0%
Q33c	I intend to conserve electricity in my home next summer.		
	1	1	1.4%

Q#	Question	Count	Percent
	2	4	5.5%
	3	9	12.3%
	4	16	21.9%
	5	40	54.8%
	Don't Know	3	4.1%
	Total	73	100.0%
Q33d	I am already doing everything I can to save energy in my home.		
	1	1	1.4%
	2	4	5.5%
	3	11	15.1%
	4	16	21.9%
	5	41	56.2%
	Don't Know	0	0.0%
	Total	73	100.0%
Q33e	I understand how actions taken by me and others in my household result in higher or lower energy use.		
	1	1	1.4%
	2	3	4.1%
	3	9	12.3%
	4	16	21.9%
	5	44	60.3%
	Don't Know	0	0.0%
	Total	73	100.0%
Q33f	It would make me proud to have one of the most energy-efficient houses in my neighborhood.		
	1	2	2.7%
	2	4	5.5%
	3	14	19.2%
	4	17	23.3%
	5	34	46.6%
	Don't Know	2	2.7%
	Total	73	100.0%
Q34	How many people live in your home year-round, including yourself?		
	1	22	30.1%
	2	11	15.1%
	3	18	24.7%
	4	11	15.1%

Q#	Question	Count	Percent
	5	7	9.6%
	6	2	2.7%
	7	2	2.7%
	Total	73	100.0%
Q35	How many of your household's residents are children aged 18 or younger?		
	0	33	45.2%
	1	15	20.5%
	2	15	20.5%
	3	6	8.2%
	4	4	5.5%
	Total	73	100.0%
Q36	How many of your household's residents are aged 65 or older?		
	0	50	68.5%
	1	20	27.4%
	2	3	4.1%
	Total	73	100.0%
Q37	Are there any disabled individuals in your household?		
	Yes	22	30.1%
	No	50	68.5%
	Don't Know	1	1.4%
	Total	73	100.0%
Q38	What is the primary language spoken in your home? If other, specify.		
	English	54	74.0%
	Spanish	9	12.3%
	Other Specified	9	12.3%
	Don't Know	1	1.4%
	Total	73	100.0%
Q39	What is your annual household income?		
	less than 10K	24	32.9%
	10k to 20k	26	35.6%
	20k to 30k	7	9.6%
	30k to 40k	5	6.8%
	40k to 50k	2	2.7%
	50k to 60k	1	1.4%
	Refused	2	2.7%

Q#	Question	Count	Percent
	Don't know	6	8.2%
	Total	73	100.0%
Q40	What is the gender of the respondent?		
	Male	31	42.5%
	Female	42	57.5%
	Total	73	100.0%