CALIFORNIA SOLAR INITIATIVE – LOW-INCOME SOLAR PROGRAM EVALUATION

FINAL SASH Program Biennial Report

Prepared for
California Public Utilities Commission

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1 Introduction

The California Solar Initiative (CSI) provides solar rebates to customers of the investor-owned utilities (IOUs) in California to increase the adoption of solar energy in California. The CSI includes components for low-income single-family homeowners and multifamily affordable housing:

» The Single Family Affordable Solar Housing (SASH) Program provides financial assistance for the installation of solar photovoltaic (PV) generating systems on qualifying affordable single-family housing. SASH is implemented statewide by GRID Alternatives, a nonprofit solar provider whose mission is to "empower communities in need by providing renewable energy and energy efficiency services, equipment and training."[1]

» The Multifamily Affordable Solar Housing (MASH) Program provides financial assistance for the installation of PV systems on low-income multifamily housing. MASH is implemented by three Program Administrators—the California Center for Sustainable Energy (CCSE) in the service territory of San Diego Gas and Electric (SDG&E), Pacific Gas and Electric (PG&E), and Southern California Edison (SCE).

Navigant Consulting, Inc., (Navigant) conducted an evaluation of the SASH and MASH programs for the Energy Division (ED) of the California Public Utilities Commission (CPUC). APPRISE, Inc., assisted in the development and deployment of surveys of program participants. Advent Consulting, Inc., provided support in the analysis of data from those surveys. This biennial report covers program years 2009-2010 and is prepared for the California Legislature as part of the statutory requirements for a biennial report to the Legislature on the progress of the CSI Program.[2] This report highlights key accomplishments from the SASH program during 2009-2010 and key findings from the Navigant evaluation.

1.1 Other SASH Reports

In addition to this biennial report, the Navigant team prepared a series of three formal evaluation reports for the CSI low-income programs:

1. A Program Administrator Assessment was delivered to the CPUC in April of 2011 and provided information on the efficacy and effectiveness of SASH and MASH and provided recommendation for program modifications;[3]

[1] Grid Alternatives. 2010. "Grid Alternatives: Mission, History, and Future." Available: http://www.gridalternatives.org/mission-history

[2] PU Code 2851 (c)(3) states, "On or before June 30, 2009, and by June 30th of every year thereafter, the commission shall submit to the Legislature an assessment of the success of the California Solar Initiative program."

[3] Navigant Consulting. Forthcoming. *CSI SASH and MASH Program Administrator Assessment Report.* Prepared for the Energy Division of the California Public Utilities Commission. (The remainder of this document will refer to this report as "the PA Assessment Report."

2. A Market Assessment was delivered to the CPUC in April of 2011 and provided information about the SASH and MASH market, including job creation, program incentive levels and project funding sources; and

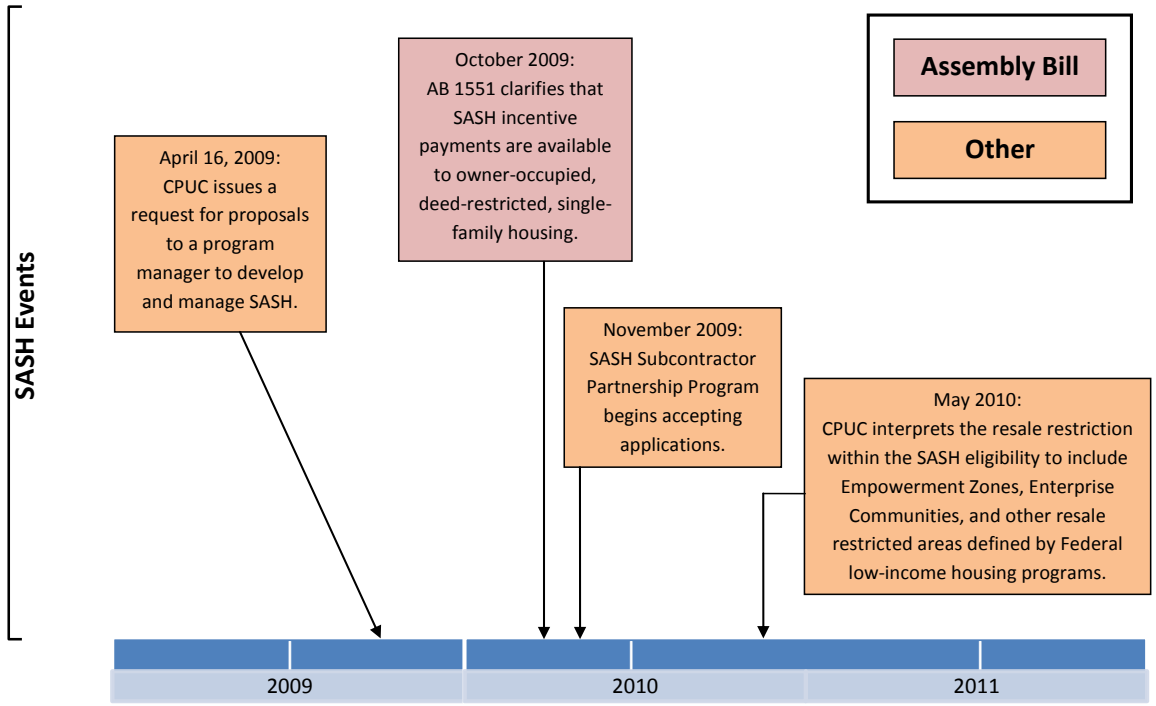
3. A SASH Impact and Cost Benefit Analysis (DRAFT) was delivered to the CPUC in May of 2011 and quantified the energy and bill impacts of the SASH program and assessed the program's cost effectiveness. An impact and cost-benefit analysis of the MASH program was not included because of the low number of projects completed by the end of 2010.

1.1 SASH Overview

The CPUC established the CSI in early 2006 in Decision 06-01-024. Decision 06-01-024 included a provision to set aside a minimum of 10 percent of CSI program funds for projects installed by low-income residential customers and affordable housing projects. Later in 2006, the California Legislature codified this low-income funding requirement in Senate Bill (SB) 1 and Assembly Bill (AB) 2723. Subsequently, in Decision 06-12-033, the CPUC directed the PAs to conform the CSI program to the SB 1 and AB 2723 requirement that 10 percent of the CSI budget be reserved for the single-family and multifamily low-income residential solar incentive programs.

On November 16, 2007, the CPUC established the $108.34 million SASH program. The administration of the SASH program was awarded to GRID Alternatives (GRID), and the program began accepting applications in May of 2009. In October 2009, AB 1551 amended Section 2852 of the Public Utilities Code to clarify that SASH incentive payments were available to owner-occupied, deed-restricted, single-family housing. An additional clarification was made by the CPUC in May 2010 by the interpretation of the resale restriction within the SASH eligibility to include Empowerment Zones, Enterprise Zones, and other resale restricted areas defined by federal low-income housing programs. GRID Alternatives began accepting applications for its Subcontractor Partnership Program in November 2009. Figure 0-1 below depicts these key milestones graphically.

Figure 0-1. Key Milestones in the SASH Development and Implementation



The goals of the SASH program are the following:

- 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 General CSI Program.
- Develop energy solutions that are environmentally and economically sustainable.[4]

Single-family low-income homeowners in PG&E, SCE, and SDG&E service territories whose homes meet the definition of low-income residential housing established in Public Utility Code 2852 are eligible for program incentives. The code states that the housing must be an individual residence sold at an affordable housing cost to a lower income household that is subject to a resale restriction or equity sharing agreement.

SASH provides incentives for PV installation based on the Expected Performance Based Buy-down Method (EPBB), a one-time up-front lump-sum payment made after verification of system installation. The program provides various incentive levels based on the household income. Households with income at or below 50 percent of the area median income qualify for a fully subsidized 1-kilowatt (kW) system, with a subsidy not to exceed $10,000. Households at higher income levels qualify for incentives

[4] Source: CPUC SASH website, http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm.

based on Federal Income Tax Liability and California Alternate Rates for Energy (CARE) Eligibility, shown in Table 0-1.

Table 0-1. SASH Incentive Levels ($/Watt)

Federal Income Tax Liability	CARE Eligible	Not CARE Eligible
$0	$7.00	$5.75
$1-$1,000	$6.50	$5.25
$1,000 +	$6.00	$4.75

Source: CPUC SASH website, http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm.

The budget for SASH was established at five percent of the CSI Program budget, $108.34 million. A maximum of 20 percent of the budget, $21.668 million, can be used for the fully subsidized 1-kW systems.[5]

SASH installations must meet the minimum performance requirement, which is 95 percent of the Design Factor[6], based on a modified EPBB calculation. If the modified Design Factor is less than 95 percent, the installation does not qualify for the SASH incentive.

1.2 Report Organization

Seven sections follow this introduction:

- Section 2, Program Statistics, summarizes SASH program participation through 2010. This section begins on page 6.
- Section 3, the SASH Market Assessment, addresses the market in which the SASH program operates. This section begins on page 11.
- Section 4, Program Satisfaction, addresses drivers and barriers of participating in the SASH program, as well as participant satisfaction. This section begins on page 21.
- Section 5, Ability of the SASH Program to Meet Goals, provides an analysis of the program's success through 2010. This section begins on page 26.
- Section 6, Participation in and Eligibility for Utility Low-Income Electric Rate and Energy Efficiency Programs, presents the intersection of the LIEE/CARE programs and the SASH program. This section begins on page 30.
- Section 7, Effectiveness of Energy Efficiency Measures Relative to PV, presents an analysis of PV's electricity savings potential relative to energy efficiency measures. This section begins on page 33.

[5] Decision 07-11-045, Opinion Establishing Single-Family Low-Income Incentive Program Within the California Solar Initiative, November 16, 2007.

[6] The Design Factor is a ratio comparing a proposed system's expected generation output with that of a baseline system. The Design Factor is used in calculating the EPBB incentive. (It is multiplied by the system rating and the incentive rate to determine EPBB incentives.) *California Solar Initiative Program Handbook*, June 2010, pg. 124.

» Section 8, Key Findings, presents the key findings from Navigant's three program evaluation reports – the Market Assessment, Program Administrators Performance Assessment, and Program Impact and Cost-Benefit Report. This section begins on page 35.

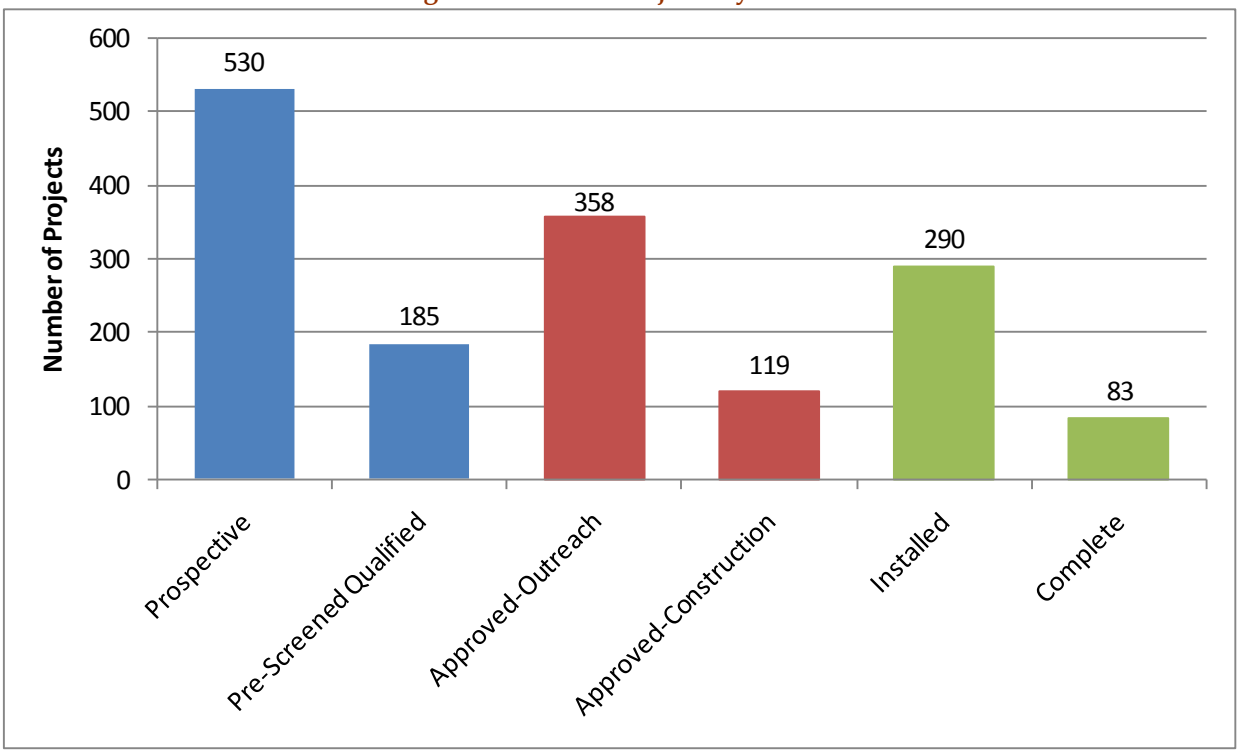
2 Program Statistics

In May 2009, the CPUC approved the SASH Handbook and authorized GRID Alternatives to begin accepting applications for the program. This section provides statistics from GRID's SASH program database as of February 2011. The analysis herein focuses on projects installed and completed through December 31, 2010.

2.1.1 Project Status

Figure 2-1 provides an overview of the status of projects in GRID's database through December 31, 2010. Thus far, 373 projects have been installed or completed[7], with 480 projects approved and "in process." Of the 373 installed projects, 330 projects were interconnected to the grid, as of December 31, 2010.

Figure 2-1. SASH Projects by Status



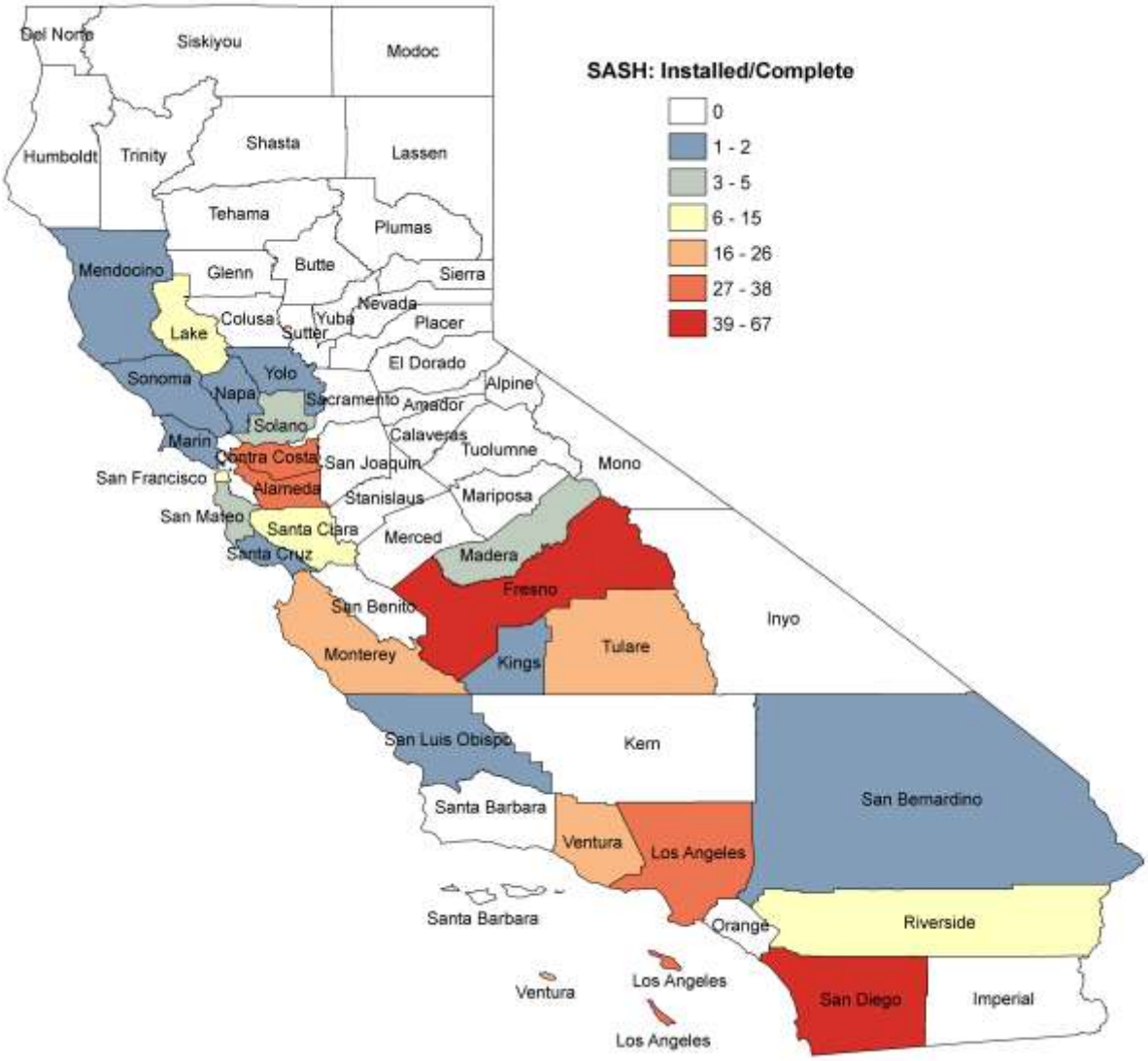
Source: SASH Program Data through December 31, 2010.

Figure 2-2 shows the distribution of projects by county. The projects on this map include those categorized as Installed/Completed as of December 31, 2010. Eight counties (Alameda, Contra Costa, Fresno, Los Angeles, Monterey, San Diego, Tulare, and Ventura) account for 81 percent of the projects installed or completed to date. GRID has office locations in four of these eight counties – Alameda,

[7] "Installed" projects have been completed by GRID but are awaiting final interconnection and building inspection before they are able to operate. "Complete" projects have finished all inspections and are in operation.

Fresno, Los Angeles, and San Diego; this likely drives higher participation rates in the areas near GRID offices.

Figure 2-2. Distribution of SASH Projects (Installed/Complete) by County through 12/31/10

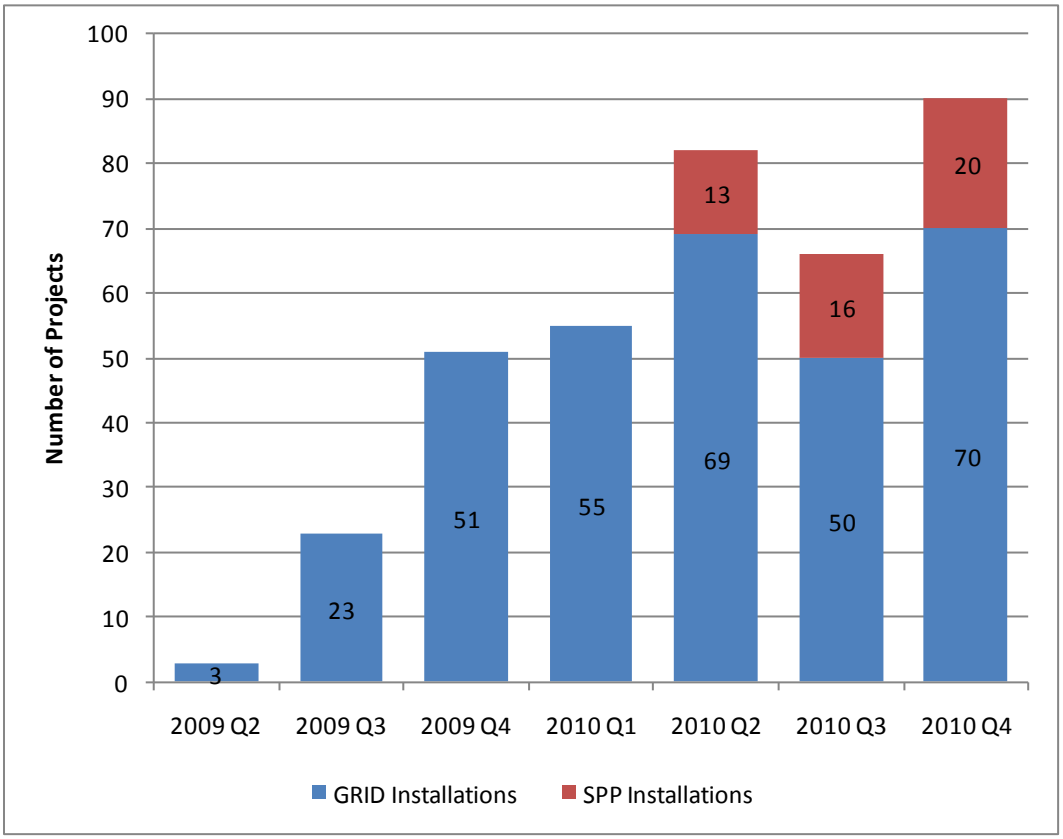


Source: Analysis of GRID's Program Database, December 31, 2010.

2.1.2 Project Installations and the Subcontractor Partnership Program

GRID has only recently begun subcontracting installations through the Subcontractor Partnership Program[8] (SPP), but anticipates increasing the volume and percentage of projects installed through third-parties. Figure 2-3 summarizes GRID and (SPP) project installations by quarter[9].

Figure 2-3. Summary of SASH Project Installations by Quarter, n=370



Source: SASH Program Data through December 31, 2010.

2.1.3 Installed Project Costs

One goal of the SASH program is to decrease the expense of solar ownership with a higher incentive than the General CSI Program. The per-Watt cost of installed SASH projects was compared to the per-Watt costs of projects in CSI's general market programs to determine the competitiveness of the prices received by GRID for installed systems.

SASH PROJECT AVERAGE COSTS

[8] The SPP is described in Section 3.

[9] Three of the 373 projects in the database with Installation Dates during or before Q4 2010 had Status records other than Installed or Complete and were left out of the following figures (n=370).

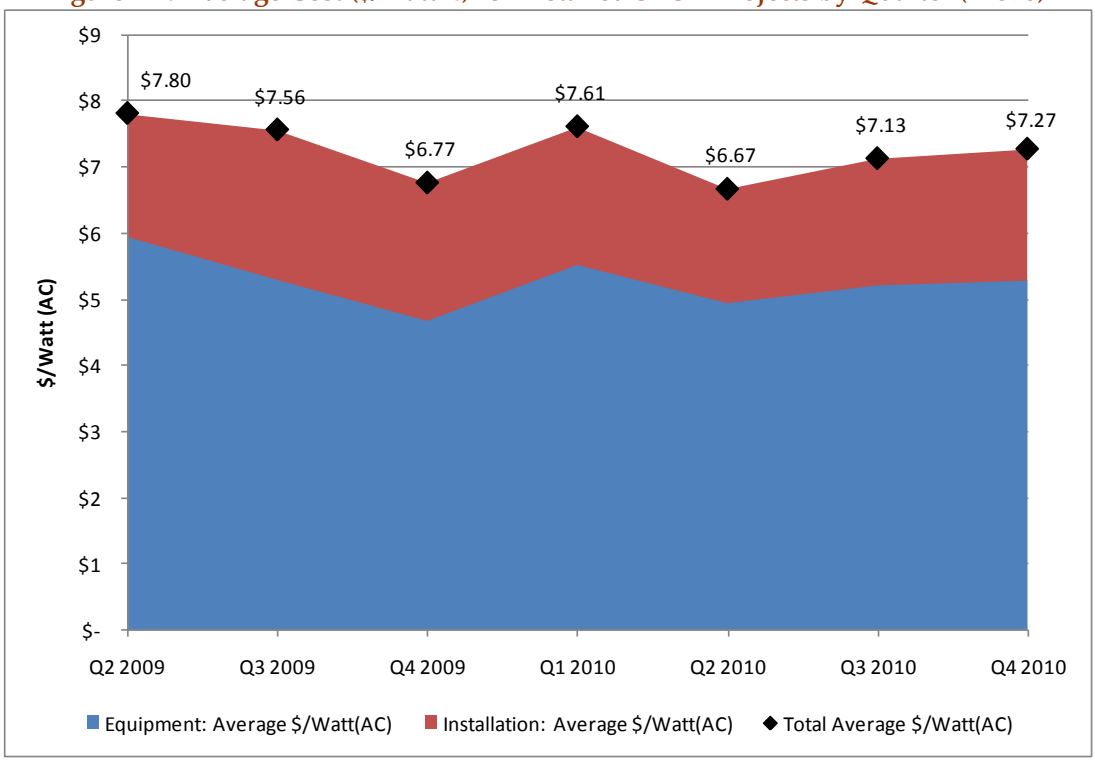
The installation and equipment cost estimates in GRID's database were used to evaluate the per-Watt$_{AC}$ cost for SASH projects installed through the third quarter of 2010. As shown in Table 2-1 and Figure 2-4, the average cost of a project completed through SASH has decreased from $7.80/W in the second quarter of 2009, to an overall average of $7.10/W through the end of 2010. Note that these figures include only equipment and installation costs and exclude the allocation of GRID's cost to administer the program.

Table 2-1. Average Cost ($/W$_{AC}$) for Installed SASH Projects

Quarter	Equipment Costs	Installation Costs	Total Installed Costs	Installations Completed	kW (AC) Installed	Avg. $/Project	Equip. Avg. $/Watt	Install Avg. $/Watt	Total Avg. $/Watt
Q1 2009	$0	$0	$0	0	0.000	--	--	--	--
Q2 2009	$ 38,174	$ 11,890	$ 50,064	3	6.415	$ 16,688	$ 5.95	$ 1.85	$ 7.80
Q3 2009	$ 229,899	$ 97,900	$ 327,799	23	43.364	$ 14,252	$ 5.30	$ 2.26	$ 7.56
Q4 2009	$ 572,093	$ 254,801	$ 826,893	51	122.197	$ 16,214	$ 4.68	$ 2.09	$ 6.77
Q1 2010	$ 712,796	$ 268,064	$ 980,860	55	128.946	$ 17,834	$ 5.53	$ 2.08	$ 7.61
Q2 2010	$ 1,138,405	$ 396,373	$ 1,534,778	82	229.979	$ 18,717	$ 4.95	$ 1.72	$ 6.67
Q3 2010	$ 984,264	$ 360,866	$ 1,345,129	66	188.633	$ 20,381	$ 5.22	$ 1.91	$ 7.13
Q4 2010	$ 1,219,567	$ 456,902	$ 1,676,469	90	230.539	$ 18,627	$ 5.29	$ 1.98	$ 7.27
Total	**$ 4,895,197**	**$ 1,846,796**	**$ 6,741,993**	**370**	**950.073**	**$ 18,222**	**$ 5.15**	**$ 1.94**	**$ 7.10**

Source: Analysis of GRID's Program database, December 31, 2010.

Figure 2-4. Average Cost ($/Watt$_{AC}$) for Installed SASH Projects by Quarter (n=370)



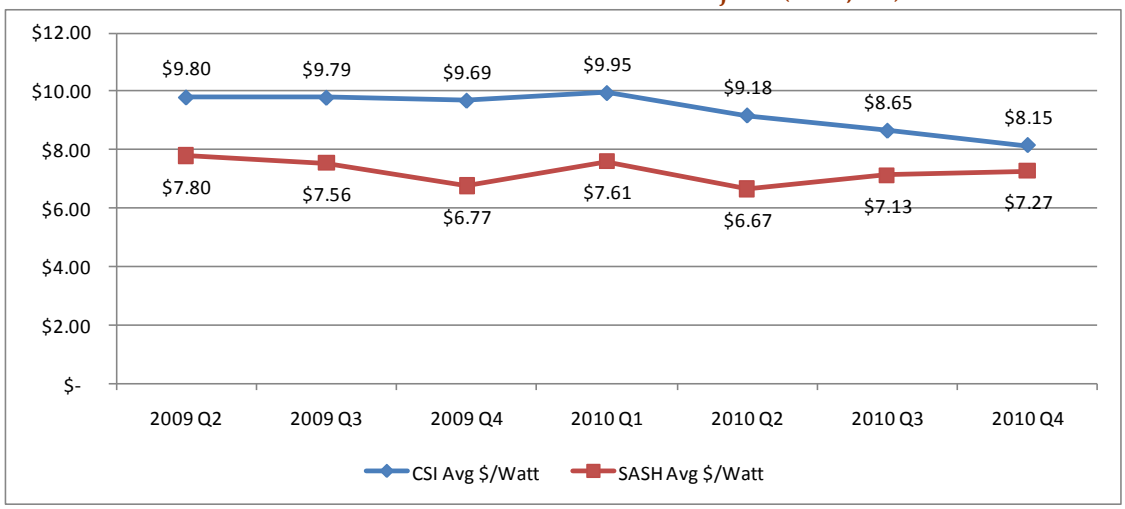
Source: Analysis of GRID's Program database, December 31, 2010.

Equipment costs have generally decreased since the program's launch. In the fourth quarter of 2009, equipment costs showed a notable, sharp decline and increased volatility. Installation costs have fluctuated less significantly. Per-Watt installation costs decreased notably in the second quarter of 2010, the same quarter in which GRID began subcontracting installations. It is too early in the SPP, however, to evaluate whether overall project costs will decrease under the SPP, as GRID administrative costs associated with the subcontractor program must also be considered.

COMPARISON TO CSI GENERAL MARKET COSTS

Using publicly available CSI statistics from the California Solar Statistics website,[10] the evaluation team compared SASH project installed cost statistics to those of CSI's general market program. Figure 2-5 shows the average installed cost for general market CSI projects between the second quarter of 2009 and the third quarter of 2010 for projects similar to those installed under the SASH program.[11] Compared to the totals in Figure 2-5, the SASH program's costs appear to be substantially lower than the general market program. This may be partly attributable to GRID's relatively strong reliance on volunteer labor, which reduces the installation labor component of project costs, which typically accounts for 13 to 15 percent of overall project costs.[12]

Figure 2-5. Average Installed Cost for CSI General Market Projects with Characteristics Similar to SASH Projects (n=12,224)



Source: Analysis of California Solar Statistics database, December 31, 2010.
Note: For consistency with SASH's program profile, the analysis of the general market program database included residential projects with capacity of 10kW or less, and a design factor of at least 95 percent.

[10] Go Solar California. 2010. "California Solar Statistics: Cost by Quarter." Available: http://www.californiasolarstatistics.ca.gov/reports/quarterly_cost_per_watt/.
[11] For consistency with SASH's program profile, the analysis of the general market program database included residential projects with capacity of 10kW or less, and a design factor of at least 95 percent.
[12] Personal communication with Paula Mints, Navigant. January 28, 2011.

3 SASH Market Assessment

This section focuses on the dynamics in the market in which GRID Alternatives operates the SASH program. The CSI low-income market is a business-to-consumer (or B2C) market, which means that GRID (the non-profit business) is marketing its offerings to a consumer market. The dynamics of B2C markets are much different than those in a business-to-business (B2B) market, such as the market for the MASH program. This section explores the unique aspects of this B2C market and assesses GRID's effectiveness in using the available resources to reach the target market and achieve the program's goals.

GRID's offering to this consumer market is multi-faceted. First and foremost, GRID offers the ability for qualifying low-income homeowners to decrease their energy costs by receiving power from a PV system. Through the Low Income Energy Efficiency (LIEE) program managed by the IOUs, GRID can also offer energy efficiency retrofits to a subset of its clients. Beyond that, however, GRID offers a way for a participating low-income homeowner to be seen as a leader in their community through the installation of a state-of-the-art PV system and by engaging their neighbors in the installation of the PV system. This combination of products and community experience has proved to be a compelling package for GRID's customers to date.

3.1 Market Description

This section provides a high-level overview of the market in which GRID operates the SASH program, which begins with a description of the ways in which GRID interacts with the major market actors and provides brief descriptions of each of those market actors.

3.1.1 Market Structure

GRID is at the center of nearly all interactions with the customer in the market for PV system development among single-family homeowners in the low-income market. GRID either interfaces directly with the customer or facilitates relationships with other market actors whose involvement contributes to a successful project. Figure 3-1 depicts the relationships between GRID, the homeowner, and key market actors.[13]

The market structure changes slightly depending on whether GRID or one of its SPP contractors installs the system. While the market actors remain largely the same, some of the interactions that are less significant to the homeowner shift from GRID to the SPP contractor. The main features of these two scenarios are as follows:

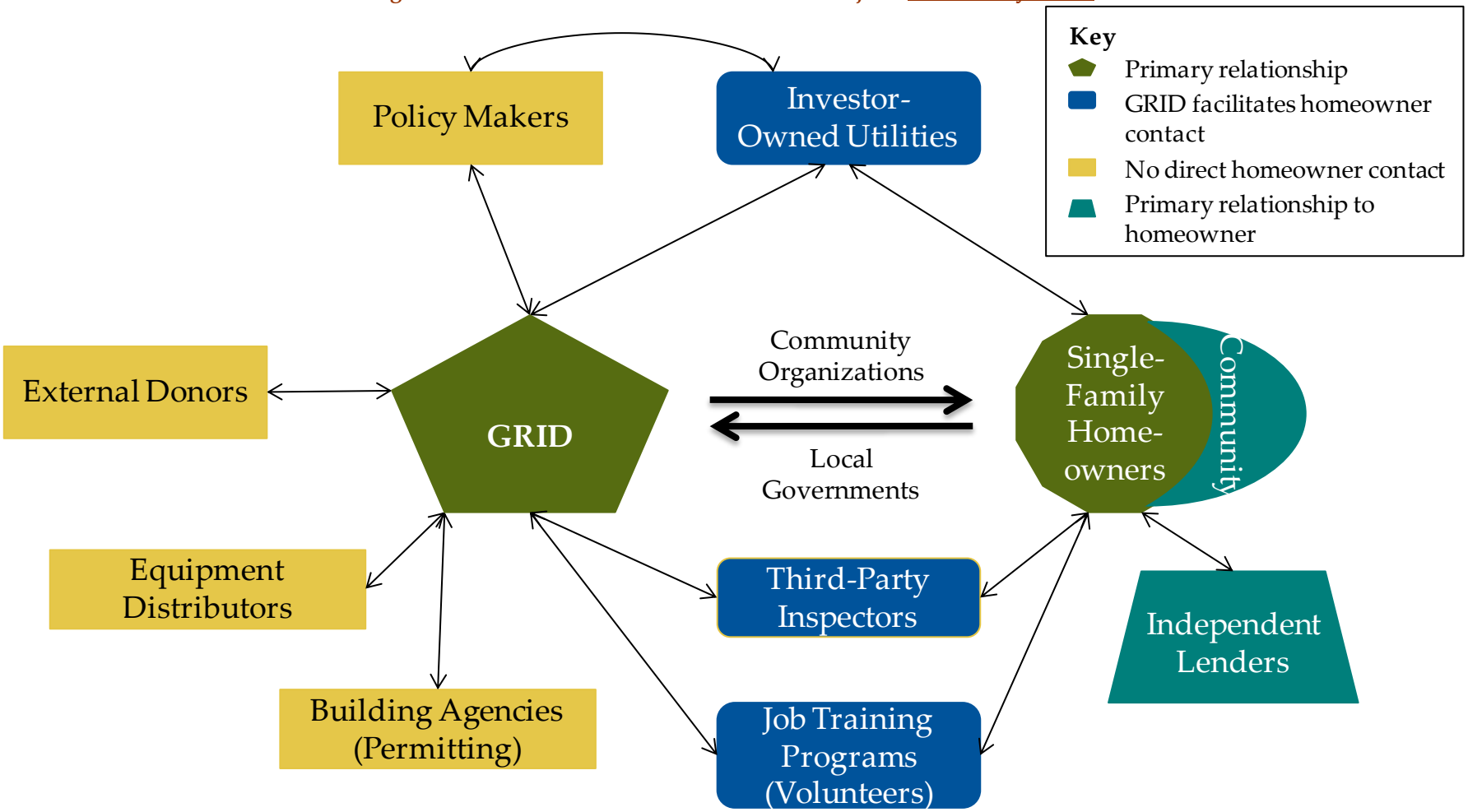
» ***For projects in which GRID installs the system***, market actors interface directly with GRID in almost every aspect of the program. GRID maintains control over messaging, quality of

[13] Organizations and individuals that have a role in the adoption of PV by single-family homeowners in the low-income market comprise the population of "market actors." Market actors may play a role in the exchange of goods and services, in influencing eligible homeowners to participate, in creating or maintaining the market for the services, or otherwise enabling these homeowners to benefit from PV.

customer experience, and the organizations that interface with the customer. Figure 3-1 summarizes the interactions in the marketplace when GRID serves as the installer.

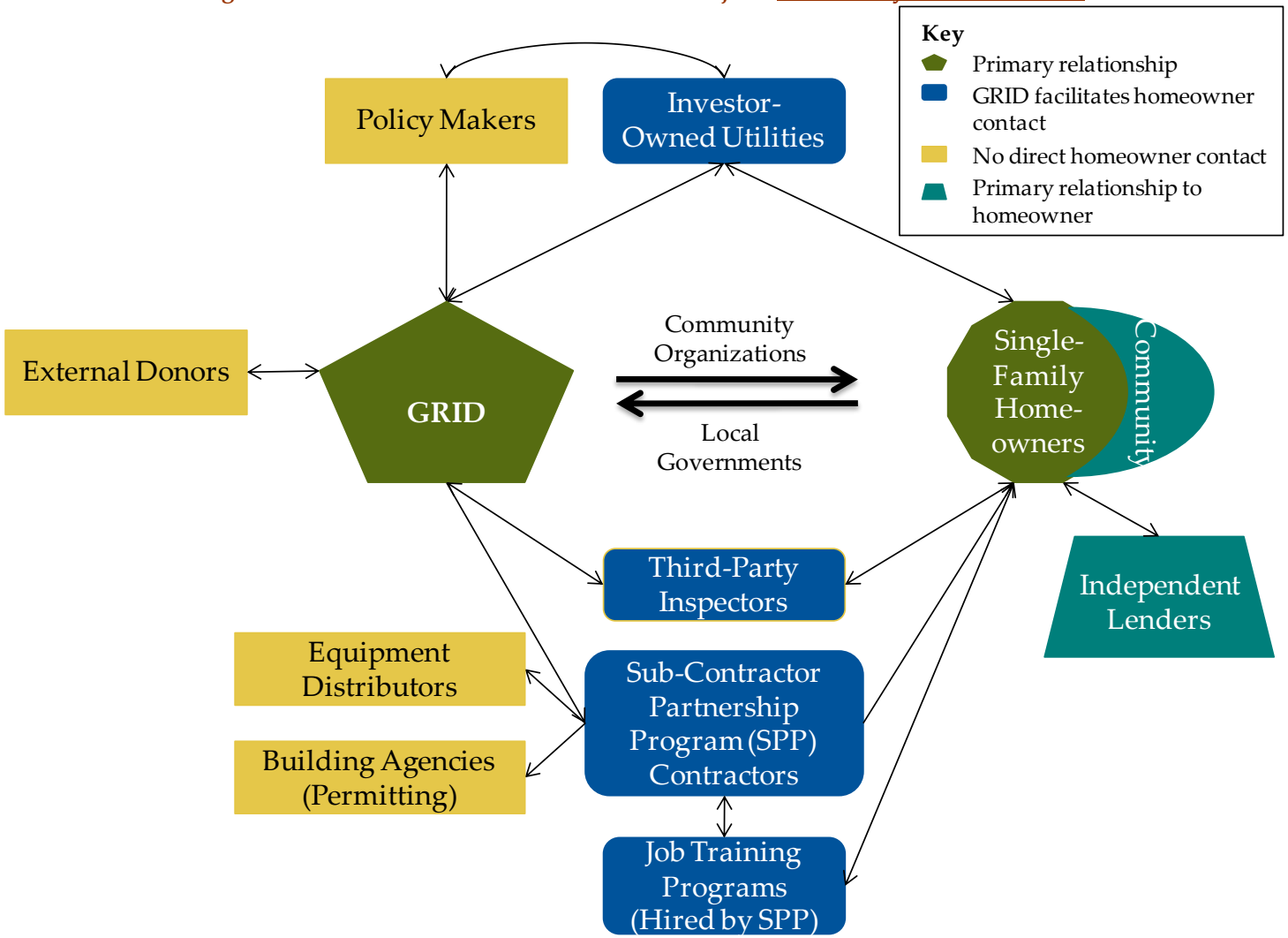
» ***For projects in which an SPP contractor installs the system***, GRID still serves as the primary "face" of the program to the homeowner. The SPP contractor, however, serves as a second point of contact for the homeowner, focused on installation-related issues. In addition, the SPP contractor assumes the responsibility for interacting with a subset of the market actors with which GRID interacts exclusively for GRID-installed system; that is, the customer remains removed from these interactions, as they would in a general market solar project. Figure 3-2 summarizes the interactions in the marketplace when the SPP contractor serves as the installer.

Figure 3-1. Overview of Market Structure for Projects Installed by GRID



Source: Navigant analysis 2011.

Figure 3-2. Overview of Market Structure for Projects Installed by SPP Contractors



Source: Navigant 2011.

A brief summary of the interaction between each market actor and GRID and the homeowner follows; the market actors are organized in alphabetical order.

BUILDING AGENCIES. Building agencies provide the permits for installing a PV system and complete (or administer) the local government's inspection of the completed project. As in the general solar market, the installer (whether it is GRID or the SPP) interfaces with the building agency, not the homeowner. The installer pays for the permit and ensures that the inspection is completed once the installation is complete.

COMMUNITY. Neighbors, friends, relatives, and coworkers can play an important role in the success of a SASH project. Over one-fifth (22 percent) of SASH participants initially learned about the program through one of these sources.[14] In addition, community members may join SASH participants in providing in-kind assistance on the day of the system installation, including making a meal for the volunteer installers or helping to install the system. The effect of word-of-mouth in these communities can play an important role in the expansion of SASH going forward.

COMMUNITY ORGANIZATIONS AND LOCAL GOVERNMENTS. Community organizations and local governments currently serve as catalysts for homeowners' participation in SASH. GRID partners include Habitat for Humanity, the San Diego Housing Commission, and the Faith-Based Community Development Corporation, and a select group of municipalities, among others. To date, these organizations have helped SASH to recruit new participants by sending out letters about SASH directly to their members/participants and sharing information about SASH with their members/participants in one-on-one and group settings. To date, GRID has not compensated these partners for their assistance. Further discussion on the role of community organizations is included in the SASH Market Assessment.[15]

EQUIPMENT DISTRIBUTORS. In cases in which GRID installs the system, GRID secures the equipment from distributors. GRID typically works with one of three main suppliers for the modules, though GRID changes its vendors periodically to obtain better prices from other sources. GRID does not have any signed agreements with suppliers; instead, GRID provides projections to its suppliers about the expected volume, helping to secure discounted pricing. In a limited number of cases, GRID has obtained the equipment through donations.

In cases in which SPP contractors install the system, the SPP contractors procure materials themselves. Many have their own relationships with the suppliers; such arrangements may include serving as a dealer for a given supplier, operating as an independently-owned franchise of a vertically integrated manufacturer-distributor-installer, formal supply agreements, or established relationships in the field.

In either case, there is typically no interaction between the distributor and the homeowner. This is consistent with the situation in the broader solar market.

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[14] Navigant Consulting California Solar Initiative Low-Income Solar Program Evaluation Market Assessment Report, April 1, 2011, page 38.

[15] Navigant Consulting California Solar Initiative Low-Income Solar Program Evaluation Market Assessment Report, April 1, 2011, page 34.

EXTERNAL DONORS. External donors often help to fill the funding gap. In cases where the SASH incentive does not provide for a fully subsidized system and the homeowner is not willing or able to provide the full amount of gap funding, GRID pursues funding from external donors. GRID may prepare an application for funding from these external donors or may negotiate a funding agreement with them. External funders range from private enterprises to local governments and private foundations. The external donors, in turn, provide some level of gap funding to one or more projects to enable the project. In most cases, the homeowner does not interact with the external donor at all or may interact indirectly through GRID. GRID performs this role regardless of whether or not it installs the system.

INDEPENDENT LENDERS. In cases in which SASH participants assist in providing the gap funding needed to pay for their system, independent lenders are one option for obtaining the necessary capital. To date, the homeowner has served as the primary conduit to these entities; GRID has not taken the lead in this area, preferring instead to work with external donors to secure the gap funding required. Independent lenders may include credit unions, banks, or other financial institutions. Per the ruling that instituted SASH, third-party providers of power purchase agreements (PPAs) may not participate in the SASH market.[16]

INVESTOR-OWNED UTILITIES. As outlined in the decision that established SASH,[17] the IOUs interact with both GRID and the customer. Fundamentally, the relationship with GRID is a contractual one in which the IOUs collectively fund GRID's operations as well as the incentives that it pays out. In addition, the operational component of the IOU-GRID relationship includes GRID's application to the IOUs for interconnection and net metering for the facilities that are installed through SASH. In the event that a program participant is eligible for low-income energy assistance, GRID also facilitates enrollment in the appropriate EE programs. After system installation, the homeowner continues to receive an account statement from the utility that details net energy usage, and the amount due to the utility or the amount owed to the homeowner, as appropriate.

JOB TRAINING PROGRAMS. Many job training programs in California have begun to offer solar installer courses in recent years.[18] Whether as a result of funding from the American Recovery and Reinvestment Act (ARRA) or through other internal initiatives, these programs produce workers with the basic skills necessary to install new PV systems. Many graduates lack the hands-on experience needed to secure stable employment, however. GRID uses the participants of these job training programs in two distinct ways:

- Volunteers on projects that GRID installs: GRID gives job trainees preference when selecting volunteers to help install a system. In some cases, job trainees may approach GRID and apply directly to the organization. In other cases, job training programs have established agreements with GRID to send a team of job trainees to install systems one or more times during a term. At least 20 percent of SASH projects are earmarked to be staffed by job training organizations.

[16] California Public Utilities Commission. November 2007. "Opinion Establishing Single-Family Low-Income Incentive Program within the California Solar Initiative. Decision 07-11-045.
[17] Ibid.
[18] SASH market actor interviews, 2010.

» Paid staff for projects installed by SPP: GRID requires that each SPP use at least one graduate from a job training program on the team that installs each SASH project.

Through their participation in the installation of projects, these job trainees interact with the homeowners. This is a unique feature of SASH; ***though it may occur in the general solar market, it is not required***.

POLICY MAKERS. State legislators and regulatory agencies have established the regulatory framework under which the solar market operates. Relevant policies include the state's renewable portfolio standard (RPS), net metering laws, interconnection processes, the funding mechanism for the SASH program, the parameters within which the SASH program operates, and the definition of low-income. CPUC also provides oversight for the overall operation of the IOUs and of GRID. As is the case in the general solar market, these policy makers do not interact directly with the homeowner or other market actors.

SUBCONTRACTOR PARTNERSHIP PROGRAM. The SPP enables external solar installation contractors to participate in SASH as installers. GRID has only recently begun subcontracting installations through the SPP but anticipates increasing the volume and percentage of projects installed through SPP up to 3,500 installations.[19] SPP contractors must submit to a review and approval process administered by GRID in order to be included in a list of pre-qualified bidders on projects that GRID chooses not to install. In this role, the SPP contractor does not need to interact with the homeowner to market its services; GRID is responsible for all up-front marketing and conducts value-added services like energy education and training on the use and maintenance of system, along with an energy efficiency audit. GRID is responsible for paying the SPP contractor based upon completion of certain milestones.

Once chosen for a job by GRID, the SPP contractor will interact with the homeowner as needed for the installation of the system. As detailed earlier in this section, the SPP contractor may also work with the equipment distributor to obtain the necessary equipment and with the building agencies to secure necessary permits and the local government's inspection. These aspects of the SPP contractor's role are consistent with those in the general solar market.

THIRD-PARTY INSPECTORS. GRID uses third-party inspectors for all installations to ensure high quality installations and to meet CPUC requirements. The third-party inspectors visit each site after the installer reports that the installation is complete, usually within three weeks of notification. GRID works with the California Center for Sustainable Energy (CCSE) in SDG&E territory and Burnham Energy in SCE and PG&E territories. For SPP-involved systems, GRID also provides funding for these third-party inspectors to apply methods that use additional rigor to maintain high standards of quality for all installations. GRID contracts directly with the third-party inspectors and funds the basic field verification inspection through the SASH administrative budget while funding the additional level of rigor for SPP projects through GRID.

[19] Navigant Consulting, California Solar Initiative SASH and MASH Program Administrator Performance Assessment Report, April 5, 2011, page 31.

3.1.2 Market Size and Eligibility under PUC 2852

This section provides a brief history of the evolution of eligibility requirements for SASH and then provides an estimate of the number of eligible residents in California. Four main criteria define a household's eligibility for SASH:

- The home receives electrical service from one of three IOUs (PG&E, SCE, or SDGE&E);
- The applicant must own the single-family residence and reside in it;
- The households annual income must be at or below 80 percent of the Area Mean Income (AMI);[20] and
- The home must fit within the definition of "affordable housing," as prescribed by P.U. Code 2852.[21]

The first three of these criteria are straightforward and have remained consistent throughout the life of the SASH program.

The requirements to meet the fourth criterion have changed twice during the course of the program and are the most difficult to interpret. Since the inception of SASH in November 2007, policy makers have evolved this definition in the following manner:

- Initially, P.U. Code 2852 defined eligible households as those with (1) incomes at or below 80% of area median income, and (2) a deed restriction requiring the resale of their house to another low-income household.[22] Under these criteria, there was concern that the pool of eligible homeowners was too small. Interviews with community housing organizations confirmed the perception that the deed restriction requirement presented a barrier to program participation. This requirement limited program outreach and recruiting because it required household buy-in before a program representative could determine whether the household met the eligibility criteria. Before talking with homeowners, GRID representatives were not able to tell if they were eligible for the program (i.e. if they had a deed-restricted house) and therefore they had to convince the homeowner to participate and then check their eligibility. GRID was not able to widely target eligible homeowners, because eligibility could only be verified after reviewing the homeowner's deed.
- In October 2009, AB1551 changed the deed restriction requirement in P.U. Code 2852 and allowed households to be subject only to a resale restriction or qualifying equity sharing

[20] This level varies by household size and by county. For example, in 2009, 80 percent of Oakland's AMI was $66,250 for a four-person household. In 2010, 80 percent of Riverside County's AMI was $52,000, for a four-person household. http://www.oaklandnet.com/government/hcd/policy/docs/IncomeLimits2009.pdf, http://www.kmtg.com/fck_uploads/2010%20Riverside%20County%20Redevelopment%20Agencies%20Worksheet.pdf

[21] California Public Utilities Commission. June 2010. *California Solar Initiative Program Handbook.* http://www.cpuc.ca.gov/NR/rdonlyres/14CD3F07-7B87-49AB-8505-D5F09403A833/0/CSIProgramHandbookJune2010v3_2.pdf (Accessed January 23, 2011)

[22] CPUC D. 07-11-045.

agreement. The legislation, however, did not define the meaning of the term "resale restriction."

» In May 2010, CPUC clarified its interpretation of the resale restriction.[23] CPUC's clarification maintained consistency with the federal definition used by federal affordable housing programs, which define resale restrictions to include deed restrictions and "presumed resale restrictions," which apply if the house is located in an Empowerment or Enterprise Zone.

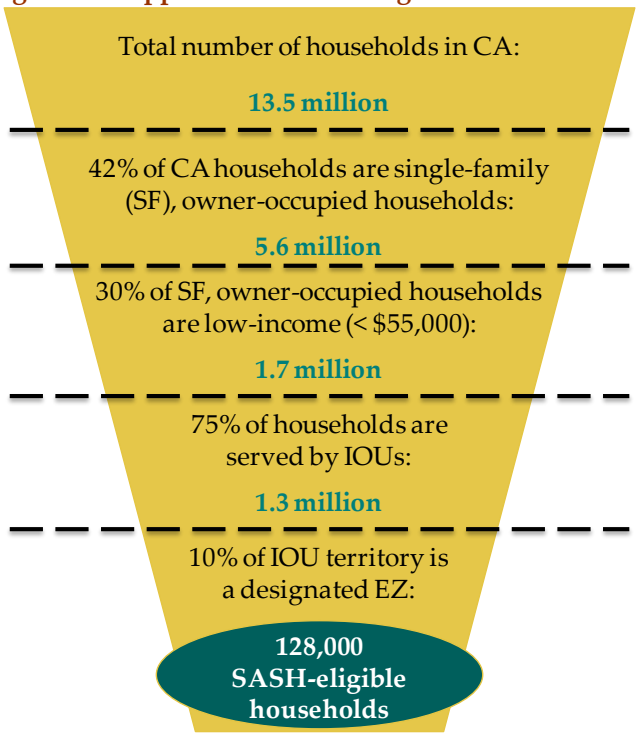
Empowerment Zones and Enterprise Zones are geographically targeted areas of economic development. There are four Empowerment Zones and 42 Enterprise Zones located throughout California.[24] The purpose of these zones is to encourage business investment and promote the creation of new jobs in blighted neighborhoods through special state and local incentives.[25] Tax incentives are provided to stimulate job creation and retention and business investment in buildings and equipment. The Federal government designates Empowerment Zones, while the state designates Enterprise Zones. While there is no list of households that are located within one of these zones, the federal Department of Housing and Urban Development (HUD) and the state provides address locators, which indicate whether a household falls into an Empowerment or Enterprise Zone.[26,27] With the revision of P.U. Code 2852 to include these zones as an eligibility condition, GRID Alternatives can use these maps and address locators to reach potential participants through door-to-door outreach as well as targeted marketing. GRID no longer needs to see a homeowner's deed, but rather can target specific neighborhoods where all homeowners are eligible.

Census data from the 2009 American Community Survey was leveraged to estimate the pool of homeowners eligible for the SASH program. Of the approximately 13.5 million households in California, 5.6 million, or 42%, are single-family, owner-occupied homes.[28] Approximately 30% of those households have a household income of $55,000 or less, which is used as a general estimate of a qualifying income for SASH (at or below 80% of AMI); thus, there are 1.7 million, single-family, owner-occupied households with a household income less than $55,000. Another program requirement is that a household is located in an IOU service territory. The three IOUs serve approximately 10 million California residents, or 75% of California households.[29] Applying this ratio to the 1.7 million households gives 1.3 million single-family, owner-occupied low-income homes in an IOU service territory. Finally, if an estimated 10% of IOU service territory is designated an enterprise zone or an empowerment zone this

[23] GRID Alternatives. May 24, 2010. Memo Defining 'Resale Restriction' for SASH Program.
[24] California Department of Housing and Community Development. 2010. Enterprise Zone Program, http://www.hcd.ca.gov/fa/cdbg/ez/EZoverview.html.
U.S. Department of Housing and Urban Development. 2010. California RC/EZ/EC Communities. Available: http://www.hud.gov/offices/cpd/economicdevelopment/programs/rc/tour/ca/.
[25] California Association of Enterprise Zones. 2007. "About Enterprise Zones." Available: http://www.caez.org/About-Enterprise-Zones/index.html.
[26] U.S. Department of Housing and Urban Development. 2010. Empowerment Zone Address Locator. Available: http://egis.hud.gov/ezrclocator/
[27] Enterprise Zone Maps and Street Ranges. Available: http://www.hcd.ca.gov/fa/cdbg/ez/enterprise/newmap.html
[28] U.S. Census Bureau. 2009. American Community Survey Public Micro-Use Data. Available: http://www.census.gov/acs/www/data_documentation/public_use_microdata_sample/
[29] U.S. Department of Energy, Energy Information Administration. 2009. EIA 861: Annual Electric Power Industry Report. Available: http://www.eia.doe.gov/cneaf/electricity/page/eia861.html

yields approximately 128,000 households that are eligible for the SASH program. Figure 3-3 illustrates this approach.

Figure 3-3. Approach to Estimating SASH Market Size



Source: Navigant analysis 2011.

This indicates that the market for SASH is big enough to support the program. A sufficient market exists to enable GRID to achieve its target of 6,000 installations, which represents a five percent market share of the 128,000 homes.

4 Program Satisfaction

To date, participants in SASH report a fairly consistent set of drivers and barriers to participate in the program. Section 4.1.1 will first outline the reasons that homeowners participate in the SASH program. Then, section 4.1.2 will summarize the barriers to participation. Lastly, section 4.1.3 summarizes participant satisfaction with the program. This section is based on the results of a survey conducted with SASH participants as part of the program evaluation.

4.1.1 Drivers to Participation

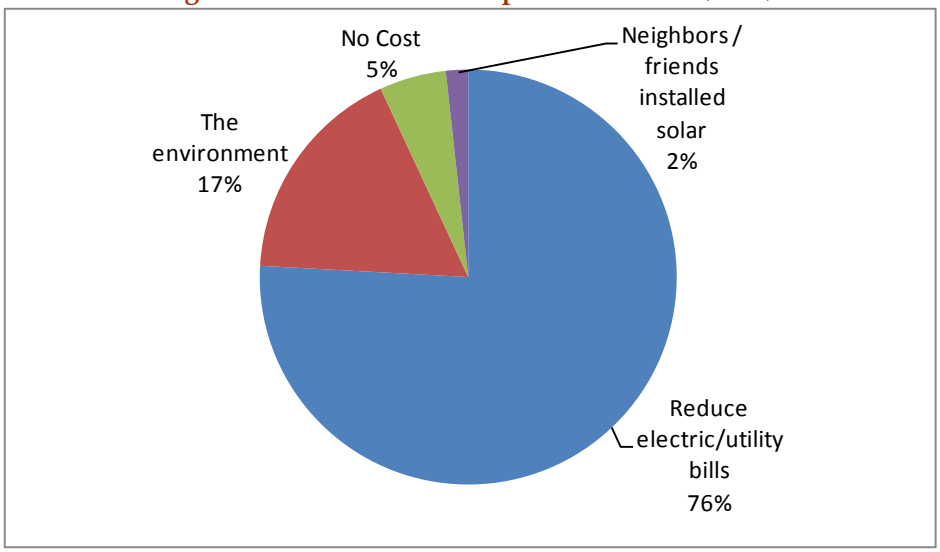
The main reason that homeowners participate in the SASH program is financial. As seen in Figure 4-1, over three-quarters of respondents (76 percent) indicate that the reduction in their electric or utility bills was the primary reason that they participated in SASH. This was consistent with more open-ended answers provided by other participants in in-depth interviews conducted by the evaluation team.

In addition, another 17 percent of survey respondents indicated that helping the environment was their primary reason for participating in SASH. Participants who responded to in-depth interview questions cited this reason more frequently, and several of those who did mention the environment had previously tried to install solar on their homes; those previous attempts were unsuccessful because the price was too high for the homeowner. Anecdotal evidence from the in-depth interviews indicates that homeowners whose primary driver is the environment are also more likely than those citing the reductions in electric bills to report having completed a variety of energy efficiency retrofits as well.

The role of neighbors and friends is a less significant factor in the decision to actually install solar than it is in introducing the SASH program to homeowners; friends, relatives, and neighbors are the most common channels for homeowners to initially learn about SASH.[30]

[30] Navigant Consulting, California Solar Initiative Low-Income Solar Program Evaluation Market Assessment Report, April 1, 2011.

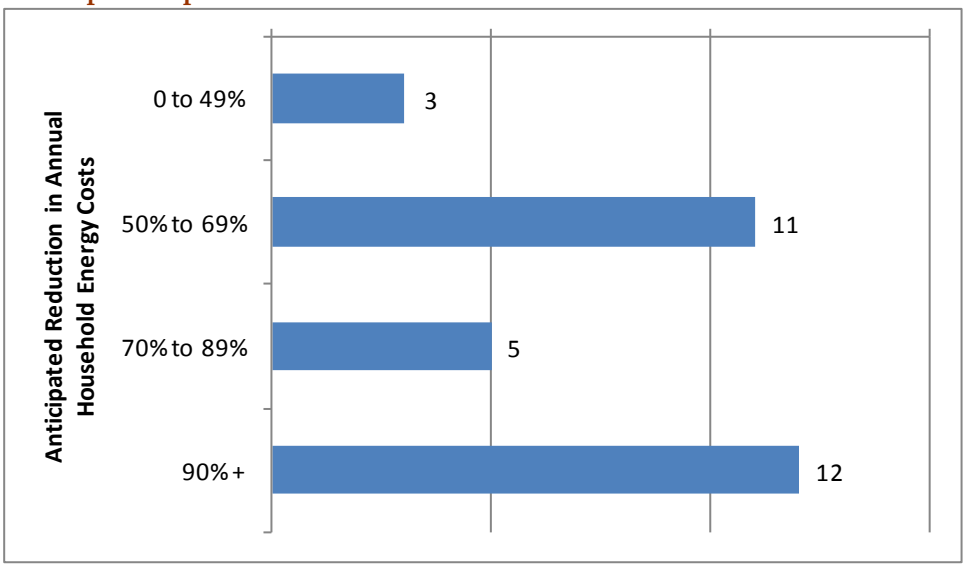
Figure 4-1. Drivers to Participation in SASH (n=58)



Source: Analysis of SASH Participant Survey, 2010.

Considering the anticipated electric cost savings that survey respondents expect makes the financial motivator even more compelling. When asked how much they believe that they will save in annual electric costs following the installation of their PV system, nearly all respondents indicate that they will save at least 50 percent. The evaluation team developed this estimate based on two questions in the survey that asked respondents to report (1) their annual electric costs before the PV system and (2) their expected annual electric costs after the PV system.

Figure 4-2. Participant-Reported Reduction in Annual Household Electric Costs Due to SASH (n=31)



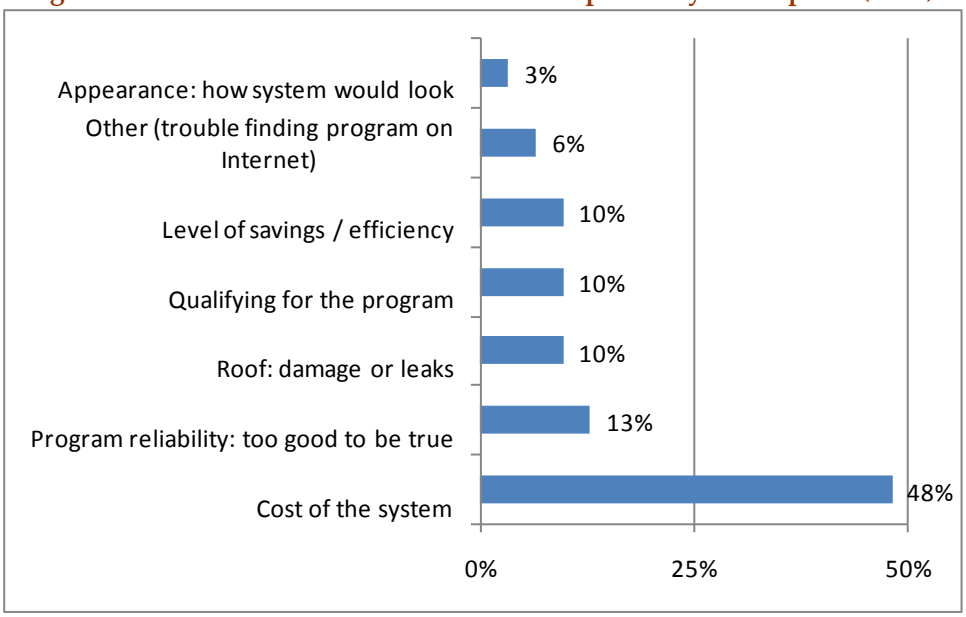
Source: Analysis of SASH Participant Survey, 2010.

4.1.2 Barriers to Participation

On the other side of the equation lay the barriers to participation in SASH. More than half (55 percent) of survey respondents indicated that they had some concerns about participating in SASH when they first learned about the program. This rate was fairly consistent, regardless of the source of the initial introduction to SASH. The initial concerns that the survey respondents indicate align closely with the issues that GRID staff have indicated that they frequently address in the field, such as cost and level of savings, as specified in the PA Assessment Report.[31] The remainder of this section outlines the issues raised by the 55 percent of survey respondents who indicated that they did have some initial concerns about the SASH program.

As seen in Figure 4-3, the main concern that participants initially have about SASH is about the cost of the system. Despite this initial concern, all of the respondents to this question decided to participate in the SASH program.

Figure 4-3. Initial Concerns about SASH as Reported by Participants (n=31)



Source: Analysis of SASH participant surveys, 2010.

Two of the concerns voiced by participants' relate to their initial perception of the credibility of the SASH program. Of the participants who indicated that they did have initial concerns about the program:

» 13 percent indicated that they thought the program was too good to be true.

» An additional 10 percent had concerns about the level of electric bill savings that they would realize after installing the system.

[31] Navigant Consulting, California Solar Initiative SASH and MASH Program Administrator Performance Assessment Report, April 5, 2011.

As with the concerns about cost, GRID deployed successful techniques to build trust with these homeowners and convince them to participate in the program. These responses indicate that GRID is still in a period of building credibility with the low-income communities throughout the state and underpin the need for GRID to retain the ability to maintain control of its ability to do so.

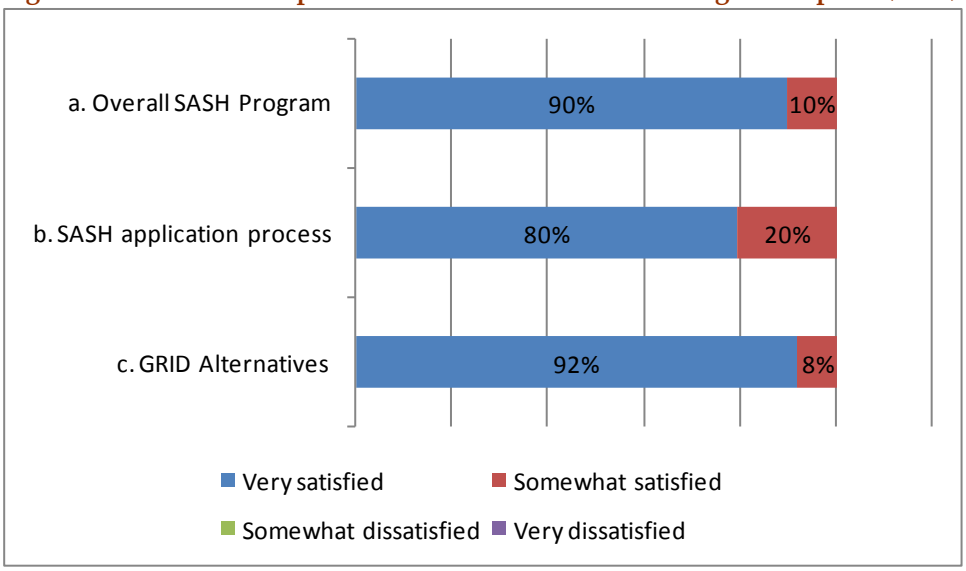
The survey respondents indicated that they had fewer concerns about technical issues than the financial, credibility, and administrative issues. Ten percent of respondents needed reassurance that the system would not damage their roof or cause leaks, and an additional three percent indicated that they had concerns about the aesthetics.

It is not clear how frequently these barriers actually prevent homeowners from participating in the program.[32] In-depth interviews with non-participants indicate that the cost of the system remained the most significant barrier. One interview respondent indicated that the resistance from a homeowners association prevented eight homeowners in their association from participating; the homeowners association was mainly concerned about the potential damage that the systems would cause to the roofs and the associated costs. As GRID develops better approaches for contacting eligible low-income households, future efforts may be targeted toward homeowners associations.

4.1.3 Participant Satisfaction

Survey data also indicate that GRID clients are very satisfied with their experience with GRID to date. As shown in Figure 4-4, 92 percent indicate that they are very satisfied with GRID, and 90 percent report that they are very satisfied with the SASH program as a whole. None of the respondents scored GRID lower than "somewhat satisfied" in any of the categories related to the channel strategy.

Figure 4-4. SASH Participant Satisfaction with Various Program Aspects (n=49)



Source: Analysis of SASH participant survey, 2010.

[32] The survey conducted for this evaluation did not include non-participants due to cost limitations and practicality considerations.

Developing the brand equity required to meet SASH's ambitious goals requires a dedicated and knowledgeable sales force that keeps the best interests of SASH and its participants in mind. While alternative implementation structures allow for more much variation in messaging and customer experience than the current one does they create the potential to erode GRID's brand equity and damage the long-term effectiveness of the SASH program.

5 Ability of the SASH Program to Meet Goals

One of the goals of the SASH program is to decrease the expense of solar ownership. As solar installations increase, costs of manufacturing and installing decrease. The following analysis provides insight into average costs for SASH installations, and how they are changing over the course of the SASH program to reach the program goals. These costs are for projects categorized as Installed or Completed in the SASH program database, from 2009-2010.

Distribution of Incentive Amount per Project

The average incentive level for the 219 installed projects for which incentives had been received through 2010 is $16,890, as shown in Table 5-1. The calculation was derived directly from the SASH program database by associating calculated incentive amounts with projects for which an "Incentive Received" date was recorded.

Table 5-1. SASH Incentive and Inspection Cost Data

Quarter	Installations Completed in Quarter	Incentives Received ($) in Quarter (per SASH expense)	Average Incentive Received per Installed Project	Average System Size (kW)
Q2 2009	2	$19,240	$9,620	1.568
Q3 2009	10	$139,704	$13,970	2.122
Q4 2009	23	$304,524	$13,240	2.033
Q1 2010	59	$896,845	$15,201	2.330
Q2 2010	45	$863,567	$19,190	2.874
Q3 2010	38	$615,406	$16,195	2.529
Q4 2010	42	$859,605	$20,467	3.075
Total	219	$3,698,890	$16,890	2.572

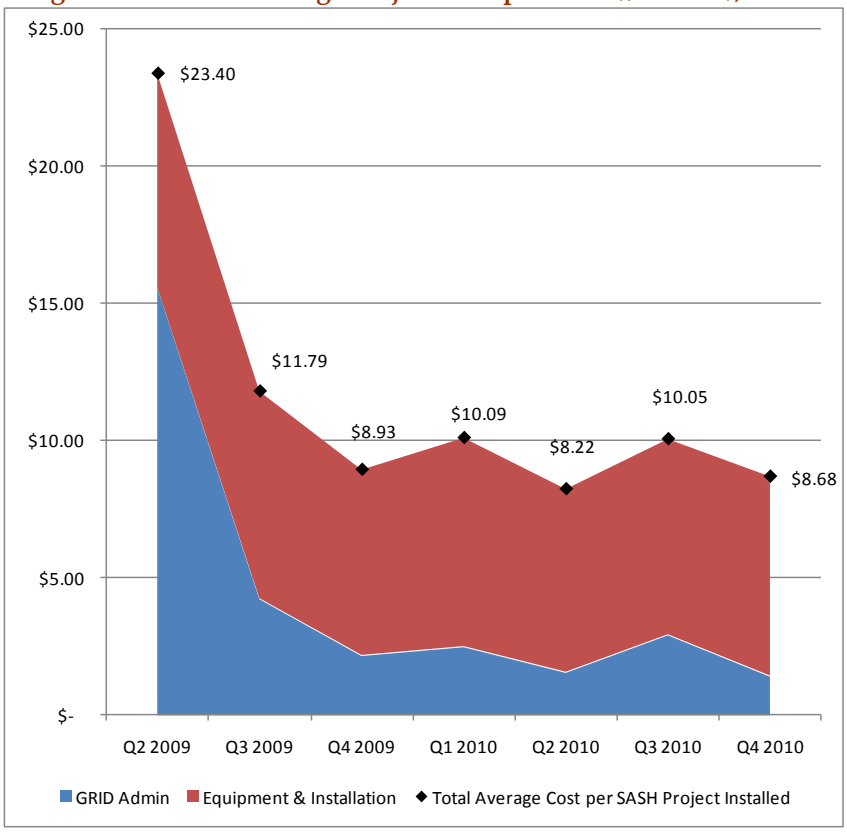
Source: SASH Program Data through December 31, 2010.

Average system size generally increases throughout the program cycle, resulting in an average size of 2.5kW from 2009-2010.

Total Cost per Watt

Navigant combined the equipment and installation cost data recorded for projects installed through Q4 2010 with quarterly allocations of GRID's administrative costs to estimate quarterly per-project costs. Following an initial ramp-up period, the total cost-per-Watt$_{AC}$ for installed projects has decreased substantially since program inception to an average of $9.19/W, with approximately $2.10/W of this cost arising from GRID administrative costs. As seen in Figure 5-1, GRID's per-project administrative costs have generally decreased, while equipment and installation costs have fluctuated less dramatically.

Figure 5-1. SASH Average Project Cost per Watt ($/Watt$_{AC}$), n=370

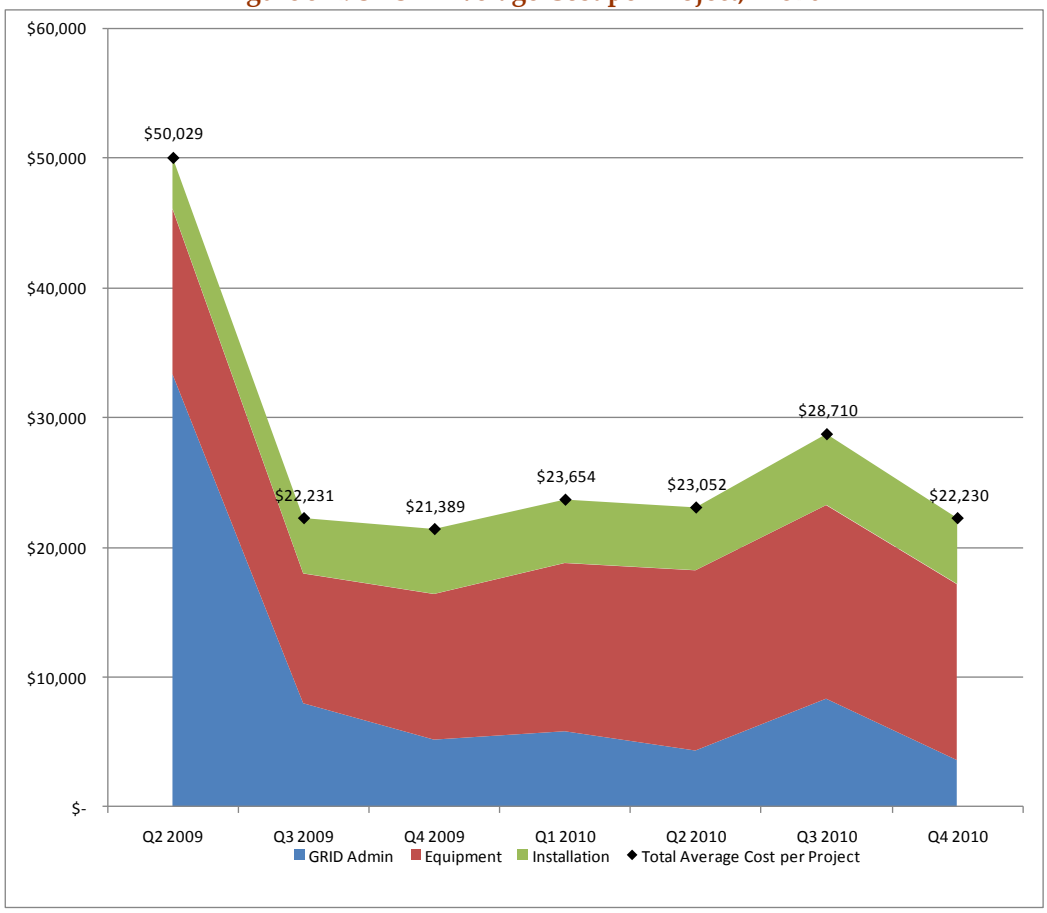


Source: SASH Program Data through December 31, 2010 and SASH Quarterly Reports to the CPUC.

Total Cost per Project

Following the initial ramp-up period, average costs for SASH projects installed through the end of 2010 approached $21,000 and then slowly climbed each quarter past $25,000, with a drop at the end of 2010 to $22,000. As shown in Figure 5-2, and as detailed in Table 5-2, the project cost increases since Q3 2009 appear to be driven primarily by increasing equipment costs. GRID administrative costs have generally decreased over time, likely due to learning curves and economies of scale associated with the implementation of new programs.

Figure 5-2. SASH Average Cost per Project, n=370



Source: SASH Program Data through November 1, 2010 and SASH Quarterly Reports to the CPUC.

Table 5-2. SASH Average Cost per Project

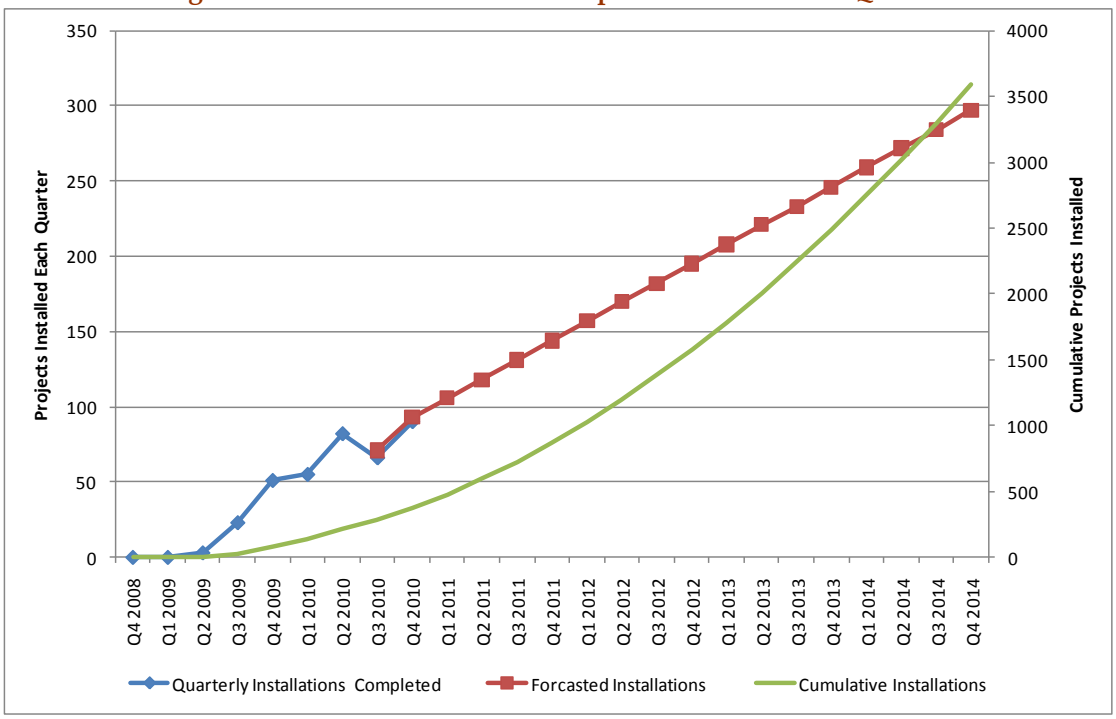
Quarter	GRID Admin: Costs Allocated to Projects Installed Each Quarter	Equipment Costs for Projects Installed Each Quarter	Installation Costs for Projects Installed Each Quarter	Total Costs Allocated to Projects Each Quarter	Installations Completed in Quarter	GRID Admin: Average Cost per Project	Equipment: Average Cost per Project	Installation: Average Cost per Project	Total Average Cost per Project
Q4 2008	$ 4,309	$ -		$ 4,309	0	$ -			$ -
Q1 2009	$ 32,826	$ -	$ -	$ 32,826	0	$ -			$ -
Q2 2009	$ 100,023	$ 38,174	$ 11,890	$ 150,087	3	$ 33,341	$ 12,724.65	$ 3,963.33	$ 50,029
Q3 2009	$ 183,509	$ 229,899	$ 97,900	$ 511,308	23	$ 7,979	$ 9,995.62	$ 4,256.53	$ 22,231
Q4 2009	$ 263,971	$ 572,093	$ 254,801	$ 1,090,864	51	$ 5,176	$ 11,217.50	$ 4,996.09	$ 21,389
Q1 2010	$ 320,123	$ 712,796	$ 268,064	$ 1,300,983	55	$ 5,820	$ 12,959.92	$ 4,873.90	$ 23,654
Q2 2010	$ 355,503	$ 1,138,405	$ 396,373	$ 1,890,281	82	$ 4,335	$ 13,882.99	$ 4,833.82	$ 23,052
Q3 2010	$ 549,744	$ 984,264	$ 360,866	$ 1,894,874	66	$ 8,329	$ 14,913.09	$ 5,467.66	$ 28,710
Q4 2010	$ 324,234	$ 1,219,567	$ 456,902	$ 2,000,703	90	$ 3,603	$ 13,550.74	$ 5,076.69	$ 22,230
Total	**$2,134,242**	**$ 4,895,197**	**$ 1,846,796**	**$ 8,876,235**	**370**	**$ 5,768**	**$ 13,230.26**	**$ 4,991.34**	**$ 23,990**

Source: SASH Program Data through December 31, 2010 and SASH Quarterly Reports to the CPUC.

Program Budget "Burn Rate" and Forecast

Based on the total per-project costs outlined above, Navigant forecasted the expected budgetary requirements for GRID to achieve various SASH program installation goals. Figure 5-3 forecasts GRID's quarterly installations through the end of 2014, assuming growth follows a linear trend based on GRID's to-date progress. Under this assumption, GRID can be expected to achieve the 1,000-installed-project milestone sometime in Q1 2012. This assumption does not account, however, for the effects of the SPP which GRID began in late 2009 to increase its installation bandwidth. Given this uncertainty, projecting past this point is challenging; however, assuming GRID maintained this growth rate (installing 150 to 300 projects per quarter statewide), the SASH program could achieve 3,500 installations by the end of 2014.

Figure 5-3. SASH Installations Completed/Forecast Each Quarter



Source: SASH Program Data through December 31, 2010.

From a budgetary standpoint, GRID's per-project average costs of nearly $24,000 suggest that the above milestones can be met within the current budget of $108 million. Using this average under a simple per-project forecast suggests that GRID will have spent nearly $25 million of the program budget to reach the 1,000-project milestone in Q1 2012, and just more than $86 million to reach 3,500 projects by the end of 2014. These forecasts do no account for inflation, fluctuating equipment costs, or any programmatic changes that might require a shift in resources, incentives, or per-project efforts by GRID.

6 Participation in and Eligibility for Utility Low-Income Electric Rate and Energy Efficiency Programs

According to GRID's records, a majority of program participants in each of the three utility territories were already paying CARE electric rates prior to involvement with the SASH program. As shown in Table 6-1(which includes both Installed/Completed and In-Process projects), at least 55 homeowners (or 12.5 percent) have switched to CARE rates from regular residential rates over the course of their interaction with GRID. Missing entries for additional customers' original rate schedules, however, suggest that total could be as high as 86 homeowners (or 20 percent).

Table 6-1. Summary of SASH Participants' Electric Rate Changes

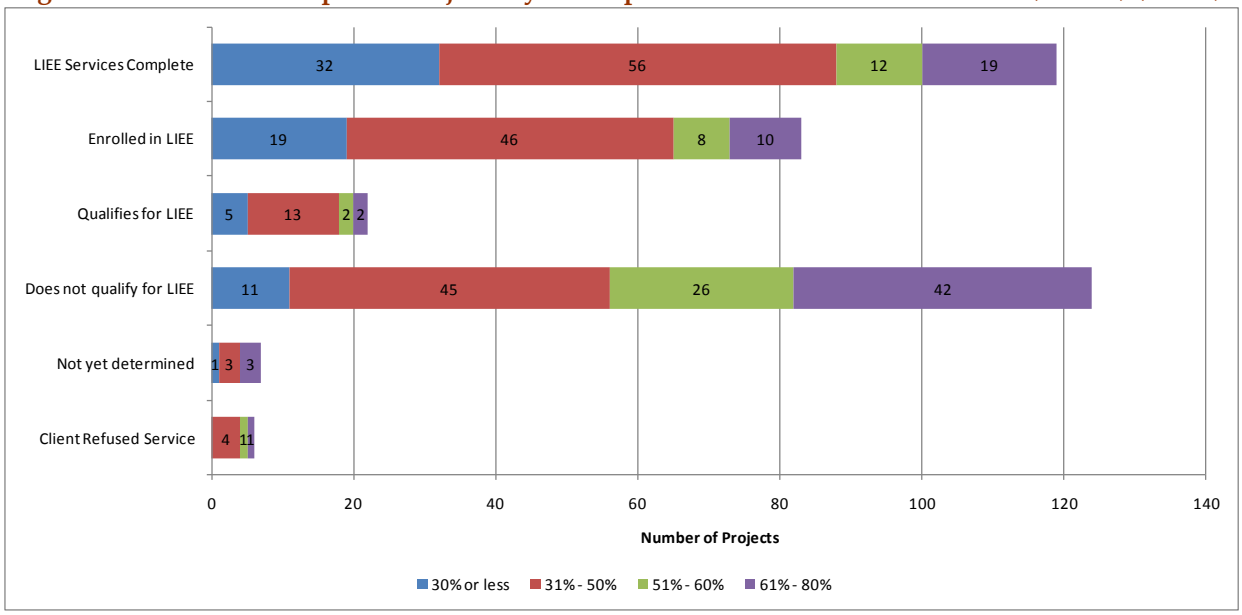
Utility	Low Income Rate Prior to SASH Participation	Retained Standard Rate	Switched from Standard Rate (E-1 or D) to Low Income Rate (E-1 CARE or D-CARE)	No Record for Original Rate; New Rate Recorded as Low Income Rate (E-1 CARE or D-CARE)	Total
PGE	303	33	32	2	248
SDG&E	70	9	3	0	63
SCE	251	3	20	29	126
Total	624	45	55	31	437

Source: Analysis of GRID's Program database, December 31, 2010.

GRID's data also indicate the status of participants' enrollment in the Low-Income Energy Efficiency (LIEE) program of their respective utility. Figure 6-1 shows the number of projects installed or completed for each category of energy efficiency status designation.[33] Each bar also reveals the number of program participants at each qualifying income level by percentage of area median income (AMI). The majority of SASH system recipients either qualifies for or is enrolled in LIEE programs.

[33] Two projects were missing energy efficiency status data, while 13 were missing AMI%. (n=272).

Figure 6-1. Installed/Completed Projects by Participant EE Status and Income Level (%AMI) (n=361)



Source: GRID's Program Database, December 31, 2010.

There is some discrepancy in the income thresholds that dictate eligibility for CARE/LIEE, SASH, and the Family Electric Rate Assistance Program (FERA).[34] Whereas the CARE/LIEE and FERA income thresholds are set at the state level, the CSI income threshold is set at the county level. The CSI income threshold is based on the area median income (AMI), which the U.S. Department of Housing and Urban Development (HUD) establishes annually at the county level. AMI takes into account variations in the cost of living at the county level. FERA's income threshold is set at 125% of the CARE/LIEE income threshold for each household size.

The degree of difference in income threshold between SASH and CARE/LIEE and FERA varies by county and by household size.

- » In smaller households (1-4 persons), SASH's thresholds are uniformly higher than those for CARE/LIEE and higher than those for FERA in about half of the counties that are served at least in part by PG&E, SCE, and SDG&E.
- » For larger households (5-8 persons), there is a wider variation in the differences. In about half of the county-household size combinations in the eligible counties, SASH income limits are higher than those set by CARE/LIEE. In many counties, SASH's income thresholds drop off more quickly than FERA's as the household size increases; as a result, the share of counties in which

[34] In addition to the income threshold, LIEE has three additional eligibility screens:

- » LIEE measures must be feasible (sufficient space and condition of home, cost effective to install);
- » Home must be more than five years old and
- » Home may not have received LIEE services in the past ten years.

Further, PG&E and SCE will deem a household ineligible if they cannot communicate with the client after three or four tries. SASH team continues to submit names that have contact issues up to three times, even after being deemed ineligible.

the SASH income threshold is higher than the FERA thresholds drops from 31% in a five-person household to just 12% in an eight-person household.

» In larger households (5-8 persons), the SASH threshold is often lower than those for CARE/LIEE and FERA are. This occurs in 41% of the counties for five-person households and 59% of the counties for eight-person households.

Overall, this means that a significant portion of SASH participants will not qualify for CARE/LIEE or FERA. The results presented in Figure 6-1 are consistent with that expectation.

7 Effectiveness of Energy Efficiency Measures Relative to PV

This section presents the results of the SASH program impact analysis, comparing the installation of energy efficiency measures to the installation of PV. Navigant estimated SASH participant annual bill impacts in 2009 and 2010, attributable to participation in the SASH program only ("PV-only"), as well as participation in SASH and the LIEE program ("PV + LIEE").

All SASH participants are required to apply for participation in the LIEE program. Since income qualifications are different between the SASH and LIEE programs, not all SASH customers qualify to participate in the LIEE program. Only basic energy efficiency measures are included in the LIEE program, and they are installed free of charge. Each IOU provided LIEE participation summaries by SASH customer, including measures installed and deemed kWh savings. Based on the IOU-provided LIEE data the LIEE participation in the PG&E territory is significantly higher than participation in other IOU territories. PG&E accounts for 53 percent of SASH participants, and 52 percent of PG&E's SASH participants also participate in the LIEE program. SCE and SDG&E LIEE participation is significantly lower. Table 7-1 summarizes the savings attributed to LIEE for the SASH customers who received LIEE installations.

Table 7-1. LIEE Participation Summary

IOU	# SASH Participants	# LIEE Participants	LIEE Participation Rate	Total Annual Energy Savings (kWh/yr)
PG&E	174	91	52%	29,520
SCE	92	27	29%	5,566
SDG&E	64	18	28%	5,528

In 2010, SASH participants saw a typical annual bill reduction of approximately $336; participants that also participated in the LIEE program saw only modest bill reductions from LIEE as compared to the SASH program. The final bill savings summarized in Table 7-2 represents a weighted average of CARE and non-CARE customer status, reported by year, for the PV and PV+LIEE cases assuming all participants were under the tiered rate schedule before and after participating in SASH.

Table 7-2. Typical Annual Customer Bill Savings Breakdown

	Number of Sites	PV+LIEE Bill Reduction ($/Site/Yr)	PV-Only Bill Reduction ($/Site/Yr)
2009	71	$ 284.20	$ 273.56
2010	259	$ 347.01	$ 336.61

The bill impacts of the SASH program average around $300 per site per year in savings. In other words, the average SASH participant can expect to save about $300 per year. The bill savings are relatively low due to the reduced rate schedules associated with CARE customer participation. Although CARE customers enjoy reduced energy costs, they also experience a reduction in generation revenue as defined

by the concept of net metering, where energy generated is valued at the rate the utility charges for energy consumed. Likewise, the vast majority of SASH participants have CARE rate schedules (87 percent before the upgrades and 96 percent after the upgrades).

It is important to note the limited relative billing impacts of LIEE participation. SASH solar systems are sized to reduce a site's annual energy consumption to net zero, which requires high financial investment. The limited LIEE energy efficiency measures, conversely, require much smaller investments, but are very limited in their potential energy savings. Furthermore, the LIEE participation data provided by the IOUs required significant cleaning and showed very low participation in measures like HVAC and refrigeration. Therefore, it is possible that more robust LIEE datasets could yield higher relative savings for LIEE.

The increase in savings from 2009 to 2010 is most likely the result of a higher percentage of larger residences starting participation in 2010 than in 2009. Additionally, significantly more systems were connected for the summer months in 2010, when capacity factor[35] is highest, compared to 2009.

As shown in Table 7-3, Navigant also divided home size into three groups (small, medium, and large), each with an approximately equal total installed PV capacity. This method of grouping gives larger facilities better representation. Even with this grouping, LIEE participation has little additional effect over PV-only.

Table 7-3. Bill Savings Impact of Residence Size

	Number of Sites	Installed PV Size Range	PV+LIEE Bill Reduction ($/Site/Yr)	PV-Only Bill Reduction ($/Site/Yr)
Small	169	1.1 – 2.2 kW	$ 218.82	$ 209.30
Medium	103	2.2 – 3.5 kW	$ 348.75	$ 340.29
Large	58	3.5 – 12.9 kW	$ 640.56	$ 623.83

[35] Capacity factor (CF) refers to the ratio of energy production of a power generation source to its energy production at full rated capacity. In the case of PV, capacity factor is simply kWh produced divided by the system's CEC-AC rating, which is the product of the number of PV panels, the PTC rating per panel, and the inverter efficiency

8 Key Findings

This section summarizes the main findings from the Market Assessment, Program Administrators Performance Assessment and Program Impacts and Cost-Benefit Report for the SASH program.

8.1.1 Overall Market

» **GRID sits at the center of the market for low-income single-family solar in California.** GRID is at the center of nearly all interactions with the customer in the market for PV system development among single-family homeowners. GRID either interfaces directly with the customer or facilitates relationships with nearly all of the other market actors whose involvement contributes to a successful project.

» **The market for SASH is big enough to support the program.** The evaluation team estimates that the total market size for SASH is approximately 128,000 households. This indicates that a sufficient market exists to enable GRID to achieve its target of 6,000 installations, which represents a five percent market share of the 128,000 homes.

8.1.2 Drivers and Barriers to Participation

» **Financial motivations drive the vast majority of homeowners' decisions to participate in SASH.** Over three-quarters of respondents (76 percent) indicate that the reduction in their electric or utility bills was the primary reason that they participated in SASH.
In addition, another 17 percent of survey respondents indicated that helping the environment was their primary reason for participating in SASH. The role of neighbors and friends is a less significant factor in the decision to actually install solar than it is in introducing the SASH program to homeowners.

» **Cost remains the primary barrier to participating in SASH.** Over one-quarter of program participants indicated that the cost of the system created an initial barrier to participation in SASH, though their interactions with GRID resolved these concerns. Interviews with non-participants indicate that the cost of the system remained the most important barrier for them; many of these non-participants had not heard of SASH previously, however. Thirteen percent of the participants initially thought the offer of a highly subsidized or free PV system was too good to be true.

» **GRID is still in a period of building credibility with the low-income communities throughout the state.** Nearly one-quarter of the program participants surveyed indicated that they initially thought that the program was "too good to be true" or had doubts about the level of anticipated bill savings.

» **Survey data also indicate that GRID clients are very satisfied with their experience with GRID and with SASH to date.** Nearly all (92 percent) indicate that they are very satisfied with GRID, and 90 percent report that they are very satisfied with the SASH program as a whole.

None of the respondents scored GRID lower than somewhat satisfied in any of the categories related to the channel strategy.

8.1.3 Paying for the System

» **SASH incentives are covering more of the total system cost than the anticipated range indicated in CPUC 07-11-045.** According to the SASH decision, CPUC designed the incentive rates for SASH to cover 50 to 75 percent of total system costs, assuming installed costs averaged $9.00/W.[36] For more than half of installed projects, the SASH incentive covers 90 to 100 percent of the system cost; for 86 percent of all installed projects, the SASH incentive covers more than 80 percent of the project cost.

» **GRID has successfully appealed to a diverse set of organizations to contribute to funding gaps for SASH projects.** The average project funding gap filled by an outside organization is approximately $2,600. A small number of participants have contributed their own financial resources to pay for their systems.

8.1.4 Impacts of the SASH Program

» The SASH program installed and interconnected 330 sites in 2009 and 2010, providing ***840.6 kW of interconnected[37] capacity***. The rate of new system installations is following a steadily increasing trend.

» Those ***330 sites*** generated approximately ***626 MWh of electricity*** through 2010.

» The weighted average ***annual capacity factor*** for SASH systems in 2010 was ***16 percent***.

» At the time of CAISO peak, Navigant models estimated a peak demand reduction of about 26 kW in 2009, with a capacity factor of 56 percent at the time of peak. In 2010, the 214 systems installed at the time of CAISO peak were responsible for an approximate ***208 kW peak reduction***, with a peak capacity factor of approximately 39 percent.

» The SASH program solar systems are responsible for ***300.6 tons of CO_2 emissions reductions*** in 2009 and 2010.

» A field evaluation of the SASH systems showed that systems are generally operating as expected, with the exception of a small number of sites with wiring issues.

» In 2010, SASH participants saw a typical annual bill reduction of approximately $336; participants who also participated in the LIEE program saw only modest bill reductions from LIEE as compared to the SASH program.

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[36] CPUC SASH decision. http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/75400.htm

[37] An "interconnected" project is a PV system that has been installed, rebated, inspected by a third-party inspector, tied to the utility grid, and is expected to be producing power. A project that does not meet all of the requirements of an interconnected project is considered "in process".