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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Order Instituting Rulemaking Regarding Policies, Procedures and Rules for the California Solar Initiative, the Self-Generation Incentive Program and Other Distributed Generation Issues.	Rulemaking 12-11-005 (Filed 11-08-2012)

ASSIGNED COMMISSIONER'S RULING ESTABLISHING THE CALIFORNIA SOLAR INITIATIVE-THERMAL PROGRAM MEASUREMENT AND EVALUATION PLAN

This ruling establishes an evaluation plan for the California Solar Initiative-Thermal (CSI-Thermal) Program. The plan identifies the program data and reports for program review and establishes a budget and a schedule for publishing the reports.

The Commission established the California Solar Initiative (CSI) in 2006, to provide $3.2 billion in incentives and other support for solar photovoltaic (PV) systems with the goal of installing 3,000 megawatts in the service territories of California's three large investor-owned electric utilities. The Legislature codified the program and adjusted the program's scope and adjusted the Commission's portion of program total cost to $2.17 billion later that year. The Commission subsequently modified the CSI program to be consistent with Senate Bill (SB) 1, including a limit of $100.8 million for incentives to solar thermal technologies.

(See Pub. Util. Code § 2851(b)). The program launched to the public on January 1, 2007.[1]

Established by Assembly Bill 1470 in 2007, the goal of the CSI-Thermal Program is to promote the installation of solar water heating (SWH) systems, as well as other solar thermal technologies, that displace the use of natural gas, electricity, and propane in homes and businesses. Decision (D.) 10-01-022 sets forth CSI Thermal Program parameters, including program goals, technology eligibility, incentive structure, energy efficiency requirements, performance monitoring, program administration, budget and implementation timing.

The Commission directed the Energy Division to obtain parties' input and work in consultation with the Assigned Commissioner to establish the CSI-Thermal Measurement and Evaluation (M&E) budget and scoping plan through an Assigned Commissioner's Ruling, which will serve as the basis for conducting M&E Studies.[2] The Commission directed that the M&E Studies would be made publicly available, and the results of the M&E studies would form the basis of program modifications, as necessary.

The CSI-Thermal (M&E) Plan is attached to this ruling as Appendix A, as directed by the Commission in D.10-01-022. The CSI-Thermal M&E Plan is the first step in creating an evaluation process for the CSI-Thermal Program. The Energy Division has solicited and incorporated comments from all four CSI-Thermal Program Administrators, and will coordinate the CSI-Thermal

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[1] SB 585 added $200 million to the incentives budget, so that the total CSI budget is now $2.37 billion.

[2] D.10-01-022.

M&E effort with that of the CSI PV Program. The Energy Division may now issue Requests for Proposals for program evaluation services pursuant to this plan. This CSI-Thermal M&E Plan will be used to guide CSI-Thermal M&E efforts under the Energy Division's direction, with allowance made for reasonable and minor deviations from the plan. The Energy Division shall have the authority to revise this plan, following due consultation with the CSI-Thermal Program Administrators.

IT IS RULED that The Energy Division's proposal for the California Solar Initiative Thermal Program's Measurement and Evaluation Plan attached to this ruling as Appendix A is approved and should be implemented by the Energy Division and the Program Administrators.

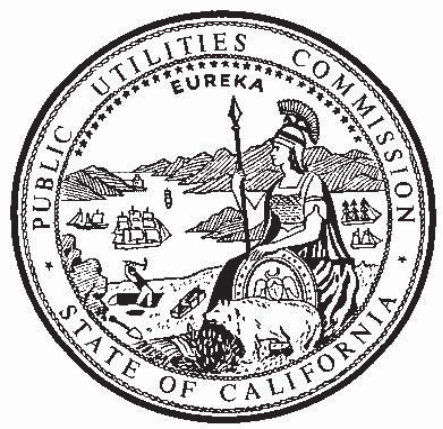
Dated February 4, 2014, at San Francisco, California.

/s/ MICHAEL R. PEEVEY
Michael R. Peevey
Assigned Commissioner

APPENDIX A

Measurement & Evaluation Plan

California Solar Initiative – Thermal Program



February 3, 2014

Prepared by:

California Public Utilities Commission

Energy Division, Customer Generation Programs

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Key Terms and Acronyms

AB: Assembly Bill
ACR: Assigned Commissioner's Ruling
ALJ: Administrative Law Judge
CCSE: California Center for Sustainable Energy
CPUC or **Commission**: California Public Utilities Commission
CSI-Thermal: California Solar Initiative-Thermal Program
D.: Decision *(of the Commission)*
ED: Energy Division
M&E: Measurement & Evaluation
M&E Plan: Measurement & Evaluation Plan *(this document)*
PAs: Program Administrators
PG&E: Pacific Gas & Electric
PV: Photovoltaic solar cells
SCE: Southern California Edison
SoCalGas: Southern California Gas Company
SDG&E: San Diego Gas & Electric
SB: Senate Bill
SWH: Solar Water Heating

Overview

The goal of the California Solar Initiative-Thermal Program, established by Assembly Bill 1470 in 2007, is to promote the installation of solar water heating (SWH) systems, as well as other solar thermal technologies, that displace the use of natural gas, electricity, and propane in homes and businesses. Decision 10-01-022 of the California Public Utilities Commission directs the Energy Division and the Assigned Commissioner in Rulemaking 12-11-005 to establish a budget, timeline and implementation strategy for the measurement and evaluation (M&E) of the CSI-Thermal Program, and memorialize this CSI-Thermal M&E Plan in an Assigned Commissioner's Ruling. This document satisfies that direction. In addition to facilitating effective management of the CSI program, this M&E Plan will support reporting requirements contained in relevant legislation and Commission decisions.

Background

In late 2007, Governor Arnold Schwarzenegger signed AB 1470 (Stats. 2007, Ch. 536), authorizing the creation of a $250 million incentive program to promote the installation of 200,000 SWH systems that displace the use of natural gas in homes and businesses by 2017. In addition, Senate Bill 1 (Stats. 2006, Ch 132) earmarked up to $100.8 million in funds from the general market CSI photovoltaic program for solar thermal projects. Monies collected under AB 1470 from gas ratepayers fund incentives to SWH systems that displace natural gas usage, while funds collected through the CSI PV program from electric ratepayers fund electric displacing SWH systems.

In February 2007, the Commission approved a $2.59 million SWH pilot program in San Diego Gas & Electric (SDG&E) territory. AB 1470 required the Commission to evaluate data from the SWH pilot and determine whether a SWH program is cost effective and in the public interest before designing and implementing an incentive program for gas customers. Itron, Inc. was contracted to perform the cost-effectiveness evaluation of gas displacing SWH incentive program. Based on the work performed by Itron, the Commission's Energy Division drafted a Staff Proposal finding that a SWH incentive program would be cost-effective and in the public interest. The Staff Proposal, released via Administrative Law Judge ruling in July 2009,[1] proposed the establishment of the CSI Thermal Program combining the $250 million from natural gas ratepayers authorized by AB 1470 with the $100.8 million from electric ratepayers authorized by SB 1. The Staff Proposal also made recommendations on various program elements, including incentive levels, funding allocation and technology eligibility.

Following workshops and public comment on the Staff Proposal, the CPUC in January 2010 approved D.10-01-022 establishing the CSI-Thermal Program, which allocates up to $350.8 million to promote SWH installations on new and existing homes and businesses. The program provides incentives towards SWH systems that displace natural

[1] Administrative Law Judge's Ruling Noticing Workshop and Requesting Comment on Staff Proposal for Solar Water Heating Program," R.08-03-008, July 15, 2009.

gas or electricity for customers of Pacific Gas and Electric Company (PG&E), San Diego Gas and Electric Company (SDG&E)[2], Southern California Edison (SCE) and Southern California Gas Company (SoCalGas). The CSI-Thermal Program is designed to significantly increase the adoption of SWH technologies in the California marketplace, reduce the installed cost of SWH systems and increase customer awareness so that a robust, competitive and self-sustaining SWH industry exists in California after the CSI-Thermal budget has been spent.

In D.11-10-015, the Commission established the CSI-Thermal Low-Income Program, which allocates $25 million for incentives intended to promote the installation of gas-displacing SWH systems on qualifying low-income single and multifamily households in the service territories of PG&E, SoCalGas, and SDG&E. The budget for the CSI-Thermal Low Income Program will be funded by collections from gas ratepayers pursuant to AB 1470. The CSI Thermal Low-Income Program began accepting applications in 2012.

D.11-11-005 further modified the CSI-Thermal Program to allow SWH technologies that displace propane usage to receive CSI-Thermal incentives. D.12-08-008 increased the incentive levels of the CSI-Thermal program, to help boost early participation and stimulate development of the SWH market. In D.13-02-018, the Commission expanded the range of technologies eligible to receive SWH incentives as a part of the program, and expanded that range even further in D.13-08-004 to include solar pool heating systems. The CSI-Thermal Program will run until December 31, 2017 or until program funds are exhausted, whichever occurs first.

CSI Thermal Program Goals

The overall goal of the CSI Thermal Program[3] is to significantly increase the size of the SWH market in California by encouraging the adoption of SWH technologies. Specific program goals include:

- Achieving the installation of natural gas-displacing systems that displace 585 million therms over the lifetime of the systems,
- Achieving the installation, by the end of 2017, of electric-displacing SWH that displace 275.7 million kilowatt hours per year of electricity,
- Achieving an expansion of the market for other solar thermal technologies that displace natural gas and electricity use, in addition to SWH systems,
- Supporting reductions in the cost of SWH systems of at least 16% through a program that increases market size and encourages cost reductions through market efficiency and innovation,
- Increasing consumer confidence & understanding of SWH technologies,
- Engaging in market facilitation activities to reduce market barriers to SWH adoption, such as permitting costs and a shortage of qualified local installers.

[2] The CSI Thermal Program is administered by the California Center for Sustainable Energy (CCSE) in the territory of San Diego Gas & Electric Company.
[3] See Appendix A of D.10-01-022, available at http://docs.cpuc.ca.gov/word_pdf/FINAL_DECISION/112748.pdf

Process

Appendix A of D.10-01-022[4] provides additional direction on the implementation of the CSI-Thermal M&E efforts. Specifically, D.10-01-022 directs:

- The CSI-Thermal Program Administrators (PAs) and Energy Division (ED) to coordinate the CSI-Thermal M&E effort with that of the CSI PV Program.
- ED to follow the guidance of the decision and to consult with the Assigned Commissioner to memorialize the M&E Plan in an Assigned Commissioner's Ruling, specifying the description and schedule of studies to be performed.
- ED to issue a Request for Proposal (RFP) for an independent entity to perform the M&E work, and select the evaluation contractor.
- The CSI-Thermal PAs to be responsible for ensuring that program participants provide the program with performance data necessary to evaluate the program.[5]

This M&E Plan is being issued as an appendix to an Assigned Commissioner's Ruling as called for by D.10-01-022. Comments and suggestions have been solicited and received by the ED from all four CSI-Thermal Program Administrators. This document will be used to guide CSI-Thermal M&E efforts, with allowance made for reasonable and minor deviations from the Plan. If more substantive alterations to the Plan are needed, then ED shall have the authority to revise this Plan, following due consultation with the PAs.

Budget

The total M&E budget for the CSI-Thermal Program (as outlined in Appendix A, D.10-01-022) is not to exceed $6.25 million, drawn on a 4:1 basis from gas and electric consumers, respectively. This figure represents 1.78% of the total potential maximum of the CSI Thermal budget, $350.8 million. Commission decisions do not further specify how these funds should be spent, although all M&E activities, including performance monitoring and contracted studies, must be provided for out of these funds.

Utility	Allocation	M&E Budget
PG&E	39.9%	$2,493,750
SCE	9.2%	$575,000
SDG&E/CCSE	10.1%	$631,250
SCG	40.8%	$2,550,000
Total	**100%**	**$6,250,000**

[4] In addition to mandating studies, the M&E section of the Appendix requires that the PAs establish a statewide database to facilitate application processing, public reporting, and program evaluation. It also requires that the PAs provide quarterly progress reports that provide a snapshot of program activity, as well as semi-annual expense reports. These activities are taking place, and are outside the scope of this Plan.

[5] Larger systems are required to provide the program with project performance data for five years.

Administering Measurement & Evaluation Activities

As directed in previous decisions and by statute, the Energy Division will oversee the implementation of CSI-Thermal M&E for the CPUC. The Project Coordinator that oversees the CSI PV Program M&E efforts should also oversee the CSI-Thermal M&E efforts.[6] The Project Coordinator is responsible for, among other things, coordinating research, planning and budget tracking activities of the various CSI M&E studies. The Project Coordinator is not required to carry out each of these studies directly, but may provide a synthesis of all the evaluations as well as provide any independent assessments of the evaluations as necessary. ED will work closely with the Project Coordinator to approve invoices and monitor progress of work by outside evaluation groups. Work products will be developed in collaboration with ED staff and will allow time for early input, review and approval.

Public Reporting

In addition to the studies outlined below, CSI Thermal M&E funds will be used to make public reporting activities more transparent and more useful for program administrators, ED staff and the public at large. Central to this effort will be the creation of a "CSI Thermal Stats" website embedded in the existing Go Solar California web architecture that will make non-confidential application, program and installation progress data available to the public at large.[7]

Technical specifics and cost estimates for such a website have already been obtained by the program administrators, and the task of creating and maintaining CSI Thermal Stats should fall well within the budget proposed below. Since M&E funds are designed to increase public transparency and accountability for the program, building such a website would be an appropriate use of M&E funds.

Because they have been ordered by the Commission in D.10-01-022, quarterly and semi-annual reporting requirements for the program administrators will remain. However, once the CSI Thermal Stats website is operational, these reports may be more narrative and qualitative in focus, as up-to-date program statistics will be readily available online for ED staff and the public.

M&E Studies Planned for the CSI Thermal Program

The studies outlined below will include the various components of the CSI-Thermal Program, including the Low-Income program. Based in part on directions from the

[6] Until April 2013, this Project Coordinator was Newcomb Anderson McCormick, who was under contract to coordinate the overall CSI evaluation effort. The continuation of the service is now being put out to bid.
[7] Data collected through the CSI Thermal program and made available for public consumption will be reported in compliance with the CPUC privacy rules. All confidential customer information will be protected.

Commission in Appendix A of D.10-01-022[8], the Energy Division will implement the M&E effort for the CSI Thermal program in two evaluation 'tracks', with one focused on technology and data collection, and the other on program evaluation:

- **Performance Data, Impact and Technology Project**: A long-term data collection and analysis project focused on technical and performance aspects of SWH systems to run from 2014 to 2018.
- **Program Evaluation I and II**: Two rounds of cost-benefit analysis and process evaluation studies, in 2014-2015 and again in 2017.

As pointed out by the Program Administrators, it is unlikely that one evaluation firm would possess all of the diverse skill sets necessary to conduct all of this analysis as part of one contract. Thus, the Energy Division will pursue these two strands of CSI Thermal program evaluation in parallel.

Of the total $6.25 million set aside by the Commission for M&E purposes, the costs of these studies are expected to total $5.83 million by 2017 with another $420,000 held in reserve for other evaluations as needed. If these funds are not used for M&E, then the Commission will either refund the amounts to ratepayers or direct them to other CSI-Thermal program purposes. For a detailed timeline and proposed budget, see page 11.

Table 1 below details the topics to be researched in the planned M&E studies:

Table 1: CSI-Thermal M&E Plan Study Descriptions

Study Title and Timetable	Sub-Component	Study Descriptions and Research Questions
Performance Data, Impact and Technology Project *2014-2018*	*Performance Data: Metering and Collection*	Performance meters will be installed on a sample of participating systems to collect data for all of the M&E studies listed below including the program evaluations. Metering costs are expected to total around $2.40 million, with the remainder of the budget listed on page 11 dedicated to the Technology and Impact Evaluations.
	Technology Evaluation	Two reports, in 2015 and in 2017/2018, will result from this study. The purpose of this study is to assess the durability, performance, costs and benefits of various solar thermal technologies. The study should evaluate each of the common single-family residential system types: integrated collector storage; thermosyphon; direct forced circulation; indirect forced circulation; evacuated tube collectors; air collectors; and concentrating collectors. Proposed questions include, but are not necessarily limited to: a. How effective are the various technologies in protecting against system freezing and system overheating?

[8] Appendix A of D.10-01-022 did not mandate a specific evaluation plan for CSI Thermal, though a number of potential study ideas borrowed from the CSI PV program were outlined in Appendix A. This document incorporates several ideas from Appendix A into a streamlined evaluation plan.

	Technology Evaluation (cont.)	b. What is the stability of Glycol over time? c. What was the average energy displacement of each type of system? d. How many systems of each type failed? e. How do various SWH technologies compare in terms of installation cost, performance over time, energy displacement and other performance metrics? f. Are there any new technologies that entered the market as a result of the program? g. What are the various meter types employed during the program, their costs and performance?
Performance Data, Impact and Technology Project (Cont.) *2014-2018*	*Impact Evaluation*	Two reports, in 2015 and in 2017/2018, will result from this study. The Impact Evaluation reports may be combined with the Technology Evaluation reports. The purpose of this study is to assess the impact of the program on electricity and natural gas demand, assess the number of systems installed, assess the greenhouse gas emission reductions achieved by the program, collect and analyze actual performance data of installed systems, compare the performance data to the expected performance of those systems, and make that information readily and transparently available to consumers and policy makers. Proposed questions include, but are not necessarily limited to: a. How many SWH systems have been installed under CSI-Thermal? b. On a program-wide basis, what was the installed cost of CSI-T supported solar thermal systems? c. What has been the energy displacement of these systems? How have systems performed over time with respect to efficiency, weather, usage and host customer characteristics? d. What has been the actual hot water load for various building types, and how did that differ from the expected hot water use profiles used by the program (i.e. in the incentive calculator)? e. How have these systems performed compared to projected performance expectations and technology ratings?
Program Evaluation I *2014-2015*	*Baseline Approximation and Market Characterization*	The purpose of this study is to provide a basis for assessing program progress towards achieving program goals and the state of the market for SWH technology in California. Since this did not occur at the outset of the program, it may pose somewhat of a challenge. These questions are envisioned as a precursor to the Market Transformation Study in 2017. Proposed questions include, but are not necessarily limited to: a. Initial Market Penetration: How many SWH systems were installed in California (per year and cumulative) prior to the start of the CSI Thermal program (IOU territories and all California) and in the Program's early years?

Program Evaluation I (Cont.) *2014-2015*	*Baseline Approximation and Market Characterization (cont.)*	b. Typical installation costs: What was the cost of the average SWH systems installed in California prior to the start and in the early years of the CSI Thermal Program? c. System Quality and Performance: What was the average performance of SWH in California prior to the CSI Thermal Program? d. Public Perception: How did the public view SWH prior to the start of CSI-Thermal, or in the early Program years? e. Installers: How many companies were selling SWH systems in California prior to the start of CSI-Thermal, or in the early Program years? How many people were employed in the industry? f. Permitting: What was the cost (in terms of time and money) of a building permit for SWH prior to the start or in the early years of the CSI-Thermal Program? g. Market Transformation Indicators: What indicators and methodologies for collecting relevant data to inform those indicators will track progress towards achieving program goals and market transformation in the 2017 Market Transformation study? h. Barriers to Adoption: What problems or issues dissuade willing customers from installing SWH systems? What role does customer information and marketing play in encouraging installations? i. Sufficiency of CSI Thermal Incentives: Will the rebates given under the CSI Thermal program be sufficient to reach the program goal of installing 200,000 SWH systems in California by 2017?[9] j. External Market Conditions: Have changes in natural gas or electricity prices influenced adoption of SWH technologies? Have water usage trends and changes in water prices and consumption influenced SWH adoption? (*Using market actor interviews and program data—quantitative metrics should be developed for 2018 study*)
	Cost-Benefit Analysis	The purpose of this study is to provide a periodic check on the costs and benefits of the program, and to evaluate the program's cost-effectiveness on an updated basis. The central evaluation question for this component is: What are the costs and benefits of the program for single-family, multi-family and commercial customers (separately for natural gas-displacing and electric-displacing systems) from the following perspectives, using the Commission-approved cost-benefit methodology from (D.) 09-08-026. These approved perspectives are: a. Participant perspectives b. Non-participating ratepayer perspective c. Program Administrator perspective d. Societal perspective (Total Res. Cost and Societal Cost test)

[9] This aspect of the 2014-2015 Program Evaluation is designed to meet the reporting requirements of Public Utilities Code Section 2867.1(b) set by AB 2249 (Buchanan) in 2012.

<table>
<tr><td>Program Evaluation I (Cont.)

2014-2015</td><td>Process Evaluation</td><td>The purpose of this study is to assess the program operations and make recommendations for improving the program's effectiveness.

Proposed questions may include:
a. What are the processes employed by the Program Administrators in marketing and administering the CSI-Thermal Program?
b. What was the administrative cost per SWH system installed?
c. Is the application process streamlined and efficient? If not, what changes need to be made to the process?
d. Are there different PA designs that could be more efficient?
e. Branding: Are messaging and branding clear to customers?
f. Marketing: How successful have marketing activities been at encouraging customers to install SWH systems?
g. Identify key areas of program success, key program challenges, key areas contributing to program challenges, and recommendations for improvement.</td></tr>
<tr><td rowspan="3">Program Evaluation II

2017</td><td>Cost-Benefit Analysis</td><td rowspan="2">These studies would follow up on the results from the 2014-2015 effort by analyzing the progress and program changes since the initial studies in 2014-2015.</td></tr>
<tr><td>Process Evaluation</td></tr>
<tr><td>2017 Market Transformation Study</td><td>Using the baseline established by the 2014-2015 study, this follow-up would determine whether the market transformation goals of the program were met.

Proposed questions include, but are not necessarily limited to:
a. What solar thermal companies are doing business in California? How many people are employed in the industry?
b. What are the perceptions among the general public about solar water heating? What are the market barriers to SWH, and how effectively is the CSI-Thermal addressing them?
c. What are the sales of SWH systems statewide?
d. How has the CSI Thermal Program affected the solar thermal market in California (qualitative and quantitative analysis, including cost and installation data—see Baseline Approximation in first Impact Evaluation)?
e. What additional steps can the Commission take to better transform the market for SWH to be self-sustaining?
f. Have changes in natural gas or electricity prices influenced adoption of SWH technologies? Have water usage trends and changes in water prices and consumption influenced SWH adoption? (Using metrics developed in 2014)</td></tr>
<tr><td>Other Evaluation Studies</td><td colspan="2">Smaller studies could be commissioned to examine participation rates, low-income outreach and enrollment, application dynamics, etc. These studies would be conducted only if and as needed.</td></tr>
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The CSI Thermal Program Estimated M&E Budget Allocation and Study Timelines*

Study Category	2010	2011	2012	2013	2014	2015	2016	2017	Post Program[10]	Study Totals
Performance Data, Impact and Technology Project -Impact Evaluation -Technology Evaluation -Data Collection *(incl. metering costs)*					$2,400,000	$450,000	$50,000	$450,000	$50,000	**$3,400,000**
Program Evaluations I and II (2014, 2017) -Baseline Approximation -Cost-Benefit Study -Process Evaluation -2017 Market Transformation Study					$1,200,000			$800,000		**$2,000,000**
Public Reporting					150,000	70,000	70,000	70,000	70,000	**$430,000**
Yearly Totals	**-**	**-**	**-**	**-**	***$3,750,000***	***520,000***	***120,000***	***$1,320,000***	***120,000***	***$5,830,000***[11]
Reserve / Other Evaluation Studies *(only if and as needed)*										**$420,000**
Total CSI-Thermal M&E Budget										**$6,250,000**

*As specified above and as in the CSI PV Program, the Energy Division has the authority to adjust the proposed M&E budgets and study timelines stated here within reasonable bounds and may issue an M&E Plan revision if necessary in the future.

[10] Added to cover any post-CSI Thermal data and reporting issues that may arise—e.g. webhosting for CSI-Thermal Stats, final reporting requirements, etc.

[11] According to D.10-01-022 (at pages 57 & 61), there is $5 million available from the gas side and $1.25 million from the electric side. In budget terms, that's an 80/20 split, gas and electric, a 4:1 ratio that D.10-01-022 mandates for M&E expenses (see pg 81). Thus, for this figure, for an 80/20 split, $4.34 million would come from gas, and the remaining $1.09 million from electric.

(END OF APPENDIX A)