GO solar CALIFORNIA

California Solar Initiative Annual Program Assessment

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California Solar Initiative
Annual Program Assessment

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Prepared by the
California Public Utilities Commission

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1. Executive Summary

1.1 Introduction

In January 2007, California began an unprecedented $3.3 billion ratepayer-funded effort to install 3,000 megawatts (MW) of new customer-sited solar energy systems over the next decade and transform the market by reducing the cost of solar generating equipment. The California Public Utilities Commission (CPUC) portion of the solar effort is known as the California Solar Initiative (CSI) Program. The CSI Program, the country's largest solar program, has a $2.2 billion budget and a goal of 1,940 MW of solar capacity by the end of 2016.

CPUC staff prepared this fourth Annual Program Assessment to meet a statutory requirement for an annual report to the Legislature on the progress of the CSI Program.[1] This report focuses on the CSI Program, and not the California Energy Commission's New Solar Homes Partnership or publicly-owned utilities' solar offerings. In most cases, the report includes data through April 1, 2011. Some program components, however, have their own reporting schedules such that some sections of this report include data reported before or after April 1st.

The market for solar generating equipment in California has grown at a rapid pace since the beginning of the CSI Program. The annual rate of new solar installations and the cumulative installed capacity both provide evidence that California is well along the path of achieving the installed capacity goals set forth by Senate Bill (SB) 1 in 2006, the legislation that authorized the CSI Program.

1.2 Key Report Highlights

This report contains current information on distributed solar energy systems in California, both those installed through the CSI Program and those installed through other incentive programs. In addition, this report provides detailed information on CSI Program participation, installed capacity, equipment costs, and program impacts. The report also includes information on the progress of other CSI Program components, including two low-income programs: Single-Family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH); the CSI-Thermal Program; and the Research, Development and Demonstration (RD&D) Program.

[1] 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." The CPUC submitted the first CSI Annual Program Assessment on June 30, 2009, available at: http://www.cpuc.ca.gov/PUC/energy/Solar/apa09.htm.

1.2.1 Statewide Installed Solar Highlights

Californians installed 194 MW of new solar electric generating equipment in 2010 – more new distributed solar generating capacity than in any other year in the state's history, and an increase of 47% over the capacity installed in 2009 (See Section 3). This grid-tied solar capacity provides clean, fossil-free power directly to 19,877 homes, businesses, non-profits, and government agencies statewide.

This surge in solar installations brings the total installed solar capacity in California to 924 MW at 94, 891 individual sites through the first quarter of 2011 (See Section 3.3). This capacity has been installed through a variety of state and local incentive programs dating back to the 1990s. Of the 924 total MW installed, 746 MW were installed at 77,461 customer sites in the service territories of the state's investor-owned utilities (IOUs).

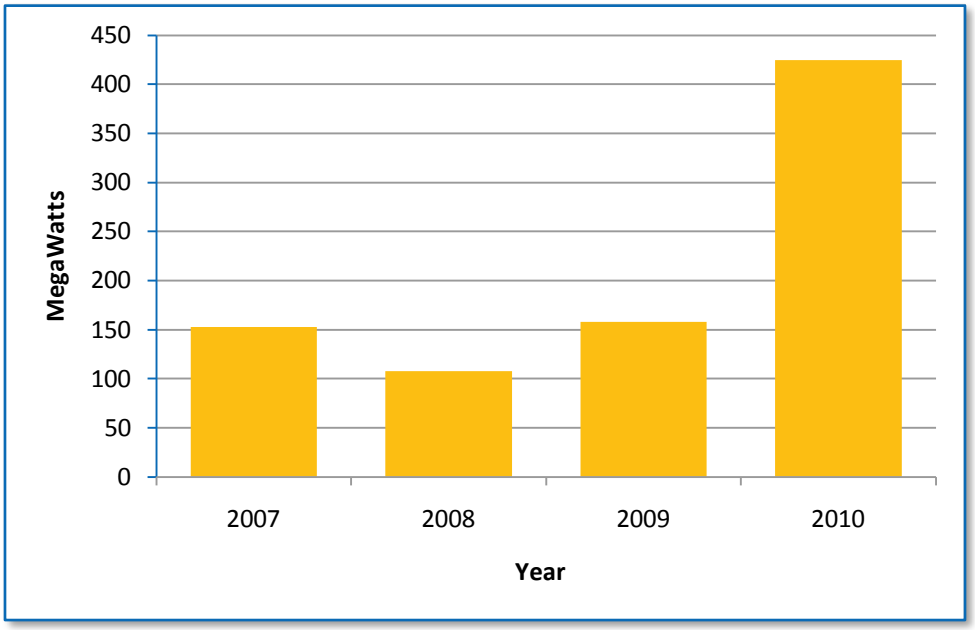
The California Solar Initiative accounts for the majority of the customer-sited solar equipment installed in the IOU territories, with 506 MW installed at 46,550 sites under CSI as of April 1, 2011. The remainder of the customer-sited capacity installed in the IOU territories was installed under other programs including the California Energy Commission's New Solar Homes Partnership (NSHP), and the CPUC's Self-Generation Incentive Program (SGIP) and Emerging Renewables Program (ERP).

1.2.2 CSI General Market Program Highlights

Just as 2010 was a banner year for solar installations in California, it was also a record-setting year for new rebate applications under the CSI Program, indicating robust and sustained growth in the solar sector. In spite of the national economic downturn, applications for solar rebates under CSI increased dramatically in 2010, with 425 MW of new applications received from 21,964 applicants – more than twice the capacity received in any previous year of the program (See Figure 1).

Many of these new applications are likely to complete installation in 2011, ensuring that the brisk pace of new solar installations in California continues. In fact, in just the first five months of 2011, the CSI program has already installed 111 MW of new solar generation – a pace of solar installation that, if continued, will exceed the previous 12-month record for CSI installations by 76% (See Section 4.1.2.3).

Figure 1: California Solar Initiative Applications by Year



Source: www.californiasolarstatistics.com, data through December 31, 2010

With the ever-increasing pace of solar installation in California, it is not surprising that four years after it first began taking applications, the CSI Program is now more than halfway to its 10-year capacity goal of 1,750 MW for the general market program. The 506 MW that have already been installed under CSI since the program began in 2007 represent 29 percent of the installed capacity goal, while 403 MW of projects that have not yet been completed represent an additional 23 percent of the goal (See Section 4.1.2.2).

If all pending projects are installed, the program progress to date will account for 910 MW of new solar electric generating capacity – enough to power more than 700,000 homes. In total, the CSI Program has 57,445 distributed solar projects in some stage of completion, including 46,550 that have been completed and another 10,895 that are in progress.

A key goal of the CSI Program has been to reduce the cost of installed solar photovoltaic (PV) equipment, and data found on www.californiasolarstatistics.com shows that this goal is being met. For systems smaller than 10 kW, inflation-adjusted prices have declined from $10.45/watt to $8.55/watt since the start of the program, a cost reduction of 18%. For systems larger than 10 kW, prices have dropped even further, from $9.18/watt to $6.71/watt, a 27% cost reduction (See Section 4.1.2.5).

As the program progresses, California ratepayers contribute a decreasing portion of the installation costs through CSI incentives. A unique feature of the CSI Program is that incentives decline as the market grows, so as more and more solar is installed, the state pays a smaller and smaller share of the cost of new installations. In 2010, for every dollar

spent on incentives by the state, there has been an additional $3.49 invested in solar technology from other sources. The $885 million in CSI incentives invested by ratepayers so far has funded installed projects costing a total of $3.7 billion. The $456 million in reserved incentive funding for pending systems will buy additional projects worth $2.24 billion, a major stimulus to the California economy (See Section 4.1.2.6).

One challenge the CSI Program has faced in the past year has been a budget shortfall that has resulted in a wait-list only policy for non-residential projects in Pacific Gas and Electric and San Diego Gas and Electric territories. The shortfall results from a number of factors, including better-than-expected performance of systems taking performance-based incentives and the inability of the program to compensate for interest factored into those 5-year payments. The CPUC has attempted to mitigate this shortfall through a decision that shifts funds from administration to incentives, but the budget shortfall, estimated to be at approximately $198 million, will continue to be a cash flow challenge for the program in the years ahead (See Section 6).

As the CSI Program nears its halfway mark, the CPUC and the Program Administrators continue to strive to make improvements that will better serve solar installers and customers. For instance, PowerClerk, the online applications database, was modified in early 2010 to allow applicants to attach documents electronically, and all three Program Administrators are now making a live respondent available on the hotline. Moving forward, the Program Administrators are working to incorporate the incentive calculator into PowerClerk, and they are coordinating their administrative practices to be more consistent across service territories (See Section 5.4).

Finally, as the General Market CSI Program nears its goals, the CPUC and the program administrators have made significant progress in the other components of the program, including low-income, research and development, and solar thermal. Progress on those program components is highlighted below.

1.2.3 Other Program Components Highlights

- **Single-Family Affordable Solar Homes (SASH):** Like the General Market CSI Program, the SASH Program experienced rapid growth in 2010. The program installed 349 projects in 2010, a nearly 300% increase over 2009 installations. To date, SASH has installed 1.2 MW of solar projects on the homes of 466 low-income California residents. With an additional 526 MW of applications in the pipeline, SASH is likely to install an additional 1.47 MW of projects in the near future (See Section 4.2).

In addition to increasing the quantity of applications received and projects installed over the past year, SASH has made significant progress in key areas, including: expanding the Sub-Contractor Partnership Program (SPP); increasing marketing and outreach efficiency; building partnerships with volunteers and job training/workforce programs; and broadening the affordable housing client database. These efforts are further described in Section 4.2.

- **Multi-family Affordable Solar Housing (MASH):** Since its creation in October 2008, the MASH program has been so popular with contractors and low-income housing agencies that many of the incentives have been fully allocated, and there is a waiting list to participate in the program. As of May 31, 2011, MASH has 71 completed projects with a capacity of 4.1 MW and another 257 projects in progress with a combined capacity of 15.6 MW. In total, MASH has installed or is in the process of installing 20 MW of clean distributed solar energy on low income multi-family housing (See Section 4.3).

- **CSI-Thermal Program:** In 2010 the CPUC created a brand new program to promote the market for solar water heating (SWH) and other solar thermal technologies. The CSI-Thermal Program began taking applications from single-family customers in May 2010 and from multi-family/commercial customers in October 2010. Over the first year of the program, CSI-Thermal received applications for $1.9 million in incentives from 275 projects with a total cost of about $6.5 million (See Section 4.4).

  Through the first year of program implementation, the CPUC and program administrators held workshops to obtain public input on program rules; drafted the CSI-Thermal Program Handbook; built program database and application tools; and began work on a comprehensive statewide marketing program. In 2011, the CSI-Thermal Program is working to implement a low-income program and open the technology eligibility to non-water heating solar thermal projects.

- **Research, Development, Demonstration and Deployment (RD&D) Program:** The CSI RD&D Program approved two rounds of grants in 2010. The program approved its first round of grants in March 2010, awarding $9.3 million to eight projects focusing on grid integration of solar energy from applicants among industry, academia, government and utilities. The RD&D Program approved its second round of grants in September, 2010, awarding $14.6 million to nine projects. A final CSI RD&D grant solicitation is being developed for 2011 release to cover grid integration, improved PV production and innovative business models (See Section 4.5).

1.3 Future CSI Program Modifications

On July 26, 2010, the CPUC released a ruling with a Staff Proposal from Energy Division recommending changes to the CSI Program in more than 40 issue areas. The CPUC then divided the issues in the Staff Proposal into phases and took public comment on 23 issues deemed high-priority "Phase I" issues. Those issues include:

- Expanding "Virtual Net Metering" to all multi-tenant properties. Virtual Net Metering is currently offered only to multi-tenant properties participating in the MASH Program.
- Expanding the Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) Program on a pilot basis to all customers (RES-BCT) is currently available only to local governments.
- Using Advanced Metering Infrastructure (AMI) data to make solar energy production information available to all customers.

Changes to the CSI Program resulting from the Staff Proposal have been incorporated into a CPUC Proposed Decision that was released in mid-June 2011.[2]

[2]The proposed decision is available here: http://docs.cpuc.ca.gov/EFILE/PD/137183.htm.

2 Introduction

2.1 Background on California Solar Initiative (CSI)

The California Solar Initiative (CSI or CSI Program) is the solar rebate program for California consumers that are customers of the investor-owned utilities: Pacific Gas and Electric (PG&E), Southern California Edison (SCE), San Diego Gas & Electric (SDG&E).

The goals of the CSI Program are to:

- Install 1,940 MW of distributed solar energy system generation capacity or the equivalent in the large electric IOU service territories and displace 585 million therms of natural gas usage, or the equivalent output of 200,000 solar thermal systems;
- Transform the market for solar energy systems so that it is price competitive and self-sustaining.

The Legislature authorized the creation of the CSI Program through SB 1 (Murray) in 2006 to support the deployment of customer-sited solar energy systems, and the CPUC oversees administration of the program. Although CSI originally provided incentives only for solar PV installations by customers of the state's large electric IOUs, starting in 2010 the program began providing incentives for gas-displacing solar water heating systems installed by customers of the large gas IOUs: PG&E, SDG&E and Southern California Gas Company (SCG). Existing residential homes, as well as existing and new commercial, industrial, government, non-profit, and agricultural properties within the service territories of the large electric and gas IOUs are eligible for CSI Program participation.

The electric portion of CSI Program, which covers PV and non-PV solar electric generating equipment as well as electric-displacing solar thermal systems, was created by the CPUC in a series of regulatory decisions between 2006 and 2010. The natural gas-displacing solar thermal portion of the CSI Program was authorized by the Legislature in Assembly Bill (AB) 1470 (Huffman, 2007) and implemented by the CPUC in early 2010 after the required evaluation of a pilot program in the San Diego area.

The CSI Program focuses exclusively on solar energy systems used by IOU customers to offset some or all of their own energy consumption. In the case of the solar PV program, the solar energy systems funded under the program reduce the customer's electricity consumption from the grid. In the case of the solar hot water program, the solar energy systems reduce the customer's gas or electricity consumption, depending on the customer's energy source for their existing hot water system. The CSI Program does not fund

wholesale solar power plants, which are designed to deliver electricity for sale over the electric grid; it is also separate from the utilities' Renewable Portfolio Standard (RPS) obligations.[3]

2.2 CSI Program Components

The overall CSI Program has two funding streams, depending on whether the rebated technology displaces natural gas or electricity. The electric portion of the CSI Program has a 10-year budget of $2,167 million collected from electric ratepayers as authorized by SB 1. AB 1470 authorized $250 million in additional spending on thermal technologies through 2017 to be collected from gas ratepayers.

The CSI Program has several program components, as shown in Table 1, each with its own Program Administrator and budgets overseen by the CPUC:

- Three Program Administrators implement the CSI general market solar program: PG&E, SCE, and the California Center for Sustainable Energy (CCSE) in SDG&E territory. The goal of the general market rebate program is 1,750 MW, and the program has a ten-year budget of $1,897 million. The general market solar program funds solar PV and other solar electric generating equipment.
- **The CSI Single-family Affordable Solar Homes (SASH) Program** provides solar incentives to qualifying single-family, low income housing owners. The SASH Program is administered through a statewide Program Manager, GRID Alternatives, with a budget of $108 million.
- **The CSI Multifamily Affordable Solar Housing (MASH) Program** provides solar incentives to multifamily low income housing facilities. The MASH Program also has a $108 million budget and is administered through the same Program Administrators as the general market solar program: PG&E, SCE, and CCSE.
- **The CSI Research, Development, Demonstration and Deployment (RD&D) Program** provides grants to develop and deploy solar technologies that can advance the overall goals of the CSI Program, including achieving targets for capacity, cost, and a self-sustaining solar industry in California. The RD&D Program is administered through the RD&D Program Manager, Itron, Inc., and has a budget of $50 million.
- **The CSI-Thermal Program** provides solar thermal incentives to eligible systems. The CSI-Thermal program is funded separately depending on whether the project is

[3] The California utilities contract for a variety of renewable resources, including large and small solar power plants as part of the RPS Program. Updates on the progress of the RPS program can be found at http://www.cpuc.ca.gov/PUC/energy/Renewables/.

electric-displacing or gas-displacing. There are five Program Administrators for the CSI Thermal Program. PG&E, SCE and CCSE administer the electric-displacing portion of the Program in their respective territories, and PG&E, SCG and SDG&E administer the Program for the gas-displacing portion.

- **The CSI Solar Water Heating Pilot Program (SWHPP)** provided solar hot water incentives through a pilot program for residences and businesses in the San Diego area only; the SWHPP was administered through CCSE with a budget of $2.6 million. The Solar Water Heating Pilot Program is closed to new applications as of May 1, 2010. All solar water heating incentives for applications since that date will be through the CSI-Thermal program.

Table 1: CSI Budget by Program Component

Program Component	Budget ($ Millions)	Goal
General Market Solar Program (includes PV and electric displacing solar thermal technologies)	$1,897	1,750 MW
Single-family Affordable Solar Homes (SASH)	$108	95 MW
Multifamily Affordable Solar Housing (MASH)	$108	95 MW
Research, Development, Demonstration, and Deployment (RD&D)	$50	~
Solar Water Heating Pilot Program (SWHPP)	$2.6	750 SWH systems
Sub-Total: CSI Electric Budget (Electric Displacing)	***$2,167***	*1,940 MW*
CSI Thermal Program (Gas-Displacing)	***$250***	*585 million therms*
Total CSI Budget	**$2,417**	

Source: CPUC D.06-12-033, FOF 15, p. 28 established goal of the general market program as 1,750 MW. The CPUC decisions on MASH and SASH did not explicitly adopt a 95 MW per program goal; however, the CPUC did adopt a total CSI program goal of 1,940 MW in D.06-12-033. In addition, D.10-01-022 established the CSI Thermal Program pursuant to AB 1470 and SB 1.

2.3 Other Solar Programs in California

The CSI Program is one part of the broader solar effort in California, which builds on over a decade of state support for solar energy. From the late 1990s through 2006, solar rebates were offered through the California Energy Commission's Emerging Renewables Program (ERP) and the CPUC's Self-Generation Incentive Program (SGIP). Both the ERP and SGIP

programs still provide incentives for other clean technologies, but have been closed to new solar project applications since the establishment of the CSI in January of 2007.

Starting in 2007, a new set of solar programs started that were authorized under SB 1, which established an overall statewide goal of installing 3,000 MW with a total budget of over $3.3 billion. The CSI Program, overseen by the CPUC and the focus of this report, has adopted an allocation of two-thirds of the statewide goal – or 1,940 MW. The balance of the SB 1 goal is expected to come from the California Energy Commission's New Solar Homes Partnership (NSHP), with 360 MW, and solar programs offered through publicly-owned utilities (POUs) that are not regulated by the CPUC for the remaining 700 MW. NSHP offers solar incentives to new homes in large IOU territories.[4]

The statewide solar effort is promoted collectively on www.GoSolarCalifornia.gov, a one-stop web portal for all information relevant to the state's solar rebate programs for consumers and contractors alike.[5] *Go Solar, California!* provides information on the CSI, as well as NSHP and the POU programs. Each program operates independently, but the *Go Solar, California!* campaign creates partnerships to maximize cost-effectiveness of marketing and outreach efforts.

2.4 CSI Program Regulatory Process

Between 2006 and 2010, the Commission adopted a number of regulatory decisions establishing the CSI Program, as well as various CSI program components.[6] Key decisions related to the CSI Program include (but are not limited to):

2.4.1 General Market Program Decisions

- D. 06-01-024 adopted the CSI Program.
- D. 06-08-028 adopted Performance Based Incentives, an administrative structure, and other program start-up elements.
- D. 06-12-033 modified earlier decisions to conform to Senate Bill 1 (Murray, 2006).
- D. 07-05-007 modified the incentive adjustment mechanism to account for program dropouts.
- D. 07-05-047 established interim marketing and outreach objectives for the program.

[4] Information on the NSHP program can be found at: http://www.energy.ca.gov/renewables/06-NSHP-1/.
[5] The Go Solar California web portal can be accessed at: www.GoSolarCalifornia.ca.gov.
[6] The Commission has developed the CSI program in a series of Rulemakings (R) since 2006, including R.08-03-008 and R.06-03-004, with precedents from even earlier proceedings like R.04-03-017. Each of the decisions noted herein occurs in one of those dockets, unless otherwise noted.

- D. 07-07-028 and D.08-01-030 modified metering and performance monitoring requirements for the program.
- On July 29, 2008, the Assigned Commissioner issued a Ruling Establishing a Program Evaluation Plan for the California Solar Initiative.
- D. 10-09-046 modifies the CSI general market budget, shifts $40 million from the program administration budget into the incentive budget as partial mitigation for higher than anticipated performance payments under the "PBI" mechanism.
- D. 11-03-007 established the Pacific Power California Solar Incentive Program, a 3.3 MW, $4.3 million solar PV incentive program serving 46,500 customers in northern California. The program is scheduled to launch July 1, 2011.

2.4.2 Other CSI Program Component Decisions

- D. 06-08-028 established the Solar Water Heating Pilot Program in San Diego Gas & Electric territory.
- D. 07-09-042 established the CSI Research, Development, Demonstration, and Deployment (RD&D) program.
- D. 07-11-045 established the CSI Single-family Affordable Solar Homes (SASH) program.
- D. 08-10-036 established the CSI Multifamily Affordable Solar Housing (MASH) program.
- D. 10-01-022 established the CSI Thermal Program to provide solar water heating incentives statewide.

2.4.3 CPUC Rulemaking (R.) 10-05-004

There are several areas of CSI Program oversight that will require further action at the CPUC, in Rulemaking (R.) 10-05-004,[7] the successor proceeding to R.08-03-008. Such areas include:

- Consideration and continued implementation of the CSI-Thermal Program, including the low-income, measurement and evaluation, and non-water heating portions of that program;
- The Energy Division Staff Proposal for modification of the Self-Generation Incentive Program; the next round of CSI Program research and development funding;
- The Energy Division Staff Proposal to expand the virtual net metering tariff to all multitenant properties;

[7] More information regarding this rulemaking can be found at http://www.cpuc.ca.gov/PUC/energy/Solar/.

- Policy guidance to CSI program administrators on permanent marketing, consumer education and protection strategies; consideration of customer-side distributed generation policies, such as net energy metering and interconnection;
- CSI budget and incentive adjustments based on solar costs, market conditions, and the program budget.

More generally, CPUC will also continue to consider modifications to solar-related tariffs, administration of the general market program, the marketing and outreach program, the measurement and evaluation program, and the two low-income programs.

In addition to formal regulatory decisions, the CPUC and CSI Program Administrators have made numerous CSI Program changes based on regular feedback from program stakeholders and in response to issues that have arisen during program implementation. To gather feedback on the program, the CSI Program Administrators host quarterly public CSI Program forums to discuss potential program changes with stakeholders.[8] The Program Administrators periodically file program rule changes via Advice Letter, consistent with the CPUC-established CSI Program Handbook process. As a result, the CPUC has revised and reissued the CSI Program Handbook numerous times per year since the program's inception in response to stakeholder input and program experience.

[8] Information on all CSI Program Forum meetings can be found at: http://www.cpuc.ca.gov/PUC/energy/Solar/forum.htm.

3 Solar Installed Through 2010

This section of the report summarizes data on the cumulative installed capacity[9] and number of solar projects installed in California investor-owned utility territories and provides a table showing all distributed solar installed statewide.

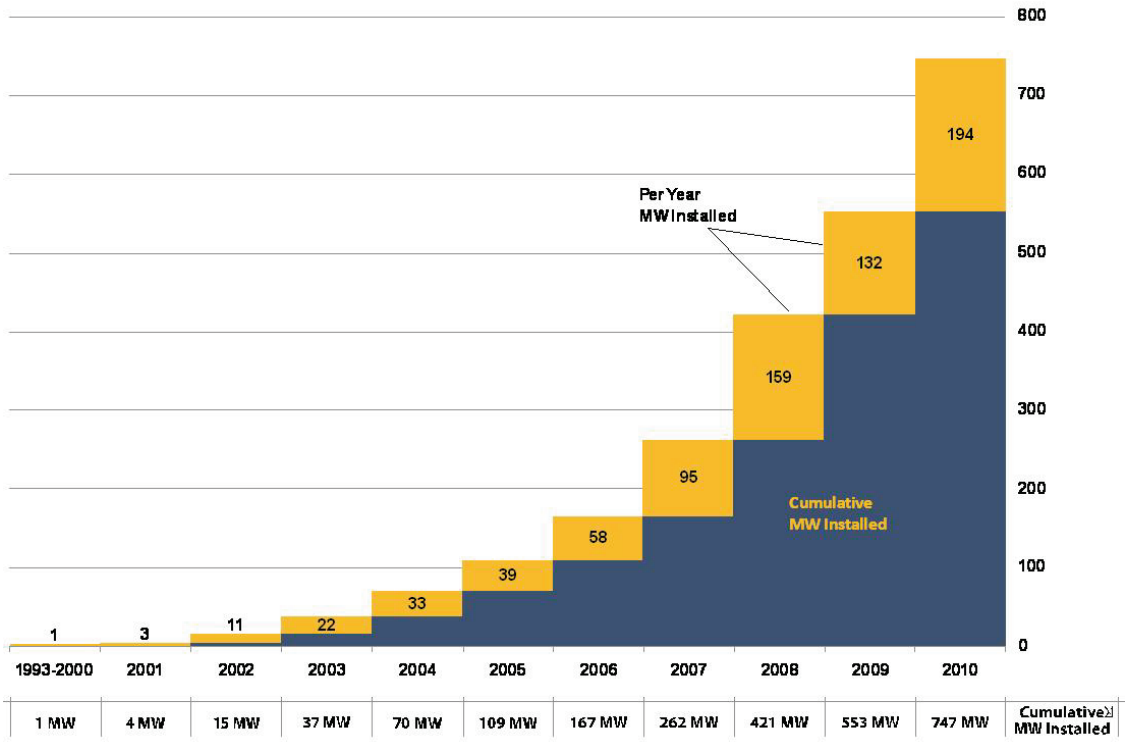
3.1 Investor-Owned Utility Territory Solar Installations

Through the end of 2010, the state installed 746 MW of solar capacity at 77,461 projects at customer sites in investor-owned utility (IOU) territories. IOU areas are those that encompass customers of PG&E, SCE, and SDG&E. This data includes solar projects interconnected under any of the IOU solar programs, including CSI, NSHP, ERP, and SGIP. IOU data does not include solar projects installed in Publicly-Owned Utility (POU) areas, such as Los Angeles Department of Water and Power or Sacramento Municipal Utility District. (See Section 3.3 for aggregate statewide data.) CSI Program-only data is featured in Section 4.1.2.

Figure 2 shows the amount of solar capacity installed annually in IOU territories, with 194 MW installed in 2010. This figure relies on interconnection data submitted to the CPUC by the utilities (rather than CSI program data featured elsewhere in this report), and it does not distinguish which solar program provided funding for the solar project. Figure 3 uses the same data as Figure 2, but shows the data as the number of installations. Figure 3 shows that there were 19,877 solar projects installed in IOU territories in 2010. All of the solar capacity identified in Figure 2 and Figure 3 is installed on customer-sites, and thus the data does not include larger solar power plants installed on the wholesale side of the meter for use in compliance with the Renewables Portfolio Standard (RPS).

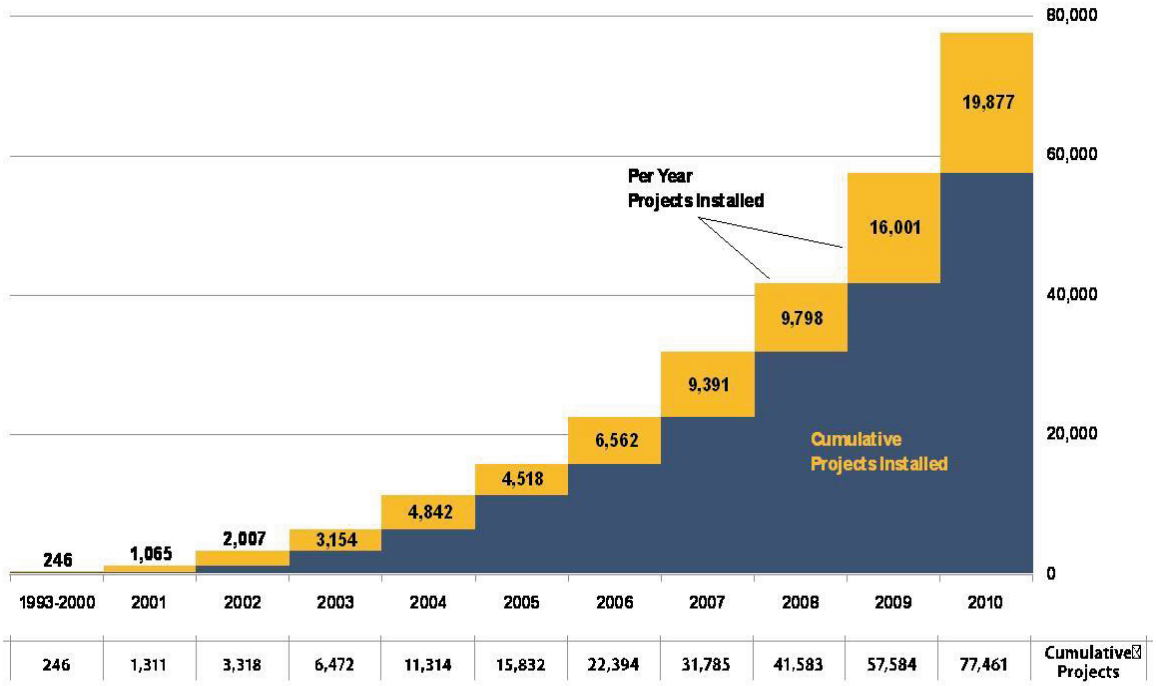
[9] All data in this assessment are for grid-tied solar PV (i.e. interconnected to the utility grid), unless otherwise noted. All solar in this report is customer-side of the meter self-generation designed to serve onsite load. All references to capacity are reported in "CEC-AC" units, which is the industry standard for net electricity output in megawatts (MW) based on the California Energy Commission's Alternating Current rating of solar panels. The "CEC-AC" rating tends to be slightly less than the nameplate capacity.

Figure 2: Customer-Sited Solar in IOU Territories by MW, 1993-2010



Data through December 31, 2010. It Includes CSI, NSHP, ERP and SGIP data, but not POU or RPS data.

Figure 3: Customer-Sited Solar in IOU Territories by # of projects, 1993-2010



Data through December 31. It Includes CSI, NSHP, ERP and SGIP data, but not POU or RPS data.

3.2 Net Energy Metering Data

A majority of the projects and capacity shown in Figure 2 and Figure 3 are enrolled in Net Energy Metering (NEM) tariffs, pursuant to Public Utilities Code 2827. Some solar projects, however, especially those with a solar system that is small relative to total load, opt to take utility service under a non-NEM tariff. Table 2 shows the total solar interconnections (MW and number) compared to the customers on NEM tariffs (MW and number). There is about 67 MW of solar capacity in the state that is not signed up for NEM tariffs. Table 2 shows exclusively customer-sited solar, and it does not include any information on RPS projects or projects intended to provide wholesale power the electrical grid.

Table 2: Solar Interconnections and NEM Customers by Utility

	MWs Interconnected	Customers Interconnected	MWs on NEM tariffs	Customers on NEM Tariffs
PG&E	439 MW	47,283	388 MW	45,113
SCE	218 MW	18,443	200 MW	11,735
SDG&E	90 MW	11,735	90 MW	11,735
Total	**746 MW**	**77,461**	**679 MW**	**68,583**

Data is from December 2010. It Includes CSI, NSHP, ERP and SGIP data, but not POU or RPS data. Note that SDG&E data does not include non-NEM projects.

3.3 California Statewide Solar Installations

Through the end of the first quarter of 2011, California has an estimated 924 MW of installed solar capacity at 94,891 sites. As detailed in Table 3, this statewide solar data combines the best available information on (1) IOU interconnections thru 2010, (2) IOU installed solar in 2011 based on CSI Program Data, and (3) POU solar data thru 2009. The CPUC tracks IOU interconnection data on a quarterly basis and the CSI program data is available weekly. However, data on POU solar projects was collected by the CEC, and to date, the information is only available annually. The snapshot shown in Table 3 provides the best available estimate of California statewide solar installations. Table 3 shows exclusively customer-sited solar, and it does not include any information on RPS projects or projects intended to provide wholesale power the electrical grid.

Table 3: California Statewide Solar Installations

Data Source and Dates	Total MWs	Total Projects
Solar Installations in California IOU Territories		
All IOU Interconnections, 1993-2010	746	77,461
CSI Program Data Only, 1/1/2011 through 4/1/2011	69	4,954
Solar Installations in California POU Territories		
CEC through 2009	108	12,476
Total California Solar Installations	**924**	**94,891**

Source: CSI Program database, Investor-owned utility data and California Energy Commission

4 CSI Program Components

4.1 General Market Solar Program

4.1.1 Program Background

The CSI general market solar program is the most well known part of CSI. It offers incentives to all eligible customers in large IOU territories who install solar systems. These incentives are based on either the actual or predicted performance of a solar system, such that higher performing systems receive a larger incentive than lower performing systems. Solar system performance is affected by design considerations, which include module efficiency, tilt, orientation, shading, and level of system monitoring and maintenance. The emphasis on performance in the CSI Program is designed to optimize California ratepayer investment in solar. In addition, the CSI Program requires program participants to complete energy efficiency audits to encourage applicants to invest in cost-effective energy efficiency measures prior to sizing their solar system, consistent with the state's Energy Action Plan and "loading order."

The CSI Program supports onsite solar installations designed to offset some or all of the customer's electrical load, but not wholesale generation projects designed to sell electricity to the utility grid.[10] CSI Program participants are eligible for utility interconnection and net energy metering (NEM) tariffs that facilitate solar by allowing solar customers to feed temporary amounts of excess electricity into the grid. NEM customers receive bill credits (in dollars) for any excess generation (in kWh) for a given billing period.

4.1.1.1 Incentive Types

The CSI Program pays solar consumers an incentive based on system performance. The incentives are either an upfront lump-sum payment based on expected performance, or a five-year stream of monthly payments based on actual system performance over five years. The Expected Performance-Based Buydown (EPBB) is the upfront incentive available only for smaller systems. The EPBB incentive is a capacity-based incentive that is adjusted based on expected system performance calculated using an EPBB calculator[11] that considers major design characteristics of the system, such as panel type, installation tilt, shading, orientation, and solar insolation available by location.

[10] The Renewable Portfolio Standard (RPS) Program supports large scale solar power plants through the procurement of such plants to serve wholesale electrical demand. Information on solar procured by large IOUs to meet RPS requirements can be found at: http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm.

[11] The EPBB calculator is publicly available at http://www.csi-epbb.com/. The EPBB calculator estimates the expected performance of a solar system based various factors including the tilt, azimuth, location, PV module type and mounting type of a specific system.

The Performance Based Incentive (PBI) is paid based on actual measured performance (output of the system) over the course of five years. The PBI is paid on a fixed dollar per kilowatt-hour ($/kWh) of generation basis and is the required incentive type for larger systems, although smaller systems may opt to be paid based on PBI. In the beginning of the CSI Program, all systems 100kW and greater were required to take the PBI incentive. In January 2008, all systems 50kW and greater were required to take the PBI incentive. As of January 2010, all systems 30kW and greater are required to take the PBI incentive. These two incentive types are explained in more detail in Table 4 below.

Table 4: CSI Incentive Types

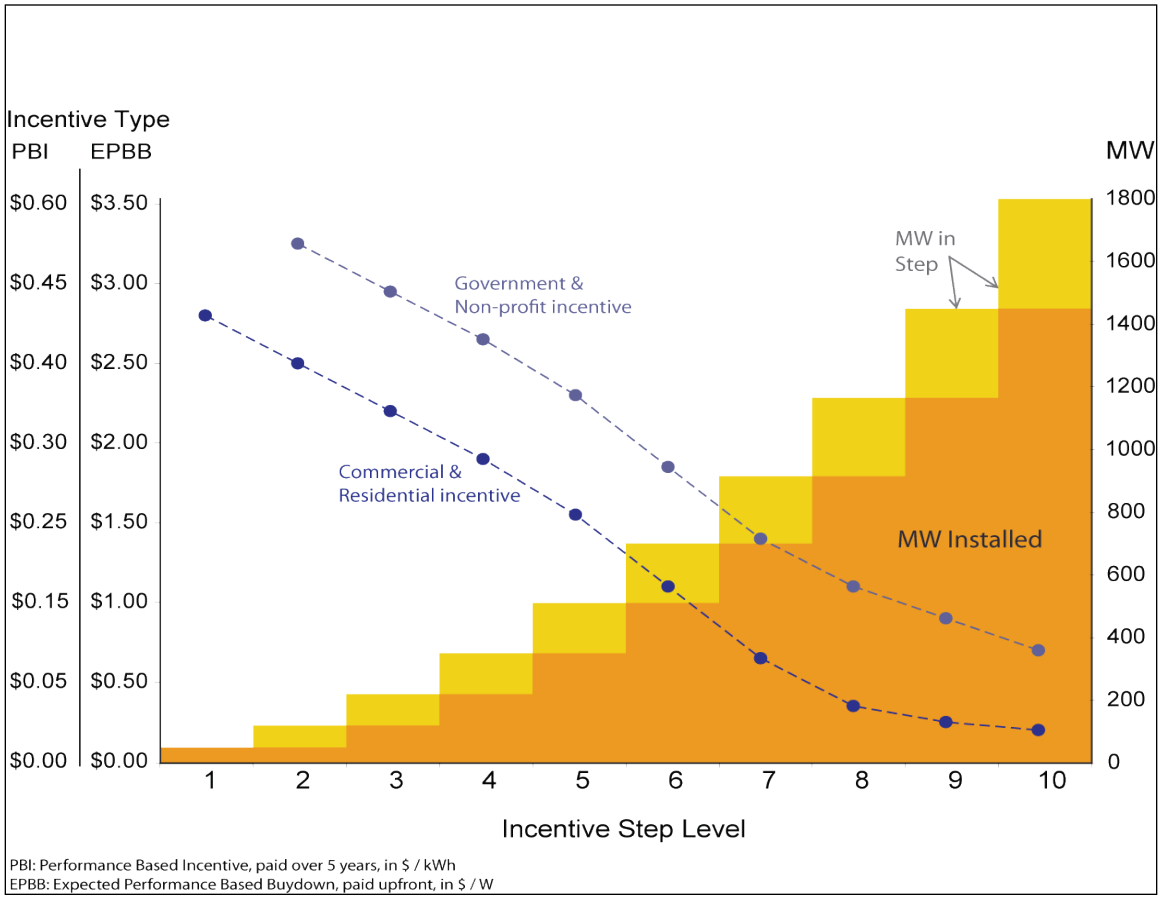
Expected Performance-Based Buydown (EPBB) Paid in $/watt	Performance-Based Incentive (PBI) Paid in cents/kWh
Ideal for residential and small business customers	Ideal for larger commercial, government & non-profit customers
Systems smaller than 30 kW	Mandatory for all systems 30 kW and greater Systems less than 30kW can opt-in to PBI
Incentive paid per Watt based on your system's expected performance (factors include CEC-AC rating, location, orientation and shading)	Incentive paid based on the actual energy produced by the solar system, measured in kilowatt-hours
One-time, lump sum upfront payment	60 monthly payments over five years

4.1.1.2 Incentive Level Design

The CSI Program offers financial incentives that decline as more capacity is installed. The incentive level design is intended to anticipate economies of scale in the California solar market – as the solar market grows, it is expected that total solar system costs will fall. The incentive scheme is designed to decline in parallel with the expected market cost-declines.

The capacity targets in each incentive step level are assigned across the whole program, as shown in Figure 4. Each step offers a certain number of megawatts, shown in yellow, and the cumulative capacity of all megawatts expected to be installed in the program for all steps are shown in orange. The dotted blue lines are the incentive levels available at each step. The dotted blue line for government and non-profit participants is higher at every step to compensate for their ineligibility for the 30% Federal Investment Tax Credit available to other taxable entities.

Figure 4: Overview of the CSI Step Level Changes



Note: See www.csi-epbb.com for a table listing of the incentive levels per step.

The capacity targets per incentive step were further broken down into allocations across customer type (approximately one-third residential and two-thirds non-residential) and across the three IOU service territories. The targets per IOU territory are set in proportion to each utility's contribution to CPUC-regulated electricity sales. Table 5 presents the capacity target by utility territory and customer class, showing how all of the incentives were originally allocated over the expected 10-step life of the program. Actual allocations by step will vary due to dropouts and other factors.

Table 5: CSI MW Targets by Utility and Customer Class

		PG&E (MW)		SCE (MW)		SDG&E (MW)	
Step	MW in Step	Res	Non-Res	Res	Non-Res	Res	Non-Res
1	50	--	--	--	--	--	--
2	70	10.1	20.5	10.6	21.6	2.4	4.8
3	100	14.4	29.3	15.2	30.8	3.4	6.9
4	130	18.7	38.1	19.7	40.1	4.4	9
5	160	23.1	46.8	24.3	49.3	5.4	11
6	190	27.4	55.6	28.8	58.6	6.5	13.1
7	215	31	62.9	32.6	66.3	7.3	14.8
8	250	36.1	73.2	38	77.1	8.5	17.3
9	285	41.1	83.4	43.3	87.8	9.7	19.7
10	350	50.5	102.5	53.1	107.9	11.9	24.2
Subtotals (Res and Non-Res)		***252.4***	***512.3***	***265.6***	***539.5***	***59.5***	***120.8***
Totals			**764.8**		**805**		**180.3**
Percent			**43.70%**		**46.00%**		**10.30%**

Source: D.06-12-033, Appendix B, Table 11.
Notes: The MWs for Incentive Step 1 were reserved under the Self-Generation Incentive Program in 2006. Non-Residential (Non-Res) includes commercial, government, and non-profit facilities.

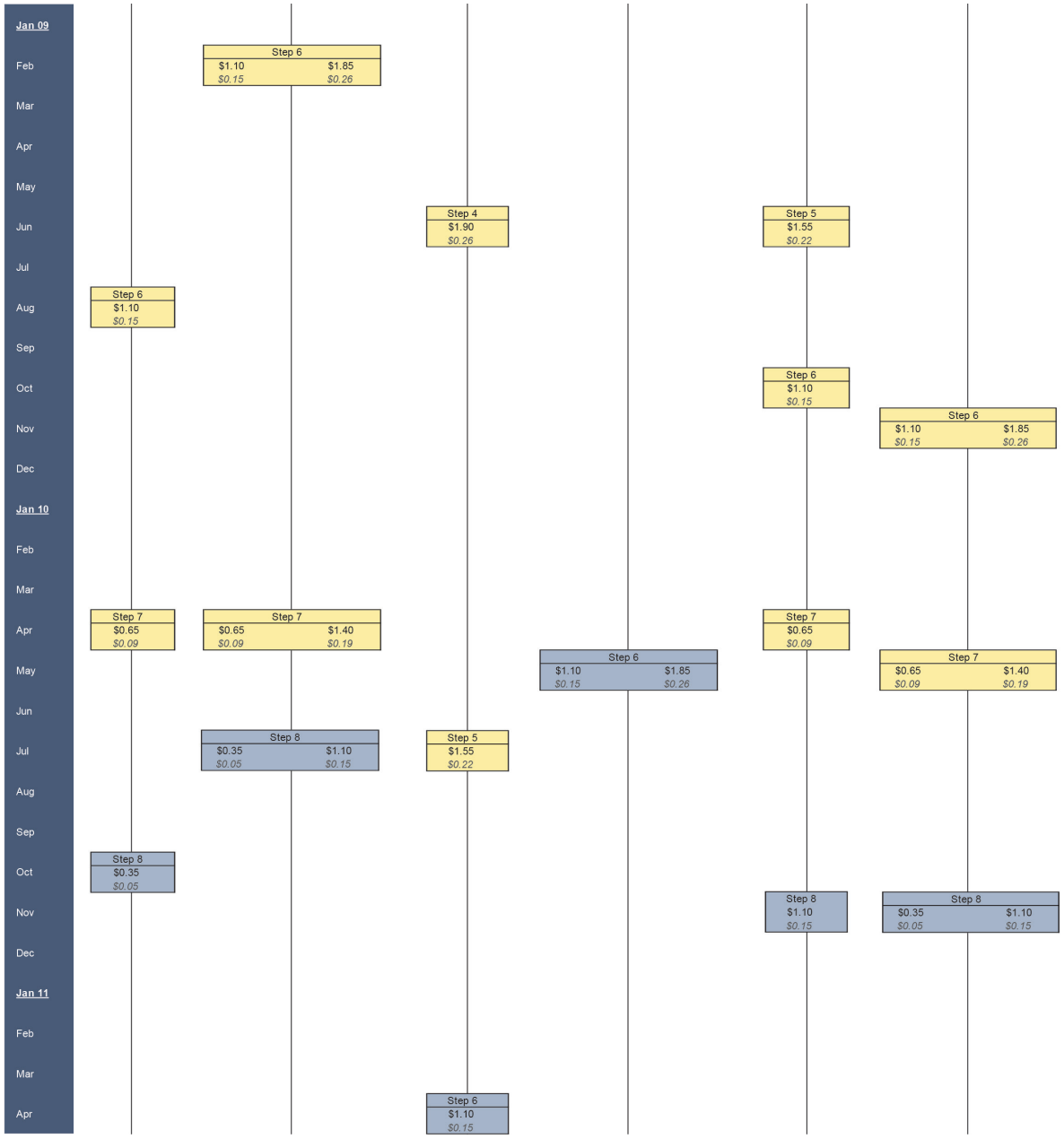
4.1.1.3 Annual Rate of Incentive Level Decline

Once the incentives reserved for each customer class within a utility territory reach the capacity target for a given step, the incentive level offered drops to the next lower step. It is important to note that these drops occur independently of one another – for example, reservations made in PG&E's residential step do not affect the level of incentives offered to PG&E's commercial customers, nor do they affect other territories. This creates a demand-driven program that adjusts solar incentive levels based on local solar market conditions. Table 4 shows how the incentive levels have declined across the three large IOU territories at different times since January 2007. The incentives have stepped down most frequently in the territories with the most market demand. As of 2011, PG&E and CCSE no longer have non-residential funding available. There is a waiting list for new applicants with non-residential projects.

Figure 5: CSI Incentive Levels, Current and Historic, January 2009 – April 2011

Program Month	PG&E			SCE			CCSE		
	Residential	Non-Residential	Govt & Non-Profit	Residential	Non-Residential	Govt & Non-Profit	Residential	Non-Residential	Govt & Non-Profit

Data truncated from 1/1/07 – 12/31/08; for historical analysis, please visit www.GoSolarCalifornia.ca.gov



4.1.2 Program Progress

The charts and tables in this section illustrate the CSI general market solar program progress to date, with data from the California Solar Statistics web page.[12] In addition, the CSI Program releases a Data Annex, available online, each quarter with key program application processing metrics.[13]

There are many ways to measure the progress of the CSI Program general market program, including progress towards the two stated goals of the Program: 1) Install 1,750 MW of solar PV capacity; and 2) transform the market for solar so that it is price competitive and sustainable. This section reports on the installations, pending and complete, the solar price trends, program participation rates, and program budgets. The CSI Measurement and Evaluation (M&E) program component performs more detailed analysis, including cost benefit analyses, impact analyses, and other studies intended to help understand and improve the Program's performance. [14] The progress of the M&E component is reported in Section 5.

4.1.2.1 General Market Program Activity

The general market CSI Program is making rapid progress towards meeting the program's goal of 1,750 MW of customer-sited solar to be installed by 2017, as shown in Table 6. Breakdowns of the data by Program Administrator and customer sector are provided in Section 4.1.2.4.

- The program has provided rebates for the installation of 506 MW of grid-tied, distributed solar PV projects with another 403 MW of projects pending, for a total of 910 MW.
- The program has provided rebates for 46,550 installed projects, with another 10,895 projects pending.
- The program has provided incentives of $974 million for installed projects, with another $497 million in incentives pending. The total amount of incentives pending or installed is $1,470 million.

[12] California Solar Statistics can be accessed here: www.californiasolarstatistics.ca.gov.
[13] The CSI Program releases a Data Annex each quarter. The Q1 2010 Data Annex was released in June 2010. See http://www.cpuc.ca.gov/PUC/energy/Solar/news.htm.
[14] All CSI Program Measurement and Evaluation reports are available at: http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm

Table 6: All CSI Projects Pending and Installed

Installed Projects	
Applications	46,550
Capacity (MW)	506 MW
Incentive $million	$ 974 M
Pending Projects	
Applications	10,895
Capacity (MW)	403 MW
Incentive $million	$ 497 M
Total CSI Activity	
Applications	**57,445**
Capacity (MW)	**910 MW**
Incentive $ million	**$ 1,470 M**

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

4.1.2.2 Progress toward Goals

Projects that have already been installed and paid represent nearly 30 percent of its total CSI Program goal, while pending projects in some stage of completion make up another 23 percent of the goal, as shown in Table 7. The CSI Program has 48 percent of the program goal remaining. The CPUC did not establish annual targets for the program when it was adopted, and the CPUC did not expect that the program would install an equal number of projects each year. Rather, the expectation is that the market will increase the annual rate of installations over time.

Also detailed in Table 11, the utilities are progressing towards their goals at varying rates depending on the utility and customer sector. Leading the way are the residential sectors in PG&E and SDG&E territory, which have 50 percent and 47 percent of their installation goals complete. The lowest installation rates are in SCE territory, where just 22% of the residential goals are complete. PG&E has the most installations in the non-residential sector, having reached 32% of their goal in installations. SDG&E and SCE have lower non-residential installation rates at 22% and 19%, respectively.

Table 7: CSI Progress Toward Program Goal of 1,750 MW

Customer Class	Installed	Pending	Remaining	Goal
SCE				
Non-Residential (MW)	102 MW	172 MW	267 MW	**540 MW**
Non-Residential (% of Goal)	19%	32%	49%	
Residential (MW)	58 MW	18 MW	189 MW	**266 MW**
Residential (% of Goal)	22%	7%	71%	
PG&E				
Non-Residential (MW)	167 MW	146 MW	201 MW	**514 MW**
Non-Residential (% of Goal)	32%	28%	39%	
Residential (MW)	125 MW	26 MW	101 MW	**252 MW**
Residential (% of Goal)	50%	10%	40%	
SDG&E (CCSE)				
Non-Residential (MW)	27 MW	37 MW	57 MW	**120 MW**
Non-Residential (% of Goal)	22%	30%	47%	
Residential (MW)	28 MW	5 MW	26 MW	**59 MW**
Residential (% of Goal)	47%	9%	44%	
Total (MW)	**506 MW**	**403 MW**	**841 MW**	**1,750 MW**
Total (% of Goal)	**29%**	**23%**	**48%**	

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

4.1.2.3 CSI Program Activity for 2010 and 2011

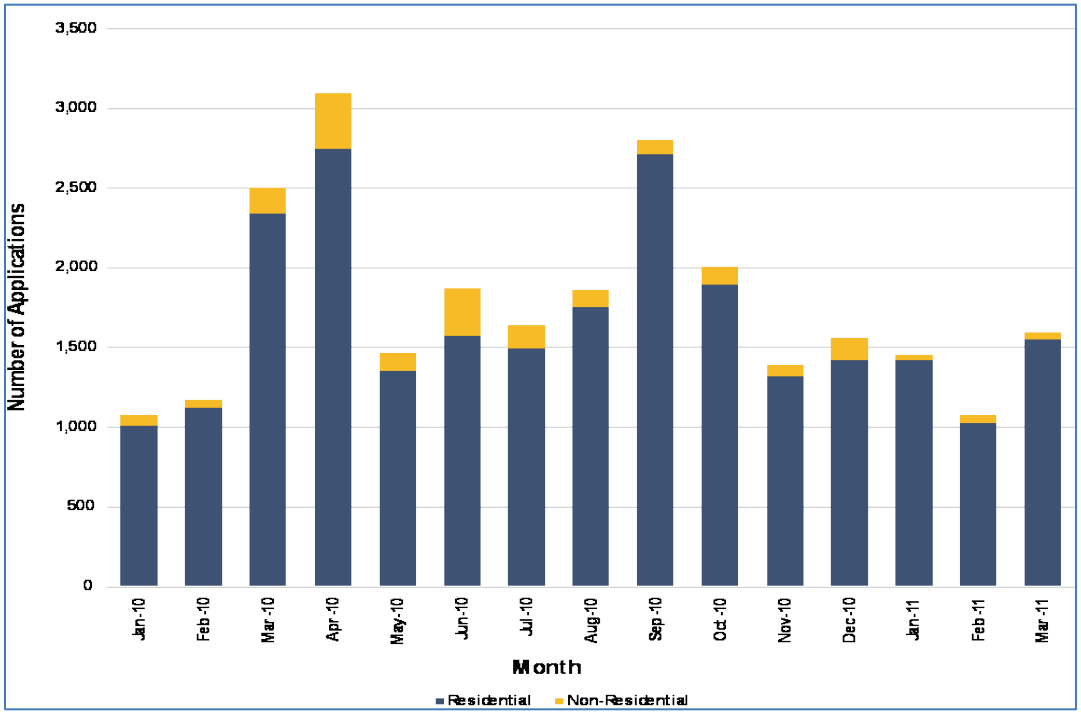
CSI Program activity accelerated dramatically in 2010, with a record 425.2 MW in applications received in that year – more than twice the capacity recorded in any previous year of the program. Although some of this increased activity might be due to a rush of non-residential applications in anticipation of a budget shortfall, single-family applications also increased by more than 65% over the 2009 total, indicating that the solar industry is becoming more robust and increasing market penetration.

Table 8: CSI Applications received by year (MW)

Year	Residential	Non-Residential	Total
2007	30	123	**153**
2008	43	65	**108**
2009	64	94	**158**
2010	102	323	**425**

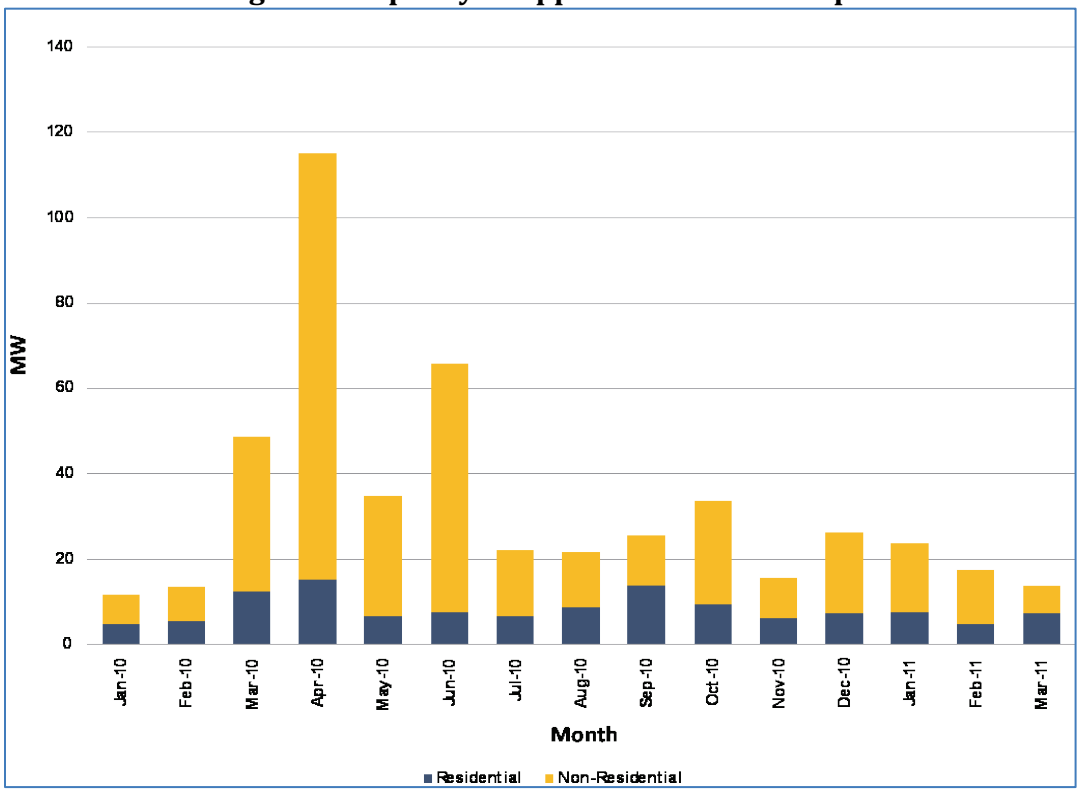
Source: www.CaliforniaSolarStatistics.com, data through December 31, 2011

Figure 6: Number of Applications Received per Month



Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011

Figure 7: Capacity of Applications Received per Month



Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011

The CSI Program continues to see variability by month in program activity levels. Figure 6 and Figure 7 show a snapshot of monthly program application demand in by number of applications and capacity of new applications. Spikes in demand usually indicate increased activity due to the seasonal business cycle or industry concern about impending drops in incentive levels.

Table 9: CSI Program Activity Jan. 1 to June 14, 2011

	New Applications Received	Installations
Capacity (MW)	80 MW	112 MW
Number of Projects	8,332 projects	8,447 projects

Source: www.CaliforniaSolarStatistics.com. January 1, 2011 thru June 14, 2011

Moving into 2011, while there has been a decrease in applications in the first five months compared with the corresponding period of 2010, the demand for new applications continues to be over 1,000 applications per month. Even though CSI program demand is not keeping up with the record pace of last year, program activity is still on track to outpace the first three years of the program. There have been 80 MW of new applications received since January 2011 through June 14 for 8,332 new solar projects. The slowdown in demand is likely due to the fact that PG&E and CCSE have reached their non-residential budget caps.

Still, 2011 is likely to be record year for projects installed under the CSI Program. In just the first five months of the year, CSI has installed 111 MW of new distributed solar, more than 70% of the amount installed in 2010, which had been the best year for the program to date (See Table 10).

Table 10: Capacity of CSI Projects Installed by Year

Year	Residential	Non-Residential	Total
2007	15	13	**28**
2008	35	86	**121**
2009	52	74	**136**
2010	79	73	**152**
2011 (thru June 14)	38	73	**111**

Source: www.CaliforniaSolarStatistics.com thru June 14, 2011.

4.1.2.4 CSI Program Activity by Program Administrator and Customer Sector

Table 11, Table 12, and Table 13 provide a snapshot of Program Activity by Program Administrator and Customer Sector by capacity (MW), incentives ($millions), and number of applications, respectively. The term "installed" refers to projects that have been interconnected and paid or in process of payment. The term "pending" refers to projects that have received an incentive reservation but are not yet interconnected or paid.

Table 11: CSI Installed and Pending Capacity (MW) by PA and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	**33**	**151**	**77**	**261**
Installed	28	125	58	211
Pending	5	26	18	50
Non-Residential	**63**	**313**	**273**	**649**
Installed	27	167	102	295
Pending	37	146	172	354
Total Megawatts	**96**	**464**	**350**	**910**
Installed	54	292	160	506
Pending	42	172	190	403

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

Table 12: CSI Pending and Installed Incentives ($ millions) by PA and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	**$42**	**$185**	**$139**	**$366**
Installed	$39	$171	$113	$323
Pending	$3	$14	$26	$43
Non-Residential	**$119**	**$511**	**$474**	**$1,104**
Installed	$71	$334	$246	$651
Pending	$48	$177	$228	$453
Total Incentive	**$161**	**$696**	**$613**	**$1,470**
Installed	$110	$505	$359	$974
Pending	$52	$191	$254	$497

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

Table 13: Number of Pending and Installed CSI Applications by PA and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	**7,147**	**30,819**	**15,638**	**53,604**
Installed	6,094	25,815	12,290	**44,199**
Pending	1,053	5,004	3,348	**9,405**
Non-Residential	**402**	**2,154**	**1285**	**3,841**
Installed	220	1,481	650	**2,351**
Pending	182	673	635	**1,490**
Total Number of Applications	**7,549**	**32,973**	**16,923**	**57,445**
Installed	6,314	27,296	12,940	**46,550**
Pending	1,235	5,677	3,983	**10,895**

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

4.1.2.5 Average System Costs for CSI Program Participants

One of the explicit goals of the CSI Program is to transform the solar market by reducing the cost of solar energy systems. Figure 8 shows a clear downward trend in the price of PV systems installed through the CSI program. The inflation adjusted cost trends show that prices have declined from $10.45/watt to $8.55/watt for systems under 10 kW, an 18 percent price reduction. Prices have declined from $9.18/watt to $6.71/watt for systems over 10 kW, a 27 percent reduction since the start of the program.

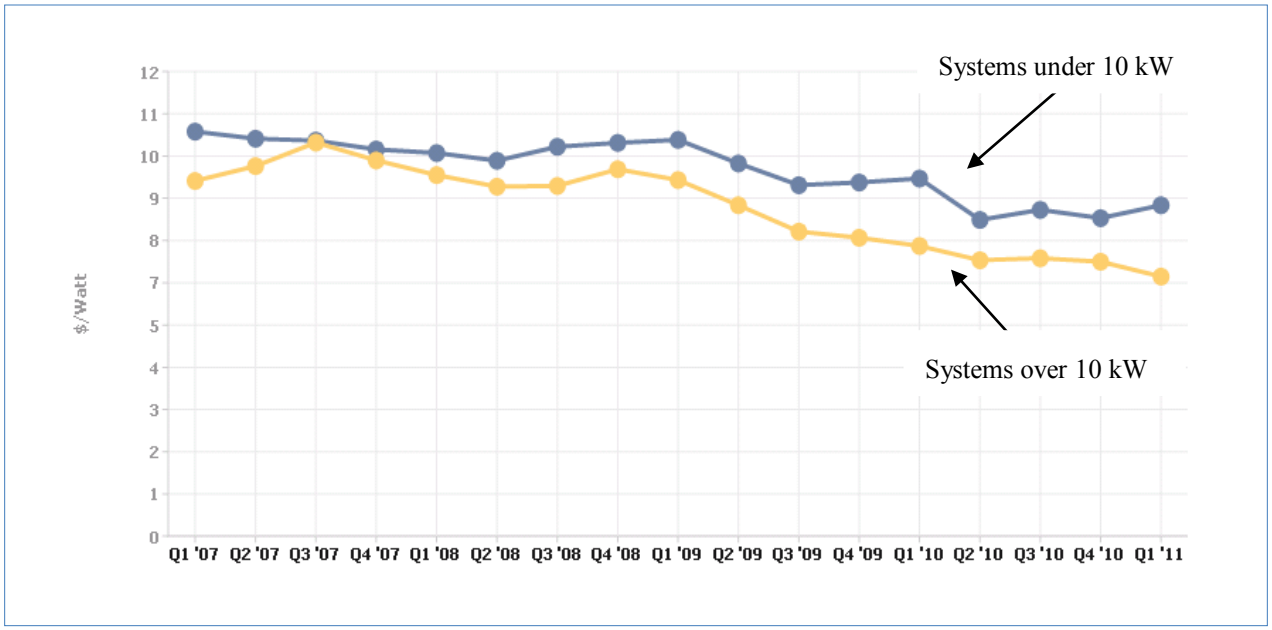
The system cost breakdown includes costs by panel, inverter and "other" costs, sometimes referred to as balance of system costs (BOS). The price decline observed in Figure 8 is clearly driven by panel price declines, as other costs hold steady or even go up as is the case for Residential Inverters. Over time, the solar industry will need to address BOS costs, which includes installation labor, mounting systems, conduits and wiring, metering and monitoring systems, and other components. Standardization and training, both encouraged by the CSI Program, will support efforts to bring those costs down.

Figure 9 shows the distribution of PV system costs in the CSI Program in 2010. In 2010, residential system costs ranged from $1-2/watt to as high as $20/watt. However, the majority of residential system costs range from $5/watt to 10/watt. Non-residential systems cost as low as $3-4/watt up to $17-18/watt, with the majority of non-residential system costs ranging from $3/watt to $13/watt.

The market for PV panels and inverters is a global one, and an individual PV incentive program, even one as large as the CSI Program, is not likely to be the main driver of cost declines for these components of a PV system. However, in a distributed generation market, the cost of installation, interconnection, permitting, balance of system costs, and even marketing can be greatly influenced by state and local incentive programs.

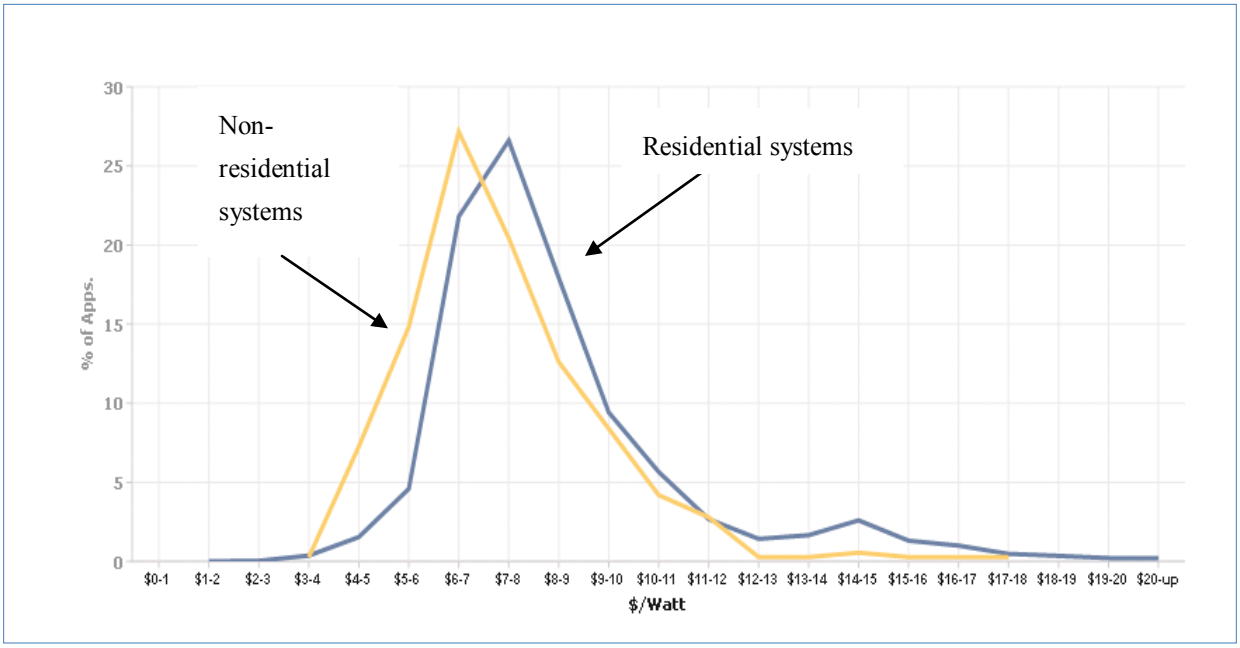
The CSI Program continually tracks PV cost trends, and make CSI system cost information available to the public on the California Solar Statistics website. Please visit, www.californiasolarstatistics.ca.gov for up to date information on PV systems costs, including costs by quarter, by size, by location, utility territory, and customer sector.

Figure 8: Average System Cost per Quarter



Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011.

Figure 9: Distribution of System Costs



Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011. Only includes costs for 2010.

4.1.2.6 CSI Program Project Costs and Incentives

To date, the CSI Program has paid or reserved nearly $1.3 billion in incentives for total estimated project costs totaling over $6 billion, as shown in Table 14. The remainder of the system costs is paid by the owner of the system, with the exception of the investment tax credit, which covers 30 percent of the installed project cost. The ratio of incentives to total project cost is 1:4.49, which means that, on average, every $1 in incentive paid by the CSI Program leverages an additional $3.49 in other funds invested in solar technology in California from other sources. The non-CSI Program rebate funds leveraged to install solar systems generally include capital investment by the system owner or the federal investment tax credit. This large investment in solar technology spurs economic growth and creates green jobs.

Table 14: CSI Estimated Incentives and Project Costs, by Sector and Status

Program Admin	Residential		Non-Residential		Total CSI Applications	
	CSI Incentives	Total Project Costs	CSI Incentives	Total Project Costs	CSI Incentives	Total Project Costs
Pending Projects ($ millions)						
PG&E	$18	$225	$207	$943	$226	$1,168
SCE	$21	$120	$146	$673	$167	$793
CCSE	$4	$44	$60	$237	$64	$281
Subtotal, Pending	***$43***	***$389***	***$413***	***$1,852***	***$456***	***$2,242***
Installed Projects ($ millions)						
PG&E	$171	$1,065	$334	$1,305	$505	$2,370
SCE	$91	$422	$180	$550	$271	$973
CCSE	$39	$232	$71	$205	$110	$437
Subtotal, Installed	***$301***	***$1,719***	***$584***	***$2,061***	***$885***	***$3,780***
Total	**$344**	**$2,108**	**$998**	**$3,914**	**$1,342**	**$6,022**
Ratio CSI $: Project $	**1 : 6.1**		**1 : 3.9**		**1 : 4.49**	

Source: www.CaliforniaSolarStatistics.com, data through April 1, 2011. Only includes costs for 2010.

4.1.3 Marketing and Outreach Efforts

The overall budget for CSI Marketing and Outreach (M&O) was established at $21,625,000. In 2007, the Commission authorized each PA to spend up to $600,000 annually on specific interim M&O activities. Such activities have included free training for more than 500 professionals and consumers per month, an electronic newsletter now distributed to more than 12,000 subscribers, various sponsorships and solar promotions, web sites and collateral materials such as fact sheets and direct mail to targeted consumers. The PAs have collectively spent $5.6 million on approved M&O activities since 2007, and have nearly $15.7 remaining for M&O until the conclusion of the program in 2016. The Commission will vote on a proposed decision specifying a simple M&O budget allocation of $5 million per PA, as opposed to following the standard program budget allocations.

In Phase I of the recent Energy Division Staff Proposal for CSI Modifications, greater direction was offered on the topic of marketing the CSI and CSI-Thermal programs. With feedback from stakeholders, the proposal identified the strategic goals of the program, which are:

1. To market the CSI Program and solar technology to consumers and end-users;
2. To facilitate the development of a sustainable solar industry through the creation of tools, information, trainings, events that expand or support the solar industry;
3. To facilitate efforts to reduce installed cost of systems (e.g. reducing permitting fees, promoting group discounts, facilitating price competition, streamlining administrative costs, reducing administrative costs to contractors).

Tools currently under development include utility-customer specific calculators that incorporate real customer electric bills and energy saving options into a full net present value calculation, similar to the California Energy Commission's upcoming SAVE calculator.

In workshops and public panels, the PAs are beginning to look at how to use CSI M&O dollars for resources that help the market transition successfully after the CSI program concludes. The CSI program has brought high degrees of transparency to the solar market by maintaining robust public databases, and experts agree that this valuable service should continue. As these discussions develop, more will be determined in terms of ultimate funding for ongoing state resources.

4.2 Single-Family Affordable Solar Homes (SASH) Program

4.2.1 Program Background

The Single-Family Affordable Solar Homes Program (SASH), one of the two low-income components of the CSI Program, provides incentives for solar PV systems for eligible low-income homeowners. The CPUC approved the SASH Program in November 2007 in D.07-11-047 as part of the CSI Program. GRID Alternatives (GRID) was selected as the statewide Program Manager for the SASH Program.[15] GRID is a non-profit providing renewable energy services, equipment, and training in low income communities throughout California since 2001. As Program Manager for the SASH Program, GRID identifies eligible low-income households, markets the SASH program, and installs PV systems for eligible SASH participants.

[15] D. 07-11-045 ordered the SASH Program to be administered by a single statewide program manager to " ensure consistency and equity in program delivery statewide while working with a diverse group of stakeholders and service providers." (p. 45, Conclusion of Law 10).

The SASH Program is uniquely designed to be a comprehensive low-income solar program. In addition to providing incentives, SASH is structured to promote or provide energy efficiency services, workforce development and green jobs training opportunities, and broad community engagement with low-income communities. There is no other low-income solar program in California that has such a diverse range of benefits for low-income communities.

Even in the early stages of SASH's implementation, the program has proven to be a valuable component of CSI and helps promote the goal of developing a sustainable solar industry in California, specifically through its workforce development and job training components. SASH will provide over 120,000 job training and volunteering opportunities totaling over 1 million hours of hands-on solar installation experience.

Also, the SASH Program provides very unique consumer education on solar and energy efficiency technologies to the diverse volunteer base that contributes to SASH installations. Over 200 volunteers per month participate in these solar orientation programs. This outreach helps further the broader *Go Solar, California!* goals of promoting the use of PV-solar technology statewide and helping build broad-based community support for solar electric technologies and energy efficiency. In some cases, GRID Alternatives sub-contracts with qualified solar contractors to install SASH projects through the SASH Sub-Contractor Partnership Program (SPP).

4.2.1.1 SASH Program Budget

The SASH budget is $108.3 million, allocated according to the information in Table 15 and Table 16.

Table 15: SASH Budget Allocations by IOU Service Territory

Utility	PG&E	SCE	SDG&E	Total
Percentage	43.7%	46%	10.3%	100%
Total Budget (millions)	$47.3	$49.8	$11.2	**$108.3**

Source: D.07-11-045

Table 16: SASH Budget Allocations by Functions

Function	Allocation
Administration	10%
Marketing and Outreach	4%
Measurement and Evaluation	1%
Incentives	85%

Source: D.07-11-045

4.2.1.1 Program Eligibility

The SASH Program is open to customers of the large electric IOUs who qualify as single-family, low income households as defined in PU Code 2852 (described further below). PU Code 2852 allows owner-occupied residences that are part of a larger multi-family complex to qualify under certain conditions. In October, 2009, AB 1551 (Fuentes, 2009) removed a minor error in the statute that precluded single family homes that were not part of a development from applying from the program. This modification opened the program up to thousands of additional homes. GRID Alternatives has created a statewide database of eligible homes in collaboration with the California Housing Partnership Corporation (CHPC) which is instrumental in the effort to establish relationships and identify resources within targeted local jurisdictions.

4.2.1.2 Program Incentives

The SASH incentives are higher than the CSI general market on a $/watt basis, and vary depending on the household's income level and their eligibility for the California Alternate Rates for Energy (CARE) program. [16] The SASH incentive does not decline over time as in the general market CSI Program.

Eligible participating households are provided a one-time payment under the CSI EPBB structure to help reduce the up-front cost of installation. The SASH Program has one fully-subsidized and six highly-subsidized incentive payment levels based on the applicant's income compared to the area median income (AMI), tax liability, and eligibility for the CARE program. The incentive rates shown in Table 17 are intended to provide low income residents who have no federal tax liability with a positive cash flow in the first year of solar installation.

Fully Subsidized (Free) Systems

[16] CARE provides a 20% to 30% discount on the energy bills of qualifying low-income customers

A maximum of 20 percent ($21,668,000) of the total SASH Program funds are available for full subsidies to qualifying households. The SASH Program provides a full subsidy for 1 - 1.2 kW systems to owner-occupied households that qualify as "extremely low income" or "very low income" (i.e., up to 50% of area median income per the Health and Safety Code definitions referenced in P.U. Code 2852). This subsidy is capped at a maximum of $10,000 per qualifying household. A household that qualifies for a full subsidy can either take the full subsidy for a 1.0–1.2 kW system or take a partial subsidy, as described below, for a larger system.

Incentive Structure

The following incentive structure is available to customers whose total household income is below 80 percent of the area median income. The incentive is calculated on a sliding-scale that is based on the homeowner's tax liability and the customer's eligibility in the CARE program. If the Applicant qualifies for the CARE program but is not currently enrolled, the Program Manager will work with the Applicant to enroll them into CARE. Table 17 exhibits the sliding-scale incentive rates:

Table 17: SASH Incentive Rates in $/watt

Federal Income Tax Liability	Low-Income CARE-Eligible	Low-Income Residents Not Eligible for CARE
$0	$7.00	$5.75
$1 to $1000	$6.50	$5.25
$1001 +	$6.00	$4.75

Source: D.07-11-045.

4.2.2 Program Progress

Throughout 2010, the SASH Program experienced steady growth in program applications and made significant progress in key areas including: expanding the Sub-Contractor Partnership Program (SPP); increasing marketing and outreach efficiency; building partnerships with volunteers and job training/workforce programs; and broadening the affordable housing client database. GRID Alternatives currently has seven offices located in Oakland (PG&E), Carson (SCE), San Diego (SDG&E), Fresno (SCE/PG&E), Atascadero (SCE/PG&E), Riverside (SCE), and Chico (PG&E).

4.2.2.1 SASH Program Data

SASH began accepting applications in December 2008 and by the end of Q1 2011, the SASH program has received 992 applications totaling 2.7MW capacity and over $17 million in

incentives. The SASH Program expects to install over 600 PV-systems in 2011, which will nearly double the total number of installations since the program began.

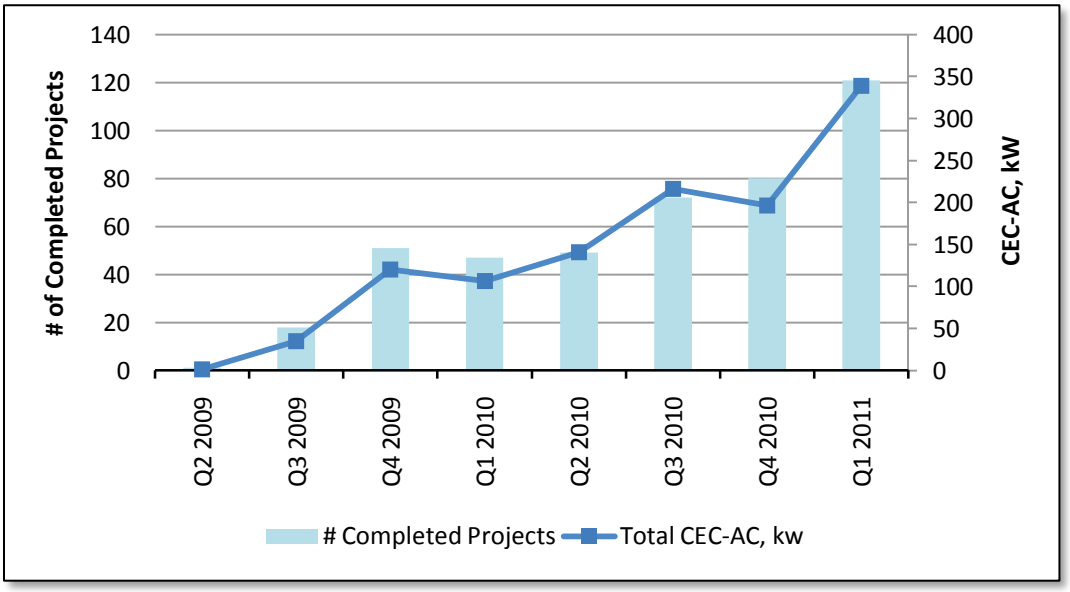
Table 18 below summarizes the status of SASH applications, while Figure 10 and the significant program growth since SASH began in Q2 2009.

Table 18: SASH Applications by Status and Service Territory

Application Status	Number of Applications				Total kW, (CEC-AC)	Total Incentives $ millions
	PG&E	SCE	SDG&E	Totals		
STEP 1: Applications under review	180	130	21	331	827.5	$4.97
STEP 2: Confirmed Applications/Reservations	68	118	9	195	643.2	$4.14
STEP 3: Completed/Installed	251	125	90	466	1,207.2	$7.90
TOTALS	**499**	**373**	**120**	**992**	**2,677.90**	**$17.01**

Data collected 4/11/2011.

Figure 10: Completed (Utility Interconnected) Projects per Quarter



Data collected 4/11/2011.

Nearly all 466 completed SASH installations were made at no cost to the homeowners. GRID Alternatives accomplished this by leveraging funding from local jurisdictions, project sponsorships, and through general non-profit fundraising. Since the SASH incentive does not cover 100% of installation costs, identifying gap financing from third-party sources is critical to achieving the long-term goals of SASH since individual homeowners are unable to fund the additional incremental costs.

4.2.2.2 Workforce Development

Every SASH installation provides workforce development opportunities. In implementing the SASH Program, GRID Alternatives provides opportunities for job trainees and local volunteers to assist with installations, to engage their communities, and to participate in the California solar and energy efficiency programs. According to Navigant Consulting's recent SASH Marketing Evaluation (April 2011), "GRID's approach to job training provides program participants with the opportunity to participate on jobs as volunteers plays an important role in the participants' professional development."[17]

These opportunities help establish a foundation for promoting and building a sustainable solar industry in California by incorporating workforce development and job training into the program. The SASH Program, as currently structured, will provide over 120,000 job training and volunteering opportunities totaling over 1 million hours of hands-on solar installation experience.

GRID Alternatives continues to expand its partnerships with local job training programs to give their trainees opportunities with hands-on installation experience that solar contractors often require for employment. GRID reserves at least twenty percent (20%) of all SASH installations for solar-installer job trainees, often targeting low-income communities. This becomes a double benefit to low-income communities since GRID recruits job trainees from the same communities that the SASH Program aims to serve.

4.2.3 Sub-Contractor Partnership Program

The SASH Sub-Contractor Partnership Program (SPP) provides opportunities for licensed California contractors to participate in SASH installations, not limited to GRID employees, volunteers and workforce program trainees. Qualified contracting companies agree to a reduced cost model and commit to hiring at least one eligible job trainee for each SASH

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

installation.

The SASH SPP also promotes partnerships between private solar contractors and local workforce development programs by including the above-mentioned job training requirement for all sub-contracted SASH projects. Though the SASH Program requires contractors to hire only one eligible job trainee per installation, some sub-contractors have exceeded this expectation by having more than one eligible trainee on their SASH installations. Other companies have committed to specific individuals' career development and offered agreements to their new solar hires to provide many hours of on the job training over several SPP installations. Sub-contractors are asked to use the installations as an extended interview, and commit to hire job trainees if they perform well and the company has open PV installer positions. In some cases, GRID Alternatives sub-contracts with qualified solar contractors to install SASH projects through the SASH Sub-Contractor Partnership Program (SPP).

The robust growth of SPP continues to be a focus of SASH as the volume of applications and installations increases throughout the program. The first quarter of 2011 has already seen a significant contribution from SPP given that sub-contractors completed more projects in the first three months of 2011 than they completed in the entire 12 months of 2010.

For more information on the SASH program, see the SASH Q1 Program Status Report on the CPUC website at http://www.cpuc.ca.gov/PUC/energy/Solar/sash.htm.

4.3 Multifamily Affordable Solar Housing (MASH) Program

4.3.1 Program Background

The second low income solar program in the California Solar Initiative targets affordable multi-tenant housing. In October 2008, Commission D.08-10-036 established the $108.3 million Multifamily Affordable Solar Housing (MASH) Program for solar installations on existing multifamily affordable housing that meet the definition of low income residential housing established in PU Code 2852.[18]

PG&E, SCE, and CCSE administer incentives for the MASH Program.[19] Low-income single family homes are covered by the SASH Program described in Section 4.2 above. The MASH program delivers two types of incentives: Track 1, which is a general incentive available for either common area or tenant load, and Track 2, a competitive grant available for proposals

[18] D.08-10-036, Appendix A, *mimeo.*, p. 1

[19] Per D.08-10-036, the CSI General Market PAs were ordered to administer the MASH Program "because of target market similarities." (P. 49, Conclusion of Law 13)

that demonstrate enhanced tenant benefit through energy efficiency, workforce development, tenant education or other related on-site benefits.

The goals of the MASH program are to: (a) Stimulate adoption of solar power in the affordable housing sector; (b) Improve energy utilization and overall quality of affordable housing through application of solar and energy efficiency technologies; (c) Decrease electricity use and costs without increasing monthly household expenses for affordable housing building occupants; and (d) Increase awareness and appreciation of the benefits of solar among affordable housing occupants and developers.

The MASH Program was intended to operate until January 1, 2016, or until all funds available from the program's incentive budget have been allocated, whichever event occurs first. However, Track 1 incentive funding in all three service territories was quickly absorbed and new applications were placed on waitlists. Furthermore, the uncertainty surrounding the future of MASH Track 2 prompted the PAs to request to postpone the Track 2 grant cycles, scheduled to open in January 2011 and again in June 2011, until further direction from the Commission was issued. The CPUC granted both requests.

Both the MASH and SASH programs are being evaluated by Navigant Consulting. The PA Performance Assessment and Market Assessments Reports have been issued, along with various findings that supported program modifications recommended in the CSI Staff Proposal.[20]

The MASH program is piloting an innovative new tariff called Virtual Net Metering (VNM) that allows individually metered tenants to receive credits on their electric bills for the energy production of a solar system installed on buildings or multi-family housing complex.

In 2010, CPUC staff issued a proposal that recommended numerous modifications to the CSI Program. Staff recommendations for MASH program modifications included expansion of VNM tariffs, allocation of SASH and MASH Track 2 funds to the MASH Track 1 budget, a reduction in the incentive amount and elimination of the two-year occupancy permit. The Commission is expected to vote on these, and other, program modifications in an upcoming Business Meeting.

4.3.1.1 Program Eligibility

The MASH program is open to multifamily affordable housing properties that meet the definition of "low income residential housing" per PU Code 2852 and have an occupancy

[20] The SASH and MASH evaluation studies are available here: http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm.

permit of at least two years, and deed restrictions on file with the County Assessor verifying that at least 20 percent of the tenants are low income.

The MASH Program also provides eligibility for certain pre-identified tenant units to enroll with their utility's Virtual Net Metering tariffs. In PG&E territory, any tenant in a qualifying affordable housing property listed by the applicant may enroll in VNM; in SCE and SDG&E territories, tenants eligible for enrollment in VNM tariffs must take service at the same single service delivery point that serves the solar system generation meter.

4.3.1.2 MASH Incentive Types

As shown in Table 19, the Commission adopted a two-track incentive structure: Track 1, which provides up front incentives to systems that offset either common area (Track 1A) or tenant load (Track 1B), and Track 2, which provides an opportunity every six months to compete for higher incentives through a grant program for projects that provide "direct tenant benefits" from the PV system and other on-site programs.[21] Such benefits include tenant education, energy efficiency measures, job training and any operating costs savings from a solar system where output is shared among tenants.

Table 19: MASH Incentive Tracks

Track 1A PV System Offsetting Common Area Load	Track 1B PV System Offsetting Tenant Area Load	Track 2 (Grant) PV System Providing Enhanced Tenant Benefits
$3.30/Watt	$4.00/Watt	$/Watt not specified; determined by proposal

Source: D.08-10-036.

4.3.1.3 Virtual Net Metering (VNM)

Multitenant buildings are a challenging housing segment for solar PV because of the problem of distributing system output among individually metered occupants. PV systems could be connected to a common area meter, or to individual tenant meters, but distribution of energy from a single system among multiple meters was not allowed under previous tariff structures. To solve this issue, the Commission directed the IOUs to file tariffs for Virtual Net Metering. [22]

VNM allows MASH participants to install a single PV system sized to the electric load of both common and tenant areas and to share energy credits from the system with individual meters identified under the rules of the tariff.[23] Under VNM, the utility meters the PV

[21] D.08-10-036, *mimeo*., p. 9.
[22] D. 08-10-036
[23] Currently, PG&E allows multiple SDPs.

system's output, then allocates credits (kWh) for the energy produced by the PV system to the building owner's and/or tenants' individual utility accounts, based on a pre-arranged allocation agreement. The intent of VNM is to help low income multifamily residents receive direct benefits of the building's solar system; however, the pilot has shown that VNM may be useful in other multi-tenant environments outside the affordable housing sector.

Based on this experience, CPUC staff has proposed recommendations to improve and expand the tariff, both within the MASH program and the affordable housing sector. The Commission is expected to decide this issue in summer 2011.[24]

4.3.1.4 Program Budget

The budget and allocations for MASH, shown in Table 20 and Table 21 were adopted by the CPUC in D.08-10-036. Table 22 shows program expenditures by program administrator through the end of 2010.[25]

Table 20: MASH Budget Allocations by Utility Territory

Utility	PG&E	SCE	SDG&E	Total
Percentage	44%	46%	10%	100%
Total Budget (millions)	$47.3	$49.8	$11.2	$108.3

Source: D.08-10-036

Table 21: MASH Budget Allocations by Function

Function	Allocation
Administration and Marketing and Outreach	10%
Measurement and Evaluation	2%
Incentives	88%

Source: D.08-10-036

[24] VNM modifications are authorized in the CSI proposed decision, available here: http://docs.cpuc.ca.gov/EFILE/PD/137183.htm.

[25] The MASH PAs are required under D.08-10-036 to submit semi-annual program progress reports; the next MASH report is due July 1, 2011 and will report on data through May 31, 2011.

Table 22: MASH Program Expenditure Data Oct 16, 2008 to December 31, 2010

	CCSE	PG&E	SCE	Total
Admin Expenses	$250,802	$430,916	$347,041	$1,028,759
Marketing	$35,407	$33,274	$21,230	$89,911
Measurement & Evaluation	$0	$41,445	$0	$41,445
Incentive	$524,184	$3,503,560	$2,561,794	$6,589,538
Total	**$810,393**	**$4,009,195**	**$2,930,065**	**$7,749,743**

Source: Data provided by the MASH Program Administrators.

4.3.2 Program Progress and Project Attributes

Since the MASH Track 1 incentives are fully subscribed, the progress of the program has been measured in terms of reserved projects reaching completion, and waitlisted projects brought into the incentive reservation queue when additional funds are made available via system resizing and project dropouts. As of May 31, 2011 MASH has 71 completed projects with a capacity of 4.13 MW[26] (See Table 23). Currently, there are 257 reserved MASH projects, awaiting completion, for a total capacity of 15.55 MW. Program Administrators are reviewing 11 applications, worth about 1.1MW of capacity, and the program waitlist remains moderate with 56 prospective applicants for 5.84 MW of solar projects.

Table 23: MASH Program Progress as of May 31, 2010

Status of Application		Total	CCSE	PG&E	SCE
Completed	Number	71	15	38	18
	Capacity (MW)	4.13	0.93	1.52	1.68
Reserved	Number	257	18	126	113
	Capacity (MW)	15.55	1.10	7.30	7.15
Review	Number	11	0	7	4
	Capacity (MW)	1.09	0	0.57	0.52
Waitlist	Number	56	10	37	9
	Capacity (MW)	5.84	1.60	2.76	1.481
Average Project costs ($/W)		**$ 7.91**	**$7.01**	**$8.83**	**$7.90**

Source: Data provided by the MASH Program Administrators.

[26] CSI PowerClerk, May 31, 2011

4.3.2.1 MASH Market Assessment and PA Performance Report Findings

The MASH Market Assessment Report, issued June 1, 2011 by Navigant Consulting, shows that participation in the MASH market is dominated by a handful of large host customers, third party system owners, and solar installers. The top six host customers hold 48 percent of MASH projects, with the most active host customers holding 52 individual project reservations. The top six third-party system owners are involved in financing 71 percent of projects, with the largest appearing on 103 individual projects (27 percent of the total). Finally, the top eight solar installers are listed on 78 percent of projects, with the largest appearing on 114 projects (30 percent of the total). In many cases, several MASH projects may be required for multiple service points on a single property. For completed projects, 27 individual projects were allocated to only 16 unique host customer locations, with one location comprising five projects.

Nonprofit affordable housing developers and solar integrators participate more frequently than other types of organizations in the MASH Program. Nonprofit affordable housing developers are the most common type of participating host customer; of these types of organizations hold 58 percent of reservations. Solar integrators hold the top spot for both system owners and installers. Six unique solar integrators are listed on 68 percent of projects as system owners, and eight unique solar integrators are listed as the installer on 53 (non-mutually exclusive) percent of projects.[27]

The MASH PAs provide data on their individual websites, updated monthly, and in 2010 were able to incorporate more data for public export from the PowerClerk database. One of the key recommendations in the CSI MASH PA Performance Assessment is to make this data available on California Solar Statistics, or to otherwise publish the data in a chart that allows for comparison at both the PA and statewide level.[28]

4.3.2.2 MASH Project Costs

Navigant Consulting provided an evaluation of project costs in the MASH Market Assessment Report showing that MASH projects are both larger and (in 2009-2010) less expensive on a capacity basis than comparable projects under the General Market CSI program. The median MASH system size is 37.7 kW versus 4.2 kW and 4.5 kW for the general market program. These larger systems appear to be generating economies of scale

[27] Navigant Consulting MASH Program Market Assessment Report, June 1, 2011, p.119. http://www.cpuc.ca.gov/NR/rdonlyres/EB601615-61B3-43B2-B034-EEC95AF46708/0/CSISASHandMASHMarketAssessmentReport.pdf.

[28] MASH PA Performance Assessment report

as reflected by lower average per-watt costs for MASH projects. The median cost for MASH systems in 2009-2010 was $7.44/W versus $8.56/W for the general market program.

The assessment also revealed that third-party ownership structures dominate the MASH program's projects, with 78 percent of surveyed MASH participants claiming project funding through some form of third-party ownership structure, of which 68 percent claim they used Power Purchase Agreements (PPAs) to help finance their projects. MASH program participants state that the Investment Tax Credit and the related Treasury Cash Grant remain strong financial drivers for projects, reinforcing the importance of third-party ownership for host customers with nonprofit status.

Due to its lower incentive per watt, MASH incentives cover a smaller portion of overall project costs than in the SASH program, which frequently provides systems at no cost to the homeowner (see section [REF]). For the majority (57 percent) of projects, incentives cover 40 to 49 percent of the calculated system cost, with a median of 43.5 percent of project costs covered.[29]

4.4 CSI-Thermal Program

The CSI-Thermal Program aims to promote a robust and sustainable market for solar water heating (SWH) and other solar thermal technologies through up-front incentives, technical training, marketing and outreach. The program began accepting applications from single-family residential customers that install SWH on May 1, 2010 and from multifamily and commercial customers on October 8, 2010.

4.4.1 Program Background

In early 2006, when the CPUC and the Energy Commission established the CSI Program, the CPUC stated its intent to consider incentives for SWH as part of the CSI program. Because earlier SWH programs in California had mixed results, however, the CPUC found it prudent to test the market for SWH incentives by conducting a limited pilot program in SDG&E's service territory prior to rolling out statewide SWH incentives.

With the passage of SB1 in August of 2006, CSI Program funds could no longer be collected from gas ratepayers. At the same time, SB 1 included a provision allowing up to $100.8 million of total CSI funds to be used for incentives for solar thermal technologies that displace electricity. With CSI funding now limited to collections from electric ratepayers, the Commission concluded in D.06-12-033 that although CSI would include incentives to

[29] Ibid.

solar thermal technologies that displace electricity, CSI should not pay incentives to solar thermal technologies that displace natural gas – the most common type of fuel used in water heating.

In February 2007, the Commission approved the SWH Pilot Program (SWHPP) in SDG&E territory with a budget of $2.6 million. The pilot began operation in the SDG&E territory on July 2, 2007 and ran through December 2009. The SWHPP offered incentives for SWH that displaced electricity, natural gas and propane.

In late 2007, the Governor signed AB 1470 (Huffman, 2007), authorizing the creation of a $250 million incentive program to promote the installation of 200,000 SWH systems in homes and businesses that displace the use of natural gas by the end of 2017. The statute requires the Commission to evaluate data from the SWHPP and determine whether a statewide SWH program is "cost effective for ratepayers and in the public interest" before designing and implementing an incentive program for gas customers.

In early 2009, CPUC staff released the results of a consultant's cost-effectiveness analysis using data from the SWHPP. Energy Division reviewed the cost-effectiveness analysis and on July 15, 2009 released a Staff Proposal finding that a statewide SWH incentive program could be a cost-effective investment for ratepayers. Based on that finding, the Staff Proposal recommended that the CPUC move forward with a comprehensive statewide program to incentivize SWH technologies.

On January 21, 2010, the CPUC approved D. 10-01-022, creating a statewide incentive program – now known as CSI-Thermal – to promote SWH through rebates to customers and market facilitation activities. The program is jointly administered by PG&E, SoCalGas, SCE, SDG&E and CCSE, with incentives distributed through a single application regardless of what utility the customer takes service from or what fuel the system displaces.

Subsequently, Energy Division held public workshop and worked with the CSI-Thermal Program Administrators to develop an application, database, incentive calculator, and the CSI-Thermal Program Handbook. The CSI-Thermal Program opened for single-family applications on May 1, 2010 and for multi-family/commercial applications on October 8, 2010.

4.4.1.1 Program Budget

The CSI-Thermal Program is funded by $250 million in collections from gas ratepayers, pursuant to AB 1470, as well as up to $100.8 million in funds already authorized and collected through the general market CSI photovoltaic program and earmarked in SB 1 for non-PV electric-displacing technologies such. Monies collected under AB 1470 will fund

incentives to solar water heating systems that displace natural gas usage, while funds collected through CSI will fund electric displacing solar water heating systems.

For the natural gas displacing portion of the program, the $250 million program budget will be collected by the three gas utilities based on the percentages in Table 24. The gas-displacing program budget is divided among the program elements as shown in Table 25.

Table 24: CSI-Thermal Gas-Displacing Budget Allocation

Utility	Budget Allocation	Total Program Budget ($M)
PG&E	39%	$97.5
SDG&E	10%	$25
SoCalGas	51%	$127.5
Total	**100%**	**$250 million**

Source: D. 10-01-022

Table 25: CSI Thermal Gas Displacing Program Budget

CSI Thermal Program Elements	CSI Thermal Program Sub-Elements	Budget ($ Millions)
Incentives 82%	General Market Incentive Component	$180
	Low-Income Component (10% of total funds)[7]	$25
	Subtotal	***$205***
Market Facilitation 10%	Marketing & Outreach, including training, consumer education, and other market facilitation activities	$25
	Subtotal	***$25***
Program Administration 8%	Application/incentive processing, General Administration, and System Inspection	$15
	Measurement and Evaluation	$5
	Subtotal	***$20***
Total		**$250**

Source: D.10-01-022

For the electric-displacing portion of the program, the Commission established the budget allocation, funded by the general market CSI budget, including $100.8 million for solar

[7] Details of SWH incentives to qualifying low income residential housing shall be set forth by the Commission at a later date.

thermal, in D. 08-12-044. The electric-displacing program budget, if utilized, reduces the amount of incentives available for PV, and shall be allocated as shown in Table 26.

Table 26: CSI Thermal Electric Displacing Program Budget

CSI Thermal Program Elements	CSI Thermal Program Sub-Elements	Budget ($M)
Incentive Program Component	General Market Incentive Component	No more than $100.8
	Low-Income Incentive Component	$0
	Subtotal	***$100.8***
Market Facilitation Program Component	Marketing & Outreach, including training, consumer education, and other market facilitation activities such as engaging with permitting offices or financing providers.	$6.25
	Subtotal	***$6.25***
Program Administration	Application/incentive processing, General Administration, and System Inspection	Subject to the overall CSI budget, but tracked separately
	Measurement and Evaluation	$1.25
	Subtotal	***$1.25***
Total		**$108.3 + CSI Admin Budget Costs**

Source: D.10-01-022

The PAs will perform marketing and M&E activities in a combined fashion for all SWH systems, whether they displace gas or electricity. The Program Administrators may fund these activities on a 4:1 ratio, so that for every $4 spent from the gas-displacing budget, $1 is spent from the electric-displacing budget.

4.4.1.2 Program Eligibility

The CSI-Thermal Program provides incentives to customers who install solar hot water heating systems that have received a certification from the Solar Rating and Certification Corporation (SRCC). Single-family residential, multifamily and commercial customers may apply for incentives. Contractors are required to be certified by the Contractor State Licensing Board, and all installers (self-installers and contractors) must complete a one-day training course provided by the utilities. Contractors must also agree to random inspections

of projects by Program Administrators and ensure that those systems are properly installed to remain in good standing.

4.4.1.3 Program Incentives

Incentives are provided in a lump-sum up-front payment based on expected first-year energy displacement of the SWH system. For residential systems, the expected displacement of the system is calculated and provided by the Solar Rating and Certification Corporation (SRCC). For larger commercial/multifamily systems, a software modeling tool is used to calculate the expected first year thermal displacement. Incentives are divided between the single-family and commercial/multifamily sectors, with 40 percent of incentives on the natural gas side reserved for single-family customers.

For systems that displace natural gas, incentives initially start at $1,500 for the typical single-family system and decline in four steps to $550 for the typical systems. Incentives are capped at 125 percent of the average incentive for a typical system. Multi-family commercial projects will be incentivized at the same rate per therm displaced, with a maximum incentive of $500,000 per project. Incentive levels decline when the total incentive budget for a particular level has been exhausted.

Incentive levels for natural-gas displacing systems are as follows in Table 27.

Table 27: CSI-Thermal Incentive Step Table

Step	Incentive for Average Residential SWH System	Funding Amount	Incentive per Therm Displaced	Therms Displaced Over System Life
1	$1,500	$50,000,000	$12.82	97,500,000
2	$1,200	$45,000,000	$10.26	109,687,500
3	$900	$45,000,000	$7.69	146,250,000
4	$550	$40,000,000	$4.70	212,727,275
	Total	**$180,000,000**		**566,164,775**

Source: D.10-01-022

Electric-displacing systems receive incentives at a lower level than natural gas displacing systems to account for the higher cost of heating water with electricity (and thus better cost-effectiveness of those systems). Incentives for electricity displacing systems also decline in four steps, but those incentive declines are triggered by step changes on the natural gas side, since the much larger natural gas market is likely to drive the industry. Incentives for electric-displacing systems are as shown in Table 28.

Table 28: Electric-Displacing Solar Thermal Incentives

Step Level	Electric-Displacing Incentive ($/kWh)	Incentive for Average Residential System
1	0.37	$1010
2	0.30	$820
3	0.22	$600
4	0.14	$380

Source: D.10-01-022

4.4.2 Program Progress

The CSI-Thermal Program began taking applications from single-family customers on May 1, 2010 and from multi-family and commercial customers on October 8, 2010. In its first full year of operation, the program has received 275 applications for $1.946 million in incentives, not including applications that were canceled or withdrawn (See Table 29).

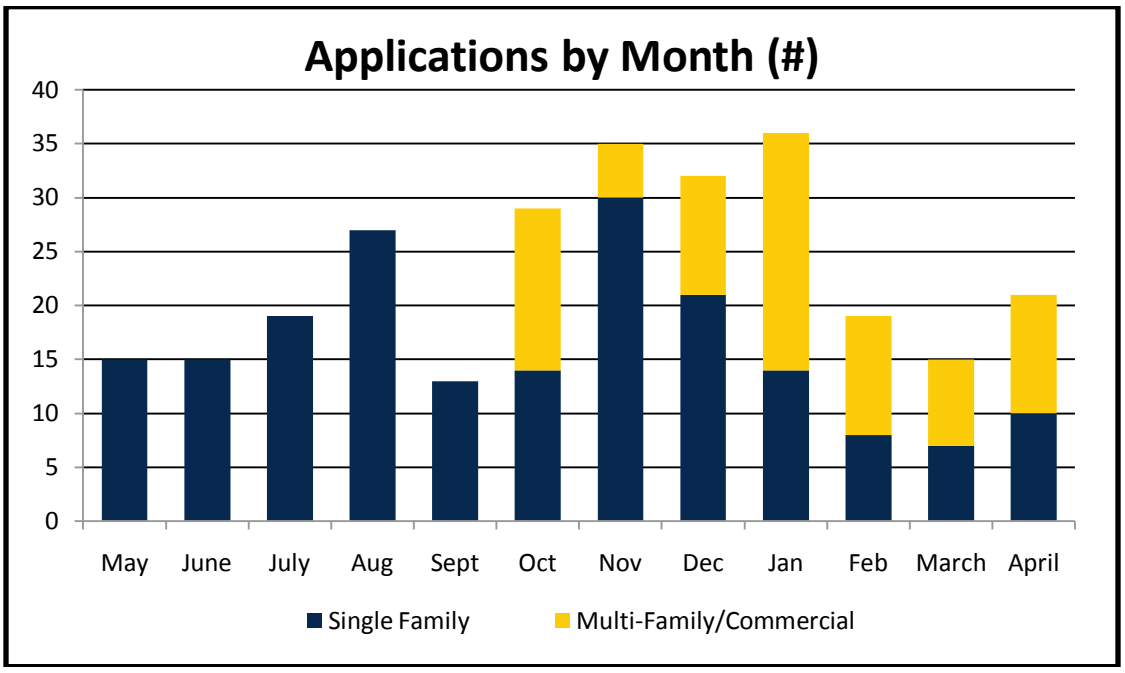
Table 29: CSI-Thermal Applications by Sector and Displaced Fuel

Sector	Number of Applications	Incentive Amount	Project Cost
Multi-Family/Commercial	82	$1,712,272	$4,971,588
Electric	1	$666	$7,630
Gas	81	$1,711,606	$4,963,958
Single Family Residential	193	$233,790	$1,534,306
Electric	105	$102,489	$773,465
Gas	88	$131,301	$760,841
Total	**275**	**$1,946,062**	**$6,505,894**

Source: www.csithermal.com/public_export; data through April 30, 2011

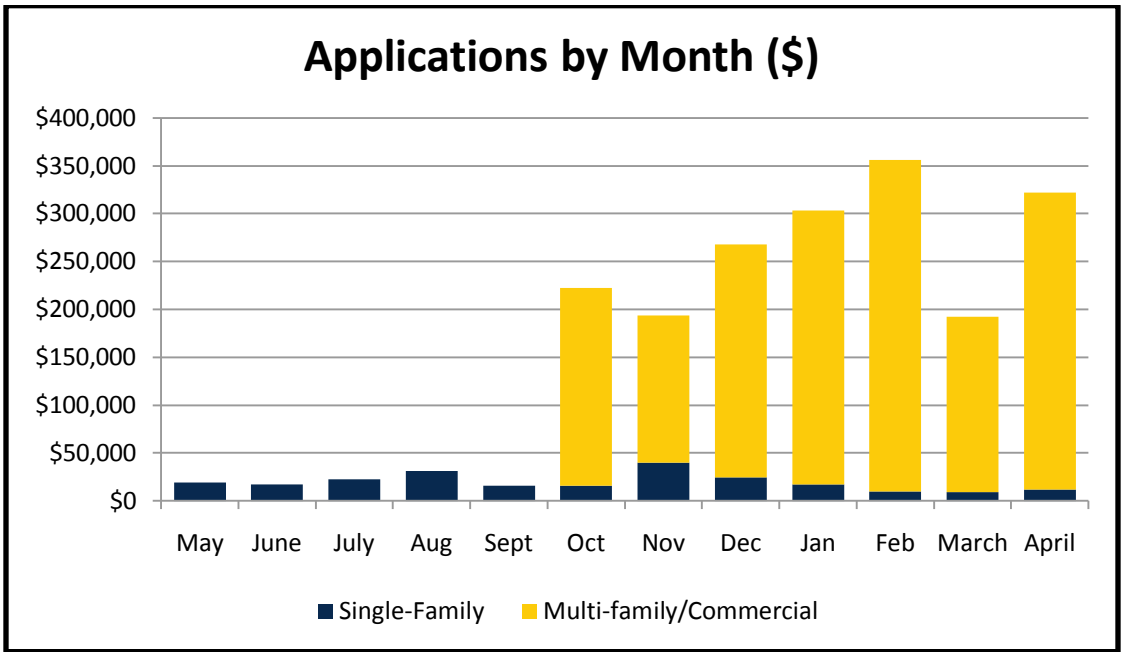
Although the single-family sector has received more than twice the number of applications as the multi-family/commercial (MF/C) sector, single-family applications account for only 12% of incentive dollars, indicating that the market for SWH on single-family properties is lagging behind expectations. To some extent, it is not surprising that the MF/C sector has far outpaced the single-family sector in incentive claims, since larger projects can have much more attractive economics than smaller ones. However, because D. 10-01-022 sets aside 40% of the incentive dollars for single-family, extra market facilitation efforts may be required in this sector in order to meet program goals.

Figure 11: CSI-Thermal Applications (number received) May 2010 – April 2011



Source: www.csithermal.com/public_export; data through April 30, 2011

Figure 12: CSI-Thermal Applications (incentive $) May 2010 – April 2011



Source: www.csithermal.com/public_export; data through April 30, 2011

Looking at applications by month for the first year of the program by number received (Figure 11) shows a distribution that reflects the normal annual building cycle. Because most installations occur in the summer months, and because single-family applicants only

submit applications after the system has been installed and inspected, one would expect the program to receive most applications in the months following the end of summer.

Figure 12 shows applications for the single-family and MF/C sector by incentive dollars. Looking at Figure 12, it is easy to see the effect of opening the program to the multi-family/commercial market in October, 2010. The larger projects have clearly been consuming the bulk of the incentives in the first year of the program, with MF/C projects averaging $250,000 per month in incentive claims, compared with $20,000/month for single-family.

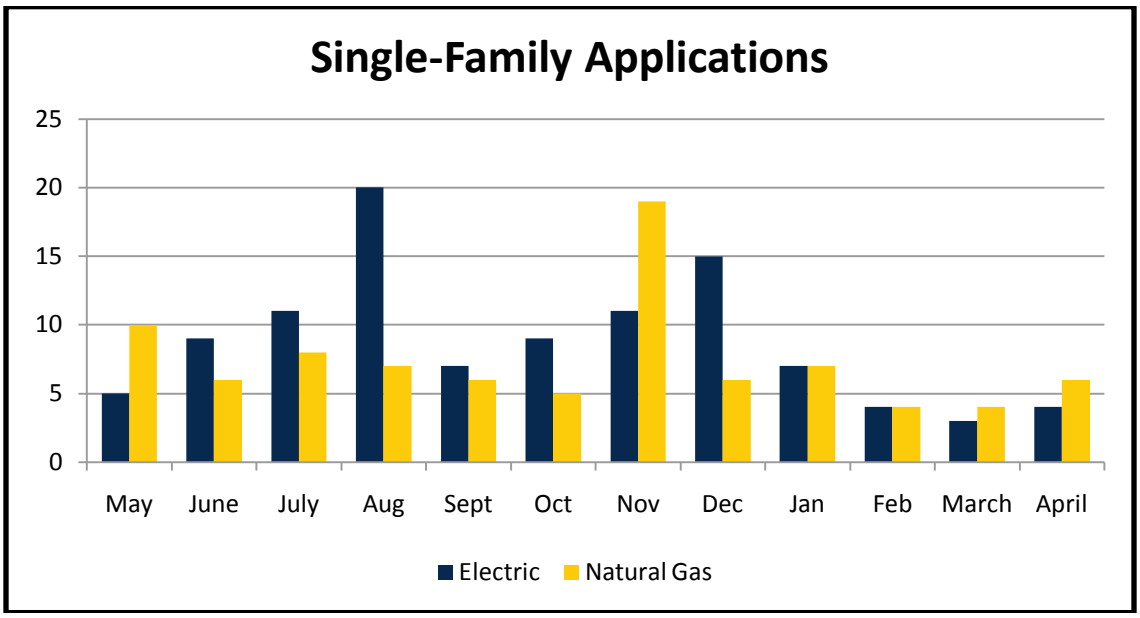
The slow start of the single-family sector of the CSI-Thermal Program can likely be attributed to several causes. The first is lack of marketing for the program. The CSI-Thermal Program has a $31.25 million market facilitation budget funded from a combination of natural gas and electric ratepayers. Since the inception of the program in January 2010, the CPUC has been working with the Program Administrators to devise a coordinated, comprehensive statewide marketing campaign for the program. As discussed in the next section, that effort is scheduled to be finalized in July 2011 and will likely go live shortly after. For the first year of the program however, the Program Administrators have done very little marketing, and for that reason, the benefits of SWH and the state incentive program are still not well known among the general public.

A second reason for the sluggish single-family sector is likely that natural gas prices have declined substantially in recent years, [30] hurting the economics of SWH projects that displace natural gas. A comparison of applications for residential incentives between natural gas and electric-displacing SWH illustrates the effect of displaced fuel cost on market viability. Since the start of the program, single-family electric-displacing incentives have outpaced natural gas incentives by about 20%, even though incentives are 50% higher for natural gas-displacing systems, and electricity is used to heat water in only 5% of California households (compared with 90% natural gas water heating penetration).

Clearly, cost of displaced fuel is a significant driver of SWH adoption. Figure 13 shows total number of electric-displacing and natural-gas displacing SWH applications by month for the first year of the program. Although electric applications are greater than or equal to natural gas applications in most months, both electric and natural gas applications appear to be down in the first few months of 2011.

[30] US Energy Information Administration, http://www.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_SCA_a.htm

Figure 13: Monthly CSI-Thermal Single-Family Apps by displaced fuel type



Source: www.csithermal.com/public_export; data through April 30, 2011.

4.4.2.1 Program Administration

4.4.2.1.1 Incentives Received

The CSI-Thermal Program is jointly administered by PG&E, SoCalGas, SCE and CCSE. While PG&E and CCSE administer incentives for both natural gas and electric-displacing systems, SCE only administer incentives for electric-displacing systems, and SoCalGas only administers incentives for natural gas displacing systems. As shown in Table 30, PG&E has received the most applications by far, with 177, followed by CCSE, SoCalGas and SCE.

Table 30: CSI-Thermal Program Applications by PA May 2010 – April 2011

Program Administrator	Paid	Approved	Under Review	Draft	Canceled	Total
PG&E	144	3	11	12	7	**177**
CCSE	53	1		1	3	**58**
SCE	5		2	1		**8**
SoCalGas	15	6	17	4		**42**
Total	**217**	**10**	**30**	**18**	**10**	**285**

Source: www.csithermal.com/public_export; data through April 30, 2011.

Although most water heating in California is done with natural gas, the economics are much more favorable for electric-displacing SWH, and indeed, more than a third of the applications received so far have been for electric-displacing SWH (see Table 29). This is likely part of the reason that PG&E and CCSE, which administer incentives for both displaced fuel types, have received more incentives than SoCalGas, which administers 51% of the budget for the natural gas displacing program, but which does not administer electric incentives.

4.4.2.1.2 Program Administrator Expenses

Table 31 shows CSI-Thermal Program expenses by Program Administrator for the first 15 months of the program. Most of the administrative costs during this time were expended on initial program startup activities, such as contracting with independent third parties to build web-based incentive application tools, a program database, and simulation tools capable of predicting first year energy displacement. In the first months of program startup, the Program Administrators have contracted with Energy Solutions to build the online application and database, and they hired Thermal Energy System Solutions (TESS) to build the simulation software that models the solar thermal energy production of each system to predict the annual energy savings that is the basis for the incentive payment.

Because the administrative budget has mostly been dedicated to program startup activities, the program administrators have spend about $2.50 on administration for every $1.00 spent on incentive payments. That ratio is likely to shrink substantially as the PAs shift from program startup activities to incentive processing. In addition, market facilitation and measurement and evaluation expenses will grow as those areas of the program are implemented in late 2011 and 2012.

Table 31: CSI-Thermal Expenditures by PA January 2010 – April 2011

Expenditure type	CCSE	PG&E	SCE	SCG	Total
Administration	$453,263	$1,054,487	$173,648	$309,910	$1,991,308
Market Facilitation	$322,143	$136,622	$6,257	$62,667	$527,689
Measurement & Evaluation	$0	$2,543	$0	$0	$2543
Incentives Paid	$184,506	$573,616	$3,855	$21,468	$783,445
Total	**$959,911**	**$1,767,269**	**$183,760**	**$394,045**	**$3,304,985**

Source: www.csithermal.com/public_export; data through April 30, 2011.

4.4.2.1.3 Market Facilitation

D. 10-01-022 sets aside $25 million from the $250 million natural gas budget and $6.25 from the electric budget for market facilitation activities, particularly marketing and outreach, consumer education, workforce training, engaging with permitting officials, and other market facilitation activities. On April 1, 2010, each of the four Program Administrators filed a market facilitation plan with Energy Division. On April 28, 2010, the Division of Ratepayer Advocates protested the plans, stating that "Since the plans lack both a unified vision on one hand, and detailed activities on the other, the Commission should require that the plans be improved before the Commission will adopt them."[31]

Upon reviewing the plans, Energy Division determined that long-term plans for CSI-Thermal Marketing would not be successful without some level of coordination and collaboration among the Program Administrators. Thus, on November 4, 2010, Energy Division issued a guidance memo directing the PAs to re-file their market facilitation plans. The guidance memo contained specific direction for the PAs to collaborate on hiring a professional marketing firm to run a statewide coordinated marketing campaigned aimed at increasing consumer awareness of solar thermal.

The PAs issued a request for proposals for that statewide marketing firm in March 2011, and they are expected to select a winner in June 2011. The PAs will then present their final marketing plans to the CPUC and the public in July and kick off the statewide marketing campaign shortly thereafter.

4.5 Research, Development, Demonstration, & Deployment (RD&D)

4.5.1 Program Background

The primary purpose of the CSI Research, Development, Demonstration and Deployment (RD&D) Program is to identify and support projects that will help reach the CSI Program's goal of 1,940 MW of installed distributed solar by 2016, and to create a self-sustaining, subsidy-free solar market in the years beyond.

The CSI RD&D Plan, established in September 2007 by D.07-09-042, identifies the goals and objectives of the program, sets forth allocation guidelines for using up to $50 million in

[31] DRA Protest of Advice Letters PG&E 3108-G/3645-E; SCE AL 2460-E; SOCALGAS AL 4098; AND CCSE ADVICE 11 Seeking Approval of Market Facilitation Plans and Budgets for the California Solar Initiative Thermal Program Pursuant to Decision 10-01-022, April 28, 2010

RD&D funds, and establishes criteria for solicitation, selection and funding of RD&D projects. The RD&D portfolio allocation percentages are guidelines and are meant to help steer funds across a range of diverse projects – they should not be interpreted as firm limits. The intent of the RD&D Plan is to provide a flexible framework for the CPUC to select the most promising projects, expected to yield the greatest public benefit. As required in D.07-09-042, $10 million of the CSI RD&D Program was allocated to support construction of the Helios Solar Energy Research Center at U.C. Berkeley, gaining leverage with additional funds committed from a variety of sources for a solar research program.

The CSI RD&D Program focuses on implementation of the CPUC's adopted RD&D Plan which establishes the funding priorities for the program as the following:

- Improving the economics of solar by reducing installed costs and increasing performance
- Enabling wide-scale deployment of distributed solar technologies by filling knowledge gaps
- Overcoming barriers to technology adoption
- Taking advantage of California's data from past, current, and future installations
- Providing bridge funding to help promising technologies make the transition to commercial viability
- Supporting efforts to integrate distributed power into the grid and maximize value to ratepayers
- Integrating the above goals with an eye toward issues that directly benefit California and may not be funded by others

The portfolio of RD&D projects are required to reflect diversity across the following RD&D stages:

- Research: Fundamental research to improve performance of energy technologies
- Development: Activities that convert research into working prototypes of improved technologies
- Demonstration: Activities that bring promising technologies closer to market by demonstrating their real-world feasibility to manufacturers
- Deployment: Aiding new technologies in gaining wide-scale adoption or to reach a "tipping point" into widespread commercialization

Within these four stages, project funds will be dispersed across a variety of different activities with distinct risk and result timeframes. The tables below show the guidelines for the RD&D budget targeted by development stages, expected activity (objectives), and expected results timeframe.

- Table 32 shows that the RD&D portfolio will be heavily focused on demonstration projects, with less emphasis on direct research and even less on development and deployment.
- Table 33 shows that 50-65 percent of funds allocated in any RD&D stage should involve grid integration, storage or metering advancements that reflect the priority to integrate solar production into California's electric grid. A smaller percentage of recipient projects should involve energy generation technologies or business development innovations, both desired to reduce solar system costs and/or increase their performance.
- Finally, Table 34 shows that about 60 percent of all funded projects, again measured in dollars, should show results in the 1-3 year time frame, 20 percent in the 4-7 year time frame, and 20 percent in 8 or more years.

Table 32: RD&D Budget by Stages

RD&D Stage	Budget % (Range)	Budget Max ($M)
Research	20%	$8.5
Development	10-15%	$6.4
Demonstration	50-60%	$25.5
Deployment	0-15%	$6.4
Total*	**100%***	**$42.5***

Source: D.07-09-042.
*Note: *Total not to exceed $42.52 million - not all stages will spend to Maximum $ amount.*

Table 33: RD&D Budget by Target Activities

Target activities	Budget % (Range)	Budget Max ($M)
Grid integration, storage & metering	50-65%	$27.64
Energy Generation technologies	10-25%	$10.63
Business development	10-20%	$8.50
Total*	**100%**	**$42.5***

Source: D.07-09-042.
*Note: *Total not to exceed $42.52 million - not all target activities will be fully subscribed.*

Table 34: RD&D Budget by Results Timeframe

Results timeframe	Budget %	Budget Max ($M)
1-3 years	60%	$25.51
4-7 years	20%	$8.50
8+ years	20%	$8.50
Total	**100%**	**$42.5***

Source: D.07-09-042.
*Note: *Total not to exceed $42.52 million- not all stages will be fully subscribed.*

The CPUC established the CSI RD&D Program budget in D.06-12-033 and further detailed budget requirements in D.07-09-042. The $6 million administrative costs for the CSI RD&D Program are incorporated into the total CSI RD&D Program budget. The CPUC capped the total administrative costs at 15 percent of the total CSI RD&D Program budget and include the costs of the outside Program Manager's program evaluation and IOU costs for accounting, reporting, and other assigned duties.

Itron, the CSI RD&D Program Manager, administers the Program with oversight of the CPUC. They are responsible for developing requests for proposals (RFPs), evaluating grant requests, entering into grant agreements, and monitoring progress on all approved projects. The budget breakdown in Table 35 below is based on the guidelines established in D.07-09-042.

Table 35: CSI RD&D Program Budget Allocations

CSI RD&D Program Funding Areas	Estimated Budget (millions)
Administration	$5.98
Triennial Evaluations	$1.50
Grants/Incentives	$42.52
Total	**$50.00**

Source: D.07-09-042.

4.5.2 Program Progress

To read more about the status of the CSI RD&D Program, visit the program website: www.calsolarresearch.ca.gov.

- The CSI RD&D Program initiated its first round grant solicitation in July 2009. In March of 2010, CPUC Resolution E-4317 approved eight grants totaling $9.3 million for the CSI RD&D's first solicitation, which focused on grid integration of solar

energy. These eight winners, shown in Table 36 include a variety of academic, industry, national laboratory, and utility participants. In total, these recipients are bringing more than $6 million in match funding. The projects are expected to be completed within two years.

- A second round of CSI RD&D grant solicitation was released in November 2009. This round focused on improved PV production technologies and innovative business models. On September 2, 2010, CPUC Resolution E-4354 approved nine grants for a total of $14.6 million. These nine recipients, who are bringing $13 million in match funding, are shown in detail in Table 40.

- All of the projects funded under the first two rounds are either located in California or have at least one California-based partner.

- The bulk of remaining funds will be allocated to grid integration, storage, and metering projects. The target allocations across energy generation and business development activities are mostly funded.

- Design is underway at the Helios Solar Energy Research Center, a joint effort of Lawrence Berkeley National Laboratory (LBNL) and U.C. Berkeley which will focus on developing low cost solar energy conversion technology using PV and successor materials. Facility construction is expected in October of 2011.

- Many of the awardees also received funding from the CEC and or Department of Energy. In March of 2011, the CPUC and DOE jointly hosted a two-day workshop to highlight the progress and challenges of grid integration projects funded by one or both of the two entities.

- A final CSI RD&D grant request for proposals is currently being developed. This RFP will cover all three topic areas: grid integration, improved PV production, and innovative business models. A draft is expected to be released for public comment in June of 2011. This draft strongly emphasizes a utility partner, especially for grid integration projects, and requires 50% match funding.

Table 36: CSI RD&D Program Grant Awardees, First Solicitation, March 2010

Applicant	Proposal title	Funding Request	Match Funding
Sacramento Municipal Utility District	High Penetration PV Initiative	$2,968,432	$1,293,259
Clean Power Research	Advanced Modeling and Verification for High Penetration PV	$976,392	$2,293,000
National Renewable Energy Laboratory	Beopt-CA (EX): A Tool for Optimal Integration of EE/DR/ES+PV for California Homes	$985,000	$329,000
kW Engineering	Specify, Test and Document an Integrated Energy Project Model	$942,500	$250,000
National Renewable Energy Laboratory	Analysis of High-Penetration Levels of PV into the Distribution Grid in CA	$1,600,000	$1,400,000
APEP/UC Irvine	Development and Analysis of a Progressively Smarter Distribution System	$300,000	$100,000
SunPower Corporation	Planning and Modeling for High-Penetration PV	$1,000,000	$320,000
University of California San Diego (UCSD)	Improving Economics of Solar Power Through Resource Analysis, Forecasting and Dynamic System Modeling	$548,148	$137,037
Total		**$9,320,472**	**$6,122,296**

Source: Resolution E-4317.

Table 37: CSI RD&D Grant Awardees from Second Solicitation, Sep. 2010

Applicant	Proposal title	Funding Request	Match Funding
SunPower	PV and Advanced Energy Storage for Demand Reduction	$1,875,000	$937,000
Amonix	Improved Cost, Reliability, and Grid Integration of High Concentration Photovoltaic Systems	$2,139,384	$3,157,000
Solaria	Proving Performance of the Lowest Cost PV System	$1,217,500	$1,217,500
Viridity Energy	Innovative Business Models, Rates and Incentives that Promote Integration of High Penetration PV with Real-Time Management of Customer Sited Distributed Energy Resources	$1,660,000	$840,000
ConSol	Low-Cost, Smart-Grid Ready Solar Re-Roof Product Enables Residential Solar Energy Efficiency Results	$1,000,000	$1,160,697
University of California Regents	West Village Energy Initiative	$2,500,000	$1,245,000
Solar City	Advanced Grid-Interactive Distributed PV and Storage	$1,774,780	$1,057,187
SunLink	Reducing California PV Balance of System Costs by Automating Array Design, Engineering and Component Delivery	$996,269	$927,031
Cogenra Solar	Improved manufacturing and innovative business models to accelerate commercialization in California of hybrid concentrating photovoltaic/thermal tri-generation (CPV/T-3G) technology	$1,467,125	$2,774,157
Total		**$14,630,058**	**$13,315,572**

Source: Resolution E-4354.

5 Program Reporting and Evaluation

5.1 Program Reporting

There are a number of periodic reports that the program makes available to the public.

The California Solar Statistics (CSS) [32] site contains a wealth of tabular and graphical data, updated weekly. The number of applications processed, incentive dollars committed, and MW of capacity installed are displayed by utility territory, type of host customer, size of installation, time period, etc. The site also contains a link to the publicly-available data (the "Working Data Set") that are used to generate the graphs and tables on CSS. In addition it contains a "Find an Active Solar Contractor" feature which helps prospective solar buyers do just that, and a search page that that facilitates data queries. Finally, it posts a weekly update to the budget status of the CSI General Market program. In the next few months, the CSI team expects to upgrade the CSS site with improved graphs and tables and new ones, with data archives, and with a more detailed CSI budget report.

The CSS site relies on data from the CSI online database, PowerClerk, which was inaugurated in 2007, and is used by program applicants and administrators. PowerClerk is also used to assist in program evaluation efforts.

The Quarterly Progress Reports were launched in September 2007. A quarterly Data Annex report, focusing on administrative processing speed, began after the third quarter of 2008. The Quarterly Progress reports were discontinued after the first quarter of the 2009, since the information was deemed redundant with what was available from other sources. The Data Annexes continue to be published quarterly. [33]

The Annual Program Assessment (APA) is embodied in the present report, and has been published annually since 2009. This year's edition of the APA is being published at nearly the same time as the 2010 Impact Evaluation. The two reports together will provide a comprehensive picture of the CSI's progress to date. Consequently, the APA has been pared back to remove material that would be redundant with the contents of the 2010 Impact Evaluation.

[32] www.californiasolarstatistics.com

[33] http://www.cpuc.ca.gov/PUC/energy/Solar/legreports.htm

5.2 Program Evaluation Plan

The CSI program goals are to deploy 1,940 MW of new solar capacity by 2016, and to help create a self-sufficient solar industry in which solar energy systems are a viable mainstream option for both homes and businesses within 10 years, without ratepayer support. [34] [35] [36] The point of the CSI evaluation efforts is to see how these goals are being met.

Early in 2006, the Commission ordered the CSI program administrators (PAs) to file a proposed evaluation outline and schedule that would implement an evaluation process.[37] The purpose of the evaluation process was to review CSI program results and consider recommendations for program changes. In July of 2008 the Commission issued a comprehensive CSI Program Evaluation Plan.[38] In addition to the reporting elements noted above, the Plan foresaw many evaluation studies, several of which have already been carried out.

The 2008 Evaluation Plan allocated $46.7 million for M&E before the end of 2016, including the electric-only portion of the CSI-Thermal program. Because of budget concerns that arose in the spring and summer of 2010 (see section 6 below), the M&E budget was lowered to $26.7 million with the $20 million savings transferred to the General Market CSI incentives budget.

Accordingly, the Commission approved in May 2011 a revised and downsized evaluation plan. The 2011 Evaluation plan retains contract funding for:

- Project Coordinator: at a reduced pay rate.
- Impact Evaluations: studies will be conducted biennially instead of annually (see section 5.3 below)
- Retention and Performance Studies: are subsumed under the Impact Evaluations.
- Market Transformation Studies: this significant new study will have components examining the inter-relationships between roofing and PV installations, and look into third party financing for PV systems.
- Process Evaluations: one more study is planned, for 2014.
- Cost Effectiveness Study: one more study is planned, for 2013
- External Financial Audit report: these will continue to be conducted on a biennial basis.

[34] Public Utilities Code Section 387.5
[35] D.06-12-033
[36] California Energy Code Section 25780
[37] D.06-01-024
[38] Appendix A of Assigned Commissioner's Ruling in R.08-03-008 on July 29, 2008

- Optional Studies: to be determined.

The current status of CSI M&E is as follows:

- Project Coordinator for M&E studies: a consultant has been performing this role since 2009.
- Impact Evaluations: three annual studies for 2007-2010 have been published (see section 5.3 below)
- System Retention and Performance Studies: none done yet.
- Market Transformation Studies: none done yet.
- Process Evaluations: these studies examine the logic of the program design to find possible impediments to achieving the program's goals; a series of studies were published from 2009 to 2011.
- CSI Cost Effectiveness Studies: first report published April 2011; a second study is underway and is expected to be completed by Q3 2011.
- Net Energy Metering Cost/Benefit Study: first report published January 2010.
- External Financial Audit Report: CPUC audit staff completed the 2007-2008 audit in 2010.
- Optional Analyses: none completed yet.

5.3 2010 CSI Impact Evaluation

Itron, a metering and consulting firm, was contracted by the CSI program to conduct CSI Impact Evaluations for 2009 and for 2010. The results of the 2009 Impact Evaluation report were incorporated into the 2010 Annual Program Assessment. The findings of the 2010 Impact Evaluation report were not ready to be incorporated into the 2011 Annual Program Assessment. The 2010 CSI Impact Evaluation report was published in late June 2011, and will be offered to the Legislature as a supplement to this 2011 Annual Program Assessment.[39]

5.4 Process Evaluation

In January 2011, the contractor hired for this work, Opinion Dynamics Corporation (ODC) delivered a final "2009-2010 Process Evaluation"[40], incorporating two main research objectives. One objective was represented in a previous draft report, which created a "logic model" for each of the program's goals (installing 1,750 MW for the General Market

[39] The 2010 CSI Impact Evaluation is available on the CPUC website: http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm.
[40] The 2009-2010 Process evaluation is available on the CPUC website: http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm

program, and creating a sustainable market). The intent was to identify the barriers within the market and the program interventions needed to remove those barriers.

The main thrust of the report offered a very practical set of observations of how the CSI program was working, what challenges remain, and failing to work and how it could be improved. The report reviewed the program from multiple perspectives: host customers, solar contractors, and PAs. Data were gathered via observational techniques, informational interviews, and quantitative surveys.

Areas of noted success:

1. The program is deploying rooftop PV at a rate which will attain the MW goals within the program's ten-year time frame, although funding shortages for the non-residential program are problematic.[41]
2. The program has put into place effective and consistent procedures to ensure customer education, correct payment of incentive dollars, quality of equipment, and training for contractors.
3. PAs are continually upgrading and modifying the administration of the program to improve outcomes and lower program costs. For example:
    a. PowerClerk enhancements: PowerClerk is the online interface[42] between program participants (most often, contractors) and the PAs. In early 2010, PowerClerk was enhanced to allow applicants to electronically attach required documents directly to their applications, instead of mailing hard copies, thus streamlining operations for both users and PAs.
    b. Customer service improvements: PAs are moving toward having one staff person assigned to an application, so that applicants can contact that person when they need help. Also, the availability of a live respondent on the hot line is now being implemented by all three PAs.
    c. Consistent interpretation of CSI Policies across PAs: As an example, one PA had applied a quick trigger in suspending applications with incomplete or incorrect applications. Later, harmonizing with the practice of the other two PAs, more leniency was allowed. The uniform practices have resulted in fewer bottlenecks.

Key program challenges:

Most CSI applications are processed at two points: when they apply for a funding reservation (after a project is sized and a contract is signed); and when they claim the incentive payment (after the system is permitted, installed, interconnected, and

[41] Indeed, after ODC drafted the report, both PG&E's and CCSE's (which runs CSI in SDG&E territory) non-residential programs were suspended because incentive dollars had run out.
[42] PowerClerk also serves as the main program database.

generating). Processing these applications and claims can be delayed by errors and omissions in the forms submitted, short staffing at the PAs, and, sometimes, inefficient procedures.

At the time that ODC wrote the report, SCE in particular was experiencing slow processing times. This was attributed to a huge spike in program applications which occurred in the Spring of 2010, and to less-than-optimal procedures at SCE. Since that time, the spike in applications has not recurred, and SCE has improved both the organization and training of its CSI administrative staff, and streamlined several administrative procedures. Still, processing times for all PAs remain high, and leave room for improvement.

In general, participants (i.e. contractors, primarily) in CCSE's territory were most satisfied with the CSI program. Because the territory that CCSE works with (i.e. SDG&E's territory) is considerably smaller than those of PG&E and SCE, it is prone to having more direct contact with the program participants, who appreciate that. On the other hand, CCSE has faced substantial hurdles in obtaining customer data, which it needs in processing applications, from SDG&E.

Processing is slowed by the two-step application which forces PAs to review the same application twice, and by the need to cross check data with several other databases (e.g. the California State Licensing Board for licensing information, utility databases for customer billing information).

ODC also notes the challenges arising from multiple program goals:

> "Through multiple application requirements and verification checks, the program is not just offering rebates. It is also performing consumer protection, making sure the customer is making an educated decision, ensuring that the contractor is licensed, ensuring equipment meets standards, and that equipment is properly sized and priced. These requirements and checks at two separate steps in the process make for a long application review process for items that are not necessarily tied to the rebate amount."[43]

As an example, ODC notes how the requirement that participants conduct an energy efficiency audit, while laudable, both retards the application process and generally fails to encourage energy efficiency investments or influence the sizing of rooftop systems.

[43] CSI Process Evaluation, pp. 11-12.

The evaluation also notes that a lack of integration between the EPBB calculator and the PowerClerk application interface slows applications and introduces possibilities for errors associated with re-entering data from the calculator to the online application.

Recommendations for improvements:

The number one recommendation for program improvement is the switch to a one-step application, and in fact the PAs have submitted an advice letter to effect this program change.[44]

The evaluators also recommend that the EPBB calculator be internalized into the PowerClerk interface. In fact, Energy Division included this recommendation in its Staff Proposal submitted in R.08-03-008 in June 2010. As of late May 2011, the PAs are working to effectuate this change, which should be in place in July 2011.

ODC also submitted additional recommendations, among which are:

1. Cross train employees.
2. Allow applicants to edit information on PowerClerk after submission (this change has already been put into place).
3. Create one standard load justification form for all thee PAs (this change has already been put into place).
4. Improve PA communication with utility Interconnection departments.
5. Review all applications in-house (this change, applicable mainly to SCE, has already been put into place).
6. Live customer care (this change has already been put into place).
7. Each PA should have access to customer account information (this change, applicable mainly to CCSE, has mostly been put into place). [confirm with Ben Airth]
8. To improve the likelihood that applications are properly filled out, ODC recommended disseminating to the contractor community a list of "Best Tips for Applicants.

Finally, the study also reviewed the format and content of the quarterly Data Annex, which reports on the administrative efficiency of the program, to determine how they could be improved. ODC recommended that "(k)nowing measures of central tendency would be useful, especially median and mean, and histograms using ten day ranges would display the information well." Consequently, the program is considering modifications to the presentation of this information.

[44] The advice letter was protested. The Energy Division has prepared a resolution which authorizes an expedited two-step application process that provides a more efficient and timely completion of CSI application.

In response to the issues listed above, the CPUC has issued a proposed decision[45] which proposes new timelines for application processing and orders the integration of the EPBB calculation in PowerClerk.

5.5 CSI Program Administrator Audits

CSI program evaluation, utility accounting and financial reporting procedures for tracking expenditures and assessing the financial fitness of the CSI general market program are requirements established by the CPUC and the Legislature. The overall CSI budget and reporting requirements were set in a series of Commission decisions beginning in January, 2006.[46] In particular, the ruling specified that external program administrator audits would be performed approximately every two years, starting in 2009, for the life of the program.

PG&E, SCE, and SDG&E's programs were audited in 2010 for the period covering 2007-2008. The CPUC's Division of Water and Audit's Utility Audit, Finance and Compliance Branch (UAFCB) performed the audits to determine the reliability and authenticity of the CSI expenditures reported to the Commission. Pursuant to (D.) 07-05-047, Program Administrators submit a semi-annual Expense Report on all CSI expenditures. While the CSI Program audits do not offer a legal determination of Program Administrator's compliance, it ascertains whether the administration costs and expenditures are properly charged against program funds. Pursuant to (D.) 07-05-047, Program Administrators submit a semi-annual Expense Report on all CSI expenditures and the auditors review the Expense Reports to ensure accurate financial reporting of program collections and expenditures. UAFCB auditing determined if the Program Administrator's financial oversight, utility accounting structure and policy strategies are in full compliance with Commission directives designed to protect ratepayer program funding. All program budgetary or policy constraints are consistent with the intent of the legislature, as well as the Commission's directives.

The Commission authorized the utilities to collect the revenue requirement established by (D.) 06-01-024 for the CSI program funding. This directive ordered that the collections and expenditures be tracked and reported separately in utility accounts for program administration, including Measurement and Evaluation, Marketing and Operations, and incentive pending and payment details.

[45] Available here: http://docs.cpuc.ca.gov/EFILE/PD/137183.htm.
[46] See Decision (D.) 06-08-028, Ordering Paragraph (OP) 24; the Assigned Commissioner's Ruling Establishing the Program Evaluation plan for the CSI program on July 29, 2008; and also in (D.) 06-01-024, page 8.

Utilities or Program Administrators have oversight over the financial fitness of the programs and audits ensure proper administration and implementation oversight in accordance with the CSI Program Handbook.

UAFCB reviewed the CSI project applications, administrative and marketing expenditures and selected samples for testing if the expenditures are relevant to the CSI program. The scope of the audit included the following:

1. Process Compliance
2. Existence of Safeguards
3. Integrity of Reporting
4. Oversight Adequacy

5.6 SWHPP Final Evaluation

On March 30, 2011, the CPUC released the Final Evaluation Report on the Solar Water Heating Pilot Program (SWHPP)[47], which ran from July 2007 to December 2009 in the San Diego region. Conducted by Itron, the SWHPP Final Evaluation Report provides a comprehensive summary of the SWHPP, including data on system performance, costs, market characteristics, consumer attitudes about SWH and other relevant information.

The SWHPP was created by CPUC Ruling[48] in February 2007. It was initially scheduled to run for 18 months with a budget or $2.6 million, but the term of the program was later extended to 30 months. Of the initial $2.6 million budget, $1.5 million was set aside for incentive payments, with $900,000 allocated to single-family systems and $600,000 allocated to multi-family/commercial systems.

Table 38 shows installations made under the SWHPP by customer sector. In total, the SWHPP installed 342 systems, the majority of which were installed on single-family households. The program spent a total of $539,156 on incentive payments – only a little more than a third of the incentive budget originally allocated in the CPUC Ruling.

[47] Solar Water Heating Pilot Program Final Evaluation Report, Itron, Inc., March 30, 2011: http://www.cpuc.ca.gov/NR/rdonlyres/C1C7FD10-05AA-493B-8CD0-F2C24DCA955A/0/CCSE_SWHPP_Rpt.pdf.

[48] Assigned Commissioner's and Administrative Law Judge's Ruling Approving Solar Water Heating Pilot Program, February 15, 2007; http://docs.cpuc.ca.gov/efile/RULINGS/64620.pdf.

Table 38: SWH Pilot Program Installations by Customer Sector

Program	No. of Systems Installed	Collector Area (ft^2)	Expected Annual Savings (therms)	Incentives Paid
Multifamily/Commercial	23	7,185	21,597	$136,978
Single Family	319	15,515	35,356	$402,178
Total	**342**	**22,699**	**56,953**	**$539,156**

Solar Water Heating Pilot Program Final Evaluation Report, Itron, Inc., March 30, 2011: http://www.cpuc.ca.gov/NR/rdonlyres/C1C7FD10-05AA-493B-8CD0-F2C24DCA955A/0/CCSE_SWHPP_Rpt.pdf.

The results of the SWHPP presented in the Final Evaluation report indicate that the SWH market in California is relatively weak and needs significant development before it becomes a robust, self-reliant industry. As part of the report, Itron conducted surveys of both participants and non-participants in the market and found that up-front cost is by far the largest barrier to SWH ownership among homeowners. This observation and others found in the SWHPP Final Evaluation will provide valuable insight as the CSI-Thermal Program begins to tackle the SWH market barriers in California.

6 CSI Program Budget

6.1 CSI Program Budget Overview

Senate Bill 1 mandates that the total cost of the CSI Program overseen by the Commission shall not exceed $2.167 billion. In D.06-12-033, the Commission adopted a CSI General Market program budget of $1.897 that included $1.707 billion allocated for incentives and $189.71 million allocated for program administration, marketing, and program evaluation. Programs that cover installations for low-income residents, research, development and demonstration (RD&D) programs, and a solar water heating pilot program are funded separately and made up the remaining $269 million of the CSI budget.

The Commission established a goal for the General Market CSI program to install 1,750 megawatts (MW) of solar energy systems. Depending on the characteristics of the solar energy system, incentives may be paid up-front in a one-time payment for smaller systems (EPBB), or over a five year period based on actual metered production data (PBI).

One significant characteristic of PBI payments that differentiates them from up-front EPBB incentives is the inclusion of an annual 8% discount rate in the PBI payment. In other words, the PBI per-kWh payment rate, which remains the same for a given project throughout its five-year payment stream, has been increased to reflect an 8% annual discount rate. This boost was deemed necessary to make the PBI option attractive to participants and equalize the effective rate of payments. Because of the adjustment for the discount factor, a system receiving PBI payments has a budgetary impact that is approximately 22% higher than the corresponding EPBB incentive at the same step level.

Additionally, the Commission adopted higher incentive rates at every incentive step level for tax-exempt entities such as government and non-profit institutions, to offset the fact that these non-taxable entities could not qualify for federal tax credits for installation costs.

On July 9, 2010, the Assigned Commissioner issued a Ruling (ACR) opening up for review the CSI budget and incentive levels to ensure that the program did not make commitments beyond its budget, and to ensure that the program's goals could be reached. The Commission was concerned about the budget and incentive levels because of high levels of program participation, the rapid pace of incentive steps reduction, and the fact that payments to PBI participants have been greater than forecast in D.06-08-028. The ACR requested comment on modifications to three aspects of the incentive mechanism to maximize the effectiveness of the remaining CSI program budget. The proposed modifications were to: 1) remove the 8% discount rate embedded in the calculation of PBI

payments; 2) reduce incentive rates for government and non-profit applicants; and 3) shift $20 million from the program administration budget to the incentive budget.

The ACR also directed the CSI Program Administrators to temporarily postpone issuing confirmed reservations for new applications seeking performance based incentives as well as any new applications seeking government/non-profit incentives pending resolution of this issue via Commission decision. A second ACR, issued on July 29, 2010, rescinded this temporary postponement and allowed the PAs to once again process all incoming CSI applications, including those government/nonprofit and PBI applications held in queue during the postponement.

The proposed modifications in the July 9, 2010 ACR were intended to help ensure the program achieves its MW goals and to address a potential budget shortfall stemming largely from the greater than anticipated impact of PBI payments on the program budget. The budget cash flow problem was, and is, compounded by the inability of the program to use accumulated interest on customer collections.

The impact of the higher-than-expected PBI payments has been somewhat dampened by program cancellations (which effectively place more MWs in the lower-priced program steps) and lower-than-expected participation by government/non-profits, paid higher incentives, resulting in a budget shortfall estimated to be approximately $198 million.[49] Other factors that add to budgeting uncertainty include the actual performance of systems receiving PBI incentives[50], as well as the number of systems that, although eligible for upfront incentives, elect to take performance based incentives. In light of the various sources of uncertainty, the Commission acknowledged that it would need to revisit the incentives at some point and make adjustments accordingly.

On September 23, 2010 the Commission decided in D.10-09-046, in order to avoid market disruption and uncertainty, to leave undisturbed the 8% discount rate which is embedded in the PBI payments. The decision also ordered the PAs to publish weekly and quarterly reports that would forecast the amount of the budget shortfall (i.e. the extra funding that would be needed to reach the goal of 1750 MW) and the target shortfall (i.e. the amount by which the program will fall short of its target if it did not receive extra funding).

[49] http://www.californiasolarstatistics.ca.gov/reports/budget_forecast/, data as of June 29, 2011.
[50] In D.06-08-028, the Commission considered whether to cap PBI payments for better budget control, but the Commission rejected a performance cap on PBI projects.

Table 39: budget revisions from D.10-09-046

Program Component	Original Budget ($ M)	Revised Budget ($M)	Net Change from Original Budget
General Market Program			
General Market Program Incentives	$1,707.41	$1,747.81	+$40.40
Program Administration	$94.86	$94.86	
Total Measurement & Evaluation (M&E)	$46.70	$26.70	- $20.00
M&E, except CSI-Thermal Electric M&E	*$45.45*	*$25.45*	
M&E, CSI-Thermal Electric Only	*$1.25*	*$1.25*	
Total Marketing and Outreach (M&O)	$21.25	$21.25	
M&O, except CSI-Thermal M&O	*$15.00*	*$15.00*	
M&O for CSI-Thermal	*$6.25*	*$6.25*	
Unallocated	$26.90	$6.90	- $20.00
Subtotal General Market Program	***$1,897.12***	***$1,897.52***	***+$0.40***
RD&D Program	$50.00	$50.00	
Low Income Single-family (SASH)	$108.34	$108.34	
Low Income Multifamily (MASH)	$108.34	$108.34	
SWH Pilot Program (SWHPP)	$3.00	$2.60	-$0.40
Total CSI Electric Budget	**$2,166.90**	**$2,166.80**	**0**

Source: D. 10-09-046

The Commission cautioned "the PAs that they must keep a close and careful watch on the funds reserved for CSI applications to ensure they do not exceed the CSI statutory spending cap of $2.1668 billion. The PAs must effectively manage the program budgets, including their respective incentive allocations, to ensure that the program's total budget liabilities do not exceed the spending cap."[51] The Commission authorized the PAs to suspend new incentive awards at a level which would preserve a safety buffer.

The Commission also declined to implement the second proposal it had outlined on July 9, and instead maintained the incentive differential between commercial and government/non-profit entities. The Commission recognized the greater difficulty that these parties would have to install rooftop solar if their incentives were made lower.

[51] D.10-09-046 p.11.

The Commission did, however, implement the last measure proposed in the ACR shifting $20 million from the administrative account to the incentives account. This was money that had been available in the CSI General Market general administrative account, but not yet allocated. On top of that, the Commission took $20 million which had been available but not allocated, from the General Market program's Measurement and Evaluation (M&E), and placed it in the incentives budget.

Table 40: Schedule of MWs and incentives in each program step

Step #	MW in Step	EPBB Payments (per Watt)			PBI Payments (per kWh)		
		Residential	Non-Residential		Residential	Non-Residential	
			Commercial	Government/ Non-Profit		Commercial	Government/ Non-Profit
1	50	$2.80	$2.80	$2.80	n/a	n/a	n/a
2	70	$2.50	$2.50	$3.25	$0.39	$0.39	$0.50
3	100	$2.20	$2.20	$2.95	$0.34	$0.34	$0.46
4	130	$1.90	$1.90	$2.65	$0.26	$0.26	$0.37
5	160	$1.55	$1.55	$2.30	$0.22	$0.22	$0.32
6	190	$1.10	$1.10	$1.85	$0.15	$0.15	$0.26
7	215	$0.65	$0.65	$1.40	$0.09	$0.09	$0.19
8	250	$0.35	$0.35	$1.10	$0.05	$0.05	$0.15
9	285	$0.25	$0.25	$0.90	$0.03	$0.03	$0.12
10	350	$0.20	$0.20	$0.70	$0.03	$0.03	$0.10

MW and incentives are unchanged by D. 10-09-046

Because the Commission ordered the PAs to establish weekly and quarterly budget reports, the CSI program now has access to regularly updated budget information. The budget forecast has many moving parts, some of which are outside the control of CSI managers. As a result the budget, which can be viewed at http://californiasolarstatistics.com/reports/budget_forecast/, tends to vary from week to week.

As a result of the September decision, the CSI General Market program had $40 million more available for incentives, but was still facing a substantial shortfall, specifically for the PBI-intensive parts of the program. Each PA divides its CSI General Market program into a residential and a non-residential program. Because the vast majority of residential program participants opt for EPBB payments, the budgets for all three PAs' residential programs are stable and likely sufficient to meet their goals. And because the vast majority of non-residential projects receive PBI payments, it is these non-residential programs that face budget challenges.

In October 2011 CCSE suspended its non-residential program because of a shortage of incentive funding, and in December PG&E's followed suit and suspended its non-residential program. These programs are accepting applications and placing them on a waitlist. Historically, a significant fraction of active projects[52] drop out, or cancel their reservations, making room for new applications. It is expected that enough dropouts will occur in the PG&E and CCSE non-residential programs so that at least some of the projects now on the waitlists will be able to receive incentive dollars.

SCE's non-residential program still has funding for new applicants, although it is not expected to reach its MW targets at the existing funding levels. All three residential programs are on-going and are expected to meet or nearly meet their targets.

As noted above, the program funding steps down through ten levels. With each step forward, the incentive rate drops and the number of MWs targeted in that step increase. All of the residential and non-residential programs are in Step 8, except for SCE's residential program which is in Step 6.[53] [54]

6.2 CSI Program Electric Balancing Accounts

The CSI Program Balancing Account (CSIPBA) was originally authorized in D.06-01-024. Its purpose is to track the recorded incremental CSI costs and authorized distribution revenue requirement. The CSI program is funded by ratepayer dollars, which are collected at a higher rate in the early program years, decreasing in the later program years.[55] This arrangement led to significant balance surpluses because of the slow ramp-up period and because PBI payments are stretched out over 5 years. To provide ratepayer relief during the 2008 economic downturn, PG&E was granted a modification to its collection schedule suspending CSI rate collections for the seven months beginning June 1, 2010.

The CSIPBA tracks in a PBI sub-account the forecasted payment amounts for all completed projects receiving PBI. To ensure adequate funds over the five-year PBI payment period, the Commission directed PG&E, SCE and SDG&E to make quarterly projections of the total

[52] Active project are those that have confirmed reservations, but have not yet installed systems and requested their incentive payment.
[53] See the Trigger-Tracker site here: http://www.csi-trigger.com/
[54] At the time this report is being prepared, SB 585 (Kehoe) is before the legislature. It proposes, among other things, to allow the program to collect enough funding to achieve its MW goals.
[55] As noted in the Table, remaining funds from the predecessor SGIP program were transferred to the CSI program on December 31, 2006.

five-year expected PBI payment amount for all solar projects completed in that quarter, and deposit that amount in an interest earning balancing account.

The Commission envisioned in D.06-08-028 that interest earned on customers' collections waiting in interest-earning accounts would augment the funds available to support the program. The subsequent passage of a CSI budget cap in SB 1 prohibited earned interest from increasing the total dollars spent on CSI. Instead, the interest merely lowers total collections required from ratepayers.[56] The budget cash flow problem is compounded by the inability of the program to use accumulated interest on customer collections.

Table 41: CSIPBA collections schedule approved by D.10-04-017

Year	PG&E	SCE	SDG&E	Total
Transfer from SGIP on 12/31/2006	$0	$104.6	$37.2	$141.8
2007	$140	$147	$33	$320
2008	$140	$147	$33	$320
2009	$140	$0	$0	$140
2010	$43.75	$110	$25	$240
2011	$105	$110	$25	$240
2012	$120	$110	$25	$240
2013	$85	$74	$16	$160
2014	$85	$74	$16	$160
2015	$85	$74	$12.8	$156.8
2016	$3.25	$45.4	$0	$47.4
Total	**$947**	**$996**	**$223**	**$2,166**

Source: D. 10-04-017

[56] See Pub. Util. Code § 2851(e)

6.3 CSI Program Costs

Total program administration costs are shown in Table 42, as reported in the Program Administrator expense reports submitted to the Energy Division. Only costs that have been posted as "expenditures" in the CSI balancing accounts are considered spent in Table 42. Table 42 shows the total budget for administration and incentives for each program component.

Table 42: CSI Administration Costs through December 2010 ($millions)

Category	CSI General Market	SASH	MASH	SHW	RD&D	Total
Administration 10-year Budget	**189.7**	**16.3**	**13.0**	**1.1**	**7.5**	**18.2**
PG&E Spent thru 2010	21.2	0.4	0.5	0	2.5	**0**
SCE Spent thru 2010	25.0	2.6	0.4	0	0.8	**28.8**
CCSE Spent thru 2010	4.8	0	0.3	1.1	0.5	**6.7**
Subtotal Administration	51	3	1.2	1.1	3.8	**35.5**
Incentives/Grants 10-year Budget	**1,707.30**	**92.1**	**95.3**	**1.5**	**42.5**	**1,938.90**
PG&E Spent thru 2010	279.7	2.8	16.7	0	7.4	**306.6**
SCE Spent thru 2010	169.6	1.0	2.5	0	0.01	**173.11**
CCSE Spent thru 2010	82.3	0.7	0.5	0.5	0	**84**
Subtotal Incentives	531.6	4.5	19.7	0.5	7.41	**563.71**
Total Balance	**582.6**	**7.5**	**20.9**	**1.6**	**11.21**	**599.21**

Source: CSI Program Administrators