



California Solar Initiative Annual Program Assessment June 2010



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California Solar Initiative Annual Program Assessment

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Prepared by the
California Public Utilities Commission

Authors

Sachu Constantine
Mona Dzvova
Damon Franz
James Loewen
Amy Reardon
Neal Reardon
Molly Tirpak Sterkel, Supervisor

Special Thanks

Jeanne Clinton
Dorothy Duda
Maryam Ebke
Julie Fitch
Pounh Ghaffarian
Dan Hartmann
Patrick Reaves
Andrew Schwartz

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1. Executive Summary

1.1 Introduction

In January 2007, the State of California launched an unprecedented \$3.3 billion ratepayer-funded effort that aims to install 3,000 megawatts (MW) of new solar over the next decade and transform the market for solar energy by reducing the cost of solar. The California Public Utilities Commission (CPUC) portion of the solar effort is known as the California Solar Initiative (CSI) Program. The CSI portion, 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 second 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, not on the California Energy Commission new homes program (New Solar Homes Partnership) or publicly-owned utilities' solar offerings. This report highlights key accomplishments to date for each CSI Program component.

The California solar market 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 up to date information on installed solar in California, including both CSI program data as well as other program data. The report includes information on the CSI Program participation, installed capacity, program costs, and program impacts. The report includes highlights from the 2009 CSI Impact Evaluation report, which focused on the CSI general market program. The report also includes information on the progress of the other CSI Program Components (See Section 2.2), including the Research, Development, and Demonstration (RD&D) Program; the solar water heating program (CSI-Thermal); and the two low-income programs, Single-family Affordable Solar Homes (SASH) and Multifamily Affordable Solar Housing (MASH).

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

- California has over 600 megawatts (MW) of solar connected to the electric grid at nearly 65,000 customer sites. (See Section 3)
 - There is 598 MW of capacity installed in investor-owned utility territories and 11 MW of solar capacity installed in publicly owned utility (POU) territories. (See Section 3.3)
 - Of the 598 MW installed in investor-owned utility territories, 342 MW were installed under the CSI Program at 31,000 sites, and 256 MW were installed through other programs, including the California Energy Commission's New Solar Homes Partnership (NSHP), the Self-Generation Incentive Program (SGIP) and the Emerging Renewables Program (ERP). (See Section 3.1)

1.2.2 General Market Program Highlights

- Despite the challenging economic situation, the CSI Program is 42 percent of the way toward its total installed capacity goal for the general market program.
 - Projects that have already been installed represent 20 percent of the general market program capacity goal, and pending projects that have been registered but not yet completed comprise another 22 percent. (See Section 4.1.2.2)
 - The CSI Program has 41,864 solar applications, including both pending and installed systems that (if all installed) will account for an estimated 729 MW of new solar capacity. (See Section 4.1.2.1)
 - The CSI Program has received a record of nearly 300 MW of new CSI project applications and has installed nearly 60 MW of solar PV since January 2010. The data from this year suggests that the CSI Program could install at least the same amount of MW in 2010 as 2009, which would be approximately 130 MW for the year. (See Section 4.1.2.3.)
 - The program had over 134 MW of new projects applying in April 2010, the highest month on record for new solar applications. March and May 2010 both brought over 50 MW of new applications. (See Section 4.1.2.3)
- For every dollar spent on incentives by the state, there has been another \$2.62 invested in solar technology in California from other sources. (See Section 4.1.2.7)
 - The program has seen \$1,400 million in demand for solar incentives.
 - The program has offered incentives of \$738 million for installed projects, and has another \$661 million available for pending projects.
 - With these incentives, the CSI program has helped support investments of \$5,061 million in solar projects in the state since 2007. For every \$1 in incentives, the program leverages an additional \$2.62 in capital investment from other sources.

- The CSI Program data shows a decline in the average cost of solar PV systems. The inflation adjusted cost trends show that systems smaller than 10 kW have declined in price about 15 percent between January 2007 and December 2009. For systems larger than 10 kW, prices declined nearly 10 percent over the same 3-year period. (See Section 4.1.2.6)
- The incentives under the CSI Program have declined several times since 2007 in response to program demand. Incentives started at \$2.50/watt across the state, and now they are as low as \$0.65/watt in PG&E and SDG&E territory. (See Section 4.1.1.3)
 - Incentives must decline an average of seven percent per year over 10 years, according to law. The average rate of decline since the start of the program been 26 percent for small systems and 38 percent for large systems.
 - Incentives are lowest in PG&E and SDG&E territory, where both non-residential and residential rebates have dropped six times. SCE rebates have dropped two times for residential and five times for non-residential.
- There is a growing trend towards third-party owned systems, especially among larger projects. Although predominantly common for larger systems, third party ownership has grown in popularity with residential systems each year. Forty percent of all MWs in the program are owned by third parties, but only 12 percent of all projects have that type of ownership structure. (See Section 5.2.2)
- In 2009, CSI online projects generated more than 390,000 MWh of electricity: more than three times the amount generated by CSI projects in 2008. (See Section 5.2.3)
 - CSI projects are located at utility customer sites where they help meet local electricity requirements. Consequently, the electricity provided by CSI facilities during 2009 represents electricity that did not have to be generated by central station power plants or delivered by the transmission and distribution system.
 - The CSI Program avoided an estimated 180,136 tons of CO₂ in 2009, which is equivalent to taking over 31,000 cars off of the road.² (See Section 5.2.6)
- During the peak hour in 2009, CSI installed solar systems had a "peak-hour capacity factor" of 0.59, meaning that 59 percent of all installed solar capacity was performing at the peak hour. (See Section 5.2.4)
 - In 2009, there were over 20,100 systems online at the time of the CAISO system peak, which occurred on September 3, 2009 from 2 PM to 3 PM with a peak load of 45,994 MW.
 - These online CSI PV systems had a CEC-AC capacity of approximately 245 MW (nearly 4 times the capacity of CSI projects online during the 2008 peak).

² Based on 5.23 metric tons (5.77 short tons) of CO₂ /vehicle/year from <http://www.epa.gov/grnpower/pubs/calcmeth.htm#vehicles>

Their generating output for the CAISO system peak hour was estimated to be 144 MWh.

- A review of actual performance metered data reveals that both small and large systems funded under the CSI program are performing above estimated expectations of system performance. (See Section 5.2.5)
- A review of customer satisfaction with system performance reveals that both residential and non-residential customers rank their solar system a "9" on a scale of 1 to 10 in terms of performance. (See Section 5.2.11)
- CSI Program participants install more energy efficiency measures than non-participants. (See Section 5.2.8 and 5.2.9)
 - From 2006-2009, CSI residential participants self-reported an average of 5 energy efficiency measures, compared with nonparticipants who reported an average of approximately 3.7 energy efficiency measures. Non-residential data reveals a similar trend.
 - Across the state, it is common for a building's total energy consumption to go down after a solar system is installed.
- There are 1,400 active contractors in the CSI program, but 80 percent of the installed capacity was installed by the largest 5 percent of firms (74 firms). (See Section 5.2.12)
- Contractors are key communicators of the availability of CSI rebates. Residential participants in the CSI Program heard about the program from their contractor 37 percent of the time, more than any other program awareness source. Participants heard about the program from TV/Internet 30 percent of the time, and from "Word of Mouth" 16 percent of the time. (See Section 5.2.11)
- The CSI Program has completed several major evaluation reports including: the CSI 2009 Impact Evaluation (June 2010); the 2007-2008 Impact Evaluation (February 2010); the Net Energy Metering Cost-Effectiveness Evaluation (March 2010); a preliminary Process Evaluation (March 2010). (See Section 4.1.3)
- The CSI Program continues to make strides in solar market facilitation activities. The program has a monthly newsletter that reaches over 8,000 subscribers. The program has provided training classes to over 7,000 individuals, including solar contractors. The program has collaborated with the California Energy Commission to re-launch the statewide consumer education website for solar customers, *Go Solar California!* (See Section 4.1.4)

1.2.3 Other Program Components Highlights

In addition to progress cited above regarding the CSI general market solar program, all other CSI Program Components have made significant progress:

- **Single-family Affordable Solar Homes (SASH).** The SASH Program has installed over 117 systems on eligible low-income qualifying homes. The program expects to install another 300 homes this year. (See Section 4.2.2)
- **Multi-family Affordable Solar Housing (MASH).** The MASH Program launched in February 2009, and as of June 2010 had received more than 300 applications for over 20 MW. As a result of high demand, Track 1 funds are fully allocated and additional applications are on waiting lists. The CPUC has authorized Virtual Net Metering (VNM) for MASH projects. Current MASH applications indicate that there are up to 6,300 tenant units that may benefit from VNM when these projects are completed. VNM allows MASH program participants to install a single solar system to cover the electricity load of both common and tenant areas in a low income multifamily residence, with the participating utility allocating solar kilowatt hour credits to the utility bills of both building and tenant accounts. (See Section 4.3.2)
- **CSI-Thermal Program.** The new rebate program for solar hot water systems began accepting applications from single-family homeowners on May 1, 2010, and already has received 19 applications. The multi-family/commercial portion of the program is under review by the Commission and is expected to be available by the fall. The solar water heating pilot program in San Diego finished in December 2009 and installed 342 systems for \$539,156. (See Section 4.4.2 and Section 4.4.3)
- **Research, Development, Demonstration and Deployment (RD&D) Program.** The CSI RD&D Program approved its first round of grant solicitations in March 2010. The first round received 21 applications and awarded \$9.3 million to eight grant winners. All projects focused on the integration of solar technologies into the grid. The CPUC is expected to issue draft approval of its second round grant solicitation in July 2010. The second round focused on improved PV production technologies and innovative business models, and 96 proposals were submitted in response to the second solicitation. (See Section 4.5.2)

1.3 Future CSI Program Modifications

Starting in July 2010, the Commission is expected to undertake a programmatic review of numerous aspects of the CSI Program. The Commission's procedural vehicle for reviewing the CSI Program is the Distributed Generation and CSI Proceeding, and the current proceeding is Rulemaking (R.) 10-05-004.³ (See Section 2.4.3)

One of the key areas that the Commission will review in R. 10-05-004 in the near future is the CSI budget in light of recent program demand. The Commission will be reviewing whether the program is on track to meet the targeted MW goals of the program given the current program demand levels. The Commission may review the assumptions underlying the budget and incentive levels offered, given the current high levels of demand. As part of this review the Commission may need to consider adjustments to the incentive levels offered,

³ For information about how to track the CPUC Proceeding related to Distributed Generation and the CSI Program, see <http://www.cpuc.ca.gov/PUC/energy/DistGen/docketinfo.htm>.

particularly to systems receiving performance based incentives and/or Government/Non-Profit entities given the current economic environment, solar market dynamics and programmatic budget constraints.

In addition to reviewing the budget, the Commission will also review an Energy Division Staff Proposal that will include staff recommendations to changes to the general market program, marketing and outreach, measurement and evaluation, as well as both low-income solar programs, SASH and MASH. The CSI Staff Proposal includes recommendations for the Commission to take actions to modify and expand the three utility tariffs structures that support solar: Net Energy Metering, Virtual Net Metering, and Bill Credit Transfer programs. The Commission will also review the implementation of a low-income component of the CSI-Thermal program.

As the Commission reviews and acts on the above mentioned issues, there may be issues that require statutory modification, although it is too early to make specific recommendations on required legislation resulting from these programmatic reviews.

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 CSI is overseen by the California Public Utilities Commission (CPUC) as part of the state's strong support for the deployment of solar technology. An outgrowth of Governor Schwarzenegger's vision of a "Million Solar Roofs" in the State of California,⁴ the CSI Program originally provided incentives for photovoltaic (PV) solar system installations to customers of the state's large electric investor-owned utilities (IOUs): PG&E, SCE, and SDG&E.⁵ Starting in 2010, the CSI Program now provides upfront incentives for gas-displacing solar thermal 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-displacing portion of CSI Program, which covers solar PV and some solar thermal systems, was authorized by the CPUC in a series of regulatory decisions between 2006 and 2010. In addition, the Legislature expressly authorized the CPUC to create the CSI

⁴ The Million Solar Roofs goal was not adopted by the Legislature as an explicit number of projects in its authorization of the State's solar programs. Instead, the Legislature adopted a 3,000 MW capacity goal. However, if the entire capacity goal were installed (hypothetically) in only small residential systems averaging 3 kW in size, it would cover approximately one million roofs. In practice, the CPUC expects its CSI portion of the statewide program to be approximately one-third residential, and two-thirds non-residential projects. Since non-residential systems are fewer in number, but larger in terms of per-project capacity, the number of systems installed will not reach one million even when the capacity targets are achieved.

⁵ Southern California Gas Company (SCG) was not originally included in the CSI because the program only served electric ratepayers.

Program in 2006 in Senate Bill (SB) 1 (Murray, 2006). The gas-displacing solar thermal portion of the CSI 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 who want 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, designed to serve the electric grid or help utilities meet Renewable Portfolio Standard (RPS) obligations.⁶

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 solar thermal technologies. Only electric-displacing solar thermal (including solar water heating) are funded from the CSI general market program, but they can use up to \$108 million from the budget.
- **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.

⁶ 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/>.

- **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 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.
- **The CSI-Thermal Program** provides solar thermal incentives to eligible systems. The CSI-Thermal program is funded separately depending on whether the project is 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.

Table 1. CSI Budget by 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
<i>Sub-Total: CSI Electric Budget (Electric Displacing)</i>	<i>\$2,167</i>	<i>1,940 MW</i>
<i>Sub-Total: CSI Thermal Program (Gas-Displacing)</i>	<i>\$250</i>	<i>585 million therms</i>
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 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 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 2/3rds 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), and solar programs offered through publicly-owned utilities (POUs) that are not regulated by the CPUC. NSHP offers solar incentives to new homes in large IOU territories.⁷ AB 1470 in 2007 authorized additional related solar goals for gas-displacing solar technologies.

Collectively, the statewide solar effort is promoted on the *Go Solar, California!* website, a one-stop web portal for all information relevant to the state's solar rebate programs for consumers and contractors alike.⁸ *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.

⁷ Information on the NSHP program can be found at: <http://www.energy.ca.gov/renewables/06-NSHP-1/>.

⁸ The Go Solar California web portal can be accessed at: www.GoSolarCalifornia.ca.gov.

Table 2. Go Solar California Program Components

Program Authority	California Public Utilities Commission	California Energy Commission	Publicly Owned Utilities (POUs)	Total
Budget	\$2,167 million (Electric) \$250 million (Gas)	\$400 million	\$784 million	\$3,351 million (Electric) \$250 Million (Gas)
Solar Goals	1,940 MW (Electric) 585 million therms (Gas)	360 MW	700 MW	3,000 MW (Electric) 585 million therms (Gas)
Scope	All solar systems in large IOU areas <u>except</u> new homes	Solar systems on new homes in large IOU areas	All solar systems in POU areas	All of California

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.⁹ 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.
- D. 07-07-028 and D.08-01-030 Modified metering and performance monitoring requirements for the program.

⁹ 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.

- On July 29, 2008, the Assigned Commissioner issued a Ruling Establishing a Program Evaluation Plan for the California Solar Initiative.

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 further action at the CPUC, in Rulemaking (R.) 10-05-004¹⁰, the successor proceeding to R.08-03-008, including the consideration of any modifications necessary to adjust the CSI budget to ensure the program is on track to meet its goals, as well as an Energy Division Staff Proposal on other CSI program changes, including modifications to solar related tariffs, modifications to the general market program, the marketing and outreach program, the measurement and evaluation program, and the two low-income programs. There is an outstanding item of implementation with respect to the creation of a low-income portion of the CSI-Thermal program.

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.¹¹ On a periodic basis, the Program Administrators file program rule changes via Advice Letter, consistent with the CPUC established CSI Program Handbook process. As a result of Advice Letters, the CPUC has revised and reissued the CSI Program Handbook numerous times per year since the program's inception in response to stakeholder concerns and program experience.

¹⁰ More information regarding this rulemaking can be found at <http://www.cpuc.ca.gov/PUC/energy/Solar/>.

¹¹ Information on all CSI Program Forum meetings can be found at: <http://www.cpuc.ca.gov/PUC/energy/Solar/forum.htm>

2.5 CSI Related Legislation

The Legislature has recently passed several bills that relate to the structure and operations of the CSI Program. In fact, dozens of bills affecting or concerning distributed generation have been introduced over the last few years, but the most important issues are described briefly below.

Net Energy Metering Cap

When the CSI program launched, existing law required California’s IOUs to make net energy metering (NEM) available to customers on a first-come, first-served basis until the total program capacity exceeded 2.5 percent of the peak demand in each territory. AB 510 (Skinner, 2010) raised the NEM cap from 2.5 percent of peak demand to 5 percent.

Net Surplus Compensation

AB 920 (Huffman, 2009) required the Commission to set a rate to compensate solar NEM customers for any surplus generation, a major revision to the existing NEM statute (PU Code 2827). The Commission is in the process of establishing the rate to be used in a regulatory proceeding, A-10-03-001.

Bill Credit Transfer Program

PU Code 2830, established by AB 2466 (Laird, 2008), authorizes the creation of a bill credit transfer program. As of June 2010, all IOUs have Commission approved Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) tariffs that allow all “local governments” in California to generate energy on one account (primary account) and provide a bill credit to a “Benefiting Account” so long as both facilities are owned or operated by the same local government. Bill credits are calculated by multiplying the Generating Account’s time-of-use (TOU) energy component of the generation electricity rate by the amount of energy exported to the grid during the corresponding time period. These bill credits can then be applied to offset generation costs at the customer’s other retail service accounts at different facilities. Customer may select one or more accounts (known as “Benefiting Accounts”) to which the bill credits will be applied.

3. Solar Installed thru 2009

This section of the report summarizes data on the cumulative installed capacity¹² and number of solar projects installed in investor-owned utility territories of the state, as well as provides a table that includes all solar statewide.

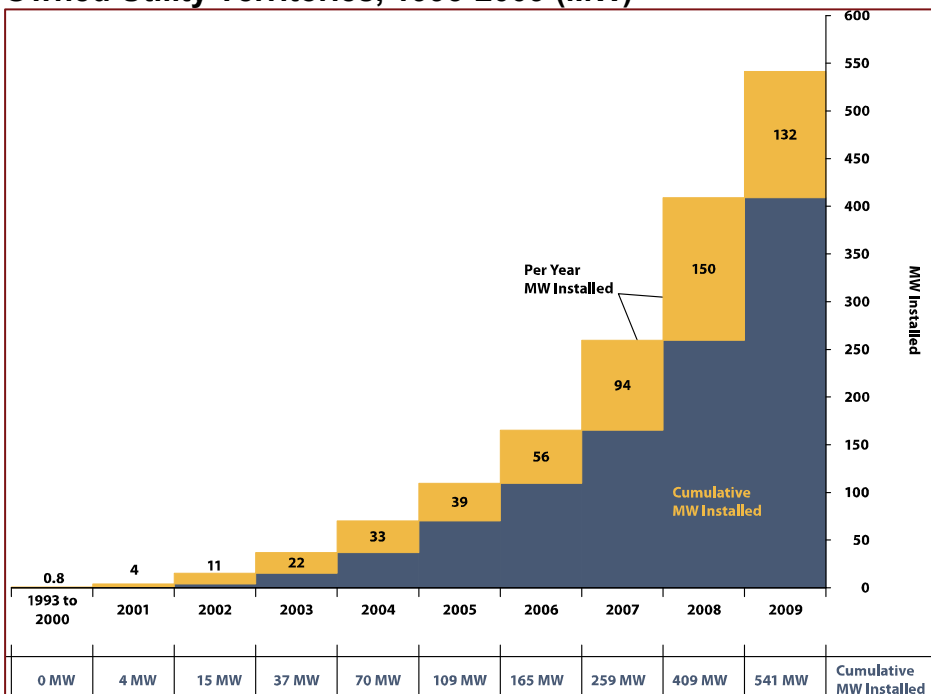
3.1 Investor-Owned Utility Territory Solar Installations

Through the end of 2009, the state installed 541 MW of solar capacity at 57,625 projects at customer sites in investor-owned utility (IOU) territories. IOU areas include customers of PG&E, SCE, and SDG&E. This data includes solar projects interconnected under any of the investor-owned utility ratepayer funded 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 statewide data.) CSI Program-only data is featured in Section 4.1 on this report.

Figure 1 shows the amount of solar capacity installed by year in IOU territories, with 132 MW installed in 2009. 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 rebate provided funding for the solar project. Figure 2 uses the same data as Figure 1, but shows the data as the number of installations. Through the end of 2009, Figure 2 shows that there were 57,625 solar projects installed in IOU territories. All of the solar capacity identified in Figure 1 and Figure 2 is installed on customer-sites, and thus, the data does not include solar power plants installed on the wholesale side of the meter for use in compliance with the Renewables Portfolio Standard (RPS).

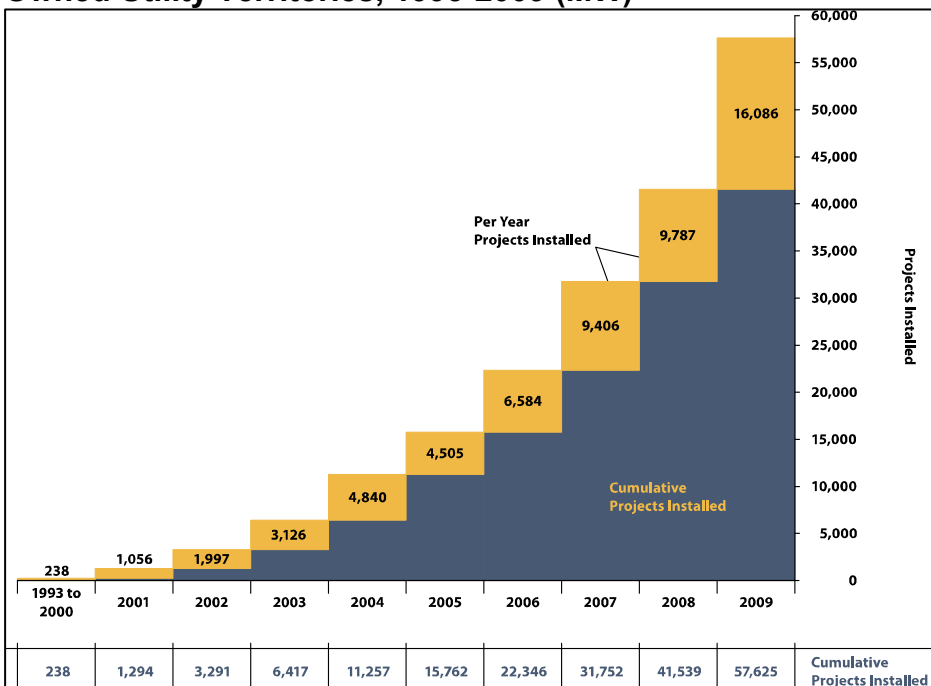
¹² All data in this assessment are for grid-tied solar PV (i.e. interconnected to the utility grid), unless otherwise noted. All solar in this report is customer-side of the meter self-generation designed to serve onsite load. All references to capacity are reported in “CEC-AC” units, which is the industry 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 1. Customer-Sited Solar Capacity Installed in California's Investor-Owned Utility Territories, 1993-2009 (MW)



Data: April 2010. Includes CSI, NSHP, ERP, and SGIP. Does not include POU or RPS.

Figure 2. Customer-Sited Solar Projects Installed in California's Investor-Owned Utility Territories, 1993-2009 (MW)



Data: April 2010. Includes CSI, NSHP, ERP, and SGIP. Does not include POU or RPS.

3.2 Net Energy Metering Data

A majority of the projects and capacity shown in Figure 1 and Figure 2 are signed up for utility service through Net Energy Metering (NEM) tariffs, pursuant to Public Utilities Code 2827. However, some solar projects – especially those with a solar system that is small relative to total load where there may be no occasion to export solar production – opt to take utility service under a non-NEM tariff. Table 3 shows the total solar interconnections (MW and number) compared to the customers on NEM tariffs (MW and number). There is about 28 MW of solar capacity in the state that is not signed up for NEM tariffs. Table 3 is focused exclusively on customer-sited solar, and it does not include any information on RPS projects or wholesale generation (power plants) designed exclusively to serve the electrical grid.

Table 3. Solar Interconnections and NEM Customers by Utility

	MWs Interconnected	Customers Interconnected	MWs on NEM Tariffs	Customers on NEM Tariffs
PG&E	327.2 MW	36,441	300.6 MW	36,241
SCE	147.9 MW	12,649	147.9 MW	12,649
SDG&E	66.0 MW	8,535	64.5 MW	8,522
Total	541.1 MW	57,625	512.9 MW	57,412

Data: April 2010. Includes CSI, NSHP, ERP, and SGIP. Does not include POU or RPS.

3.3 California Statewide Solar Installations

As of early June 2010, California has an estimated 609.6 MW of installed solar capacity at 64,627 sites. As detailed in Table 4, this statewide solar data combines the best available information on (1) IOU interconnections thru 2009, (2) IOU installed solar in 2010 based on CSI Program Data, and (3) POU solar data thru 2008. The CPUC tracks IOU interconnection data on an annual basis (at a minimum) and the CSI program data is available weekly via California Solar Statistics. 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 4 provides the best available estimate of California statewide solar installations. Table 4 is focused exclusively on customer-sited solar, and it does not include any information on RPS projects or wholesale generation (power plants) designed exclusively to serve the electrical grid.

Table 4. California Statewide Solar Installations

Area	Data Source & Dates	MWs	Projects
IOU area Solar Installations in California			
	All IOU Interconnections 1993-2009	541.1 MW	57,625
	CSI Program Data, 2010 Only 1/1/2010 – 6/9/2010	57.2 MW	7,002
POU area Solar Installations in California			
	CEC, thru 2008	11.3 MW	~
Total California Solar Installations		609.6 MW	64,627

Data: Includes CSI, NSHP, ERP, SGIP, and POU data. Does not include RPS.

Data References:

Row 1: All IOU Interconnections, as shown in Figure 1 and 2;

Row 2: CSI Program Data thru June 9, 2010 available at California Solar Statistics, CSI Applications by Month; and

Row 3: California Energy Commission data collected on POU solar installs is only available for capacity and only thru 2008, data is available at: http://www.energy.ca.gov/sb1/pou_reports/index.html.

4. CSI Program Components

This section reports the status on each of the five CSI Program components: the General Market Program, the Single-Family Affordable Homes (SASH) Program, the Multi-Family Affordable Solar Homes (MASH) Program, the CSI-Thermal Program, and the CSI Research, Development, Demonstration, and Deployment (RD&D) Program. Each program component section of the report starts with the program background, including program design and a description of the incentive offering, and then provides a snapshot of program activity and current data.

For more detailed information on how customers can in any of the CSI Program components, please see the CSI Program Handbook or the CSI Consumer Guide, both available for download at www.GoSolarCalifornia.ca.gov.

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 calculated 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 heavy 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.¹³ CSI Program participants are eligible for utility interconnection and NEM tariffs that facilitate solar by allowing solar customers to feed temporary amounts of excess

¹³ 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>.

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 monthly payment based on actual 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 calculator¹⁴ that considers major design characteristics of the system, such as panel type, installation tilt, shading, orientation, and solar insolation available by location.

The Performance Based Incentive (PBI) is paid based on actual performance 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 5 below.

Table 5. CSI Incentive Types

Expected Performance-Based Buydown (EPBB) (Paid in dollars/Watt)	Performance-Based Incentive (PBI) (Paid in cents/kWh)
Ideal for residential and small business projects	Ideal for larger commercial, government & non-profit projects
Systems less 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

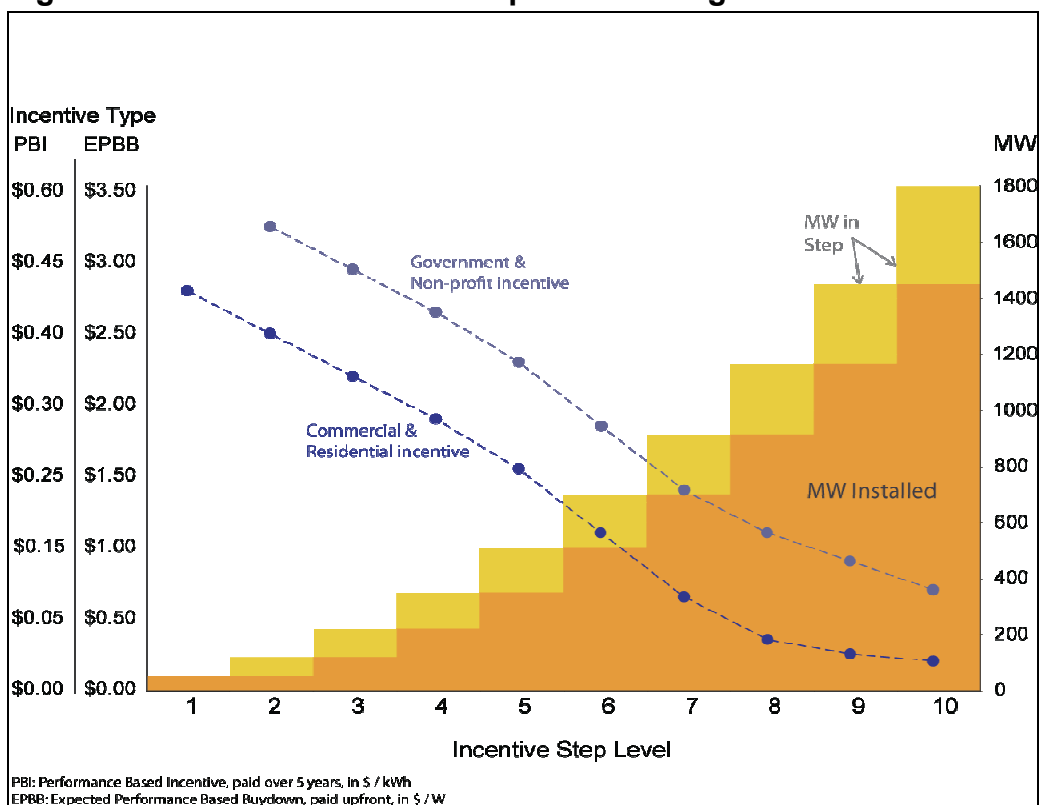
¹⁴ The EPBB calculator is publicly available at <http://www.csi-epbb.com/>. The EPBB calculator estimates the expected performance of a solar system based various factors including the tilt, azimuth, location, PV module type and mounting type of a specific system.

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 and thus will require fewer incentives to be economic. 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 3. Each step offers a certain number of MWs, shown in yellow, and the cumulative capacity of all MWs 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 the inability of these entities to take advantage of the 30 percent Federal Investment Tax Credit available to other taxable entities.

Figure 3. 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 6 presents the CSI Program "step table", showing capacity target by utility territory and customer class. The table shows how all of the incentives were originally allocated over the expected 10-step life of the program. Actual allocations by step will vary, primarily due to dropouts, which are added back in to the currently applicable step level.

Table 6. CSI Program Step Table, Allocations by Utility and Customer Class (MW)

Step	MW in Step	PG&E (MW)		SCE (MW)		SDG&E (MW)	
		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
<i>Subtotals</i>		252.4	512.3	265.6	539.5	59.5	120.8
Totals by Utility		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 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.

The incentive levels have declined across the three large IOU territories at different times since January 2007. The incentives have stepped down in response to market demand in each sector in each territory, and the recent declines are shown in Figure 4. PG&E moved to incentive Step 7 in March 2010 for all customer classes, and is approaching Step 8 in June

2010 for non-residential. CCSE moved to incentive steps 7 for Residential in March 2010 and Non-Residential in April 2010 respectively. SCE moved into Residential Step 4 in May 2009 and will likely move to Step 5 in June 2010. SCE moved to Non-Residential Step 6 incentives in April 2010 and will likely move to Step 7 in July 2010. Current incentive levels are posted daily at the Trigger Tracker website.¹⁵

Incentive levels are required by law to decline at annual average rate of 7 percent over a 10 year period.¹⁶ Table 7, focuses on EPBB systems, shows the average rate of decline for incentives to EPBB systems has been 26 percent since 2007. Table 8, focuses on PBI, and it shows that the average rate of decline for incentives to PBI systems has been 38 percent. Overall, the average is well above the required 7 percent per year.

Table 7. Average EPBB Incentive Levels, 2007-2009

Program Administrator	Average \$/W			% Decline 2007-2009	
	2007	2008	2009	Avg. Annual	Total
PG&E	\$2.29	\$1.83	\$1.31	24%	43%
SCE	\$2.43	\$2.20	\$1.95	10%	20%
CCSE	\$2.47	\$2.11	\$1.58	20%	36%
Average, All EPBB applications	\$2.43	\$2.15	\$1.81	20%	26%

Source: www.CaliforniaSolarStatistics.ca.gov, June 9, 2009

*Note: This data presents the average \$/watt for both “installed” and “pending” systems by year of reservation.

Table 8. Average PBI Incentive Levels, 2007-2009

Program Administrator	Avg. \$/kWh			% Decline 2007-2009	
	2007	2008	2009	Avg. Annual	Total
PG&E	\$0.33	\$0.24	\$0.19	7%	42%
SCE	\$0.34	\$0.25	\$0.23	5%	32%
CCSE	\$0.38	\$0.30	\$0.21	8%	45%
Total, All PBI applications	\$0.34	\$0.25	\$0.21	7%	38%

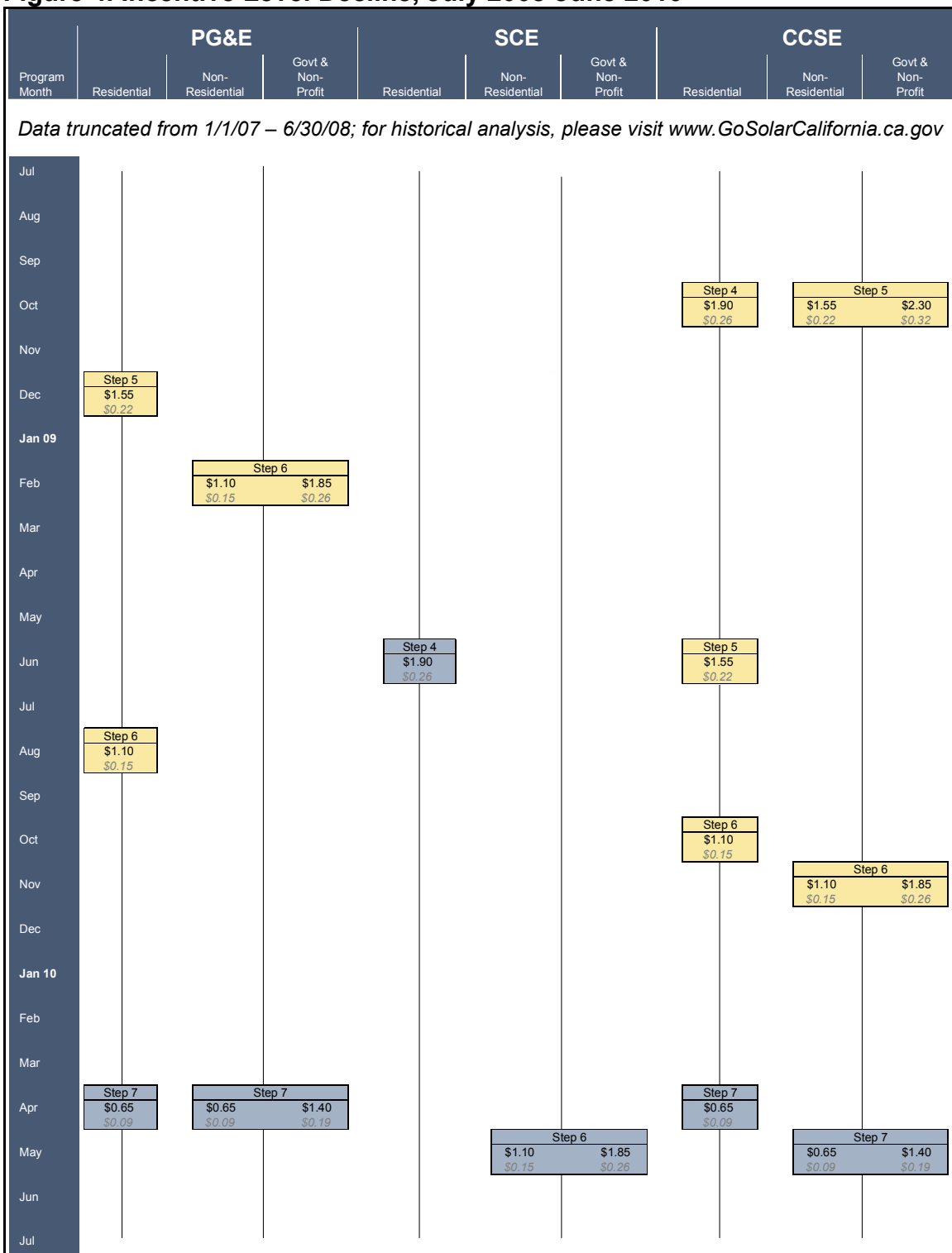
Source: www.CaliforniaSolarStatistics.ca.gov, June 9, 2010.

*Note: Data presents the average \$/kWh by year of reservation, excluding sites with multiple payment rates.

¹⁵ <http://www.csi-trigger.com/> Click on the Administrator name to see historic levels and change dates.

¹⁶ PU Code 2851(a)(1) states, “The incentive level authorized by the commission shall decline each year following implementation of the California Solar Initiative, at a rate of no less than an average of 7 percent per year, and shall be zero as of December 31, 2016.”

Figure 4. Incentive Level Decline, July 2008-June 2010



Note: Incentive Levels for each step are shown as **EPBB = \$/Watt, PBI = \$/kWh**.

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 and the 2009 CSI Impact Evaluation. In addition, the CSI Program releases a Data Annex, available online, each quarter with key program application processing metrics.¹⁷

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 program performs more detailed analysis, including cost benefit analyses, impact analyses, and other studies intended to help understand and improve the Program's performance.¹⁸

4.1.2.1 General Market Program Activity

The general market CSI Program is making progress towards meeting the program's goal of 1,750 MW to be installed by 2017. As shown in Table 9, the CSI general market is working towards the total program goal. Breakdowns of the Table 9 data by Program Administrator and customer sector are provided in Table 12, Table 13, and Table 14 in Section 4.1.2.4.

- By capacity, the program has provided rebates for the installation of 342 MW of grid-tied, distributed solar PV projects with another 387 MW of projects pending, for a total of 729 MW.
- By number of projects, the program has provided rebates for 31,799 installed projects, with another 10,065 projects pending.
- By incentive dollars, the program has provided incentives of \$738 million for installed projects, with another \$661 million in incentives pending. The total amount of incentives pending or installed is \$1,400 million.

¹⁷ The CSI Program releases a Data Annex each quarter, usually in conjunction with the Staff Progress Report. The Q1 2010 Data Annex was released in June 2010. See <http://www.cpuc.ca.gov/PUC/energy/Solar/news.htm>.

¹⁸ All CSI Program Measurement and Evaluation reports are available at: <http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm>

Table 9. Pending and Installed CSI Projects, June 9, 2010

All CSI Projects	
Installed Projects	
Applications	31,799
Capacity (MW)	342 MW
Incentive \$million	\$738 M
Pending Projects	
Applications	10,065
Capacity (MW)	387 MW
Incentive \$million	\$661 M
Total CSI Activity	
Applications	41,864
Capacity (MW)	729 MW
Incentive \$ million	\$1,400 M

Source: www.CaliforniaSolarStatistics.ca.gov, Data includes January 1,2007 - June 9, 2010.

4.1.2.2 Progress toward Goals

The CSI Program has installed 20 percent of its total program goal, and it has another 22 percent of the goal in pending projects, as shown in Table 10. The CSI Program has 58 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 10, 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 34 percent and 32 percent of their installation goals complete. The lowest installation rates are in SCE territory, where just 14 percent of the goals of the residential and non-residential sectors are complete.

Table 10. CSI Progress Toward Program Goal of 1,750 MW

Customer Class	Installed	Pending	Remaining	Goal
SCE				
Non-Residential (MW)	75 MW	148 MW	317 MW	540 MW
Non-Residential (% of Goal)	14%	27%	59%	
Residential (MW)	37 MW	14 MW	216 MW	266 MW
Residential (% of Goal)	14%	5%	81%	
PG&E				
Non-Residential (MW)	108 MW	156 MW	250 MW	514 MW
Non-Residential (% of Goal)	21 %	30 %	49%	
Residential (MW)	86 MW	29 MW	137 MW	252 MW
Residential (% of Goal)	34 %	11 %	55%	
SDG&E (CCSE)				
Non-Residential (MW)	18 MW	35 MW	67 MW	120 MW
Non-Residential (% of Goal)	15%	29 %	56%	
Residential (MW)	19 MW	6 MW	34 MW	59 MW
Residential (% of Goal)	32 %	10 %	58%	
Total (MW)	342 MW	387 MW	1,021 MW	1,750 MW
Total (% of Goal)	20%	22%	58%	

Source: www.CaliforniaSolarStatistics.com, data from January 1, 2010 - June 9, 2010.

4.1.2.3 CSI Program Activity by Month

The CSI Program continues to see variability by month in program activity levels. Figure 5 and Figure 6 show a snapshot of monthly program application demand in terms of number of applications and capacity of new applications. The monthly demand for new applications has been well over 1,000 applications per month for the past year.

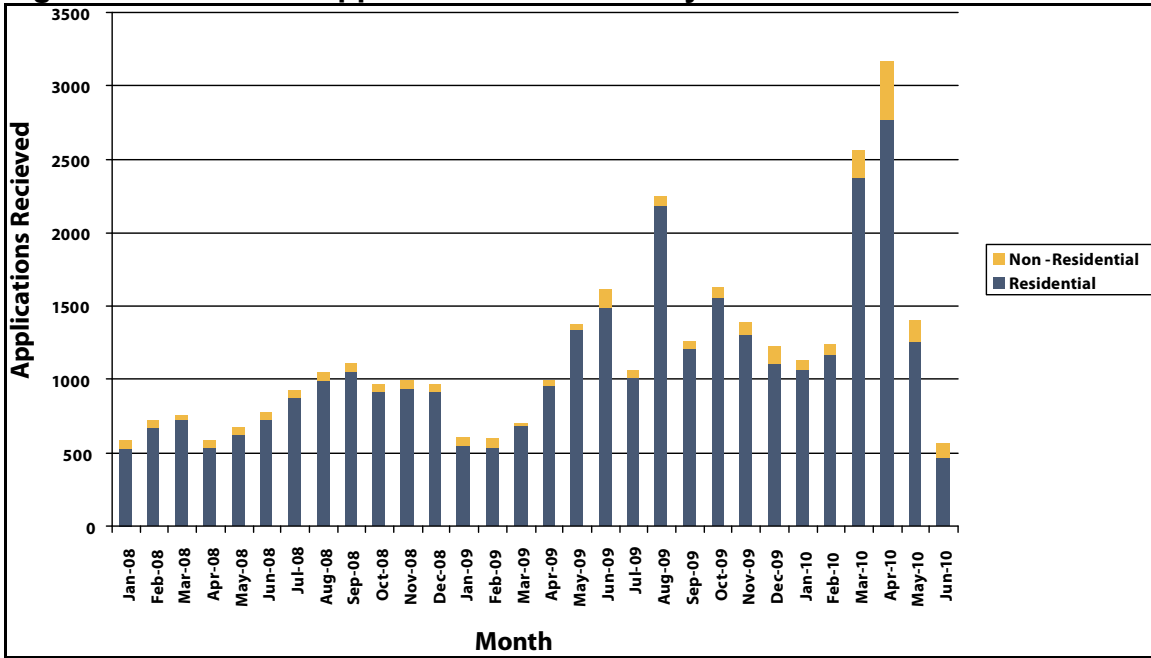
Just focusing on the activity since the beginning of 2010, the CSI Program has seen extremely high levels of demand, both in terms of capacity and number of applications. As shown in Table 11, there have been 294.7 MW of new applications received since January 2010 for 10,075 new solar projects.

Table 11. CSI Program Activity, first half of 2010

	New Applications Received	Installations
Capacity (MW)	294.7 MW	57.2 MW
Number of Projects	10,075 projects	7,002 projects

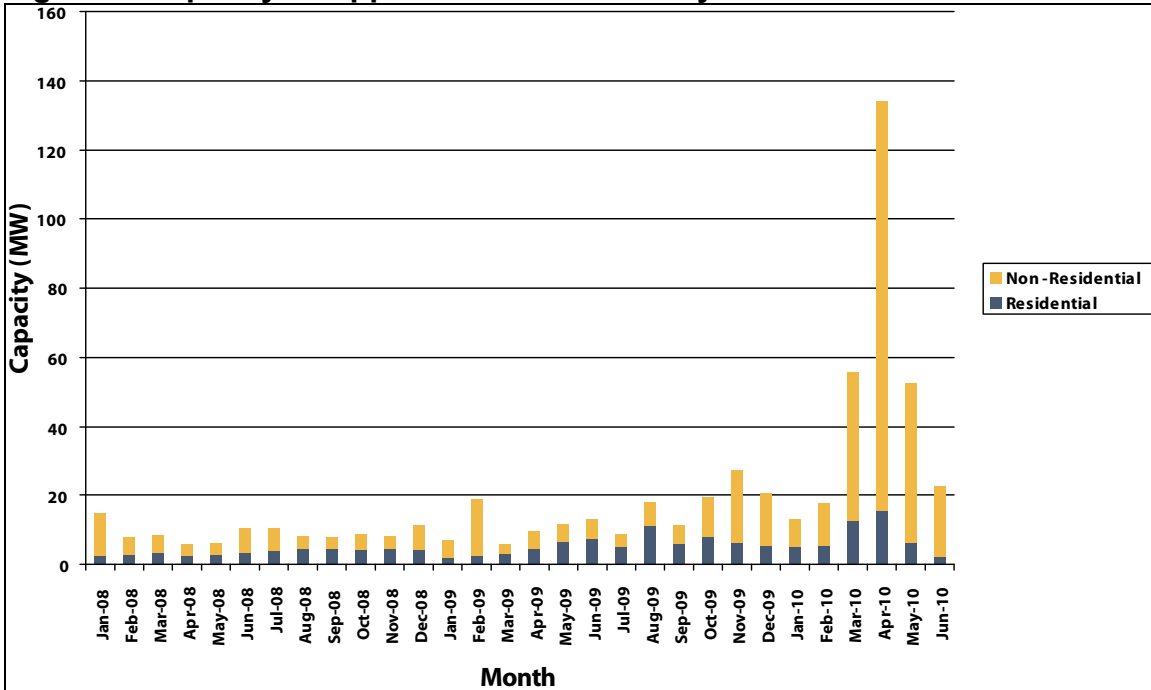
Source: www.CaliforniaSolarStatistics.com, data from January 1, 2010 - June 9, 2010.

Figure 5. Number of Applications Received by Month



Source: www.CaliforniaSolarStatistics.com, data through June 9, 2010.

Figure 6. Capacity of Applications Received by Month



Source: www.CaliforniaSolarStatistics.com, data through June 9, 2010.

4.1.2.4 CSI Program Activity by Program Administrator and Customer Sector

A snapshot of Program Activity by Program Administrator and Customer Sector by capacity (MW), Incentives (\$millions), and number of applications, respectively, are shown in Table 12, Table 13, and Table 14.

Table 12. CSI Installed and Pending Capacity by Program Administrator and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	24.9	114.8	50	189.6
Installed	19.0	86.1	36.5	141.6
Pending	5.9	28.6	13.5	48.0
Non-Residential	52.9	264.0	222.8	539.7
Installed	17.8	107.9	75	200.7
Pending	35.0	156.1	147.8	338.9
Total Megawatts	77.8	378.7	272.8	729.3
Installed	36.8	194.0	111.5	342.3
Pending	40.9	184.8	161.3	387.0

Source: www.CaliforniaSolarStatistics.com, data from January 1, 2007 - June 9, 2010.

Table 13. CSI Pending and Installed Incentives¹⁹ (\$ millions) by Program Administrator and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	38.7M	169.3M	103.2M	311.2M
Installed	32.7M	143.1M	78.0M	253.8M
Pending	5.9M	26.3M	25.3M	57.5M
Non-Residential	108.6M	479.0M	500.8M	1,088.3M
Installed	50.9M	235.7M	198.1M	484.7M
Pending	57.7M	243.3M	302.7M	603.7M
Total Incentive	147.2M	648.3M	604.0M	1,399.5M
Installed	83.6M	378.8M	276.0M	738.4M
Pending	63.6M	269.5M	328.0M	661.1M

Source: www.CaliforniaSolarStatistics.com, data from January 1, 2007 - June 9, 2010.

¹⁹ For PBI projects that are installed but still in payment, the incentives are included in the totals for “installed” projects as the sum of expected monthly payments over the five-year payment period, expressed in nominal dollars.

Table 14. Number of Pending and Installed CSI Applications by Program Administrator and Sector

Application Type	Program Administrator			Total
	CCSE	PG&E	SCE	
Residential	5,348	23,322	10,156	38,826
Installed	4,250	18,230	7,660	30,140
Pending	1,098	5,092	2,496	8,686
Non-Residential	314	1,752	972	3,038
Installed	162	1,050	447	1,659
Pending	152	702	525	1,379
Total Number of Applications	5,662	25,074	11,128	41,864
Installed	4,412	19,280	8,107	31,799
Pending	1,250	5,794	3,021	10,065

Source: www.CaliforniaSolarStatistics.com, data from January 1, 2007 - June 9, 2010.

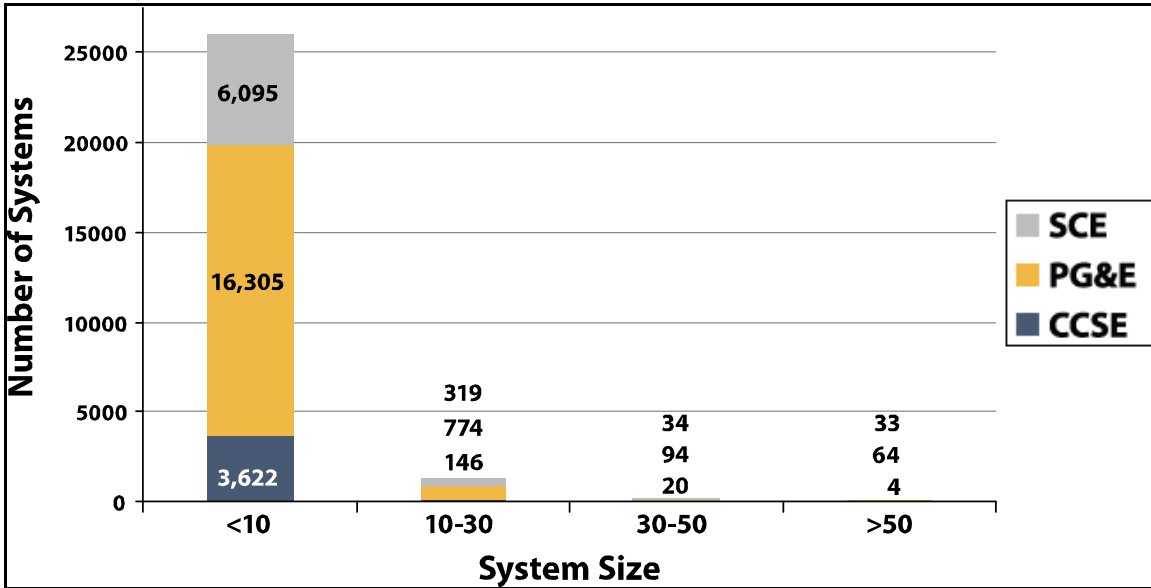
4.1.2.5 CSI Program Activity by Incentive Type and System Size

Most of the MW subscribed through the CSI Program use the PBI incentive type, while most of the installations use the EPBB incentives. Figure 7 and Figure 8 below show the size-breakdowns of EPBB and PBI systems respectively.

Figure 7 shows that the vast majority of EPBB systems are under 10 kW in size. There are a small number of EPBB systems over 10 kW. As of January 2010, all systems over 30 kW must take a PBI incentive. But even prior to that rule going into effect, the program saw relatively few projects taking the EPBB incentive for systems over 30 kW.

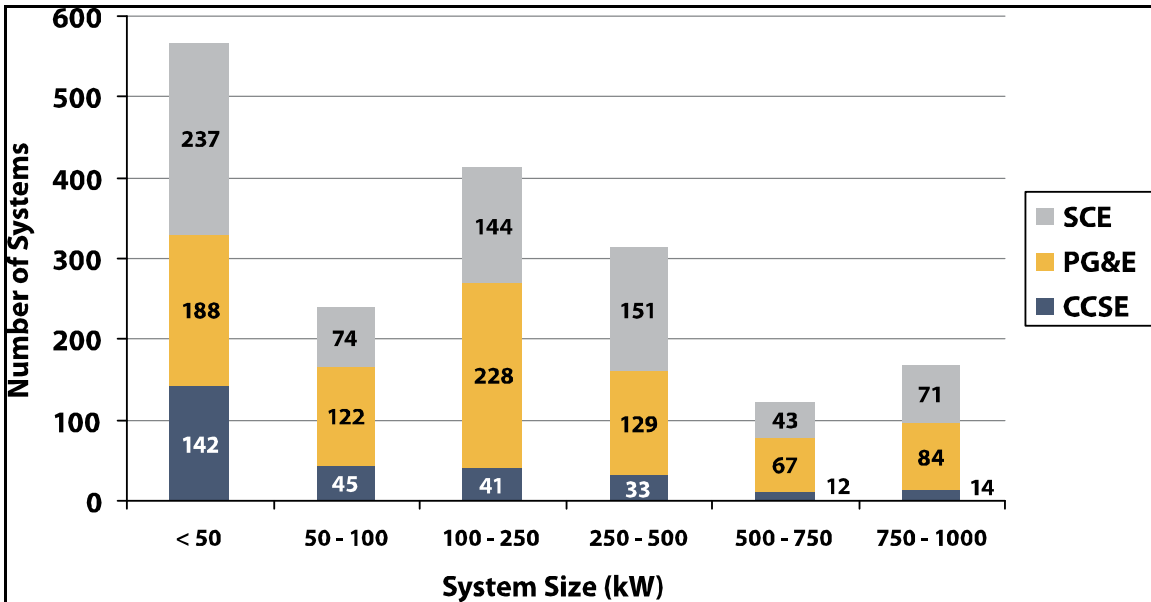
Figure 8 shows the range of system sizes for PBI systems. There is a wide distribution of average system sizes across all the PBI systems. Also, this figure shows that there are 567 projects that took the PBI incentive that are below 50 kW. Most of these projects could have opted to take the up-front EPBB incentive, but chose instead to take the PBI incentive which provides incentives based on actual performance. These projects likely opt for PBI based on the assumption that the PBI incentives will pay slightly more over time than EPBB incentives, assuming their systems perform well.

Figure 7. Number of Installed EPBB Systems by Size (kW) and Program Administrator²⁰



Source: www.CaliforniaSolarStatistics.ca.gov, January 1, 2007 - June 9, 2010.

Figure 8. Number PBI Incentives by System Size (kW) and Program Administrator



Source: www.CaliforniaSolarStatistics.ca.gov, January 1, 2007 - June 9, 2010.

²⁰ For systems in the 50 to 100 kW range, EPBB incentives were only available in 2007, which partially accounts for the small number of EPBB projects from 50 kW to 100 kW.

4.1.2.6 Average System Costs for CSI Program Participants

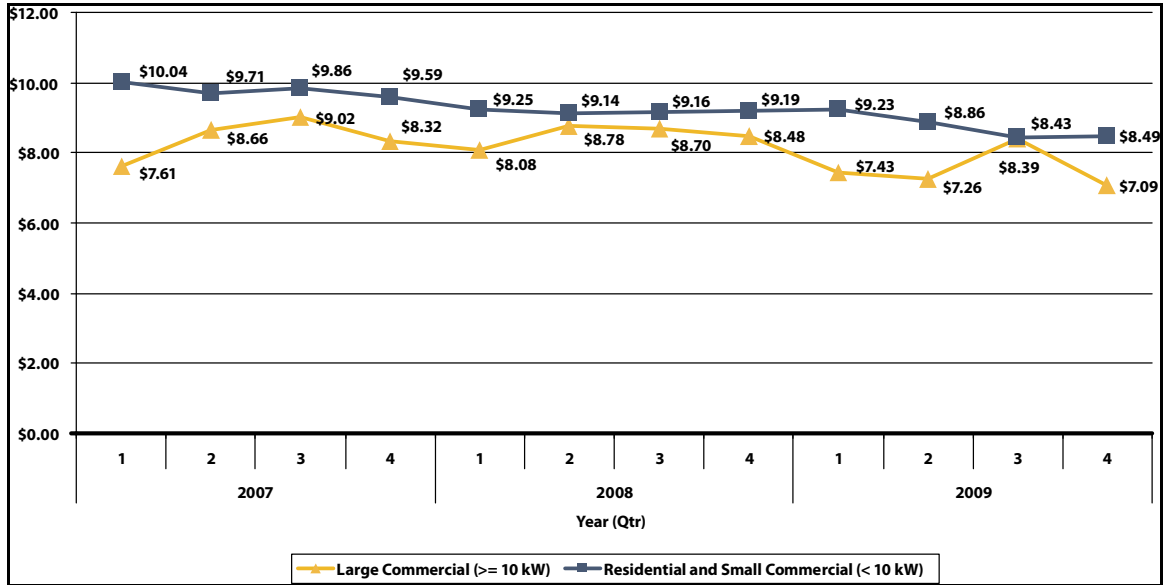
One of the explicit goals of the CSI Program is to transform the solar market by reducing the cost of solar energy systems. Figure 9 shows a clear downward trend in the price of PV systems installed through the CSI Program. The inflation adjusted cost trends show that prices have declined from \$10.04/watt to \$8.49/watt for systems under 10 kW. Prices have declined to \$7.09/watt for systems over 10 kW.

The prices shown in Figure 9 are for completed systems grouped by customer class based on the quarter in which the applications were received, not the quarter in which the project completed. Data is sorted by application origination because length of time to complete is a variable figure. Figure 9 shows data only for systems owned by the host customer. Including third-party owned systems introduces the cost of financing as a new factor and would further cloud the picture of market trends. The 2009 CSI Impact Evaluation, Chapter 2, provides detailed information on the cost trends of systems with and without third-party ownership, some of which is also described in Section 5 below.

Figure 10 compares shows the system cost breakdown in 2007-2008 to the system cost breakdown in 2009. The breakdown includes costs by panel, inverter and “other” costs, sometimes referred to as balance of system costs (BOS). The price decline observed in Figure 9 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.

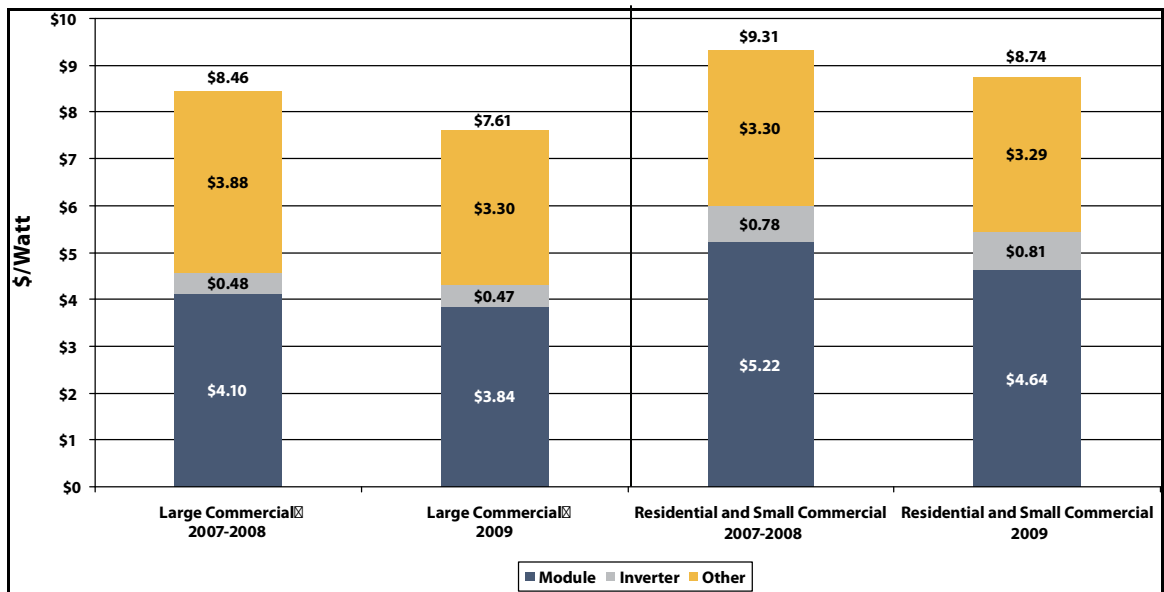
The market for PV panels and inverters is a global one, and an individual PV incentive program, even one as large as the CSI Program, is not likely to be the main driver of cost declines for these components of a PV system. However, in a distributed generation market, the cost of installation, interconnection,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

Figure 9. Average System Cost for Completed Host-Customer Owned Systems, Based on Quarter of Application (2009 \$)



Note: The data is inflation adjusted to 2009 dollars.
 Source: Itron, *CSI 2009 Impact Evaluation*, June 2010.

Figure 10: System Cost Breakdown (2007-2009) for Installed Systems by Reservation Date



Source: *CSI 2009 Impacts Evaluation*, June 2010.
 Note: The data shown includes averages of multi-year data on a non-inflation adjusted basis.

4.1.2.7 CSI Program Project Costs and Incentives

To date, the CSI Program has paid or reserved nearly \$1.4 billion in incentives for total estimated project costs totaling over \$5 billion,²¹ as shown in Table 15. 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 1:3.62, which means that, on average, every \$1 in incentive paid by the CSI Program leverages an additional \$2.62 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 15. CSI Program Estimated Incentives²² and Total Project Costs (\$ millions), by Sector and Status

	Residential		Non-Residential		Total CSI Applications	
	CSI Incentives	Total Project Costs	CSI Incentives	Total Project Costs	CSI Incentives	Total Project Costs
Pending Projects						
PG&E	\$26.3	\$237.0	\$243.3	\$768.2	\$269.5	\$1,005.2
SCE	\$25.3	\$123.0	\$302.7	\$898.4	\$328.0	\$1,021.4
CCSE	\$5.9	\$42.9	\$57.7	\$153.5	\$63.6	\$196.4
<i>Subtotal, Pending</i>	<i>\$57.5</i>	<i>\$402.9</i>	<i>\$603.7</i>	<i>\$1,820.1</i>	<i>\$661.1</i>	<i>\$2,223.0</i>
Installed Projects						
PG&E	\$143.1	\$762.3	\$235.7	\$900.3	\$378.8	\$1,662.6
SCE	\$78.0	\$327.3	\$198.1	\$536.8	\$276.0	\$864.1
CCSE	\$32.7	\$165.4	\$50.9	\$146.8	\$83.6	\$312.2
<i>Subtotal, Installed</i>	<i>\$253.8</i>	<i>\$1,255.0</i>	<i>\$484.7</i>	<i>\$1,583.9</i>	<i>\$738.4</i>	<i>\$2,838.9</i>
Total, All Projects	\$311.2	\$1,657.9	\$1,088.3	\$3,404.0	\$1,399.5	\$5,061.9
Ratio CSIS : Project \$		1 : 5:32		1 : 3.13		1 : 3.62

Source: www.CaliforniaSolarStatistics.ca.gov, January 1, 2007 - June 9, 2010.

²¹ Note that a portion of the total system costs are covered through the Federal Investment Tax Credit.

²² Data consists of projects with the application status “Completed” and “Payment Pending”

4.1.3 Program Evaluation Plan

The CSI Program Evaluation Plan, adopted in July 2008,²³ establishes a plan to conduct program evaluations to support CSI in achieving its goals and in creating a transparent program. The CSI Program Evaluation Plan includes a nine-year work-plan and is intended to ensure that the CPUC, and by extension the PAs, manage the CSI Program in a manner consistent with the intent of the Legislature, as well as the CPUC's objectives and directives. In addition to supporting future versions of this annual report to the Legislature as required by SB 1, the Evaluation Plan is designed to ensure that the CSI Program's impacts are independently evaluated, measured, and verified to provide reliable results for decision makers, resource planners, and program implementers.

The evaluation plan is designed to answer a number of questions about the program including, but not limited to, the following:

- What are the impacts of the program on peak electricity demand?
- What are the impacts of the program on grid reliability?
- How effective is the design and delivery of the program?
- What are the costs and benefits of net energy metering?
- Is the program cost-effective?
- What are the quality, reliability and durability of solar systems?
- What are the key economic drivers in the solar industry and what is the impact of CSI?
- What are the barriers to adoption of solar?
- Is the program achieving its goals of:
 - Decline in solar installation costs?
 - Increased system performance?

The CSI Evaluation Plan includes three main elements: 1) Progress Reports; 2) Program Evaluation Reports; and 3) Annual Program Assessments.

(1) Progress Reports – These reports are provided by CPUC staff on a quarterly or regular basis to inform the public of the progress of the program. They include information on the most pressing current issues and current program demand information.

²³ The CSI Program Evaluation Plan was adopted in the July 29, 2008 Assigned Commissioner's Ruling in proceeding R.08-03-008 proceeding, available at: <http://docs.cpuc.ca.gov/EFILE/RULINGS/85799.htm>. Up to \$46.7 million over 9 years was authorized for program evaluation, amounting to roughly 2.5% of the overall CSI budget.

Staff released quarterly reports starting in September 2007 continuing through 2009.²⁴ In 2010, CPUC staff issued only limited reports, but regular reporting will continue in various forms after the 2010 Annual Program Assessment. Weekly updates to Program Data are available each Wednesday at the California Solar Statistics website. Information on Program Administrator performance processing CSI applications are found in the CSI Data Annex (published quarterly) available at <http://www.cpuc.ca.gov/PUC/energy/Solar/news.htm>

(2) Independent Program Evaluation Reports - The Evaluation Reports are designed to look in depth at five elements of the CSI Program covering both solar PV and solar thermal technologies: 1) Impact Studies; 2) System Retention and Performance Studies; 3) Market Transformation; 4) Process Studies; and 5) Cost-Effectiveness Evaluations. The plan also includes support for other types of evaluations, including audits, the Net Energy Metering (NEM) Cost-Benefit Analysis, and any optional studies needed to fully evaluate the CSI Program. In November 2008, the CPUC staff initiated evaluation consultant solicitations and contracts for the Impact Study, Process Study, and Cost-Effectiveness Study. The contract for the Impact Study was approved in February 2009. Due to delays caused by the state's fiscal situation, the Cost-Effectiveness Study and Process Study contracts were approved in June 2009.

The first year of the CSI Program Evaluation Plan included three major studies and several reports, all available on the Commission's CSI website. The Impact Evaluation is in its second year, and the final 2007-2008 CSI Impact Evaluation and the final 2009 CSI Impact Evaluation are both available at:

<http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm>.

The CSI Cost Effectiveness Evaluation, which included an evaluation of the NEM program, is currently underway. The final NEM Cost Effectiveness report is available at:

http://www.cpuc.ca.gov/PUC/energy/DistGen/nem_eval.htm

The final CSI Cost Effectiveness report is expected in Fall, 2010.

Finally, a CSI Process Evaluation is underway, and preliminary findings are available at:

<http://www.cpuc.ca.gov/PUC/energy/Solar/CSI+Process+-+Evaluation+Early+Findings.htm>.

There is a CSI Program Financial Audit for the program years 2007 and 2008 underway. It is expected to be released in the second half of 2010.

²⁴ All reports are available online at: <http://www.GoSolarCalifornia.ca.gov/documents/csi.html>.

(3) Annual Program Assessments – This report is prepared by CPUC staff each June starting in 2009, and is submitted to the Legislature in compliance with PU Code 2851(c)(3). The assessment includes information from the evaluation and progress reports, as relevant as available.

The first Annual Program Assessment is available at:
<http://www.cpuc.ca.gov/PUC/energy/Solar/apa09.htm>

4.1.4 Marketing and Outreach Efforts

With annual budgets of \$500,000,²⁵ the three general market CSI Program Administrators focus on developing marketing and outreach materials to assist both consumers and solar contractors, including websites, fact sheets, a consumer guide, a fact-filled 2010 wall calendar as well as, public service announcements (PSAs), earned media, tradeshows and public expositions. Program news and California solar market highlights are distributed to 8,800 subscribers via the monthly *Go Solar, California!* electronic newsletter. Program Administrators also support Energy Commission and CPUC staff with content updates to the *Go Solar, California!* website, see Figure 11, the State's primary solar portal that was redesigned in June 2010.

Free solar classes are offered regularly for contractors and consumers in dozens of locations throughout the state by the Program Administrators. These classes have made significant impact on the solar workforce and on demand for solar. In three years, the CSI Program has provided training for more than 7,000 professional installers on topics ranging from CSI program basics to specialized technical subjects, creating a more skilled and sustainable workforce.

Program Administrators also offer classes and informational sessions on a regular basis to residential consumers. In the past three years, more than 8,500 residential consumers have attended these sessions. The Program Administrators have hosted more than 130 Web-based training sessions, attended by thousands of additional consumers.

In October of 2009, which was proclaimed Solar Energy Month by Governor Schwarzenegger, nearly 200 people download “Solar Ambassador” signs and materials designed for neighborhood solar enthusiasts who voluntarily spread the word about going solar in their local communities.

²⁵ D.07-05-047.

The Commission intends to consider additional budget and strategies for future solar market facilitation activities when it considers CSI marketing and outreach within the current rulemaking. (See Section 1.3)

Figure 11. Screenshot of New Go Solar California homepage, June 2010.



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 electric displacing portion of the CSI Program. GRID Alternatives (GRID) was selected as the statewide Program Manager for the SASH Program and has been running the program in all three large electric IOU territories since early 2009. GRID Alternatives 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 Alternatives identifies eligible low-income households, markets the SASH program, and installs PV systems for eligible SASH participants. In some cases, GRID Alternatives sub-contracts with qualified solar contractors to install SASH projects.

The SASH program is an innovative program designed to reduce energy bills and consumption of electricity from the grid in low-income households. The SASH incentives are higher than the CSI general market on a \$/watt basis, and vary depending on the income level of the participant. Participants that qualify are enrolled in the California Alternate Rates for Energy (CARE) program. The SASH incentive does not decline over time as in the general market CSI Program.

The SASH program benefits the communities it serves by leveraging local green-job training and workforce development programs through a volunteer installation model.

- GRID Alternatives partners with local job training programs to give their trainees an opportunity to get on-the-roof, hands-on experience installing PV-solar during SASH installations.
- The SASH Program also promotes partnerships between solar contractors and local workforce development programs by including a job training requirement for all sub-contracted SASH projects. These partnerships become a double benefit to low-income communities since many green-collar job trainees come from the same communities that the SASH Program aims to serve.
- GRID Alternatives has trained approximately 1,500 volunteers and job seekers to perform solar installations and energy efficiency retrofits since the start of the SASH program, bringing their pool of qualified volunteers to about 9,000 statewide.

4.2.1.1 SASH Program Budget

The SASH budget is \$108.3 million, allocated according to the Table 16 and Table 17 below.

Table 16. SASH Budget Allocations by IOU Service Territory

Utility	PG&E	SCE	SDG&E	Total
Percentage	43.7%	46%	10.3%	100%
Total Budget (millions)	\$47.34	\$49.80	\$11.20	\$108.34

Source: D.07-11-045.

Table 17. SASH Budget Allocations by Function²⁶

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

Source: D.07-11-04.

4.2.1.2 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. PU Code 2852 does allow 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.

4.2.1.3 Program Incentives

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),²⁷ tax liability, and eligibility for the CARE program. The incentive rates shown in Table 18 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

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

²⁶ The MASH and SASH program were established separately from the general market solar program, and have different budget allocations from the general market solar program.

²⁷ For more information on AMI, please visit: http://www.hcd.ca.gov/hpd/hrc/rep/state/cdbg_home09.pdf.

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 1–1.2 kW system or take a partial subsidy, as described below, for a larger system.

Partially Subsidized Systems

The partial-subsidy is available to customers whose total household income is below 80% of the area median income. The partial-subsidy 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 18 exhibits the sliding-scale incentive rates:

Table 18. 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

In the first quarter of 2010, the SASH Program experienced a growth in application demand and made significant progress in key areas including: launching the Sub-Contractor Partnership Program (SPP); increasing marketing and outreach efficiency; building partnerships with volunteers and job training/workforce programs; broadening the affordable housing client database; and successfully completing all third-party field and application inspections. Since the launch of the program, GRID has been opening offices in key areas of the state with concentrations of low income populations and currently has offices in Oakland, Carson, San Diego, and Fresno. In early 2010, GRID extended its outreach to the Inland Empire and will establish a permanent office there in mid-2010. GRID will open an office in Salinas (Central Coast) in October 2010, and will expand to the North Central Valley in 2011.

4.2.2.1 Sub-contractor program

GRID Alternatives continued developing the Sub-Contractor Partnership Program (SPP) in Q1 2010 and has created a strong foundation for the future of the program. Contractors

can apply to the SPP program through GRID's website. In Q1 2010, GRID began bidding out over 40 SASH projects to SPP contractors which are anticipated to be installed in Q2 2010. GRID anticipates steady growth in sub-contracted projects throughout 2010. During the SPP process GRID Alternatives will be responsible for all marketing, outreach, application inspection, coordination of third-party system inspection, homeowner training and follow-up. The sub-contractor will be responsible for the PV-solar system design and installation, warranties, permitting and building inspection, and utility interconnection. One particular objective of the SPP is to be able to conduct installations to eligible homeowners in the rural areas of the state that are far from the GRID Alternatives offices.

4.2.2.2 SASH Program Data

SASH began accepting applications in December 2008; just one month after Grid Alternatives received a final contract to administer the program. By the end of Q1 2010, 117 PV systems had been installed and interconnected, 40 projects had been reserved, and another 166 applications are under review by either the third-party Application Inspector or by GRID's construction staff to determine if the system design meets the 95% Design Factor requirement. Third-party Field Inspectors inspected and passed 100% of the completed SASH installations.

Twenty-five projects qualified for the fully subsidized 1 kW system, but nearly all 117 completed SASH installations, were free to the homeowners. GRID Alternatives accomplished this objective by leveraging funding from local jurisdictions, project sponsorships, and general 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. Table 19 summarizes the status of all SASH applications through Q1 2010.

Table 19. SASH Applications by Utility Area

Application Status	Number of Applications				Total kW, (CEC-AC)	Total Incentive
	PG&E	SCE	SDG&E	Totals		
STEP 1: Applications under review	101	56	9	166	Not yet known	Not yet known
STEP 2: Confirmed Reservations	30	7	3	40	126.25	\$813,857
STEP 3: Completed/Installed	62	27	28	117	265.05	\$1,745,400

Source: SASH Progress Report, May 2010

The SASH Program expects to install 300 projects in 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

On October 16, 2008, in D.08-10-036, the Commission established the \$108.3 million Multifamily Affordable Solar Housing (MASH) Program as a second low-income component of the CSI Program. The MASH Program provides incentives for solar installations on existing multifamily affordable housing that meet the definition of low income residential housing established in PU Code 2852.²⁸

PG&E, SCE, and CCSE administer incentives for the MASH Program. Low-income single family homes are covered by the SASH Program described in Section 4.2 above.

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.

²⁸ D.08-10-036, Appendix A, *mimeo.*, p. 1

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. Currently Track 1 funds in all three service territories have been fully allocated and new applications have been placed on waitlists.

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 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.

4.3.1.2 MASH Incentive Types

As shown in Table 20, 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” (i.e. any operating costs savings from solar that are shared with their tenants) from the solar system and other on-site programs.²⁹

Table 20. MASH Track 1 Incentive Rates in \$/Watt

Track 1A: PV System Offsetting Common Area Load	Track 1B: PV System Offsetting Tenant Area Load
\$3.30/Watt	\$4.00/Watt

Source: D.08-10-036.

4.3.1.3 Virtual Net Metering (VNM)

Historically, multitenant buildings with individual electric meters for each tenant faced difficulties installing distributed solar PV systems because of the problem of assigning the benefits of the generation to each occupant. A system could easily be connected to a common area load or to an individual tenant, but if it was connected directly to multiple loads, there would be no way of ensuring equitable distribution of the generation. Some tenants would benefit more than others. Installing multiple systems, one for each tenant or load in the building, is cost prohibitive. Approved via Advice Letters in June 2009³⁰, Virtual Net Metering (VNM) allows MASH participants to install a single solar system to cover the electricity load of both common and tenant areas connected at the same service

²⁹ D.08-10-036, *mimeo.*, p. 9.

³⁰ Advice Letters 3555-E (PG&E), 2322-E-A (SCE), 2064-E-A (SDG&E).

delivery point. The electricity does not flow directly to any tenant meter, but rather it feeds directly back onto the grid. The participating utility then allocates the kilowatt hours from the energy produced by the solar PV generating system to both the building owner’s and 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, rather than all of the benefits going to the building owner. VNM also gives building owners the option of installing a single solar system to cover both common area and tenant load without master-meters and site-specific upgrades that are potentially cost-prohibitive.

4.3.1.4 Program Budget

The budget and allocations for MASH, shown in Table 21 and Table 22, were adopted by the CPUC in D.08-10-036.

Table 21. 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 22. MASH Budget Allocations by Function³¹

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

Source: D.08-10-036.

The Decision also provided allocations among the different incentive tracks, as shown in Table 23.

³¹ The CSI MASH and SASH programs were established separately from the general market solar program and have different budget allocations for the general market solar program.

Table 23. MASH Budget Allocations by Incentive Type

	PG&E	SCE	CCSE	Total
Budget %	43.7%	46%	10.3%	100%
Track 1A and 1B (\$ million)	\$32.9 M	\$34.7 M	\$7.8 M	\$75.3 M
Track 2 (20%) (\$ million)	\$8.7 M	\$9.2 M	\$2.1 M	\$20.0 M
Administration (12%) (\$ million)	\$5.7 M	\$6.0 M	\$1.3 M	\$13.0 M
Total	\$47.3	\$49.8 M	\$11.2 M	\$108.3 M

4.3.2 Program Progress

4.3.2.1 MASH Program Data

As shown in Table 24, there are a total of 307 MASH Track 1 projects with reserved incentives of over \$68 million and an estimated capacity of 19.7 MW as of May 31, 2010. An additional 18 project applications are under review, representing approximately 1.6 MW of capacity. Of the 307 reserved projects, twenty-five of the projects are master-metered and 282 are individually metered. Nearly 7,000 tenant units will be served if all the projects move to completion.

Also shown in Table 24, the MASH Program now has two completed Track 1 projects paid in PG&E territory and five projects paid in SCE territory, with projects in San Diego nearing completion. At this time, more than \$1.4 million of incentives have been paid to MASH Track 1 projects.

Table 24. MASH Track 1 Program Summary Data

	CCSE	PG&E	SCE	Total
Under Review MASH Projects				
Projects (Number)	0	3	15	18
Capacity (MW)	0 MW	0.2 MW	1.4 MW	1.6 MW
Incentives (\$ Million)	\$0	\$0.8 M	\$6.3 M	\$7.1 M
Reserved MASH Projects				
Projects (Number)	29	161	117	307
Capacity (MW) ¹	2.1 MW	9.4 MW	8.3 MW	19.8 MW
Incentives (\$ Million)	\$8.1 M	\$31.9 M	\$28.4 M	\$68.4 M
Completed MASH Projects				
Projects (Number)	0	2	5	7
Capacity (MW)	0 MW	0.07 MW	0.37 MW	0.44 MW
Incentives (\$ M)	\$0 M	\$0.2 M	\$1.2 M	\$1.4 M

Data: February 17, 2009-May 31, 2010.

4.3.2.2 MASH Project Costs

As shown in Table 25, the average costs for MASH Track 1 projects are \$8.09/watt before incentives, similar to average costs in the general market program. Average system size is 54.5 kW, and the average incentive award is \$201,723.

Table 25. Average Total Costs for MASH Track 1 Projects, Feb. 17, 2009- May 31, 2010

	CCSE	PG&E	SCE	Total Program
Average system costs before incentives (\$/Watt)	N/A	\$8.38	\$7.99	\$8.09
Average system costs after incentives (\$/Watt)	N/A	\$4.76	\$4.34	\$4.44
Average System Size (kW)	N/A	32.7	61.8	54.5
Average Incentive (\$)	N/A	\$118,641	\$229,417	\$201,723

Data: February 17, 2009-May 31, 2010.

4.3.2.3 MASH Track 1 Fully Subscribed

The MASH Program began accepting applications for Track 1 incentives in March 2009. As of late June 2010, all three Program Administrators were fully subscribed for Track 1 incentives and began to add all new applicants to a waiting list. PG&E reached the end of Track 1 incentives in October 2009, SCE in January 2010, and CCSE in June 2010. Over 80 projects, with a combined capacity of 6 MW requesting more than \$20 million in incentives have been waitlisted across the state since Track 1 incentives have been fully subscribed. As Track 1 funds become available (due to a variety of possible project changes) waitlisted applications are moved into the “active” status category and reviewed by the Program Administrators.

4.3.2.4 MASH Track 2

The MASH Program began accepting Track 2 applications in May 2009 by issuing a Request for Proposals (RFP) for projects that met the Track 2 criteria. From this RFP cycle, two applications were awarded, one in CCSE and the other in PG&E territory, as shown in Table 26. The Program Administrators issued another RFP cycle in March 2010 after offering workshops to affordable housing developers to familiarize them with the program’s expectations. Program Administrators are in the process of awarding these Track 2 grants, but they are not yet finalized and included in Table 26. In response to a large volume of SCE Track 2 applications that met the program’s standards, SCE was granted authority to increase its Track 2 incentive budget to fund additional projects above their per RFP cycle Track 2 allocation and four projects will be awarded in the near future.

Table 26. MASH Track 2 Summary (first grant cycle)

	CCSE	PG&E	SCE	Total
Number of Projects Awarded	1	1	0	2
Awarded Capacity (MW)	0.06 MW	0.18 MW	0	0.24 MW
Awarded Incentives(\$)	\$412,000	\$871,799	\$0	\$1,283,799.00

Data: March 2010.

4.3.2.5 Virtual Net Metering Activity

VNM tariffs are available as a tariff option for individually metered buildings that go solar under the MASH program. As shown in Table 27, completed MASH projects have designated benefits for 576 tenant subscribers. Based on MASH reserved projects, VNM tariffs will soon be available to more than 6,301 additional tenant units as projects are interconnected. Measurement and Evaluation studies, already underway, will determine the value of the program to these tenants in terms of both dollar and energy savings.

Table 27. Tenant Units Served by Virtual Net Metering (VNM) Tariffs

	CCSE	PG&E	SCE	Total
MASH VNM Tenant Units (Reserved)	197	5,134	970	6,301
MASH VNM Tenant Units (Interconnected)	0	490	86	576

Data thru: May 31, 2010.

VNM is currently limited to MASH or qualified NHSP participants through tariffs offered by PG&E, SCE and SDG&E. However, per D.08-10-036, the CPUC may consider expanding VNM to multi-tenant properties beyond the MASH Program. Furthermore, the CPUC is also considering expanding VNM to MASH-eligible but non-participating properties, in lieu of the now-closed MASH Track 1 incentive.

Assembly Bill 920 (Huffman, 2009) necessitated a change in the MASH VNM tariffs to provide compensation for surplus electricity generation from solar systems, and all IOUs responded by filing advice letters to establish the new tariffs.³²

In its original implementation, PG&E's VNM tariff required customers to have interval meters in order to calibrate what was then expected to be numerous tariffs, many with

³² Advice Letter 3605-E (PG&E), Advice Letter 2447-E (SCE), Advice Letter 2145-E (SDG&E)

non-coincidental time-of-use periods. In Advice Letter 3638-E, approved on May 5th, 2010, PG&E provided an alternative metering option, allowing solar generators to use generation output meters, as the utility noted that “most cases involve only flat (non-TOU) rates (e.g., E1, A1, or E8) or only one TOU rate structure along with a flat rate. These situations are well within the capability of a TOU meter.”³³ The advice letter’s metering alternative was approved retroactively to June 8, 2009.

4.4 CSI-Thermal Program

The newest component of the California Solar Initiative, the CSI-Thermal Program aims to promote the market for solar water heating (SWH) and other non-photovoltaic solar 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. The CPUC is currently working to extend incentives to multi-family/commercial customers and low-income residents.

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, funds for CSI were limited to \$2,167 million and funded exclusively from electric ratepayers. 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 non-photovoltaic solar technologies that displace electricity, such as SWH and other solar thermal technologies. With CSI funding now limited to collections from electric ratepayers, the Commission concluded in D.06-12-033 that although CSI would include as part of its total budget \$100.8 million for incentives to non-PV solar technologies, CSI should not pay incentives to solar thermal technologies that displace natural gas – the most common type of fuel used in water heating. The Solar Water Heating Pilot Program (SWHPP) in the SDG&E territory was allowed to proceed with incentives for both electric- and natural gas-displacing SWH.

³³ AL 3638-E, p.3.

In February 2007, the Commission approved the SWHPP budget of \$2.6 million and the pilot began operation in the SDG&E territory on July 2, 2007, with a scheduled end date of December 31, 2008. In D.08-06-029, the Commission made minor modifications to the SWHPP and allowed it to run until December 31, 2009 or until the budget is exhausted, whichever occurs first.

In late 2007, the Governor signed AB 1470, 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, Itron released the results of its cost-effectiveness analysis using data from the SWHPP. The 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. Because SWH that displace natural gas and electricity employ the same basic technology, the Staff Proposal recommended creating a single administrative structure to provide incentives for SWHs that displace natural gas and electricity, even though the funding for each would come from different sources.

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. The CSI-Thermal program is jointly administered between 4 Program Administrators that represent both electric and gas ratepayers. A portion of the CSI-Thermal program is funded by gas ratepayers and directed at gas displacing SWH systems, and another portion of the program is funded by electric ratepayers and directed at electric displacing SWH systems.

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 as solar water heating. 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.

Table 28. Gas Displacing Budget Allocation

Utility	Budget Allocation	Total Program Collections (in millions)
PG&E	39%	\$97.5
SDG&E	10%	\$25
SoCalGas	51%	\$127.5
Total	100%	\$250 million

The gas-displacing program budget is divided as shown in Table 29.

Table 29. CSI Thermal Gas Displacing Program Budget

CSI Thermal Program Elements	CSI Thermal Program Sub-Elements	Budget
Incentives 82%	General Market Incentive Component	\$180,000,000
	Low-Income Incentive Component (10% of total funds) ⁷	\$25,000,000
	Subtotal	\$205,000,000
Market Facilitation 10%	Marketing & Outreach, including training, consumer education, and other market facilitation activities such as engaging with permitting offices or financing providers.	\$25,000,000
	Subtotal	\$25,000,000
Program Administration 8%	Application/incentive processing, General Administration, and System Inspection	\$15,000,000
	Measurement and Evaluation	\$5,000,000
	Subtotal	\$20,000,000
Total		\$250,000,000

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 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 30.

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

Table 30. CSI Thermal Electric Displacing Program Budget

CSI Thermal Program Elements	CSI Thermal Program Sub-Elements	Budget
Incentive Program Component	General Market Incentive Component	No more than \$100,800,000
	Low-Income Incentive Component	\$0
	<i>Subtotal</i>	<i>\$100,800,000</i>
Market Facilitation Program Component	Marketing & Outreach, including training, consumer education, and other market facilitation activities such as engaging with permitting offices or financing providers.	\$6,250,000
	<i>Subtotal</i>	<i>\$6,250,000</i>
Program Administration	Application/incentive processing, General Administration, and System Inspection	Subject to the overall CSI budget, but tracked separately
	Measurement and Evaluation	\$1,250,000
	<i>Subtotal</i>	<i>\$1,250,000</i>
Total		\$108,300,000 + CSI Admin Budget Costs

The Program Administrators may 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 submit 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 paid 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% 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 31.

Table 31. 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

Electric-displacing systems are incentivized at a lower level than natural gas displacing systems to account for the higher cost of water heating 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 32.

Table 32. 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

4.4.1.4 Market Facilitation

The interim evaluation of the SWHPP found that in addition to the upfront cost of installing SWH, a number of other market barriers prevent widespread adoption of the technology, including lack of public awareness of SWH, lack of knowledge among local building officials, and shortage of trained SWH installers. To address these market barriers, D.10-01-022 set aside \$31.25 million for market facilitation activities. The Program Administrators are directed to file market facilitation plans each year aimed at reducing the non-financial barriers to SWH adoption.

4.4.2 Program Progress

Since the approval of D. 10-01-022, Energy Division has worked Program Administrators to develop the program handbook, application, database and incentive calculation tools necessary to begin accepting incentive applications. Energy Division held public workshops in March and April to solicit public feedback on these topics and it approved the single-family handbook, application and incentive calculator in April 2010. As a result, the CSI-Thermal Program began accepting applications from single-family homeowners on May 1, 2010, meeting the deadline set by the decision.

Since the start of the single-family portion of the SWH program, Energy Division continues to work on other program features. The draft multi-family commercial section of the handbook was completed on May 24, 2010, and Energy Division is currently accepting public feedback on that document. Incentives for multi-family and commercial customers are expected to be available in summer 2010. Moreover, Energy Division plans to hold a workshop later in 2010 to take public comment on the low-income portion of the CSI-Thermal Program and other outstanding program issues.

Because D. 10-01-022 allowed projects to apply for incentives retroactively to the date of the Staff Proposal (July 15, 2009), the Program Administrators began receiving

applications shortly after the May 1 program launch. The first incentive was paid to a SWH customer less than three weeks later. Some contractors with completed projects may be slow to participate in the program, however, since participation requires completion of a 1-day CSI-Thermal training, and the first of those classes was not offered until just before the program launch. To date, 108 contractors and self-installers have taken the CSI-Thermal training.

Even though the program is less than two months old, it has already received nearly 20 complete applications, as shown in Table 33. The table shows that 4 of the 20 projects have already been paid. The table shows active applications to the CSI Program by each of the four Program Administrators, but it does not show all of the applications received, since it omits any applications that have not been deemed complete.

The CSI-Thermal program has generated \$150,000 of economic activity using just \$21,000 of ratepayer funded incentives. Although too few applications have been received to draw any significant conclusions on costs or trends in the market, the data shows that the program is under way in all four large IOU service territories in California, and participation is likely to increase as more contractors become eligible.

Table 33: Applications for CSI-Thermal Incentives by Program Administrator

Utility	Number of Applications				Incentives		System Costs	
	Total	Paid	Approved	Under Review	Average	Total	Average	Total
CCSE	8	3	1	4	\$1,037	\$8,299	\$6,513	\$52,106
PG&E	5	1	1	3	\$1,175	\$5,874	\$11,413	\$57,068
SCE	2			2	\$905	\$1,809	\$6,825	\$13,650
SoCalGas	4			4	\$1,250	\$5,000	\$6,306	\$25,223
Total	19	4	2	13	\$1,092	\$20,982	\$7,764	\$148,047

Data: June 2010.

4.4.3 Solar Water Heating Pilot Program

The SWHPP completed on December 31, 2009 when it stopped taking applications. In 30 months, the SWHPP completed 342 total projects for SWH in single-family residences and commercial buildings, as shown in Table 34. The 342 projects received incentives of \$539,156, with incentive payments of \$412,178 going to single-family residential projects and \$136,978 going to commercial projects.

The SWHPP did not meet its goal of 750 SWH systems installed. This goal, however, did not recognize that some systems would be commercial systems, which are generally larger and displace more energy than single-family residential systems. The goal of the new statewide program is defined as energy displaced, rather than just systems installed.

The SWHPP program provided useful information on SWH market barriers, as well as significant technical experience in administering SWH incentives that have provided a sound basis for designing the Statewide CSI-Thermal Program.

Table 34. Total Applications and Completed Projects from the SWHPP

Customer Class	Applications Received	Cancelled Projects	Completed Projects	Total Incentives	Average Incentive per SWH System
Single-family	370	51	319	\$402,178	\$1,261
Commercial	36	13	23	\$136,978	\$5,956
Total	406	64	342	\$539,156	~

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

4.5.1 Program Background

The primary purpose of the CSI Research, Development, Demonstration and Deployment (RD&D) Program is intended 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 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, which will yield the greatest public benefit. As required in D.07-09-042, \$10 million of the CSI RD&D Program will be allocated towards construction of the Helios Solar Energy Research Center at U.C. Berkeley, gaining leverage from 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 \$50 million RD&D 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 will be allocated across the following RD&D stages:

- Research: Fundamental research to improve performance of energy technologies
- Development: Activities which convert research into working prototypes of improved technologies
- Demonstration: Activities which 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 35 shows that the RD&D portfolio will be heavily focused heavily on demonstration projects, with less emphasis on direct research and even less on development and deployment.
- Table 36 shows that 50-65 percent of funds allocated in any RD&D stage should involve grid integration, storage or metering advancements. Likewise, a smaller percentage of recipient projects should involve energy generation technologies or business development.

- Finally, Table 37 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 35. RD&D Budget by Stages

RD&D Stage	Budget % (Range)	Budget (Max \$ in millions)
Demonstration	50-60%	\$25.5
Research	20%	\$8.5
Development	10-15%	\$6.4
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 36. RD&D Budget by Target Activities

Target activities	Budget % (Range)	Budget (Max. \$ in millions)
Grid integration, storage & metering	50-65%	\$27.638
Energy Generation technologies	10-25%	\$10.63
Business development	10-20%	\$8.504
Total*	100%	\$42.52

Source: D.07-09-042.

Note: *Total not to exceed \$42.52 million- not all target activities will be fully subscribed.

Table 37. RD&D Budget by Results Timeframe

Results timeframe	Budget %	Budget (Max \$ in millions)
1-3 years	60%	\$25.512
4-7 years	20%	\$8.504
8+ years	20%	\$8.504
Total	100%	\$42.52

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 administrative costs for the CSI RD&D Program are incorporated into the total CSI RD&D Program budget. To prevent ratepayers from excessive exposure to unreasonable costs, the CPUC capped the total administrative costs at 15 percent of the total CSI RD&D Program budget. These

administrative costs include the Program Manager’s costs, the Program Evaluator’s costs, the costs of performing all evaluations on the program or grant recipients, as well as costs incurred by the large IOUs for accounting, reporting, and implementing the program.

Overall program administration costs over the eight-year life of the program are approximately \$5.98 million with another \$1.5 million reserved for triennial program evaluation activities. Itron is responsible for management of the \$50 million allocated for the budget and will continue to record expenditures across activity categories for transparency and accountability. The budget breakdown in Table 38 below is based on the guidelines established in D.07-09-042.

Table 38. 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.

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 CSI RD&D Program initiated its first round grant solicitation in July 2009. In March of 2010, the 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 39 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.
- In November of 2009, a second round of CSI RD&D grant solicitation was released. This round focused on improved PV production technologies and

innovative business models. The 96 proposals submitted in response to the second solicitation are currently under review, and the awardees are expected to be announced in mid-2010. The CPUC was very pleased with the breadth, depth, and quality of projects applications it received.

- In February of 2010, The Helios Solar Energy Research Center project site was selected. This joint effort of Lawrence Berkeley National Laboratory (LBNL) and U.C. Berkeley will focus on developing low cost solar energy conversion technology using PV and successor materials. Design is underway and the Construction Notice to Proceed is expected in July of 2011.

Table 39. CSI RD&D Program Grant Awardees from First Solicitation, March 2010

Applicant	Proposal title	Funding Request	Match funding
Sacramento Municipal Utility District	High Penetration PV Initiative	\$2,968,432.00	\$1,293,259.00
Clean Power Research	Advanced Modeling and Verification for High Penetration PV	\$976,392.00	\$2,293,000.00
National Renewable Energy Laboratory	Beopt-CA (EX): A Tool for Optimal Integration of EE/DR/ES+PV for California Homes	\$985,000.00	\$329,000.00
kW Engineering	Specify, Test and Document an Integrated Energy Project Model	\$942,500.00	\$250,000.00
National Renewable Energy Laboratory	Analysis of High-Penetration Levels of PV into the Distribution Grid in CA	\$1,600,000.00	\$1,400,000.00
APEP/UC Irvine	Development and Analysis of a Progressively Smarter Distribution System	\$300,000.00	\$100,000.00
SunPower Corporation	Planning and Modeling for High-Penetration PV	\$1,000,000.00	\$320,000.00
University of California San Diego (UCSD)	Improving Economics of Solar Power Through Resource Analysis, Forecasting and Dynamic System Modeling	\$548,148.00	\$137,037.00
Total		\$9,320,472.00	\$6,122,296.00

Source: Resolution E-4317.

5. Results from 2009 CSI Impact Evaluation of CSI General Market Program

This section covers the highlights of the 2009 CSI Impact Evaluation (June 2010) prepared by Itron, Inc. under the direction of the CPUC. The report is the source of all tables and figures in this section. The full report is available for download at <http://www.cpuc.ca.gov/PUC/energy/Solar/evaluation.htm>.

5.1 Introduction to 2009 CSI Impact Evaluation

The primary purpose of the 2009 CSI Impact Evaluation was to assess the impact of the general market portion of the CSI program during the 2009 timeframe. This scope includes not only CSI solar systems installed during calendar year 2009, but also systems installed in 2007 and 2008 that were operational in 2009.

Similar to the 2007- 2008 CSI Impact Evaluation Report, the 2009 CSI Impact Evaluation Report examines the impacts of the CSI program on electricity energy production and peak demand reduction, performance relative to installed capacity, expected versus actual solar production, emissions reductions (GHG, NO_x, PM-10), and transmission and distribution system impacts.

In addition, a primary research objective for this report was to assess the extent to which the CSI participants have undertaken energy efficiency measures and the level of integration between energy efficiency and solar. The research team also conducted billing and load profile analyses to further evaluate the impact of the CSI program. Key objectives addressed in the evaluation include:

- Impacts on electricity energy production and demand reduction
- Performance relative to installed capacity
- Expected vs. actual solar production
- GHG, NO_x and PM-10 emissions reductions associated with the solar installations
- Transmission and distribution system impacts
- Energy use and daily energy profiles of CSI participants.
- Monitoring and maintenance impacts on PV performance
- Energy efficiency adoption and impacts of CSI participants
- Awareness and satisfaction of the CSI program and future opportunities

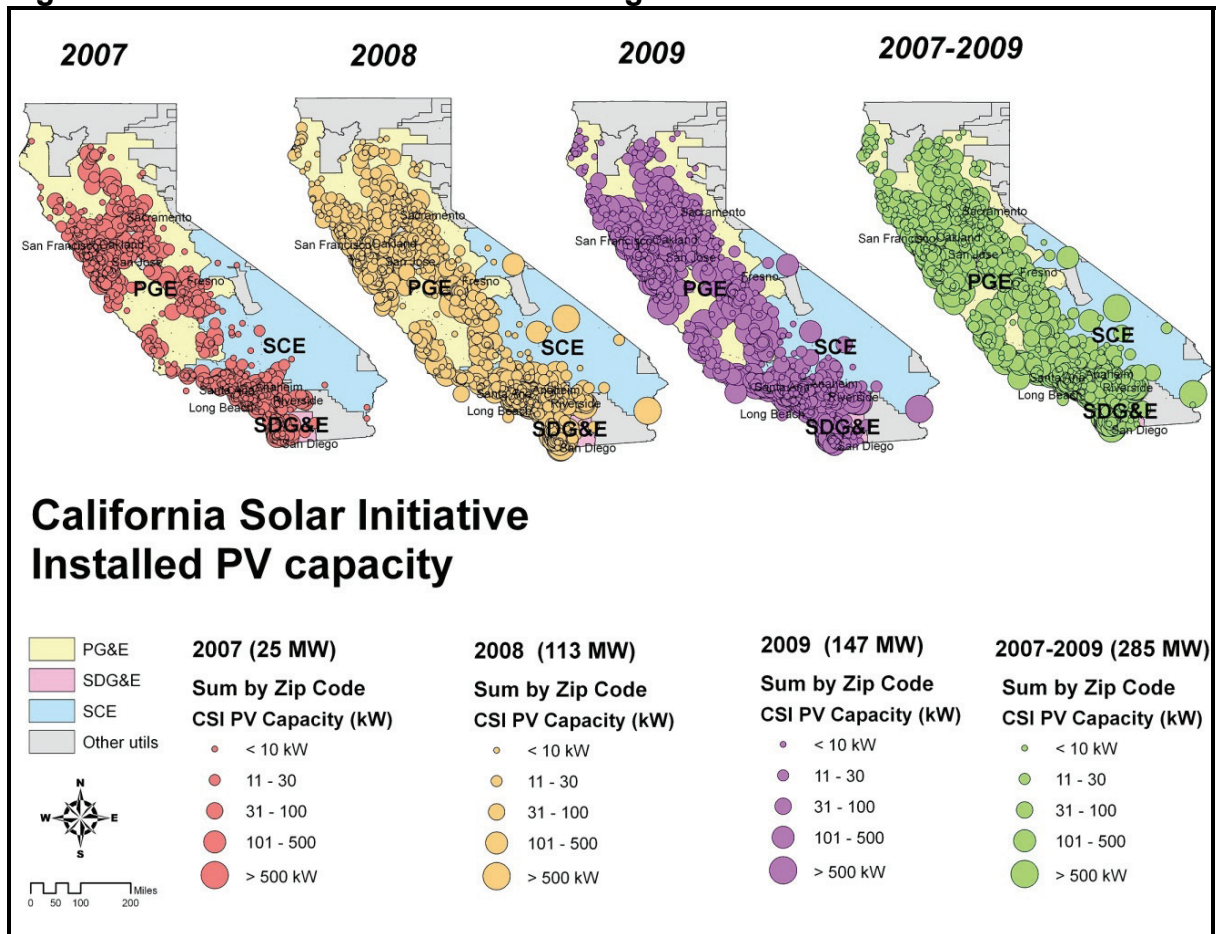
5.2 Highlights from the 2009 CSI Impact Evaluation

A few key findings of the CSI 2009 Impact Evaluation are cited in this section, but the full report includes full chapters on each of the above mentioned items. The 2009 CSI Impact Evaluation only includes data through the end of 2009; however, CSI Program data presented in Section 4.1 shows CSI Program data through June 9, 2010.

5.2.1 Geographic Diversity of the Impact of CSI Program

Geographically, this growth in PV installed capacity is distributed relatively equally throughout California, as Figure 12 illustrates. In 2007, systems were installed in population centers but with 2008 and 2009 there was an expansion of systems being installed in the north coast, northern and central valleys, and east of Los Angeles County. In short, the CSI is California-wide.

Figure 12. Evolution of CSI Incentive Program in California



PV systems, particularly smaller residential systems, are located in urban areas such as the San Francisco Bay Area, the Los Angeles metro Area, and San Diego County (see Figure 13). Additional geographic breakdowns of CSI data by city and county are available at California Solar Statistics.

Figure 13. CSI Systems Installed per County—Top 20

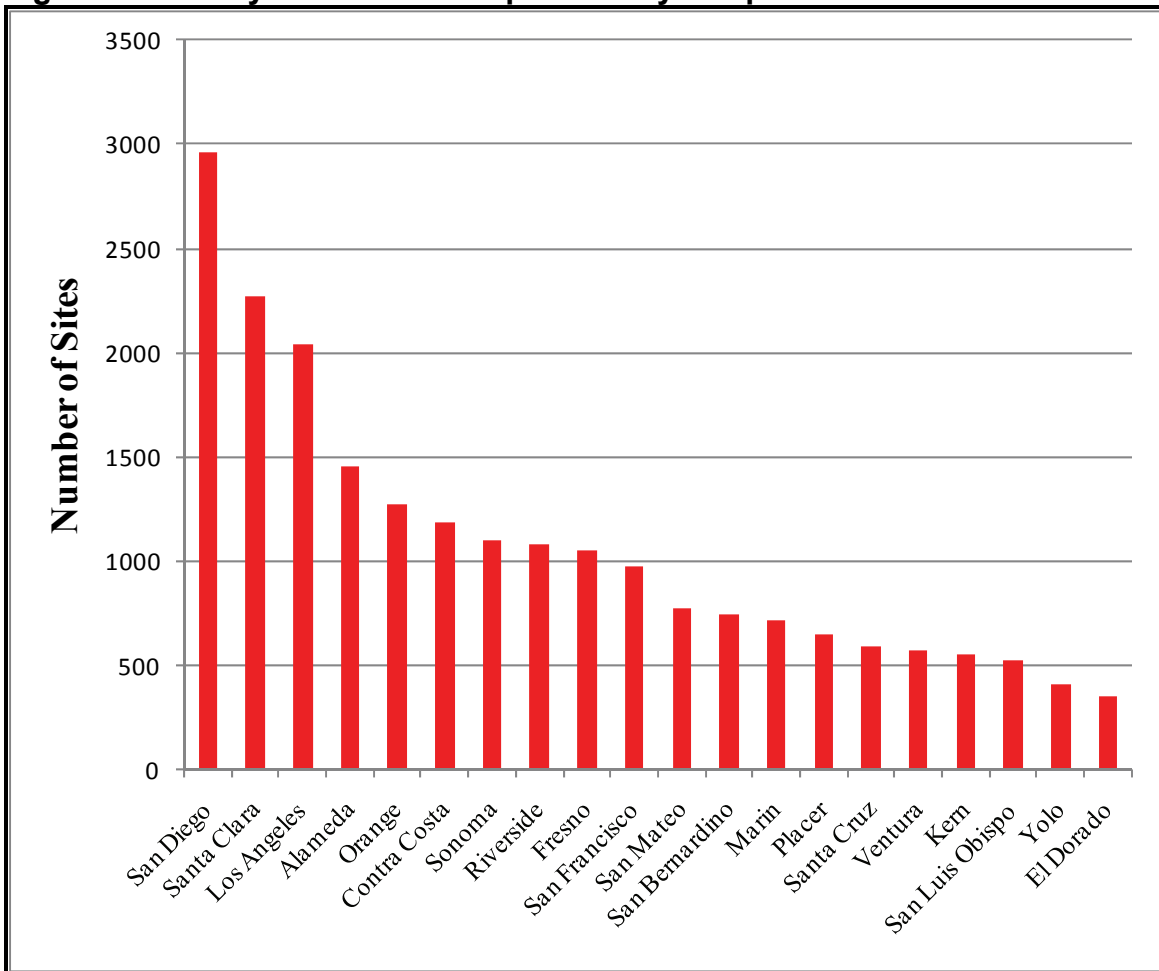
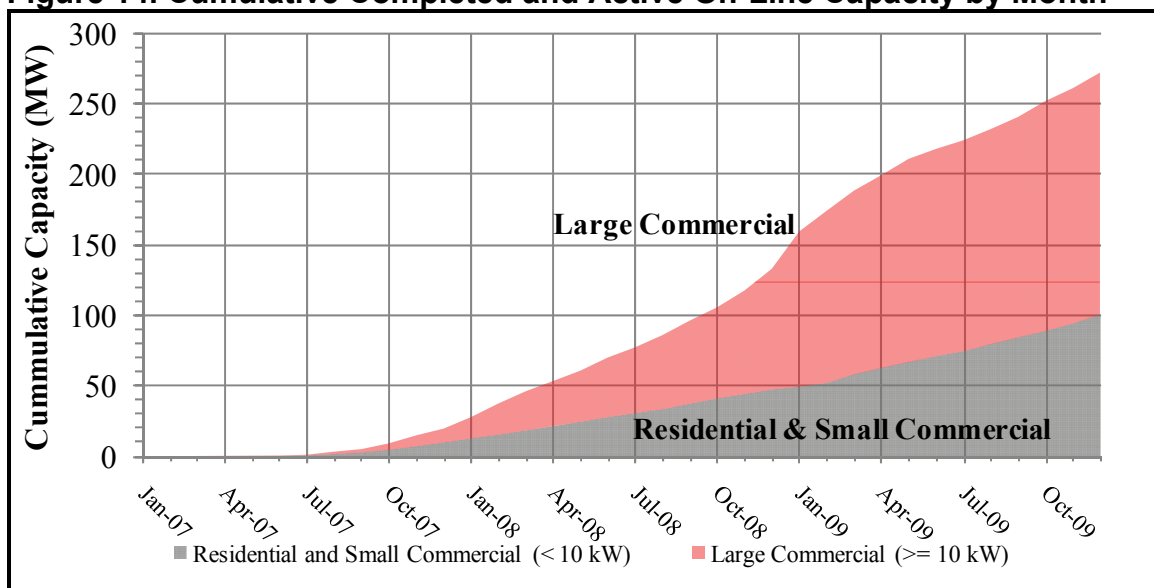


Figure 14 illustrates the cumulative installed capacity since the beginning of the CSI Program. Approximately 40 percent of the total installed capacity is in the residential and small commercial market sectors for systems that are 10 kW and below.

Figure 14. Cumulative Completed and Active On-Line Capacity by Month



In 2008, there was an increase in the percentage of MW installed for large commercial. This trend reversed itself as more residential systems were installed in 2009 and fewer and fewer commercial systems and MW were installed. Some of this change could be due to the change in the federal tax law removing the investment tax credit cap for residential systems that went into effect January 1, 2009.

5.2.2 Increases in Third Party Ownership

Overall, 12 percent of systems accounting for 40 percent of installed MW are owned by third parties, as shown in Table 40, indicating that larger systems are more likely to be owned by third parties when compared with smaller systems. The portion of systems owned by third-parties was approximately nine percent in both 2007 and 2008, but increased substantially in 2009 to 14 percent. The portion of total capacity represented by third-party owned systems was the same in 2007 and 2009 at 43 percent, but dropped to 34 percent in 2008. Overall, third party ownership appears to have contracted in 2008 and then grew in terms of systems in 2009.

Table 40. Third Party Ownership by Year

Year	Total	Third Party Owned (n)	Third-Party Owned (%)	Third Party Owned (MW)	MW (%)	Third Party Owned Average System Size (kW)
2007	3,440	319	9%	16.5 MW	43%	51.8 kW
2008	8,443	762	9%	31.9 MW	34%	41.9 kW
2009	13,100	1,793	14%	65.0 MW	43%	36.2 kW
Total	24,983	2,874	12%	113.4 MW	40%	39.5 kW

The growth in systems in 2009 appears to come from the residential sector, as shown in Table 41. For residential facilities, the portion of third-party owned systems (both number and capacity) was approximately the same in 2007 and 2008. However, third party ownership in the residential sector increased by 155% in 2009, while the entire residential sector grew at 56%. There is clearly an increased trend in third party ownership for the residential market.

Table 41. Third Party Ownership – Residential

Year	Total	Third Party Owned (n)	Third Party Owned (%)	Third Party Owned (MW)	MW%	Third Party Owned Average System Size (kW)
2007	3,260	255	8%	1.1 MW	7%	4.2 kW
2008	7,944	627	8%	2.9 MW	8%	4.6 kW
2009	12,386	1,605	13%	8.0 MW	14%	5.0 kW
Total	23,590	2,487	11%	11.9 MW	11%	4.8 kW

5.2.3 Energy Delivery Impacts

In 2009, CSI projects generated more than 390,000 MWh of electricity: more than three times the amount generated in 2008³⁴. CSI projects are located at utility customer sites where they help meet local electricity requirements. Consequently, the electricity provided by CSI facilities during 2009 represents electricity that did not have to be generated by central station power plants or delivered by the transmission and distribution system.

³⁴ 118,489 MWh were estimated to be generated by CSI systems in 2008.

Table 42 provides annual energy impacts for CSI projects by each PA for 2009, the corresponding number of solar systems installed by the end of 2009, and the estimated annual capacity factor.

Table 42. Estimated CSI Annual Energy Impacts by PA (MWh)

Program	PV Systems	PV Systems	Impact	Annual Capacity Factor
Administrator	(n)	(MW)	(MWh)	(kWh/kWp)
PG&E	15,613	164.1	223,845	0.20
SCE	6,231	93.0	128,149	0.20
CCSE	3,139	27.4	38,837	0.21
Total	24,983	284.5	390,830	0.20

* The uncertainty on all of these estimates is better than 90/10 confidence.

** CCSE is the program administrator of the CSI program in SDG&E's service area.

PV systems installed in the PG&E area are estimated to have supplied slightly over 58 percent of the total electricity delivered by the CSI in 2009, whereas SCE and CCSE systems are estimated to have supplied approximately 32 percent and 10 percent, respectively.

5.2.4 Impacts on Peak Demand Reduction

The CA ISO system peak in 2009 was 45,994 MW on September 3rd from 2:00 to 3:00 PM Pacific Daylight Savings Time (PDT). The peak was slightly below 46,000 MW whereas the system peak for both 2007 and 2008 was slightly above 46,000 MW. Figure 15 shows the estimated hourly impact of CSI projects on the 2009 CAISO system peak. Table 43 shows the data broken out by utility. Based on the available metered data, CSI system generating capacity increased steadily from 8:00 PM to noon; remained fairly level from noon to 2 PM and then declined steadily through the rest of the afternoon. This overall generation profile is typical of solar systems.

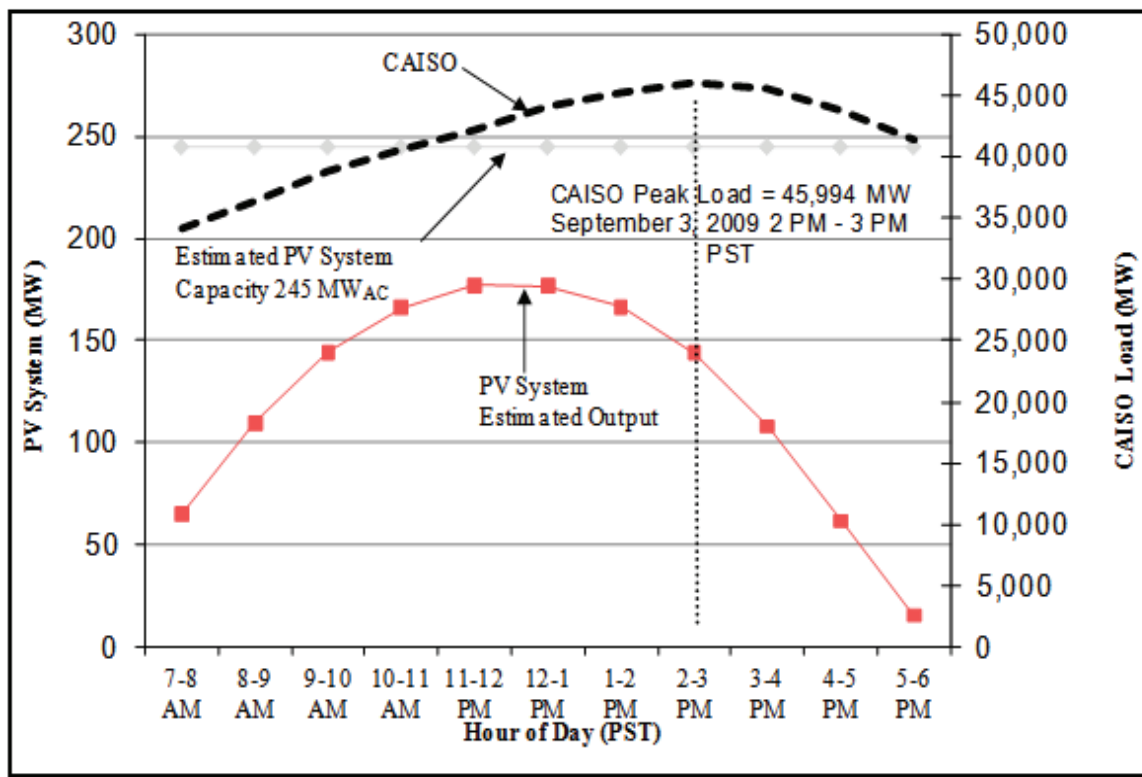
In 2009, there were over 20,100 systems online at the time of the CAISO system peak.³⁵ These systems had a CEC-AC capacity of approximately 245 MW (nearly four times the capacity of CSI projects online during the 2008 peak). Their generating output for that hour was estimated to be 144 MWh. Consequently, CSI systems had a peak hour capacity factor of 0.59 implying that 59 percent of the installed capacity (245 MW) was generating electricity for that hour (144 MWh). The peak hour capacity factor of SCE

³⁵ The differences between the 20,142 and 24,983 systems represents those systems that were estimated operational after September 3, 2009 and before January 1, 2010.

was somewhat lower than other areas for 2009. We believe this is correlated with the wild fires in the Los Angeles metropolitan area at this time (including the Station Fire).³⁶ The additional haze and soot on SCE CSI PV systems would impact their capacity factor.

In comparison, the total rebated capacity of all on-line SGIP projects (solar PV, wind fuel cells, micro turbines, gas turbines and internal combustion engines) during the 2009 CAISO system peak was 349 MW. The total impact of the SGIP projects coincident with the CAISO peak load was estimated to be 165 MWh. The collective peak hour capacity factor of the SGIP projects on the CAISO 2009 peak was approximately 0.47 kW per kW of rebated capacity. The difference between SGIP and CSI projects demonstrates that the performance of new solar projects is getting better on peak (in addition to the fact that newer projects tend to perform better).

Figure 15: Estimated CSI Impact on CAISO 2008 System Peak



³⁶ The Station Fire burned 251 square miles in the Los Angeles metro area. It began August 26, 2009 and was 100% contained October 16, 2009.

Table 43. Estimated Demand Impact Coincident with CAISO System Peak

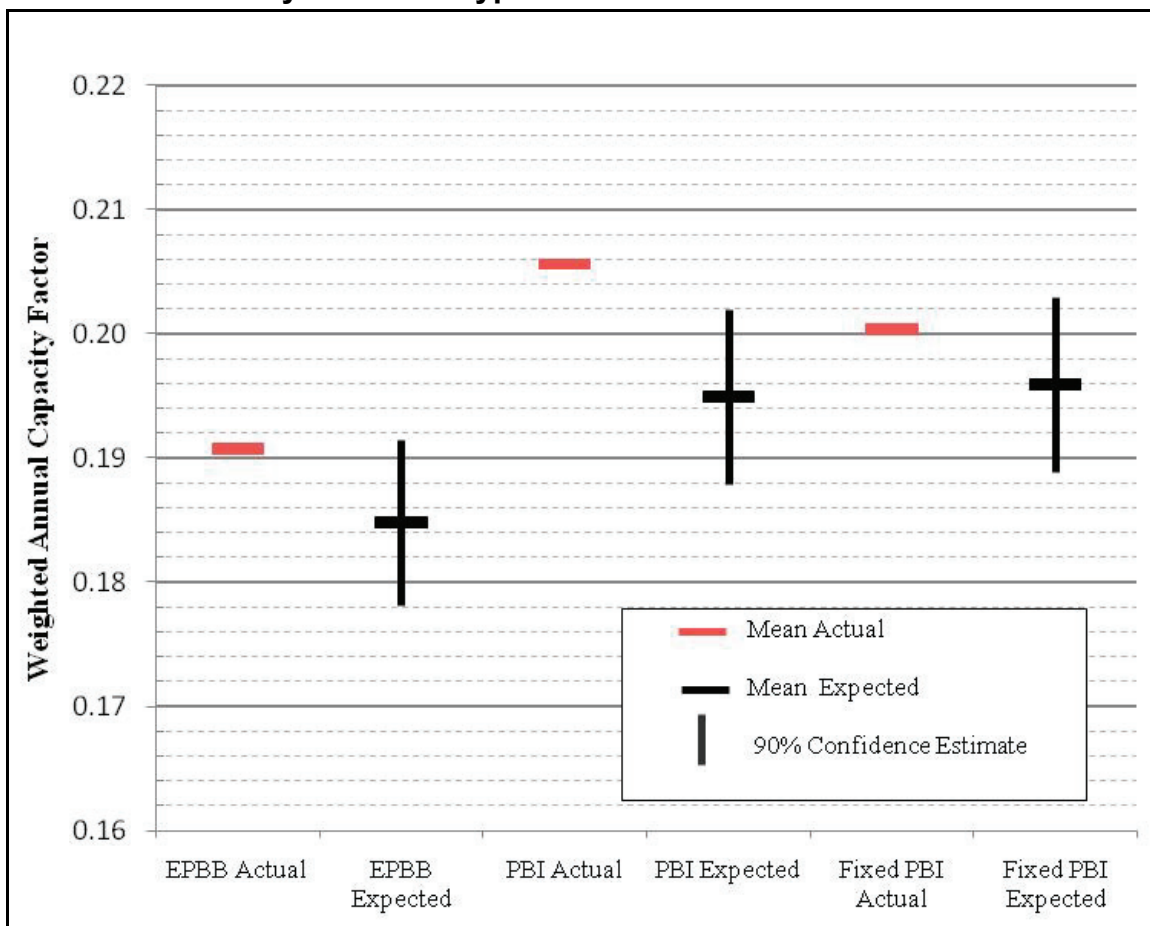
Program	PV Systems	PV Systems	Impact	Peak Hour Capacity Factor
Administrator	(n)	(MW)	(MW)	(kWh/kWp)
PG&E	12939	139.5	87.2	0.62
SCE	5005	82.8	43.3	0.52
CCSE	2198	22.6	13.6	0.60
All	20142	245.0	144.0	0.59

5.2.5 Comparison of Actual vs. Expected Performance

The expected annual average output of CSI systems is currently calculated during the incentive application process. These expected average outputs are used to calculate incentive payments for EPBB systems and allow Program Administrators to plan payments for PBI systems. Comparisons of estimated annual capacity factor based on estimates of system wide generation to expected annual capacity factor provide one way to assess actual performance of installed systems.

Figure 16 shows a comparison of actual vs. expected performance for all EPBB Systems, all PBI Systems, and all Fixed (non-tracker systems) PBI Systems. The "actual" performance is a combination of metered performance data, and weather adjusted estimated data normalized to the metered data. For the expected data, the figure shows both the mean expectation, as well as a range that represents the 90 percent confidence level error bounds that would be expected for each type of data based on historical solar resource variation. The methodology for estimating uncertainty for actual performance is described in Appendix E of the 2009 CSI Impact Evaluation.

Figure 16. Comparison of Estimated Actual and Expected Annual Capacity Factors for 2009 by Incentive Type



The capacity factors for "PBI Actual" systems appear slightly above the uncertainty bounds in relation to the estimated annual capacity factor. When looking at "Fixed PBI Actual" systems, which excludes any PBI systems on trackers, the annual performance of PBI systems is somewhat lower but is still better than the mean expected. For "EPBB Actual" systems, performance is above the expected average but still within the uncertainty bounds for the estimated annual capacity factor³⁷. These differences could be due to a few reasons including:

- The solar insolation in 2009 may have been higher than the TMY2 (Typical Metrological Year Data) average used to estimate expected performance; or
- The metered systems used to estimate system wide performance currently are slightly out-performing their estimated annual capacity factors.

³⁷ EPBB systems are almost entirely fixed so excluding tracking systems from EPBB systems has no noticeable effect on annual capacity factors.

5.2.6 Environmental Impacts: GHG, NO_x and PM emissions

The CSI 2009 Impact evaluation examined the effect of CSI PV projects on CO₂, NO_x, and PM₁₀ emissions for 2009. The team estimated the avoided quantity of these three pollutants as they comprise the majority of the air and GHG pollutants associated with electrical generation. The estimated emissions impacts for 2009, is the cumulative CSI impact and therefore includes capacity installed from 2007 to 2009.

A variety of approaches exist to estimating GHG emissions and air pollutant reductions from the installation of PV systems. Three approaches are noted here, each of which gauges what type of generation would likely have produced electricity in lieu of the installed PV.

The first approach, referred to here as the Avoided Cost approach, is derived from the Avoided Cost calculator developed by Energy and Environmental Economics (E3) and uses hourly price data. The second approach, referred to here as the Plant Schedule approach, was developed by KEMA, and uses plant schedule data from the California Independent System Operator (CAISO). The third approach, referred to here as the Generator Bid approach, was developed by KEMA, and uses real-time generator bid data from the CAISO. Each method has its drawbacks and benefits, detailed in Section 5 of the 2009 CSI Impact Evaluation. The intent of using multiple approaches to estimate the CSI emissions impact is to draw from the benefits of each and to assess the extent of the different limitations and their impact on the emission results.

Table 44 illustrates the estimated emissions savings by emission type and by approach. The CO₂ reductions for the Avoided Cost Approach are 180,136 tons of CO₂, which is equivalent to taking over 31,000 cars off of the road.³⁸

Table 44. Estimated GHG, PM10 and NO_x Emissions Reductions by Approach

Approach	Energy Impact (MWh)	CO₂ Emissions Avoided (tons)	PM₁₀ Emissions Avoided (lbs)	NO_x Emissions Avoided (lbs)
Avoided Cost	390,750	180,136	24,280	39,649
Plant Schedule	390,750	208,704	20,817	34,132
Generator Bid	390,750	163,183	16,277	20,899

³⁸ Based on 5.23 metric tons (5.77 short tons) of CO₂ /vehicle/year from <http://www.epa.gov/grnpower/pubs/calcmeth.htm#vehicles>

5.2.7 Transmission and Distribution System Impacts

In addition to providing electricity over the course of the year and during peak demand periods, CSI PV facilities impact the transmission and distribution (T&D) systems of California’s electrical grid. CSI PV systems reduce loading on the T&D lines by displacing remote sources of electricity with sources close to customer load. This reduced line loading potentially alleviates the need to expand or build new T&D infrastructure, saving utility and ratepayer resources. Delivering less energy through the T&D grid may reduce transmission congestion and potentially lower the risk of transmission overloads during many operating hours, which in turn may increase overall system reliability. The 2009 Impact Evaluation performed an analysis showing the various T&D impacts associated with CSI installations.

5.2.7.1 Transmission Benefits

The 2009 Transmission Capacity Benefit (TCB), or the equivalent of how much transmission capacity is “freed-up” by the CSI PV systems, is estimated to range from 500 to 900 MW.³⁹ This is comparable to the delivery capacity of a modern 230kV transmission line. Between 2008 and 2009 there was a 240 percent increase in both the statewide TCB and transmission loss savings (calculated at peak system load).

In the future when CSI penetration reaches twice the 2009 level, the modeling yields a projected 1000-1600 MW statewide TCB, which is comparable to the delivery capability of a 500kV transmission line. Furthermore, the analysis shows that when the CSI full capacity target (1,750 MW) is reached, the statewide TCB could grow to 4,000 MW or more. However, it is important to note that these capacity benefits are distributed statewide, rather than on any one 230kV or 500kV corridor. Thus, the incremental benefits on each individual transmission corridor within the state of California represent only a small percentage of the aggregate TCB.

5.2.7.2 Distribution System Impacts

Based on the 2009 feeder case studies performed, the greatest level of benefits is generally expected to occur on feeders with one of more of the following characteristics:

³⁹ See Chapter 6 of the 2009 CSI Impact Evaluation for a more detailed definition and discussion of the Transmission Capacity Benefit.

- Longer distribution feeders
- Feeders located in inland areas
- Feeders that have their summer peak demand in the mid-afternoon hours

The 2009 CSI Impact Evaluation shows that positive benefits are generally expected for a range of PV penetration levels, but also observes that there can be decreasing (or even negative) benefits above certain penetration levels.

5.2.8 Impact on Customer Bills

A detailed study of customer bill impacts will be part of the CSI Cost Effectiveness Evaluation, expected in Fall 2010. In the 2009 Impact Evaluation, Itron performed some customer bill analysis, looking at monthly generation and consumption for a sample of households. They did not look at the actual monetary value of the bill impacts, but focused on the billable consumption.

Table 45 lists the distribution of pre- and post-electricity consumption by utility. The results indicate that for PG&E and SDG&E over 40 percent of sites have pre- and post-PV electricity consumption that are within 10 percent of each other, while only approximately 27 percent of sites in SCE have pre-electricity consumption within 10 percent of post-consumption. For all three IOUs, it is more common for pre-consumption to exceed post-PV installation consumption.

Table 45. Pre- and Post-Residential Electricity Consumption Distribution by Utility

Utility	PG&E Site	PG&E % of Sites	SCE Site	SCE % of Sites	SDG&E Site	SDG&E % of Sites
Pre is Less than 50% of Post	6	0.9%	11	4.6%	1	1.1%
Pre is 50% to 90% of Post	140	20.6%	76	31.4%	14	14.7%
Pre- and Post are within 10%	292	42.9%	66	27.3%	44	46.3%
Pre is 110% to 150% of Post	196	28.8%	73	30.1%	33	34.7%
Pre is more than 150% of Post	47	6.9%	16	6.6%	3	3.2%

Table 46 below shows that PV generation offsets a significant portion of the average monthly consumption for each consumption decile. The distribution of household consumption and production indicate that average PV production increases with increase in consumption, but PV production increases more slowly than consumption. As consumption rises from the lowest 10 percent to the highest 10 percent PV’s share of consumption falls from 88 percent to 52 percent.

For households with consumption in the lowest 10 percent, the average monthly electricity consumption is 335 kWh and the average PV production is 293 kWh. For these households, PV production covers 88 percent of their electricity consumption. Households in the top 10 percent of the consumption distribution average 2,584 kWh of electricity consumption per month and their PV production averages 1,343 kWh per month. For households in the top 10 percent of consumption, their PV system only covers 52 percent of their electricity consumption.

Table 46. PV Production and Household Consumption

Consumption Deciles	Monthly PV Production (kWh)	Average Size of System kW	Average Monthly Consumption (kWh)	PV Production Share of Consumption
1	293	2.4	335	88%
2	339	2.7	497	68%
3	378	3.2	610	62%
4	448	3.4	722	62%
5	505	3.7	852	59%
6	552	4.2	989	56%
7	599	4.5	1,123	53%
8	696	5.1	1,320	53%
9	731	5.3	1,573	47%
10	1,343	9.5	2,584	52%

The 2009 Impact Evaluation also found that certain households had one or more months where solar PV production actually exceeded monthly consumption. Table 47 below shows the share of participating households for which data was available that had surplus generation in a given month. Table 47 also lists the average size of the negative utility monthly billing data. For all three utilities, the average size of the monthly surplus generation data increases as the number of months with surplus generation within the year grows. For PG&E, sites with only one month of negative billing data averaged 84.1 kWh of PV production in excess of consumption for that month, while SCE households' excess production averaged 109.7 kWh and SDG&E CSI participants' average was 116.2 kWh. For sites with nine months of PV production in excess of energy consumption, PG&E sites' monthly average excess production is 300 kWh, SCE sites' produce 502.6 kWh in excess of their monthly energy consumption and SDG&E participants' excess production is 246.1 kWh per month.

Table 47. Participant Sites with Monthly Surplus Generation

IOU	Months Negative	Count of Sites	Percent of Total	Mean Monthly Negative Utility Usage (kWh)
PG&E	0	449	56.2%	
	1	139	17.4%	-84.1
	3	150	18.8%	-157.6
	6	55	6.9%	-253.7
	9	6	0.8%	-300.1
SCE	0	210	62.9%	
	1	45	13.5%	-109.7
	3	52	15.6%	-159.2
	6	22	6.6%	-205.1
	9	4	1.2%	-502.6
SDG&E	0	79	46.7%	
	1	22	13.0%	-116.2
	3	30	17.8%	-154.3
	6	28	16.6%	-207.4
	9	10	5.9%	-246.1

5.2.9 CSI Participants and Energy Efficiency

The CSI 2009 Impact Evaluation looked at energy efficiency measures installed by both residential and non-residential CSI program participants. The evaluation compared the measures installed by participants to those installed by non-participants. The residential results are presented below, and the full results are in Section 10 of the full evaluation.

From 2006-2009, CSI participants self-reported an average of five energy efficiency measures, compared with nonparticipants who reported an average of approximately 3.7 energy efficiency measures, as shown in Figure 17. A similar trend was found in the non-residential sector. However, shows while CSI participants have adopted more energy efficiency measures overall from 2006 through 2009, they install similar numbers of IOU rebated measures as nonparticipants. Therefore, most of the difference in energy efficiency adoptions is due to the number of self-reported measures. More energy efficiency measures were installed by customers when their solar contractor discussed energy efficiency options with the customer.

Figure 17. Measure Adoptions per Customer, Participants vs. Nonparticipants and Rebated vs. Self-Reported (2006-2009)

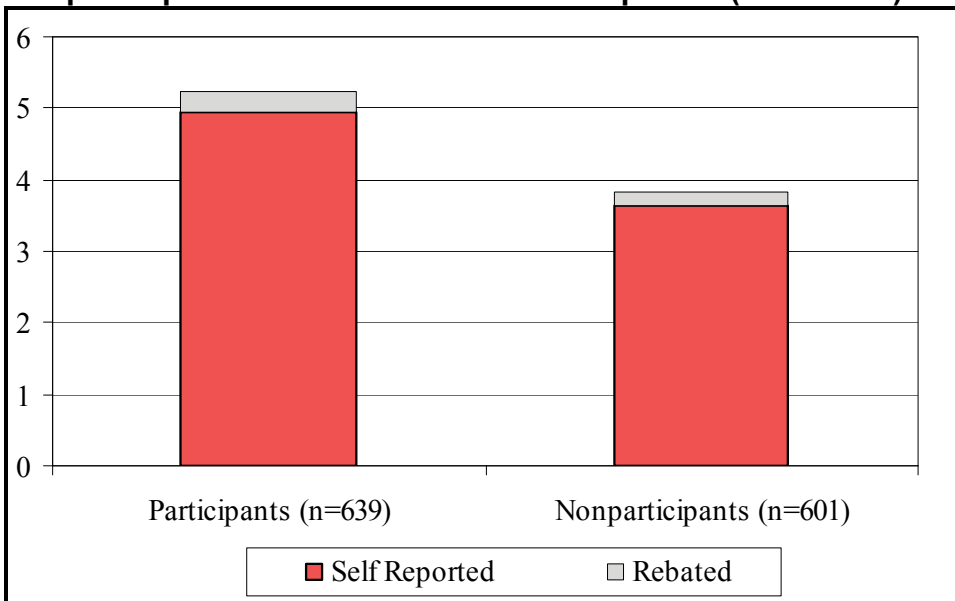
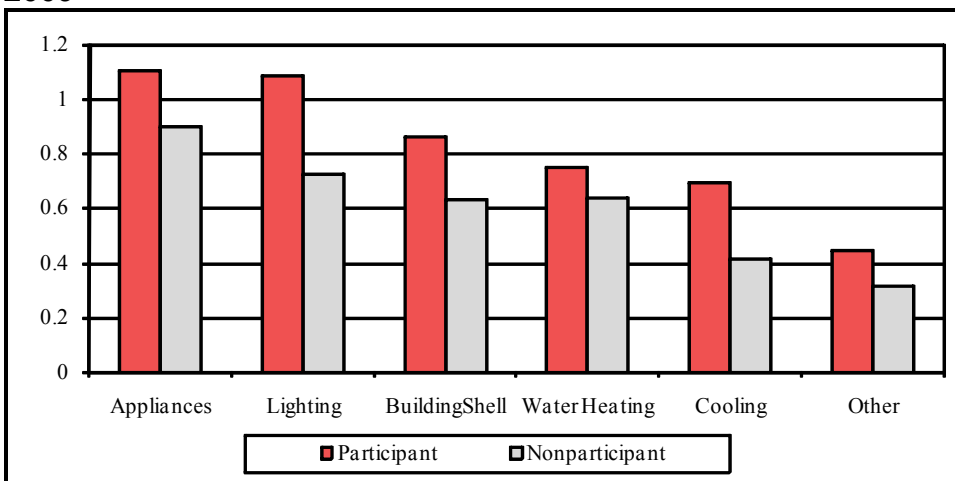


Figure 18 below further explores the type and frequency of energy efficiency measures installed by participants and nonparticipants over the four-year analysis timeframe, 2006-2009. This figure shows all measures verified and reported in the residential phone survey. Approximately 1.1 appliance measures were reported installed by CSI participants, compared with 0.9 appliance measures by nonparticipants. Appliances include dishwashers, clothes washers, refrigerators, freezers, and unplugging or removing second refrigerators or freezers. Furthermore, the lighting end use category shows the biggest difference between participant and nonparticipant adoption rates, 1.1 versus 0.7, respectively.

Figure 18. Number of Measures Installed Per Participant by End Use, 2006-2009

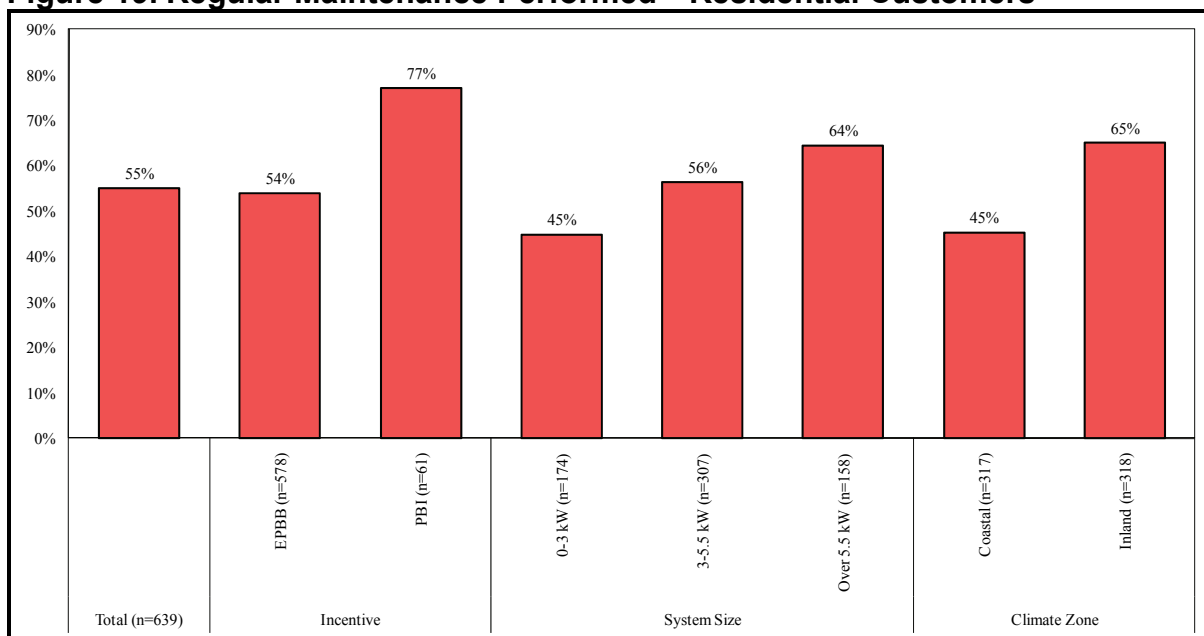


5.2.10 System Maintenance

The regular maintenance and cleaning of panels can go a long way in ensuring high yield of a system. This is particularly critical for systems that are more prone to collecting dust over the dry summer, which is typical in California and coincides with the highest production periods.

As shown in Figure 19, 55 percent of the residential phone survey participants reported regular maintenance and cleaning of panels. A higher percentage was reported under the PBI structure; those participants presumably have a bigger motivation to maximize their production for the related financial incentive benefit. The larger systems also tended to have a higher instance of maintenance, again with the motivation of larger investment and thus vested interest in high solar production. The inland and coastal climate difference in the level of maintenance was also notable, which may be attributed to the potential higher production benefit in the inland versus coastal climates.

Figure 19. Regular Maintenance Performed—Residential Customers



5.2.11 Residential and Nonresidential Program Satisfaction and Awareness

A phone survey conducted as part of the 2009 Impact Evaluation provided an opportunity to ask participants about their level of satisfaction with the program, with their solar contractors and with the size and performance of their solar PV system. Overall for both residential and nonresidential participants there is a high degree of satisfaction across these attributes, as shown in Table 48.

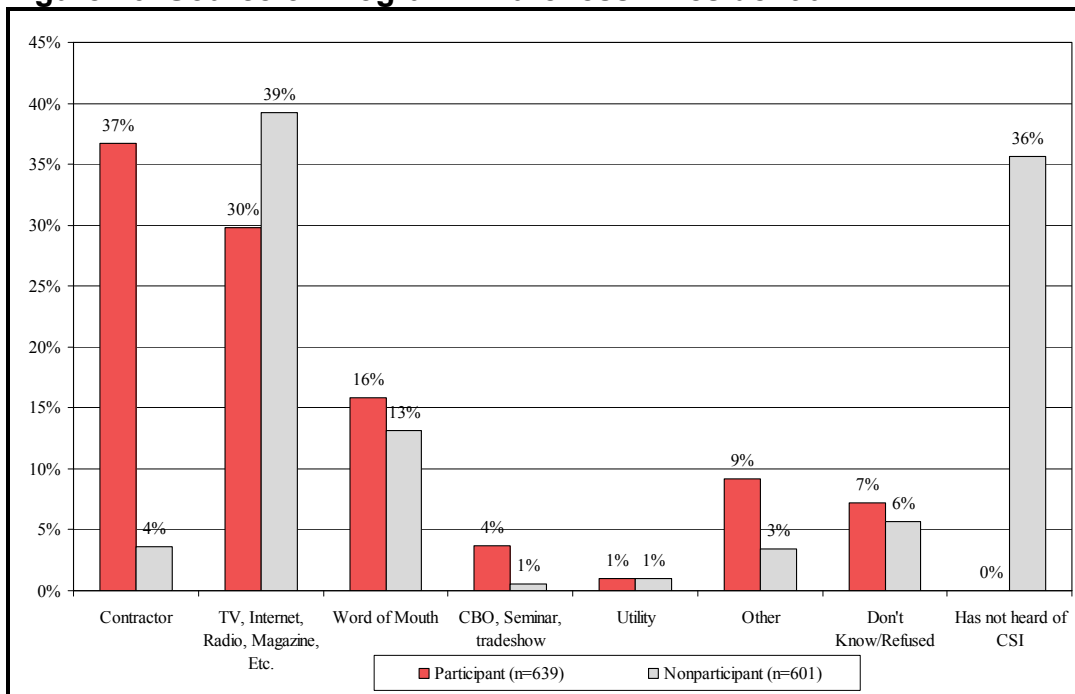
Table 48. Residential and Nonresidential Satisfaction with CSI (Scale of 1 to 10)

Market Segment	Program	Contractor	System Size	System Performance
Residential	8.0	9.1	8.8	9.1
Nonresidential	7.8	8.6	8.5	9.0

The phone surveys also asked residential participants and nonparticipants how they first became aware of the program, shown in Figure 20. For participants, contractors are the most common source of information followed by traditional marketing channels such as television, radio, and print advertisements. Only 1 percent of the participants heard about the program through their utility. More than one-third of the residential nonparticipants have *not* heard of the CSI program. Traditional marketing channels are the most

common source of program information for nonparticipants, with almost 40 percent of the survey respondents stating that they learned about the program through these channels. As seen with program participants, only 1 percent of nonparticipants gained awareness of the program through their utility.

Figure 20. Source of Program Awareness—Residential



5.2.12 Solar Contractor Growth Expectations

Surveys were conducted with 50 installation contractors active in the CSI program. While there are more than 1,400 such active contractors, CSI program jobs and installed capacity are concentrated in the top 74 firms. These top firms account for 80 percent of the program installed capacity, and are referred to as “high volume contractors” in the Table 49; contractors less dominant in the field are referred to as “general contractors.”

PV installation contractors were asked to comment on their business outlook over the next three years. The results are quite striking, with nearly 80 percent of the contractors reporting a positive business outlook, and only 4 percent expressing a negative outlook. General contractors are not quite as positive as high volume contractors, with 60 percent reporting a positive outlook.

The reasons offered for having a positive outlook are led by a growing market for solar (20 percent) and the continued availability of incentives and financing options. 16 percent mentioned incentives, and another 10 percent mentioned the advent of new

programs, including some that offer financing options for customers. Others cite their own business practices, general concern for the environment, and an improving economy.

Table 49 below shows the percent change in full-time-equivalent (FTE) staff experienced over the past 12 months and expected over the next 12 months. Overall, the CSI program grew by 55 percent year over year from 2008 to 2009, and this growth is observed with the majority growing their FTEs in the past 12 months by an average of 28 percent. However, some firms experiencing cutbacks over the past 12 months reduced their FTEs substantially, possibly reflecting their own difficult economic conditions. Expectations for future growth are more optimistic. Among the surveyed contractors that expect growth, the average expected increase in FTE is nearly 60 percent.

Table 49. Percent Changes in Firm FTE, Past 12 Months and Expected Changes over the Next 12 Months—Solar Contractors

Description	Change Description	Total		High Volume Contractors		General Contractors	
		Change in FTE	N	Change in FTE	N	Change in FTE	N
Prospective/ Next 12 Months	Grow	59%	37	33%	28	140%	9
	Shrink	100%	1		0	100%	1
Retrospective/ Past 12 Months	Grew	28%	23	29%	20	23%	3
	Shrank	46%	14	39%	10	65%	4

6. CSI Program Budget

This section reports on the status of the CSI Program balancing accounts and CSI Program Budget.

6.1 CSI Program Electric Balancing Accounts

In D.06-12-033, the Commission established a total budget of \$2,167 million over ten years for the CSI, including all program components except the CSI-Thermal gas-displacing budget. The large IOUs were authorized to collect the CSI Program funds from electric ratepayers according to the schedule provided by the CPUC.⁴⁰ The CSI funds are held by each utility in a balancing account, which is a standard utility accounting practice. The CSI schedule of collection is slightly front-loaded for a number of reasons, including ensuring that participants applying for CSI incentives today can be confident that the funds will be available for their projects upon completion.

The CSI Program has collected 43 percent of the total authorized ten year budget through the end of 2009. Table 50 shows that as of December 31, 2009, the large IOUs had collected just over \$922 million and spent more than \$364 million. The CSI expenditures include payments for all CSI Program components that are paid out of the CSI Balancing Account.

In total, the CSI Balancing accounts had \$561 million that was collected but not spent at the end of 2009. These accounts are not considered over collected, however, because the figures do not include future payments for PBI projects that have been installed but not yet paid. Expenditures for each "in payment" PBI project will be deducted monthly over 5 years based on actual performance. If PBI "in payment" projects are considered, the balancing accounts are not over collected. Further, if all pending (not yet installed) projects are considered, it is even less likely the balancing accounts would be over collected. As of June 9, 2010, the CSI Program had paid or pending incentives totaling more than \$1.4 billion, or 152 percent of what has been collected so far. Some pending incentives will not need to be paid out for several years, so the program likewise faces no threat from under collection.

⁴⁰ The CPUC modified the CSI Program rate collections schedule in December 2008, in D.08-12-004.

Table 50. CSI Balancing Accounts by IOU, through Dec 31, 2009

Year	IOU	Notes	CSI		End of Year Balance
			Revenue	Expenditures	
2007	PG&E	1,2,3	\$ 180,513,901	\$ (21,913,007)	\$158,600,894
	SCE	1,3,4	\$ 251,594,913	\$ 1,288,000	\$252,883,000
	SDG&E	1,3	\$ 72,881,003	\$ (4,370,951)	\$ 68,510,052
Subtotal			\$ 504,989,904	\$ (24,995,958)	\$479,993,946
2008	PG&E	2,3	\$ 106,234,059	\$ (82,297,100)	\$182,537,837
	SCE	3	\$ 134,750,000	\$ (34,690,000)	\$352,943,000
	SDG&E	2,3	\$ 34,882,960	\$ (11,943,193)	\$ 91,449,819
Subtotal			\$ 275,867,019	\$ (128,930,293)	\$626,930,672
2009	PG&E	3	\$ 140,960,420	\$ (114,873,627)	\$208,624,631
	SCE	3	\$ 698,856	\$ (71,399,185)	\$284,656,179
	SDG&E	3	\$ 277,432	\$ (23,886,963)	\$ 67,840,288
Subtotal			\$ 141,936,708	\$ (210,159,775)	\$561,121,098
Grand Total			\$ 922,793,631	\$ (364,086,026)	\$561,121,098

Source: Program Administrator Expense Reports, May 2010, data thru December 31, 2009. Notes:

- (1) 2007 collections include transfer to CSI of “unspent SGIP funds” to CSI balancing accounts.
- (2) 2008 collections include transfer back to SGIP of “unspent SGIP funds.”
- (3) End of Year Balance is the cumulative net balance in account at the end of specific calendar year.
- (4) In 2007, SCE transferred \$104.6 million of funds from the SGIP Memorandum Account to the CSI Program Balancing Account (CSIPBA). Interest in the amount of \$9.1 million more than offset the \$7.8 million of CSI expenses recorded in the SCE CSIPBA in 2007, which resulted in a counterintuitive negative total expenditure balance.

6.2 CSI Program Costs

Total CSI Program costs are shown in Table 51, 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 51. There is a small discrepancy between Table 50 and Table 51, likely due to balancing account interest. Table 51 shows the total budget for administration and incentives for each program component.

**Table 51. CSI Program Costs by Program through December 2009
(\$millions)**

Category	CSI General Market	SASH	MASH	SHW PP	RD&D	Total
Administration 10-year Budget	189.7	16.3	13.0	1.1	7.5	227.5
PG&E Spent thru 2009	17.1	0.5	0.2	0	0.4	18.2
SCE Spent thru 2009	17.9	1.4	0.2	0	0.2	19.7
CCSE Spent thru 2009	4.8	0.1	0.1	1.5	0.03	6.6
Subtotal Administration	39.8	2.0	0.5	1.5	0.63	44.5
Incentives/Grants 10-year Budget	1,707.3	92.1	95.3	1.5	42.5	1,938.9
PG&E Spent thru 2009	190.1	0.3	0	0	0	190.4
SCE Spent thru 2009	89.4	0.03	0.2	0	0	89.6
CCSE Spent thru 2009	34.0	0.1	0	0.3	0	34.5
Subtotal Incentives	313.5	0.43	0.2	0.3	0	314.5
Total Balance	353.3	2.43	0.7	1.8	0.63	359.0

Source: CSI Program Administrators, Expense Reports May 2010, data thru December 31, 2009. Note: Incentives paid includes only checks issued, but not necessarily PBI Payments committed.