CALIFORNIA SOLAR INITIATIVE – LOW-INCOME SOLAR PROGRAM EVALUATION

FINAL MASH 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 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 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).

This biennial report covers program years 2009-2010 and is prepared for the California Legislature to meet a statutory requirement for a biennial report to the Legislature on the progress of the CSI Program.[2] This report highlights key accomplishments from 2009-2010 for the MASH program.

1.1 Other MASH 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]

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. An Impact and Cost Benefit Analysis will be delivered to the CPUC in the second quarter of 2011 and will quantify the energy impacts of the SASH program and assess the program's cost

[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."

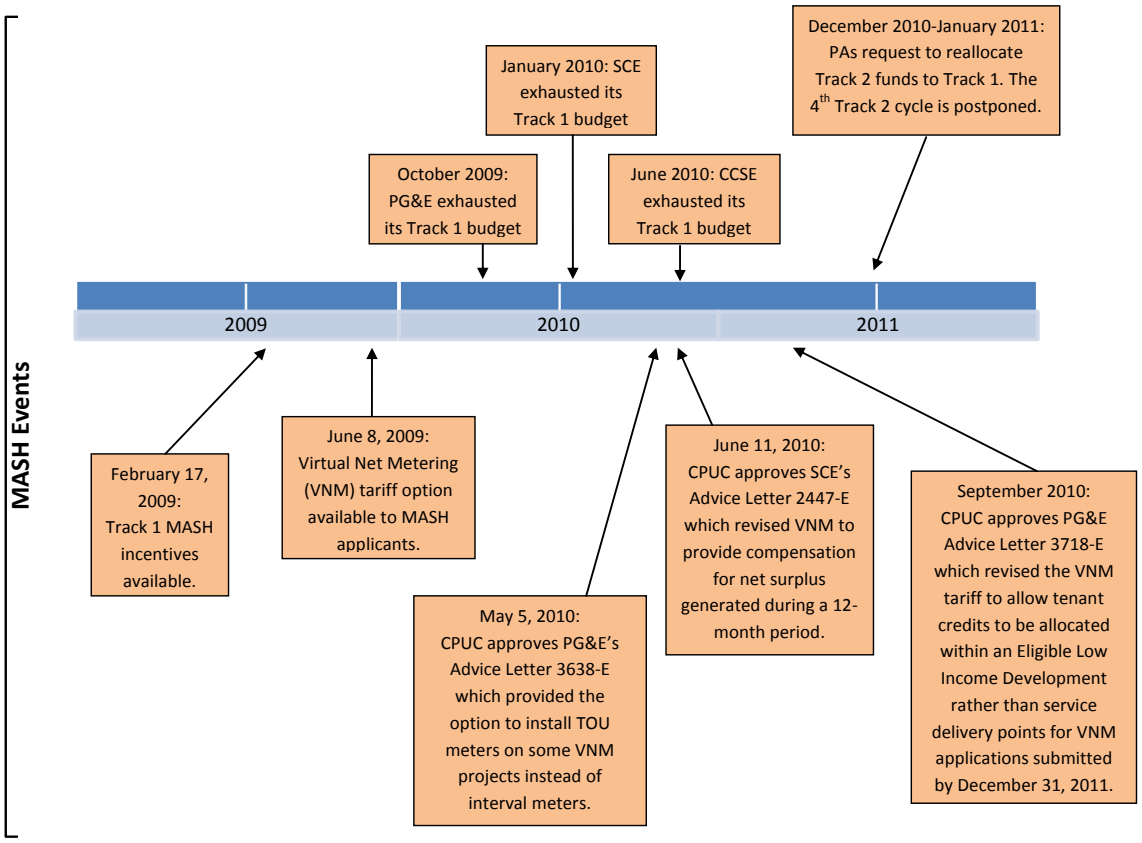
effectiveness; additional areas of investigation include customer bill impacts. An impact and cost-benefit analysis of the MASH program is not included because of the low number of projects expected to be completed by the end of 2010.

1.1 MASH 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 October 16, 2008, in Decision 08-10-036, the CPUC established the $108.34 million MASH program. Track 1 incentives were first available on February 17, 2009. By June 8, 2009, the virtual net metering (VNM) tariff option was available to MASH applicants. On May 2010, the CPUC approved an advice letter filed by PG&E which would allow the use of time-of-use (TOU) meters on qualifying VNM projects, instead of the more expensive interval meter. An advice letter filed by SCE was approved in June of 2010 and revised their VNM tariff to provide compensation for net surplus generated during a 12-month period. In September 2010, the CPUC authorized the allocation of VNM tenant benefits in PG&E territory to be allocated within an Eligible Low-Income Development, rather than the service delivery point for systems that submit a VNM interconnection by December 31, 2011. MASH program incentives are almost entirely allocated to active reservations, however, some reservation cancellations and withdrawals may have freed up some funds that the Program Administrators (PAs) have yet to reallocate to waitlisted applications. Track 1 incentives were fully subscribed in June 2010. On December 29, 2010, the CPUC granted PG&E and CCSE's request to postpone the fourth cycle for Track 2 incentives, in response to a recommendation to reallocate all unreserved Track 2 incentive funds to Track 1. SCE filed a request for postponement of MASH Track 2 fourth cycle on January 6, 2011 and was approved on January 12, 2011.

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



The goals of MASH are the following:[4]

- 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.
- Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants.
- Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers.

Multifamily buildings in PG&E, SCE, and SDG&E service territories that meet the definition of low-income affordable housing established in Public Utilities Code 2852 are eligible for program incentives. The code states that the housing must fall into one of the follow categories:

- A multifamily residential complex financed with low-income housing tax credits, tax-exempt mortgage revenue bonds, general obligation bonds, or local, state, or federal loans or grants, and for which either of the following applies.

[4] CPUC Decision 08-10-036, October 16, 2008, page 7.

- The rents of the occupants do not exceed those prescribed by deed restrictions or regulatory agreements.
- The affordable units have been or will be initially sold at an affordable housing cost to a lower income household and are subject to a resale restriction or equity-sharing agreement.

» A multifamily residential complex in which at least 20 percent of the total housing units are sold or rented to lower income households and either of the following applies:

- The rental housing units targeted for lower income households are subject to a deed restriction or affordability covenant with a public entity or nonprofit housing provider that ensures that the units will be available at an affordable rent for a period of at least 30 years.
- The housing units have been or will be initially sold at an affordable cost to a lower income household and those units are subject to a resale restriction or equity-sharing agreement.

MASH provides incentives for PV installation based on the Expected Performance-Based Buydown (EPBB), a one-time lump-sum payment after verification of system installation and proposed activities for Track 2 projects. The program is divided into two components.

» Track 1 provides a fixed incentive level based on whether the benefits are credited to the common area electric load or the tenant load.

- Track 1A provides an incentive of $3.30 per Watt for offsets of the common area load.
- Track 1B provides an incentive of $4.00 per Watt for offsets of tenant area load.

» Track 2 is a competitive application process that allows applicants to compete for higher incentive levels for projects that demonstrate additional tenant benefits such as energy education and green job creation.

A virtual net metering (VNM) tariff was approved for the three utilities to facilitate the provision of solar PV with tenant offsets. This tariff was instituted to provide the benefits of solar to low income tenants without requiring the system to be physically connected to each tenant meter. VNM allows the owner to install one system and designate a set percentage of the solar output to each tenant based on the relative tenant unit sizes.

The budget for MASH was established at five percent of the CSI Program budget, $108.34 million. It has been allocated between the program components and program administration, as show in Table 0-1.[5]

Table 0-1. MASH Budget Allocation ($Millions)

	CCSE	PG&E	SCE	Total
Budget %	10.3%	43.7%	46%	100%
Track 1	$7.76	$32.92	$34.66	$75.34

[5] *MASH Semi-Annual Progress Report*, July 26 2010.

Track 2	$2.06	$8.74	$9.20	$20.00
Administration	$1.34	$5.68	$5.98	$13.00
Total	$11.16	$47.34	$49.84	$108.34

Source: *MASH Semi-Annual Progress Report*, July 26, 2010.

1.2 Report Organization

Six sections follow this introduction:

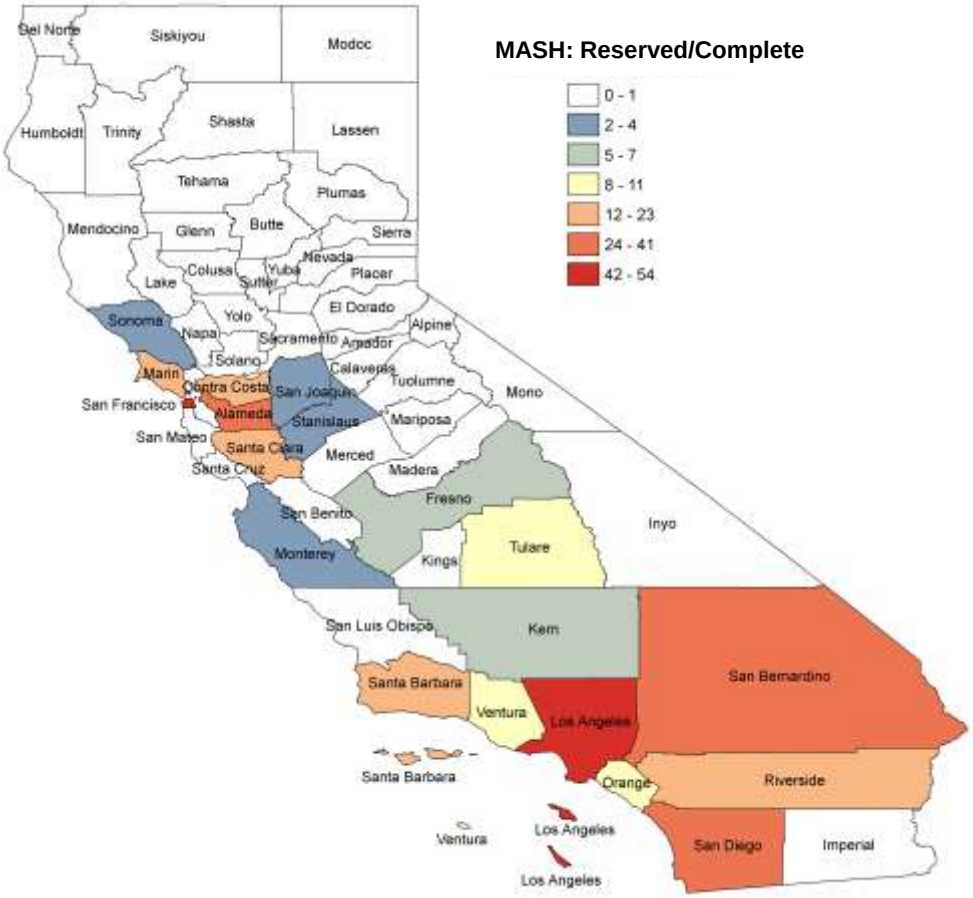
- Section 2, Program Statistics, addresses MASH program participation through 2010.
- Section 3, the Market for the MASH Program, addresses the market in which the MASH program operates.
- Section 4, Program Satisfaction, addresses drivers and barriers of participating in the MASH program, as well as participant satisfaction.
- Section 5, Virtual Net Metering, addresses the challenge the program has faced with virtual net metering policies.
- Section 6, Ability of Programs to Meet MW Goals, provides analysis of the program's success through 2010.
- Section 7, Key Findings, presents the key findings from Navigant's three program evaluation reports – the Market Assessment, PA Report and Impact and Cost Benefit Analysis Report.

2 Program Statistics

The MASH program statistics in this section draw primarily from program data exported from the central program database (*Power Clerk)* for CCSE and SCE on January 7, 2011, and acquired from PG&E on January 7, 2011. Each Program Administrator (PA) also provided supplementary data, including monthly administrative expenditures and Track 2 information. In most cases, the following analysis focuses on the aggregate status of active Track 1 reservations (excluding those that have been cancelled or withdrawn) through December; however, several budgetary and project management-related statistics appear as quarterly comparisons through December 2010.

Figure 2-1shows the distribution of installations by county. The projects on this map include those categorized as Reserved or Complete as of December 31, 2010. The top five counties (San Francisco, Los Angeles, San Bernardino, San Diego, and Alameda) account for over 55 percent of active MASH reservations, while the top ten (through Contra Costa County in the below figure) represent 83 percent of reservations.

Figure 2-1. Number of Active MASH Reservations by County, n=331



Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

2.1.1 Capacity and Budget Overview

Figure 2-2 presents a snapshot of the expected incentive costs and capacity of both completed and active MASH reservations for Tracks 1 and 2. Presently, just over 2 MW of capacity[6] have been installed, with an additional 21 MW of capacity expected from active reservations. None of the awarded Track 2 projects have been installed as of the end of 2010.

Figure 2-2. Summary of MASH Program Activity – December 31, 2010

	PG&E	SCE	CCSE	Total
Track 1 Reservations: Completed and Incentive Paid				
Number of Applications	21	8	6	35
Incentives Paid	$3,503,560	$2,561,794	$524,184	$6,589,538
Capacity of Completed Projects (kW)	1,205	807	173	2,185
Track 1 Reservations: Active				
Number of Applications	143	124	24	291
Incentives Allocated	$28,243,257	$28,725,600	$7,252,458	$64,221,315
Capacity of Completed Projects (kW)	8,249	9,563	2,170	19,982
Track 2 Reservations: Active				
Number of Applications	7	4	2	13
Incentives Allocated	$2,598,023	$4,733,376	$820,000	$8,151,399
Capacity of Completed Projects (kW)	513	699	115	1,327
Totals				
Number of Applications	171	136	32	339
Incentives Paid or Allocated	$34,344,840	$36,020,770	$8,596,642	$78,962,252
Capacity of Completed Projects (kW)	9,967	11,069	2,458	23,494

Source: MASH Semi-Annual Progress Report, February 2, 2011.

Figure 2-3 provides a detailed analysis of program budgets and expenditures for each program administrator. Track 1 incentives remain mostly allocated to active reservations, however, some reservation cancellations and withdrawals may have freed up some funds that the PAs have yet to reallocate to waitlisted applications. Collectively, more than $4M in Track 1 and $12M in Track 2 incentives remain to be allocated to reservations. Each of the PAs has over 75% its administrative budget remaining, although most will be spent on processing remaining applications and on inspection costs associated with the 100% inspection requirement and field verification costs for MASH VNM projects.

[6] Capacity rating are CEC-AC.

Figure 2-3. Summary of Program Budgets and Expenditures

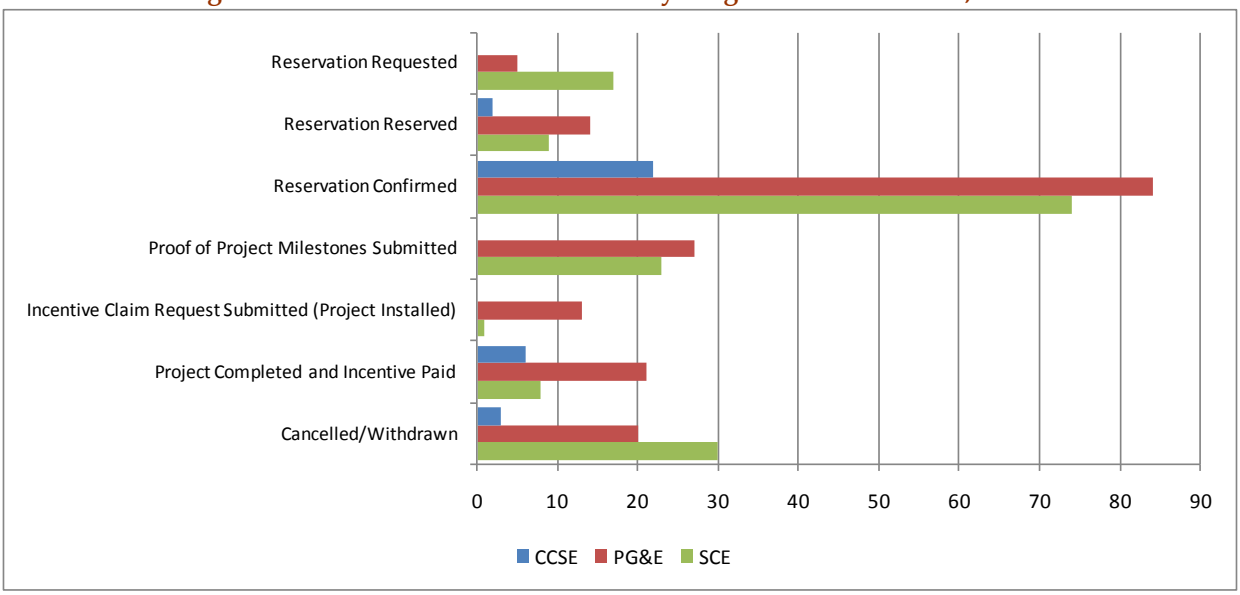
PG&E					
Category	**Budget**	**Spent**	**Reserved**	**Unallocated**	**% Remaining**
Track 1A and 1B	$ 32,923,230	$ 3,503,560	$28,243,257	$ 1,176,413	**3.6%**
Track 2	$ 8,740,000	$ -	$ 2,598,023	$ 6,141,977	**70.3%**
Administration (12%)	$ 5,681,350	$ 464,190	-	$ 5,217,160	**91.8%**
Total	**$ 47,344,580**	**$ 3,967,750**	**$30,841,280**	**$ 12,535,550**	**26.5%**
SCE					
Category	**Budget**	**Spent**	**Reserved**	**Unallocated**	**% Remaining**
Track 1A and 1B	$ 34,656,032	$ 2,561,794	$28,725,600	$ 3,368,638	**9.7%**
Track 2	$ 9,200,000	$ -	$ 4,733,376	$ 4,466,624	**48.6%**
Administration (12%)	$ 5,980,368	$ 368,271	-	$ 5,612,097	**93.8%**
Total	**$ 49,836,400**	**$ 2,930,065**	**$33,458,976**	**$ 13,447,359**	**27.0%**
CCSE					
Category	**Budget**	**Spent**	**Reserved**	**Unallocated**	**% Remaining**
Track 1A and 1B	$ 7,759,938	$ 524,184	$ 7,252,458	$ (16,704)	**-0.2%**
Track 2	$ 2,060,000	$ -	$ 820,000	$ 1,240,000	**60.2%**
Administration (12%)	$ 1,339,082	$ 286,209	-	$ 1,052,873	**78.6%**
Total	**$ 11,159,020**	**$ 524,184**	**$ 8,072,458**	**$ 2,276,169**	**20.4%**
TOTAL					
Category	**Budget**	**Spent**	**Reserved**	**Unallocated**	**% Remaining**
Track 1A and 1B	$ 75,339,200	$ 6,589,538	$64,221,315	$ 4,528,347	**6.0%**
Track 2	$ 20,000,000	$ -	$ 8,151,399	$ 11,848,601	**59.2%**
Administration (12%)	$ 13,000,800	$ 1,118,670	$ -	$ 11,882,130	**91.4%**
Total	**$ 108,340,000**	**$ 7,421,999**	**$72,372,714**	**$ 28,259,078**	**26.1%**

Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011; Track 2 incentive allocations and PA administration costs based on the MASH Semi-Annual Progress Report, February 2, 2011.

2.1.2 Reservation Status

The following analysis focuses on the Track 1 reservations tracked in the MASH program database. Figure 2-4 provides a snapshot of the reservations at each stage by PA. CCSE and PG&E have made the greatest degree of progress moving projects through the process, with installations complete for 18 and 12 percent of reservations for the two PAs, respectively. Each has reservations confirmed for an additional 67 and 46 percent of reservations, respectively. SCE has experienced a relatively greater number of cancelled or withdrawn reservations (18.5 percent). The greater share of projects in SCE's reservation request and review stages likely include a number of applications recently added from their waitlist to take the place of cancelled and withdrawn reservations.

Figure 2-4. MASH Reservation Status by Program Administrator, n=379



Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

The 53 reservations that were cancelled or withdrawn would have added 3.5 MW of capacity, and used $12 million in incentives. This is shown in Table 2-1. These applications account for 14% of the total MASH applications received.

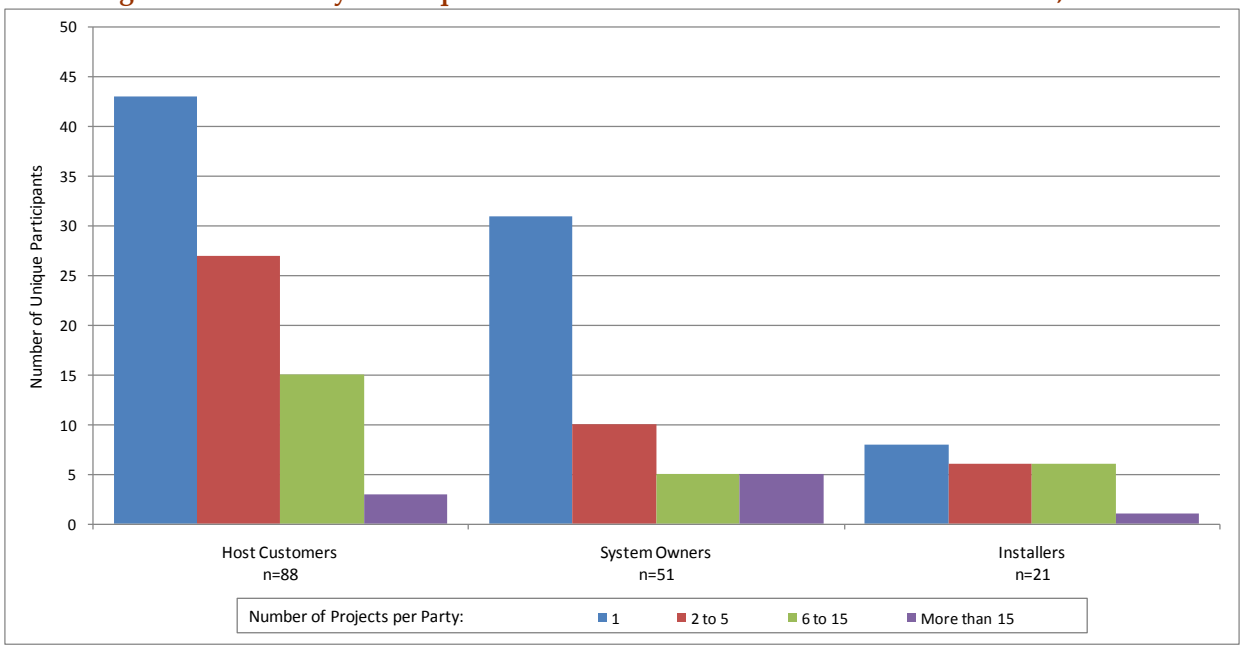
Table 2-1. Cancelled and Withdrawn Projects

Status	Number of Applications	Capacity (kW)	Incentive Amount
Cancelled	20	896.7	$3,118,502
Withdrawn	33	2,586.5	$9,021,349
Total	**53**	**3,483.2**	**$12,139,851**

2.1.3 Program Participant Analysis

As shown above in Figure 2-4, the program data currently includes 379 Track 1 reservations. With the 53 cancelled or withdrawn reservations excluded, the total number of active (including completed) reservations stands at 326. In an effort to understand more about those participating in the MASH program, Navigant analyzed the composition of unique host customers, system owners and installers listed for these reservations. Figure 2-5 presents a snapshot of the number and involvement of program participants in each of these categories. Participation in the MASH market is dominated by a handful of large host customers, third-party system owners, and solar installers. For the 326 MASH reservations, there are only 88 unique host customers, 15 unique system owners, and 21 unique installers participating across the state.

Figure 2-5. Summary of Unique Parties Involved in Active MASH Reservations, n=160



Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Table 2-2 provides additional details to help characterize these program participants. As shown, approximately half of the 76 unique host customers have only a single active MASH reservation. An even greater disparity exists among system owners. While 31 system owners have a single reservation, only six unique organizations are listed as system owner for more than two-thirds of active MASH reservations (226 of the 326 reservations). The largest single owner is listed for 94 reservations (29 percent of the total). Finally, the top four installers are listed on 65 percent of projects, with the largest appearing on 53 projects (37 percent of the total)

Table 2-2. Details of Unique Party Participation in Active MASH Reservations, n=160

Participant Category	Unique Parties	Number of Projects per Party				Range of Projects per Party		
		1	2 to 5	6 to 15	More than 15	Min	Max	Median
Host Customers	88	43	27	15	3	1	28	2
System Owners	51	31	10	5	5	1	94	1
Installers	21	8	6	6	1	1	53	4

Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

The above statistics reveal the degree to which large affordable housing organizations, third-party financiers, and solar integrators are involved in the MASH program. While many of these participants have secured reservations for numerous sites, it requires noting that individual projects often require multiple MASH reservations to accommodate separate buildings at a single project site. This is illustrated in Table 2-3, which provides summary statistics for the 35 reservations for projects that have already been completed. As shown, only 16 unique hosts and 21 individual sites exist for the 35 reservations.

Table 2-3. Summary Statistics for Completed Projects

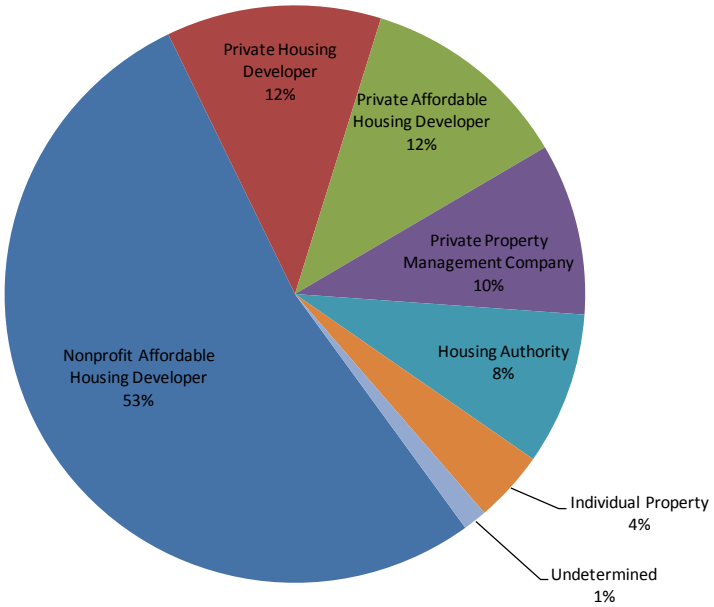
Completed Projects	
Total Applications	35
Unique Host Locations	21
Max Applications per Project	5
Average Applications per Project	1.6
Unique Host Customers	16
Applications with Direct Ownership	13
Applications with Third Party Ownership	22

Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Host Customers

There are 88 unique parties listed as host customers for MASH projects. As shown in Figure 2-6, the majority (53 percent) of MASH projects are held by host customers identified on their websites as nonprofit affordable housing developers or community development corporations. Private housing developers hold an additional 24 percent of projects, with an even split between those working primarily in the affordable housing market and those for whom affordable housing is only one of several targeted real estate sectors.

Figure 2-6. Share of All MASH Projects by Host Customer Type (n=379)

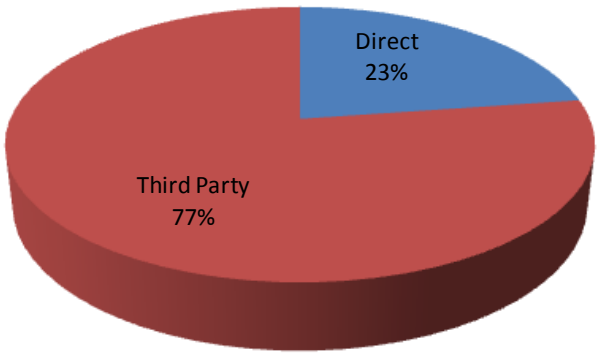


Source: Analysis of PowerClerk Database, January 2011.

As mentioned, third-party financing plays a large role in the development of MASH projects and the securing of incentive reservations. Third party ownership accounts for more than three fourths of all installations. Figure 2-7 Third party ownership accounts for more than three fourths of all installations.

Figure 2-7 illustrates the division of ownership structures for active MASH reservations based on differences in last name between the host customer and system owner listed for each reservation. Third party ownership accounts for more than three fourths of all installations.

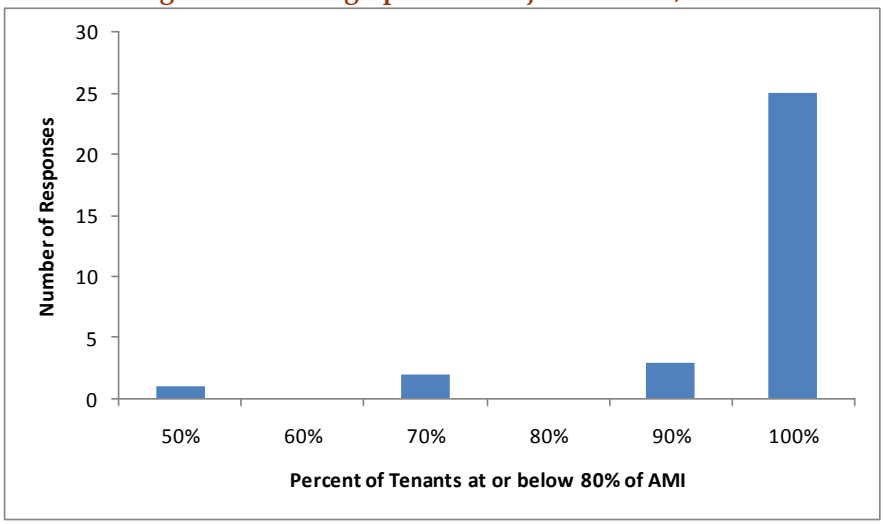
Figure 2-7. Ownership Structure for Active MASH Reservations, n=326



Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

When host customers were surveyed about the demographics of their tenants, they revealed that the majority of their tenants are at or below 80% of the Area Median Income (AMI). Almost all of the host customers have more than 90 percent of tenants at this income threshold, as shown in Figure 2-8.

Figure 2-8. Demographics of Project Tenants, n=31



Source: Analysis of MASH Participant Survey, 2010

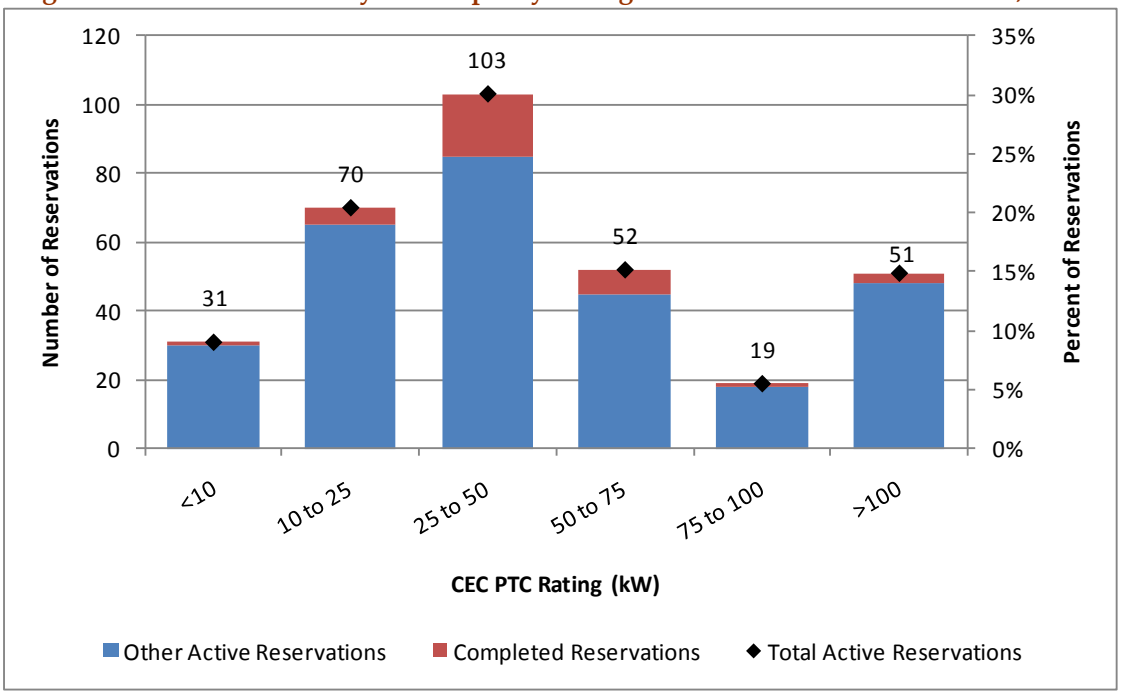
2.1.4 System Size and Cost Data

The following analysis provides insight into the distribution of capacity sizes as well as system and incentive costs for both completed and remaining active MASH reservations from Power Clerk data through December 2010.

System Capacity

Figure 2-9 **s**ummarizes the distribution of system capacity ratings for active MASH reservations, revealing 32 percent of all active systems falling in the 25 to 50 kW range. System size appears to mostly follow a normal standard distribution, but with a more significant number of reservations for larger systems (>100 kW).

Figure 2-9. Distribution of System Capacity Rating for Active MASH Reservations, n=326



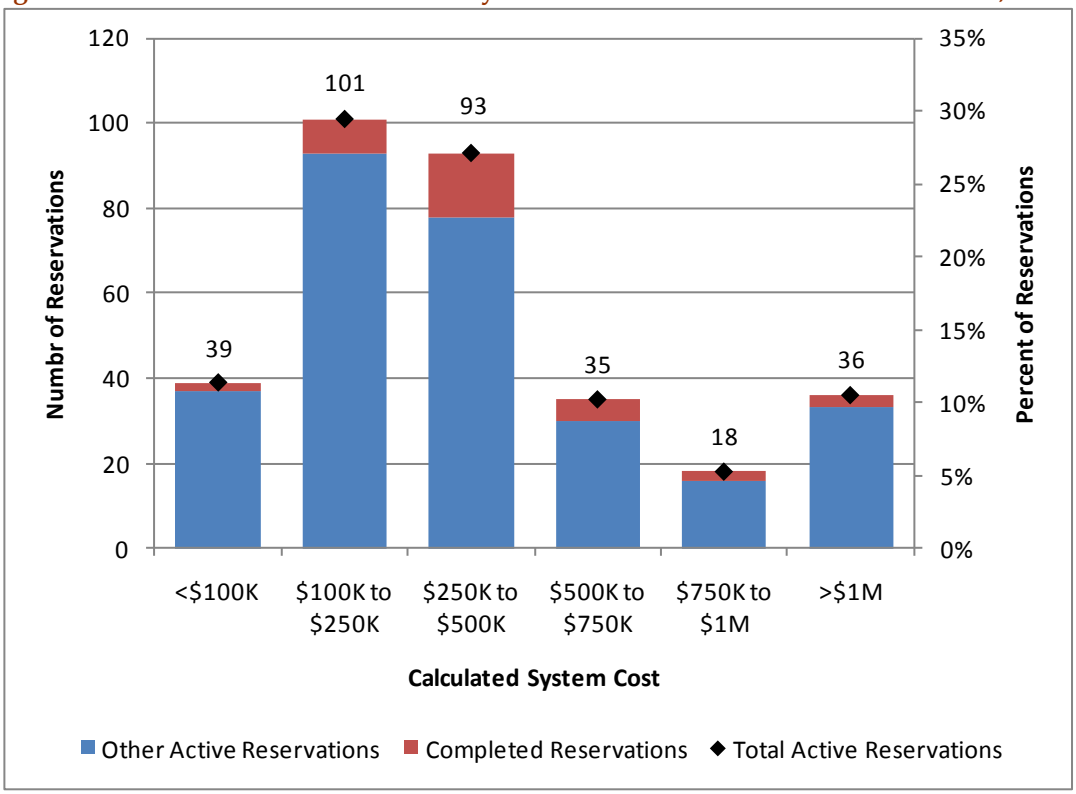
Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Calculated System Cost

Figure 2-10 illustrates the distribution of calculated system costs for active MASH reservations.[7] Similar to the above system capacity statistics, while 31 percent of all active reservations fall in the $100,000 to $250,000 range, the costs for systems installed and categorized as completed have tended to fall in the $250,000 to $500,000 range. The median calculated system cost for all active reservations is $292,680; however, several multi-million dollar systems fall in the >$1M category.

[7] Six active projects were excluded for missing system cost data.

Figure 2-10. Distribution of Calculated System Cost for Active MASH Reservations, n=326

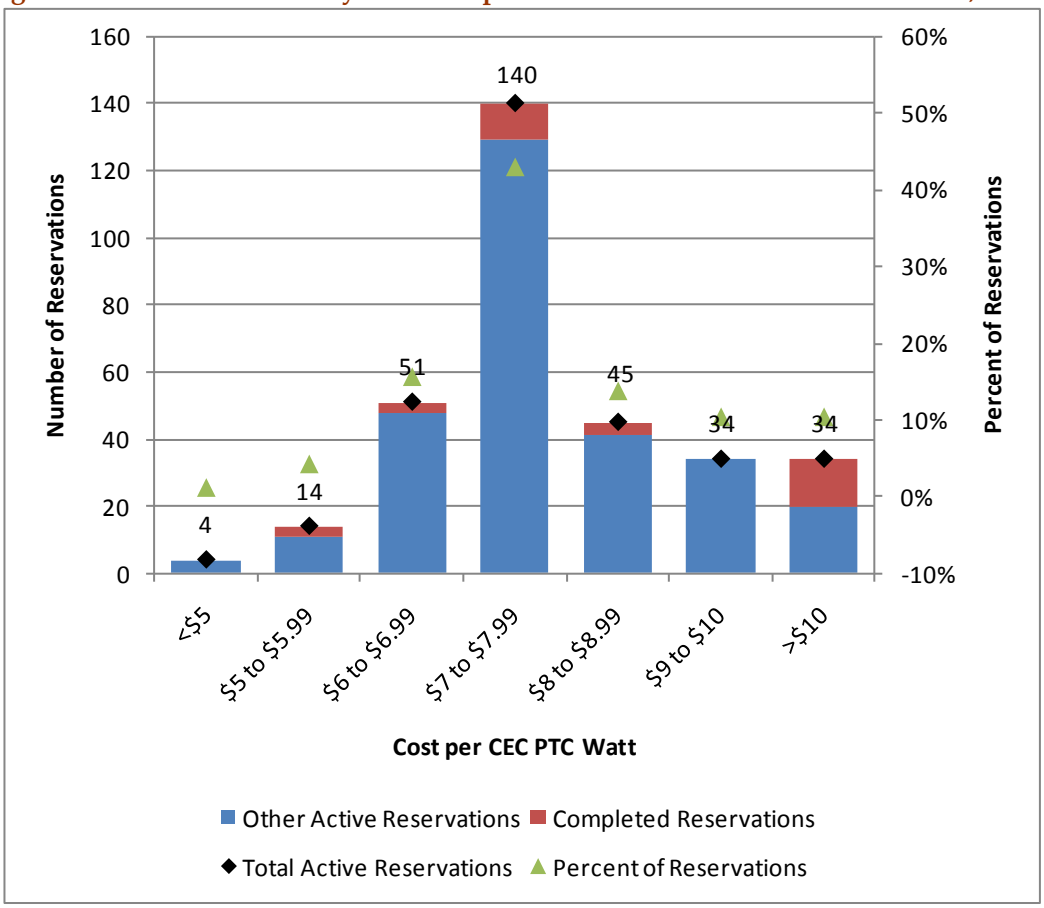


Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

System Cost per Watt

Combining the two preceding analyses, Figure 2-11 shows the distribution of per-Watt system costs for all active MASH reservations. Many (43 percent) calculated system costs fall between $7/W and $8/W, with a median of $7.44/W. As a point of comparison, the average cost of installed SASH systems is also between $7/W and $8/W at $7.10/W.

Figure 2-11. Distribution of System Cost per Watt for Active MASH Reservations, n=326

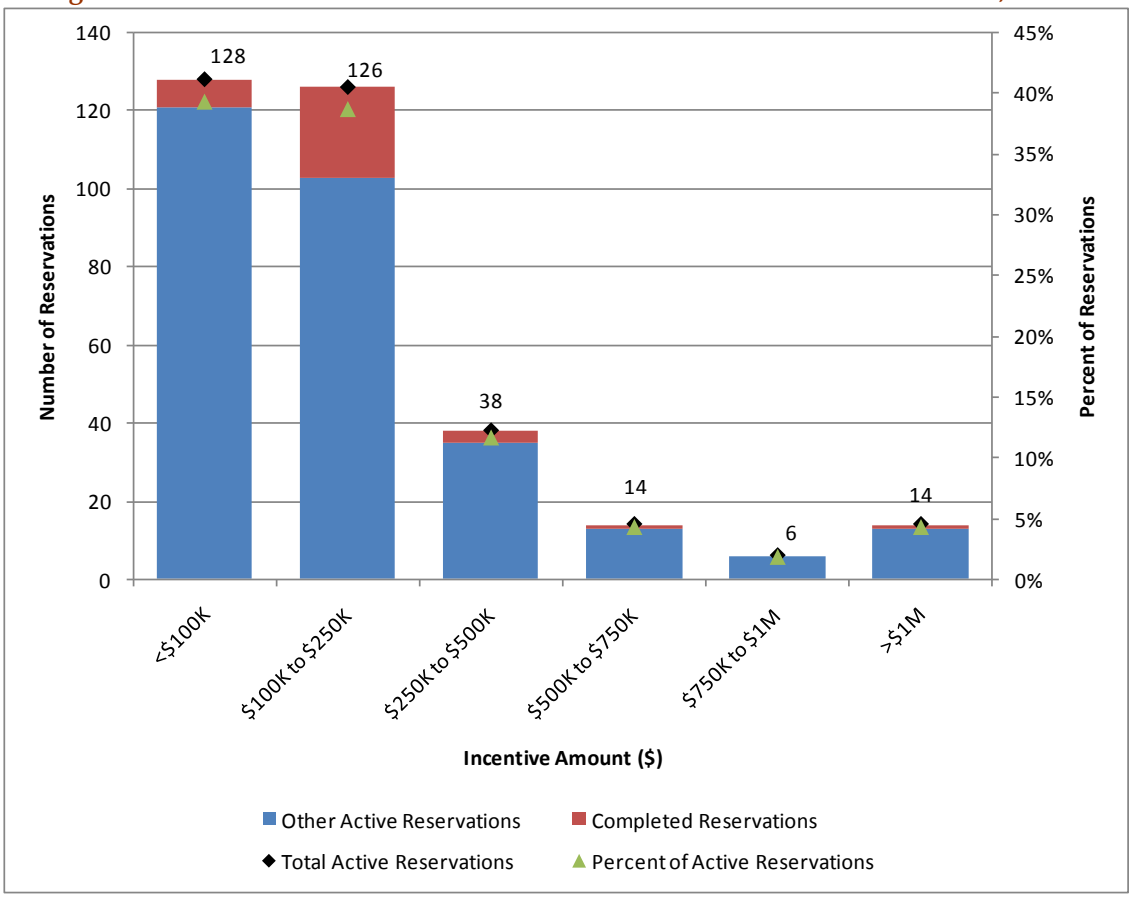


Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Incentive Amount

Figure 2-12 illustrates the distribution of per-system incentive amounts for all active MASH reservations. More than 77 percent of incentives fall below $250,000, with a median calculated incentive of $129, 355.

Figure 2-12. Distribution of Incentive Amounts for Active MASH Reservations, n=331

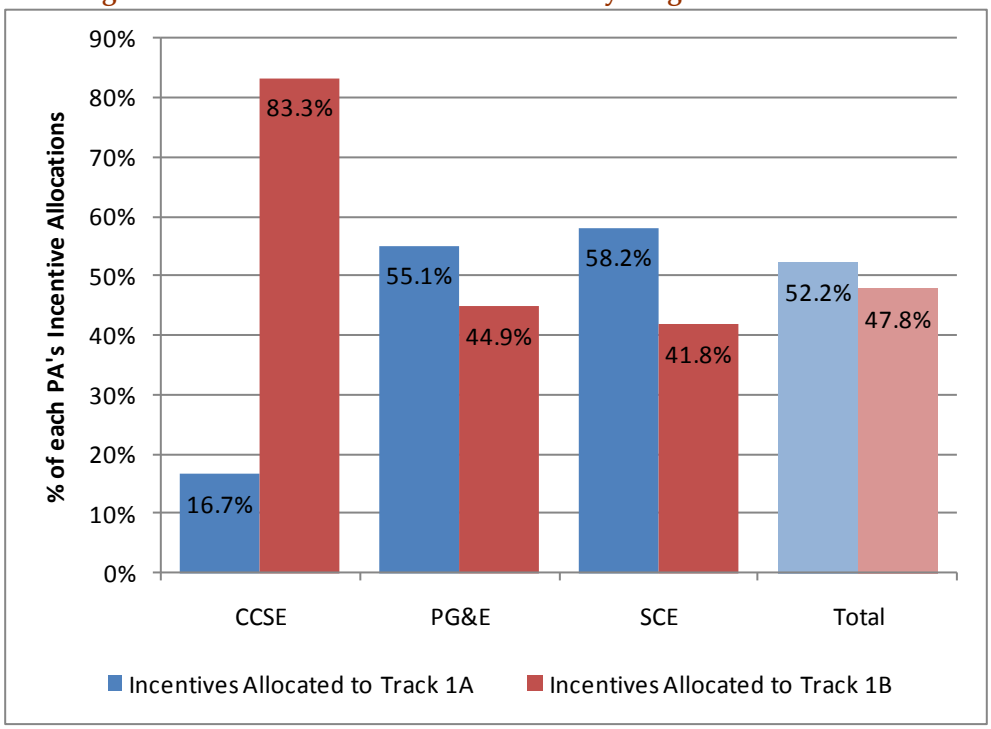


Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Incentive Allocation between Tracks 1A and 1B

As shown in Figure 2-13, the overall allocation of Track 1 incentives is fairly evenly split between Tracks 1A and 1B, with slightly more allocated to Track 1A. However, breaking out the allocations by program administrator presents some clear disparities. While both PG&E and SCE have allocated more incentives to Track 1A, CCSE has allocated more than 80 percent of its to-date incentive dollars to Track 1B.

Figure 2-13. Track 1 Incentive Allocations by Program Administrator



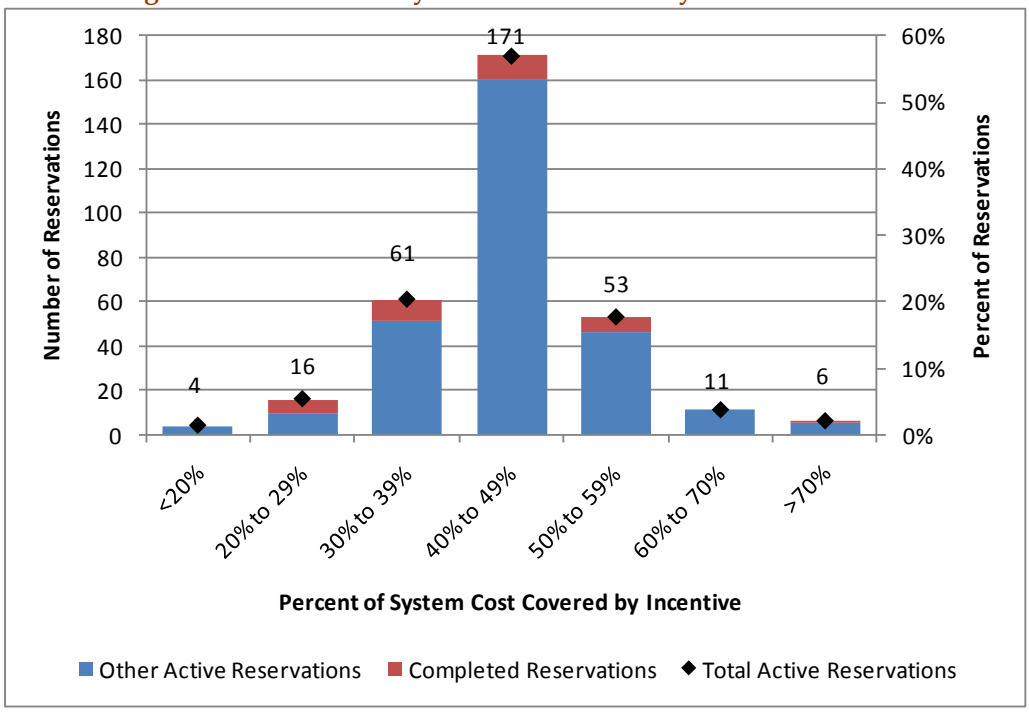
Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

Price

The rapid pace of subscription for incentives through MASH Track 1 indicates that the price set was too low. In this case, the "price" to the customer was the system cost less the MASH incentive. This is the result of an imbalance between supply and demand. Demand for the incentives was higher than expected in the early months of implementation, but the supply of incentives remained constant (as defined in the decision instituting MASH). In a competitive market, this would have resulted in an increase in the price in order to bring supply and demand back into balance. The General Market CSI program made provisions to address such an imbalance with its step-down incentive approach. Since the price was fixed, however, demand was unrestrained, and the incentives were fully subscribed less than 18 months into what was supposed to be a seven-year program.

Over half of the applications for MASH Track 1 qualify for incentives that will cover 40-49 percent of the project's total cost, as shown in Figure 2-14, with a median of 43.3 percent of project costs covered.

Figure 2-14. Percent of System Cost Covered by MASH Incentive



Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011.

3 The Market for the MASH Program

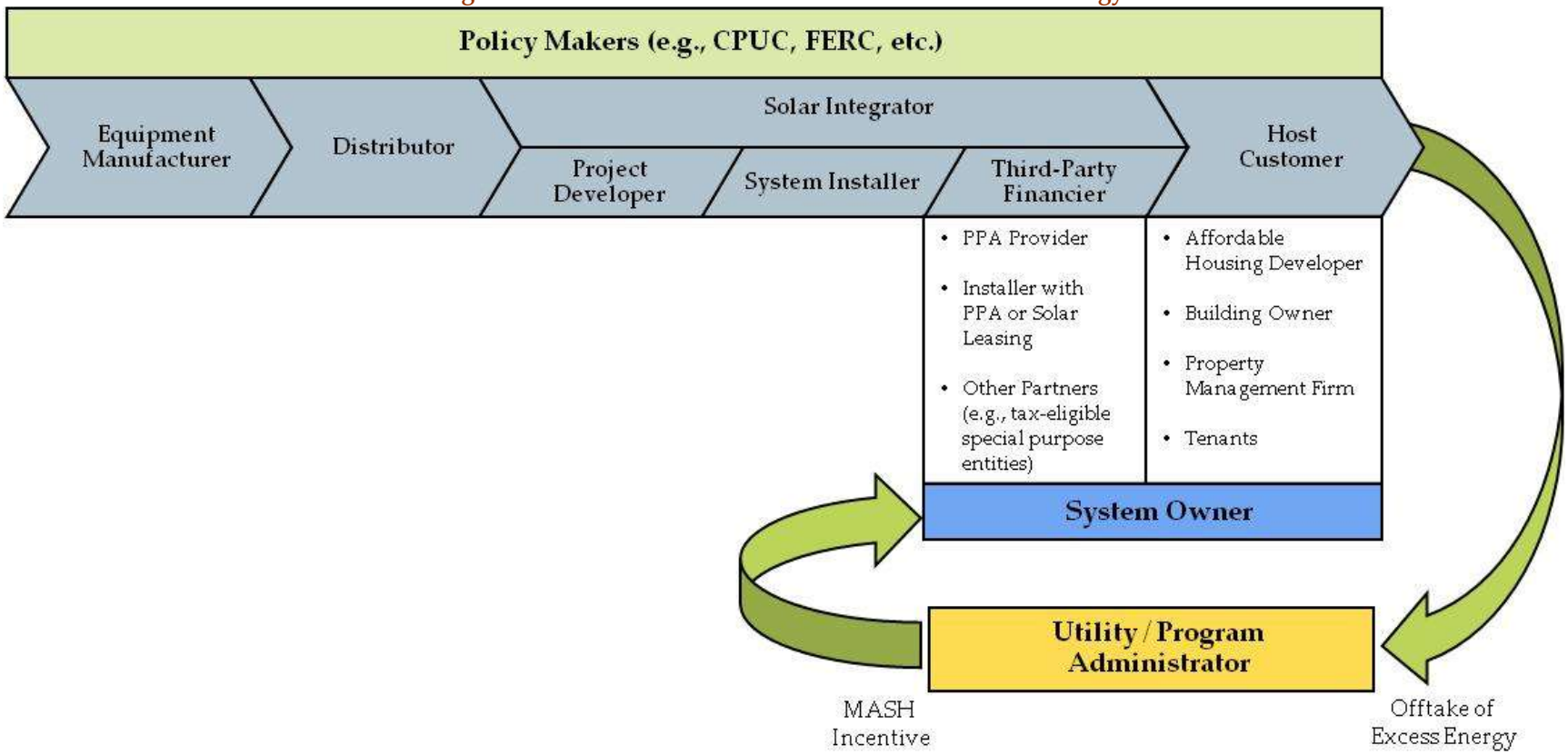
This section focuses on the dynamics in the market in which the PAs operate the MASH program. As an example of a business-to-business market, where PAs market the program to businesses, the market for solar on low-income multifamily buildings (the MASH program) has a structure similar to the General Market CSI program. The key decision makers in this market represent business, non-profits, and other organizations; in contrast, individuals constitute the decision making population in the SASH market. Thus, the dynamics in the market in which MASH interacts follow more closely the dynamics of other markets in which decision makers must consider the priorities of their investors (or funders) and the implications for the profitability (or sustainability) of their organization. This section will explore the unique aspects of the market in which MASH operates.

3.1 Market Description

The MASH program design provides market actors a great deal of flexibility in establishing the specific project approaches, financing arrangements, and relationships that will create viable solar installations for the affordable multi-family housing market. For a given project, the program administrator (PA) works primarily and most directly with a single project applicant, usually from one of three primary market actor categories: host customers, system owners, and installers. For many projects, a single party may be listed in the program application for more than one of these roles. For example, a host customer that finances its own project will also list itself as the system owner; a vertically integrated solar company that markets itself as a "solar integrator" may appear as both the installer and the system owner (indicating a third-party ownership financing arrangement). In other cases, a project may involve three separate entities for each role.

Figure 3-1 depicts the primary relationships between the PAs and the key MASH market actors. A brief summary of the interactions between market actors follows; the market actors are organized in alphabetical order.

Figure 3-1. MASH Market Structure and Intervention Strategy



Source: Navigant analysis, 2011.

EQUIPMENT MANUFACTURERS AND DISTRIBUTORS. MASH program participants benefit from California's well-established and competitive solar industry. Host customers can solicit bids from a wide range of experienced project developers, installers, integrators, and third-party financing firms that have diverse approaches to equipment procurement and supplier relationships. These 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. As with the broader solar market, most host customers rely on these solar industry players to deal with the complexities of equipment selection and to provide competitive equipment pricing rather than approaching suppliers themselves.[8]

HOST CUSTOMERS. The MASH program's host customers own the qualifying affordable housing properties on which incentivized systems are installed. Also referred to in this report as "program participants," these organizations include affordable housing developers (both nonprofit and for-profit entities), general-market housing developers that own some affordable housing properties, municipal housing authorities, property management firms, and independent property owners.[9] Independent of the type of host customer, these program participants interact to varying degrees with the PAs. Some take a primary role in applying for incentives, interacting with program staff, and providing requested information, while others rely on their chosen financing or system installation partners to handle the day-to-day requirements for moving a project forward.

Whether or not the host customer directly receives the MASH incentive payment or requests the PA to redirect it to a parent company, solar financing firm, or other third-party system owner, the host customer and its installer must still interact with its respective utility (the same party as the PA, except in the case of SDG&E, which contracts MASH administration to CCSE) for approvals and billing arrangements related to any interconnection, net metering, and virtual net metering requirements. The host customer also represents the channel through which MASH program benefits pass on to affordable housing tenants.

INVESTOR-OWNED UTILITIES (IOUS) AND PROGRAM ADMINISTRATORS (PAS). The CPUC holds each of the three investor-owned utilities (PG&E, SCE, and SDG&E) independently responsible for implementing the MASH program in its service territory. Both PG&E and SCE administer the program internally, while CCSE, a San Diego-based nonprofit organization, implements the program in SDG&E's service territory. Each PA handles all aspects of MASH program marketing, application processing, project review and approval, progress monitoring, and final incentive disposition.

In addition, the IOUs must handle any interconnection requests, net metering, and virtual net metering arrangements provided for MASH projects, and must accept any excess energy generated by the system in a given month. After system installation, the account holder 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 customer or system owner, as appropriate.

[8] Market Actor Interviews

[9] Navigant categorized host customers based on a combination of Power Clerk data and information available on each organization's website.

SOLAR COMPANIES. As indicated in Figure 3-1, California's diverse solar market has given rise to a variety of solar business models. Some companies offer services across the solar value chain – from equipment procurement to system design and installation, and even project financing. Other firms focus their activities in one or a few of these areas. The following provides a brief overview of the most common combinations of market functions and approaches.

» **PROJECT DEVELOPERS.** Some firms develop renewable energy projects (i.e., secure property rights, equipment orders, interconnection agreements, etc.) independent of any in-house construction or installation capabilities. Often this approach is used with the intention of securing a Power Purchase Agreement (PPA) and/or selling all or part of the potential project "package" to an investor interested in owning the assets. In the case of solar, this approach most commonly occurs for large utility-scale projects. For the system sizes typical of the MASH program, the project development function falls primarily to the third-party system owners and firms offering installation services (e.g., solar integrators and solar installers).

» **SOLAR INTEGRATORS.** The term "solar integrator" is a nebulous term used by many solar companies. In most cases, such firms position this integration as providing "complete solutions" that include system design, installation services, and financing services (though they may subcontract a portion of these functions to a third-party partner). In this analysis, the term refers to a company that directly offers customers some form of project financing assistance in combination with project development and/or installation services.

  For MASH projects listing a solar integrator as the system owner, a review of the associated project installers provides some notable insights. In particular, two solar integrators list themselves as installer for all but one of the projects for which their firm is also owner (n=156 projects). The other four solar integrators exclusively list third-party solar installers or contractors as the system installer for their projects (n=98 projects), revealing the degree to which solar integrators may or may not self-perform system installations.

» **SOLAR INSTALLERS.** Many solar companies generally limit the scope of their activity to the actual design and construction of the PV system, having been contracted by a host customer or third-party system owner. Some installers may only provide construction services for a solar integrator that has already developed a project and designed a system. For this analysis, the term is used to differentiate "solar installers" not directly providing system ownership or third-party financing solutions from "solar integrators" who offer such fully integrated services.

» **OTHER INSTALLATION CONTRACTORS.** In addition to solar installers that focus primarily on constructing solar PV systems, other firms offer solar installation services as a supplement to other areas of expertise such as general contracting, electrical contracting, or energy consulting.

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 MASH program, the parameters within which the MASH program operates, and the definition of low-income. CPUC also provides oversight for the overall operation of the IOUs and their internal and contracted program administration staff.

THIRD-PARTY OWNERSHIP AND FINANCING PROVIDERS. More so than general market customers who wish to install PV, MASH participants tend to have significant constraints on their ability to provide the upfront capital typically required for a PV system. The solar market, however, has developed alternative financing mechanisms in the form of solar PPAs and solar leases that enable host customers to reap the benefits of onsite PV without having to actually own the system. In these cases, a project developer or solar integrator will retain ownership of a system installed on the host customer's property (sometimes leasing the space for the system from the customer) in exchange for a contractual agreement from the customer to purchase the system's output for a pre-determined price and length of time.

Other third-party ownership models include arrangements for system ownership by a host customer's parent company or affiliate, sometimes a special purpose entity established specifically for that purpose. More than 75 percent of MASH projects in the program database listed a system owner that was other than the host customer, while 68 percent of surveyed program participants reported utilizing a PPA to finance their systems. In most of these cases, the system owner or PPA provider likely played a lead role in interacting with the PA throughout the application and project development process.

3.2 Market Size Estimate

This section provides an estimate of the number of eligible multi-family housing projects in California. Two main criteria define a multi-family housing project's eligibility for MASH, as defined by Public Utilities Code Section 2852 (a)(2):

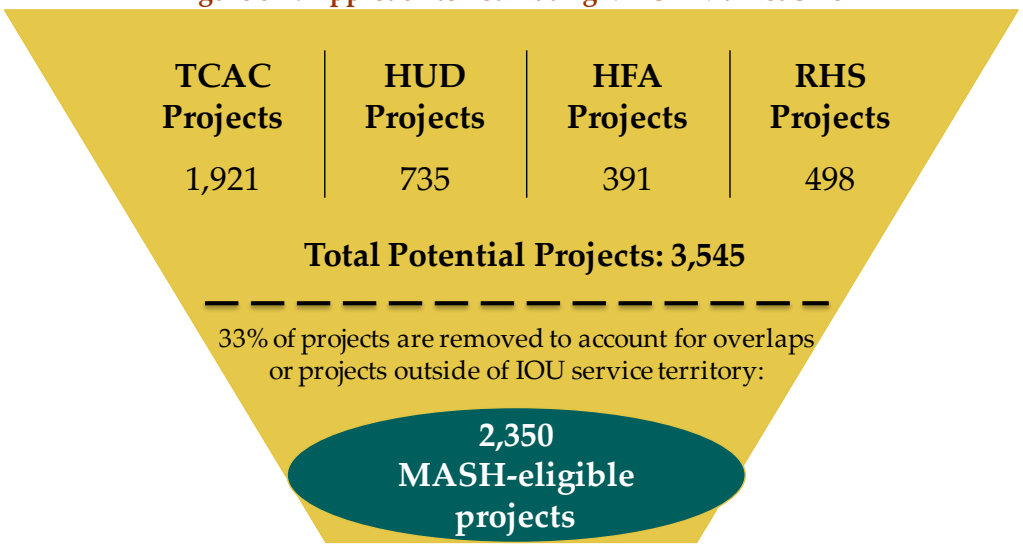
- Residential housing that receives low-income finance assistance
- A residential complex in which at least 20% of the total units are sold or rented to low income households

To estimate the size of the affordable multi-family housing market in California, Navigant updated an estimate developed by KEMA in 2007.[10] This estimate was made by reviewing the California Tax Credit Allocation Committee's (TCAC) list of past participants in qualifying affordable housing programs, including Housing and Urban Development (HUD), California Housing Finance Authority (HFA) and Rural Housing Services (RHS) projects. The total number of housing projects from these agencies was discounted by removing projects that fell outside of the investor-owned utilities' service territories and eliminating projects that received funding from multiple housing programs. It is estimated that one third of potential housing projects either fall outside of IOU service territory, or overlap in funding sources.

[10] CSI Program Administrators' Recommended Low Income Multifamily Solar Program (MSP), July 12, 2007

Using the most recent affordable housing data available, and discounting by one third for overlaps, it is estimated that there are approximately 2,350 housing projects.[11] Figure 3-2 illustrates this approach.

Figure 3-2. Approach to Estimating MASH Market Size



[11] TCAC data: Active Projects Receiving Tax Credits 1999-2009, http://www.treasurer.ca.gov/ctcac/history.asp. HUD data: Multifamily Initial Endorsements: 1999-2009, http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/mfh/fhamie/miebyfy. HFA data: Apartment Rental Information by County, http://www.calhfa.ca.gov/multifamily/rental/. RHS data: Overview of Multi-family Housing Programs, http://www.rurdev.usda.gov/ca/pdf%20files%20and%20documents/Overview_Multi-Family%20Housing%20Programs.pdf.

4 Program Satisfaction

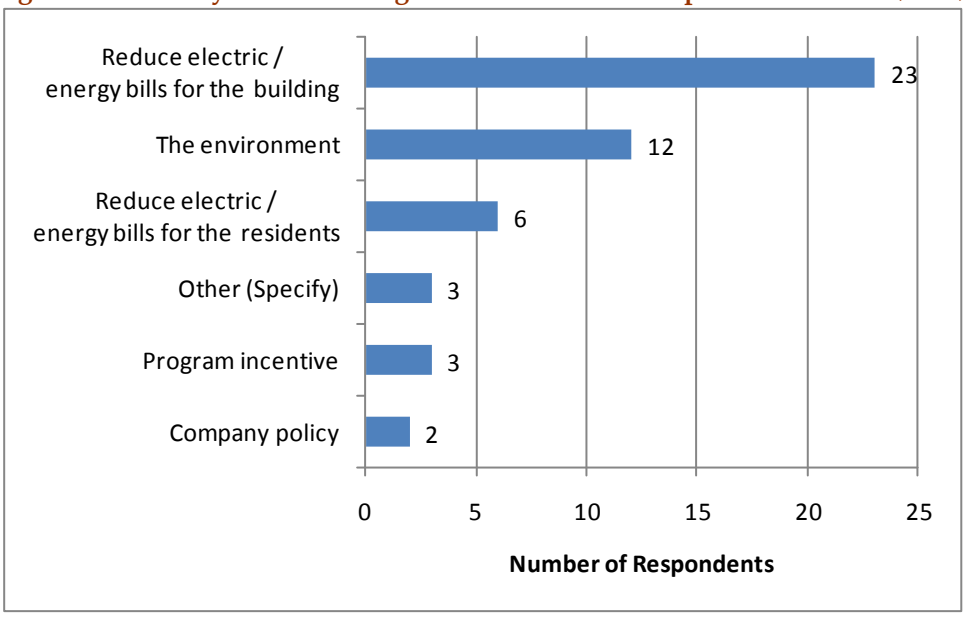
The drivers and barriers to participation in MASH reflect the different characteristics of the target market and relationships among the market actors. Section 4.1.1 first discusses the drivers to participation; these are consistent across market actor groups. Section 4.1.2 then outlines the major barriers to participation in MASH; these differ across the market actor groups.

4.1.1 Drivers to Participation in MASH

Across the board, the primary motivation for participating in MASH is the attractive financial benefit. Host customers, installers, PPA providers, and agencies that support the low-income multi-family owners all indicate that the primary reason that they enrolled in the program was to achieve some financial gain. In order for the solar market to become sustainable among low-income multifamily building owners, the financial case will need to continue to meet their financial goals.

Figure 4-1 indicates the primary reasons cited by MASH host customers for participating in MASH. Host customers cited the reduction in electric bills for the building by nearly twice as many survey respondents as any other factor. As in SASH, the environmental benefits of installing solar came in a distant second behind the bill savings. Passing on the benefit of lower bills to tenants was a primary driver for about 12 percent of respondents.

Figure 4-1. Primary Factor Driving Host Customer Participation in MASH (n=49)



Source: Analysis of MASH Participant surveys, 2010.
Note: Two of the "Other" respondents indicated that both bill savings and the environment factored into their decision.

In addition to similar reasoning around the financial benefits, host customers and PPA providers cited another similar driver to participate in MASH: corporate strategies or policies. Two host customers indicated that the primary reason that their facility participated in MASH was because it fit with their organization's mission. In parallel, two of the three PPA providers interviewed indicated that they decided to offer financing for MASH projects because of the fit of these investments with their broader corporate strategies, which often involved investments related to affordable housing.[12] Identifying partners with similar corporate objectives will contribute to the long-term sustainability of the market for solar among low-income multifamily building owners.

4.1.2 Barriers to Participation in MASH

Market actors report a variety of concerns about the MASH program. In some cases, multiple types of market actors reported the same concerns. In other areas, a host customer expressed concerns that can be characterized as project-specific concerns. This section discusses the key barriers to participation, beginning with the high-level issues and then identifying other issues that may be less common.

[12] This is similar to the cross-over seen between affordable housing investors and other renewable energy system investment. Tax equity investors often serve as an important contributor of equity for affordable housing developments. When tax equity became a more important part of renewable energy project finance (especially for wind), many of these investors entered the renewable energy market as tax equity investors.

Need for education and outreach on financing options. Agencies that support the low-income multifamily segment and at least one program participant indicate that owners of these types of buildings have a steep learning curve to overcome before they will agree to participate in a project. While many building owners understand the concept and benefits of solar power, they lack experience in negotiating a PPA. Ensuring that they secure a fair deal for their facility (and possibly their tenants) requires them to understand the risks and implications very well. It takes time for the individuals and organizations that are new to solar to gather the needed information from trusted sources and determine the implications for their own organization.

Data indicate that many of the organizations that have participated in MASH to date may be considered "early adopters." Survey responses indicate that 65 percent of participants had considered solar prior to applying for MASH. These organizations would have considered at least some of the issues and may have met with a PPA provider or installer previously. Installers and PPA providers indicate that they developed projects first with organizations with which they had previous relationships. Organizations that needed time to get up to speed would have had limited time to do so; given the myriad of other issues on their plate, it is possible that they missed the window for participation. In the future, an expansion of MASH would need to consider the additional needs of organizations that are further down the technology adoption curve. This is similar to how product companies adjust their sales tactics to reach consumers at different points of the technology adoption curve.

Access to client energy usage data. Another barrier to enabling participation from the PPA provider's perspective is the inability to access data about a potential client's past energy usage. PPA providers would use such information to assess the appropriate match between the host customer's energy usage and system size. This is an important consideration for the PPA provider's due diligence on their investment. The PPA provider interviewed indicated that they submitted the appropriate paperwork to the utility which then went into "a black hole." Facilitating access to those records will accelerate the process for negotiating PPAs.

Process-related issues. Host customers, PPA providers, and installers all cited process-related issues. These are covered in more depth in the PA Assessment Report.[13] A brief list is as follows:

- Application cycle (sales cycle) is too long.
- Paperwork to prove low-income eligibility is too complex.
- Energy efficiency requirement could be an issue because these types of facilities operate with limited capital.
- Delays in receiving payment on rebates.
- Dealing with the utility companies – e.g., net metering and interconnection processes not standardized among the utilities.

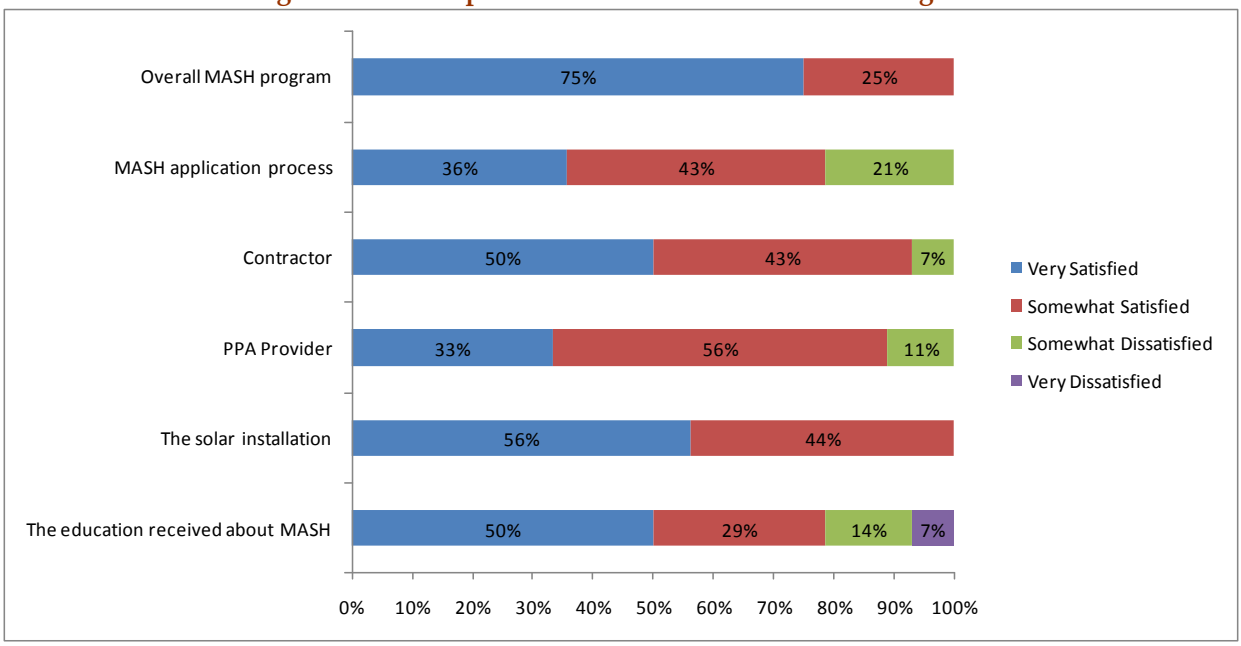
[13] Navigant Consulting, California Solar Initiative SASH and MASH Program Administrator Performance Assessment Report, April 5, 2011.

Technical considerations. Finally, installers list two technical concerns. One installer indicated difficulty installing monitoring equipment because he lacked the ability to establish internet connections in appropriate locations. Another installer mentioned that accessing and working at the points of interconnection can pose challenges due to constrained space.

4.1.3 Participant Satisfaction

Survey data also indicate that MASH participants are very satisfied with their experience with MASH. As shown in Figure 4-2, 75 percent indicate that they are very satisfied with the MASH program overall, and 100 percent report that they are somewhat or very satisfied with the solar installation. Only one respondent (7 percent) was very dissatisfied in any of the categories; this respondent was disappointed in the lack of materials that they received about VNM.

Figure 4-2. Participant Satisfaction with the MASH Program



Participants also gave recommendations about how to improve the MASH program. The top-reported suggestions were to clearly communicate the status of MASH applications throughout the process, consolidate the application paperwork and to extend MASH program funding.

5 Virtual Net Metering

In buildings with multiple tenants, allocating solar PV benefits across multiple meters has historically been difficult. A solar PV system is attached to only one meter per building, making it difficult to equally distribute the electricity generation across all meters in the building, and installing a solar PV systems for each tenant unit is cost-prohibitive. VNM allows low-income tenants to benefit from on-site solar generation and reduced electricity bills without requiring the generator to be physically connected to each billing meter.[14] The electricity generated flows directly to the grid, which the electric utility credits to the accounts of each meter in the building according to a pre-arranged allocation. In this way, tenants of low-income multifamily buildings can receive solar PV benefits from one system, rather than all of the benefits going to the building owner. The CPUC required each investor-owned utility to file a rate tariff for VNM. As implemented, VNM has encountered issues from both the utility and project perspective. This section explores the benefits and costs of VNM for MASH.

5.1.1 Barriers to VNM

The most commonly cited reasons for not using VNM on MASH projects were the service delivery point issue, a lack of awareness or understanding of VNM, and having enough common area load to use the generation of a PV system (or having a roof too small to warrant allocating credits to tenant area load).

» **Service delivery point issue.** By far, the most commonly named issue with VNM was the definition of the service delivery point within the IOU VNM tariffs. For instance, a six-building project would likely have six utility delivery points. Currently, for example, to be eligible for VNM, a developer would have to wire PV system to each of the six delivery points as the IOU tariffs[15] do not permit taking power out of one service delivery point and put it into another. If a developer were to wire six different systems, the project costs could increase significantly. Many times, these extra costs have made or broken projects. Respondents mentioned resolution of the "service point issue" as a key area for improvement. Many projects were delayed to await this resolution.

However, the definition of service delivery point is supported by the PAs. Allowing the systems to use the utility grid to move the power from the point of production to the point of consumption in this manner would constitute a form of retail wheeling. Even though power would be transferred over a relatively short distance, from building to building within a housing project, the PAs believe that it would be an undesirable precedent to allow customers to do this without paying for use of the grid. [16]

[14] Advice Letters from June 2009 approve VNM: 3555-E (PG&E), 2322-E-A (SCE), 2064-E-A (SDG&E).

[15] In September of 2010, the CPUC approved an advice letter filed by PG&E that would relax the service delivery point requirement and allow the tenant benefits to be netted beyond the service delivery point within a defined low-income development through the end of 2011.

[16] In September of 2010, the CPUC approved an advice letter filed by PG&E that would relax this requirement and allow the generation to be netted by common area and tenant meters beyond the service delivery point of the installed generator within a defined Eligible Low Income Development through the end of 2011.

» **Lack of awareness and understanding.** Very few respondents understood or had experience with VNM. Some respondents indicated that there needs to be more clarity around what installers can and cannot do to make a system eligible for VNM and what the associated costs may be. Other survey and interview respondents had never even heard of VNM.

» **Sufficient common area load.** Some respondents mentioned that they only pursued Track 1A funds as the size of the roof, and consequently the system, did not warrant allocation among the tenants. The load on the common area meter is often large enough to be offset the PV system, so the installers pursue those savings rather than tenant area savings.

Of the survey and interview respondents that were aware of VNM, most found the potential benefits of VNM attractive. The mostly commonly cited positive attribute was the ability to pass on the direct benefits of solar to tenants. Respondents indicated that without VNM, potential solar adoption would have a much lower ceiling as roughly half of residential and commercial units are multi-tenant. Of 10 host customer survey respondents, eight considered VNM either very important or somewhat important in the decision to install solar under the MASH program. Of eight respondents, only three indicated that they would have installed solar in the absence of VNM.

5.1.2 MASH VNM participation by Program Track

The two incentive levels available under Track 1 provide a higher incentive to projects that offset tenant load (Track 1B) than to projects that offset common area load (Track 1A). Although VNM participation is not a requirement to receive the higher Track 1B incentive, because both support projects that provide tenant benefits, one would expect a high correlation between VNM and Track 1B incentives. Table 5-1 presents the percentage split of projects between Track 1A and 1B for VNM and non-VNM projects, and for projects overall for PG&E and CCSE. The split between Track 1A and 1B for SCE VNM projects is also provided.

Table 5-1. Track 1A and 1B Incentives by VNM Participation

	% Track 1A (Common Area)	% Track 1B (Tenant Load)
CCSE		
CCSE VNM Projects*	13.6	87.3
CCSE Non-VNM Projects*	59.1	40.9
CCSE Overall*	24.2	76.5
PG&E		
PG&E VNM Projects*	30.7	69.9
PG&E Non-VNM Projects*	54.9	43.8
PG&E Overall*	53.3	45.6
SCE		
SCE VNM Projects#	16.9	83.1

* Source: PG&E and CCSE "MASH Stats" spreadsheets downloaded November 17, 2010. SCE data provided by SCE November 2010.

For all PAs, the VNM projects are weighted toward Track 1B incentives, supporting the positive correlation between VNM and Track 1B incentive. CCSE has the highest proportion of Track 1B incentives overall, while their non-VNM projects provide only 41% of tenant load benefit.

PG&E indicated that 11 out of their 183 projects were participating in VNM, while CCSE's records indicate that 23 out of 30 projects are participating. Navigant notes that this disparity may be the result of the PA's awareness of VNM status of in-progress projects rather than a difference in the actual percentage of projects participating in VNM. There is no specific time requirement for submitting VNM applications; therefore, MASH participants can apply for VNM at any point during the installation process. Because CCSE has a smaller number of projects, they are possibly able to monitor each project's status closely and therefore know the VNM status.

5.1.3 Tenant Benefits in Track 2

Track 2 was designed as a competitive grant-style application process. Through Track 2, applicants can request and may "receive a higher incentive level than Track 1 provides, if they can justify the need for a higher incentive and prove the system will provide a 'direct tenant benefit.'"[17]

Table 5-2 summarizes the tenant and common area benefit of the Track 2 projects accepted as of the writing of this report. Overall, the Track 2 projects provide a high level of tenant benefits, generally outpacing the tenant benefit of the Track 1 projects (as shown in Table 5-1). Three of the twelve projects provide 100% tenant benefits, and all projects transferred the majority of the system's benefits to the tenants. In their project application, SCE Project 1 asserted that, although 15% of the system's output offset common area loads, the tenant portion of the system would cover 100% of their tenant's electricity needs.

Table 5-2. Track 2 Tenant and Common Area Benefit

Track 2 Project	% Tenant Benefit	% Common Area Benefit
SCE Project 1	85%	15%
SCE Project 2	76%	24%
SCE Project 3	80%	20%
SCE Project 4	100%	0%
PG&E Project 1	51%	49%
PG&E Project 2	100%	0%
PG&E Project 3	72%	28%
PG&E Project 4	90%	10%
PG&E Project 5	90%	10%
PG&E Project 6	90%	10%
PG&E Project 7	90%	10%
CCSE Project 1	100%	0%
Overall	85%	15%

[17] CPUC Decision 08-10-036, October 16, 2008

Source: MASH Track 2 applications approved as of November 2010.

6 Ability of Programs to Meet MW Goals

6.1.1 Current Progress Toward Program Goals

The current forecast for aggregate installed and reserved capacity for MASH projects (for both Track 1 and Track 2) was highlighted in section 2, with just under 24 MW of capacity expected from currently allocated incentives. While there is no MW goal for the MASH program, each PA has a budget allocated to each incentive Track, to be spent by 2016 or until the funds are exhausted. For the active Track 1 projects, the average incentive per reserved kW is $3,194. If this trend continues, an additional 1.4 MW of capacity can be realized with the remaining Track 1 budget of $4.5 million, as shown in Table 6-1. For Track 2, while no installations have been completed, the budget allocated per approved kW is higher than Track 1 projects, at $6,143 per kW. With a remaining Track 2 budget of $11.8 million, this would result in another 1.9 MW installed. The MASH program is on track to deliver a total of 26.8 MW of capacity.

Table 6-1. Allocation of Remaining MASH Program Budget

Program Track	kW Installed or Active	Budget Installed or Allocated	Budget per kW	Unallocated Budget	Potential Additional kW	Potential Total kW
Track 1A and 1B	22,167	$70,810,853	$3,194	$4,528,347	1,418	23,584
Track 2	1,327	$8,151,399	$6,143	$11,848,601	1,929	3,256
Total	23,494				3,346	26,840

In June 2010, the PAs filed a request to move the remaining Track 2 budget to fund Track 1 projects. If this request is approved, then the remaining $11.8 million would be distributed among the three PAs to fund Track 1 projects on their waitlist. If this were to occur, the total potential kW would increase to 27.3 MW.

6.1.2 Capacity Forecast under Varying Incentive Levels

This section explores the theoretical additional capacity that might be achievable should the CPUC wish to change the incentive levels for Track 1. The below calculations are for illustrative purposes only, and assume a reduction in incentive step for Track 1A and 1B to $2.30/W and $2.80/W, respectively. For the purpose of calculating a revised per-Watt cost under the new incentive levels, the forecast also assumes that all presently reserved projects (or new projects with similar size and cost distributions) would be completed under the new incentive levels.

Table 6-2 on the following page illustrates two theoretical situations for increasing the installed capacity from MASH projects under the current incentive budget. The first assumes that all currently reserved projects (excluding those already completed) were reallocated incentives based on the reduced incentive steps. While such a change would certainly encounter resistance from program participants whose projects would not remain viable, the point is to demonstrate the additional capacity the CPUC could expect from the MASH program if similar projects were installed under the reduced incentive levels. The second situation assumes that currently unallocated portions of each PA's Track 1 and Track 2 budgets were reallocated to Track 1 under the reduced incentive levels. Expected capacity calculations for each of

the two situations apply an average incentive cost of $2.50/W based on the reallocation of incentives against the system size characteristics of existing MASH reservations.

Under these assumptions, the CPUC could potentially expect the MASH program to achieve an additional 6.8 MW (for a total of 30.8 MW) if presently unallocated incentive budgets for both Tracks were reallocated to Track 1 under the reduced incentive levels mentioned above.

Table 6-2. Theoretical Capacity Forecast Calculations for Reduced Incentive Steps

	PG&E	SCE	CCSE	Total
Track 1 Projects Completed and Paid	**21**	**8**	**6**	**35**
Incentives Paid	$3,503,560	$2,561,794	$524,184	$6,589,538
Capacity of Completed Projects (kW)	1,205	807	173	**2,185**
Track 1 Reservations Outstanding	**143**	**124**	**24**	**291**
Calculated Incentive Amount	$28,243,257	$28,725,600	$7,252,458	$64,221,315
% Track 1A	55.1%	58.2%	16.7%	52.4%
% Track 1B	44.9%	41.8%	83.3%	36.8%
Theoretical Cost Expectations Under Reduced Incentive Steps				
Cost of Outstanding Track 1A Reservations at $2.30/W	$10,452,008	$12,791,325	$832,982	$24,076,316
Cost of Outstanding Track 1B Reservations at $2.80/W	$9,021,860	$6,997,063	$4,564,975	$20,583,898
Total Incentive for Outstanding Track 1 Reservations with Reduced Incentive	$19,473,869	$19,788,388	$5,397,957	$44,660,214
Average $/W Under Reduced Incentives	$2.36	$2.07	$2.49	$2.24
Theoretical Additional Capacity if Incentives were Reduced for Existing Reservations				
Additional Budget Available as a Result of Reduced Incentives	$8,769,388	$8,937,212	$1,854,501	$19,561,101
Additional Capacity Afforded using Average $2.50/W (MW)	3.92	4.00	0.83	**8.75**
Thoerteical Additional Capacity from Unallocated Track 1 & Track 2 Incentive Budgets				
Unallocated Budget for Track 1 and Track 2 Incentives	$7,318,390	$7,835,262	$1,223,296	$16,376,948
Additional Capacity Afforded using Average $2.50/W (MW)	3.27	3.51	0.55	**7.33**
Comparative Analysis of Expected Program Capacities				
Presently Expected Capacity of All Track 1 Reservations (MW)	9.45	10.37	2.34	**22.17**
Presently Expected Capacity of All Track 2 Reservations (MW)	0.51	0.70	0.12	**1.33**
Total Theoretical Capacity if Current Reservation Incentives are Reduced	13.89	15.07	3.29	**32.25**
Total Theoretical Capacity with Reduced Incentives Applied to Unallocated Budgets (Track 1 and Track 2)	13.24	14.57	3.01	**30.82**
Total Theoretical Capacity with Both Situations Combined	17.17	18.57	3.83	**39.57**

Source: SCE and CCSE data exported from Power Clerk January 7, 2011; PG&E data acquired from PG&E January 7, 2011; Track 2 incentive allocations based on the *MASH Semi-Annual Progress Report*, February 2, 2011.

7 Key Findings

This section summarizes the main findings from the Market Assessment, PA Report and Impact Report for the MASH program

7.1.1 Market Description

» **Participation in the MASH market is dominated by a handful of large host customers, third-party system owners, and solar installers.** The top ten host customers hold 44 percent of MASH projects, with the most prolific holding 28 projects. The top six third-party system owners are listed on 70 percent of projects, with the largest appearing on 94 projects (29 percent of the total). Finally, the top four installers are listed on 65 percent of projects, with the largest appearing on 53 projects (37 percent of the total).

» **In many cases, several MASH applications may be required for multiple service points on a single property.** For completed projects, 35 individual applications were allocated to only 21 unique host customer locations, with one location comprising five applications. The average for completed projects is 1.6 applications per project site.

7.1.2 Market Channels

» **MASH has used an intensive distribution model in which many entities have the ability to distribute information about MASH and recruit participants for the program.** Whereas the SASH program retains control over the messaging and customer interaction, the MASH program enables a variety of market actors to perform the outreach and promote the program.

» **Contractors served as the primary distribution channel for MASH's Track 1 program.** The incentive available for MASH accrues directly to these entities in most cases, and the potential financial benefits for these entities drive their efforts to recruit participants. In parallel, participants report that solar contractors and PPA providers, combined, serve as the most common channels to initially learning about MASH.

» **The third-party ownership structure permeates MASH projects.** Two-thirds (68 percent) of surveyed MASH participants said they used PPAs to help finance their projects, while 78 percent of projects in the Power Clerk data appeared to use some form of third-party ownership structure. Market actors related that the Investment Tax Credit and the related Treasury Cash Grant remained strong financial drivers for projects, reinforcing the importance of third-party ownership for host customers with nonprofit status.

7.1.3 Drivers and Barriers

» **Across the board, the primary motivation for participating in MASH is the attractive financial benefit.** Host customers, installers, PPA providers, and agencies that support the low-income multifamily owners all indicate that the primary reason that they enrolled in the program was to achieve some financial gain. In order for the solar market to become sustainable among low-

income multifamily building owners, the financial case will need to meet their financial goals.

» **Participants also cite environmental benefits, tenant bill savings, and alignment with organizational priorities as their primary reason for participating in MASH.** A subset of host customers and PPA providers cited alignment with corporate strategies or policies as a primary driver to MASH. Identifying partners with similar corporate objectives will contribute to the long-term sustainability of the market for solar among low-income multifamily building owners.

» **Without previous experience in solar, potential host customers need support in learning about the issues related to negotiating PPAs.** Agencies that support the low-income multifamily segment and at least one participant indicate that owners of these types of buildings have a steep learning curve to overcome before they will agree to participate in a project. While many building owners understand the concept and benefits of solar power, they lack experience in negotiating a PPA. Ensuring that they secure a fair deal for their facility (and possibly their tenants) requires them to understand the risks and implications very well.

» **Data indicate that many of the organizations that have participated in MASH to date may be considered "early adopters."** Survey responses indicate that 65 percent of participants had considered solar prior to applying for MASH. These organizations would have considered at least some of the issues and may have met with a PPA provider or installer previously. It takes time for the individuals and organizations that are new to solar to gather the needed information from trusted sources and determine the implications for their own organization, which may have prevented them from participating in MASH already.

» **Incentives cover a smaller portion of overall project costs than in the SASH program.** For the majority (53 percent) of projects, incentives cover 40 to 49 percent of the calculated system cost, with a median of 43.3 percent of project costs covered.

7.1.4 Virtual Net Metering

» **The potential benefits of VNM are the ability to pass along the direct benefits of solar to the tenants.**

» **The most commonly cited reasons for not using VNM are the definition of service delivery point, a lack of understanding and awareness of VNM, and sufficient common area load to offset PV production.**

7.1.5 Ability to Meet Program Goals

» **Although there are no stated program objectives around installed capacity, the MASH program is on track to deliver a total of 26.8 MW**. This increases to 27.3 MW if the unallocated Track 2 funds can be moved to Track 1.