



California Solar Initiative

Solar Water Heating

Pilot Program Description

Prepared for
California Public Utilities Commission

Prepared by
San Diego Regional Energy Office

April 13, 2007

About the San Diego Regional Energy Office

The San Diego Regional Energy Office (SDREO) is an independent, nonprofit 501(c)(3) corporation whose mission is to foster public policies and provide programs, services, information and forums that facilitate the adoption of clean, reliable, renewable, sustainable and efficient energy technologies and practices. SDREO also provides the community with objective research, analysis and long-term planning on energy issues and technologies. For more information, visit our website at <http://www.sdenergy.org> or call us toll free at 1-866-SDENERGY. *We are working for a sustainable energy future.*

TABLE OF CONTENTS

1 PROGRAM OVERVIEW..... 5

1.1 PROGRAM CONCEPT..... 5

1.2 BACKGROUND 5

1.3 PROGRAM RATIONALE 6

 1.3.1 *Current Market Penetration Barriers*..... 6

 1.3.2 *Program Strategies to Address Market Barriers*..... 7

1.4 PROGRAM OBJECTIVES..... 8

 1.4.1 *Short-term objectives*..... 8

 1.4.2 *Other Objectives*..... 8

2 PROGRAM IMPLEMENTATION..... 9

2.1 PROGRAM TIMELINE 9

2.2 PROGRAM REPORTS..... 10

 2.2.1 *Periodic Program Reporting*..... 10

 2.2.2 *Program Evaluation Reports* 11

2.3 CUSTOMER ELIGIBILITY 11

2.4 ELIGIBLE TECHNOLOGIES 11

2.5 INCENTIVES 11

 2.5.1 *Prescriptive Method* 11

 2.5.2 *Area Method*..... 12

 2.5.3 *Incentive Budget*..... 12

 2.5.4 *Incentive payment*..... 12

2.6 QUALITY ASSURANCE 12

 2.6.1 *Inspections*..... 12

 2.6.2 *Incentives paid to Installer*..... 13

 2.6.3 *Recording Project Costs*..... 13

 2.6.4 *License and Permit Requirements* 13

 2.6.5 *Installer/Contractor Training*..... 13

 2.6.6 *Metering*..... 14

 2.6.7 *Owner’s Manual*..... 14

2.7 POTENTIAL PROGRAM SYNERGIES 15

3 EDUCATION, OUTREACH AND MARKETING 15

3.1 OBJECTIVES 15

3.2 TARGET CUSTOMERS..... 16

3.3 EDUCATION TACTICS 16

3.4 OUTREACH TACTICS 16

3.5 MARKETING TACTICS 17

3.6 OTHER TACTICS 17

4 MONITORING AND EVALUATION 18

4.1 REQUIRED EVALUATION REPORTING..... 18

4.2 SYSTEM PERFORMANCE MONITORING 19

5 BUDGET 20

6 APPENDIX A – INCENTIVE DESCRIPTION..... 21

7 APPENDIX B – SOLAR ORIENTATION FACTOR 25

8 APPENDIX C – DRAFT INSTALLATION CHECKLIST..... 27

1 Program Overview

1.1 Program Concept

The Solar Water Heating (SWH) Pilot Program will provide rebates to residential and non-residential customers who install qualifying solar water heating systems that offset energy used by an existing natural gas or electric water heater or boiler. It will also provide necessary education and training. The 18 month pilot will be available to residential, commercial and industrial customers of the San Diego Gas and Electric (SDG&E) service territory. The explicit goal of the Pilot Program is to determine whether SWH systems are a desirable candidate for a statewide incentive program.

The SWH Pilot Program is innovative in basic design by virtue of type of technology – SWH is an energy efficiency measure with a renewable component. It will be the first ratepayer funded program that tangibly connects renewable technology to energy efficiency. Additionally, solar water heating is a measure that speaks to the concept of sustainability and specifically climate change.

1.2 Background

On January 12, 2006, the California Public Utilities Commission (CPUC) issued Decision D.06-01-024 creating the California Solar Initiative (CSI). As part of the CSI, SDREO was directed to develop a SWH Pilot Program. SDREO submitted the Pilot Proposal on May 14, 2006. Subsequent discussions with the CPUC resulted in approval of the program in a CPUC Ruling on February 15, 2007¹. This revised Pilot Program Description was ordered by, and incorporates all elements from, that ruling.

The SWH Pilot Program is designed to encourage the adoption of SWH technologies by providing financial incentives to assist with installation costs, training for installers and education to help potential customers make informed decisions. In addition, an explicit goal of the Pilot is to inform State policy makers and the CPUC as to the relative importance of the various barriers to utilization of these technologies and the effectiveness of various strategies to overcome them. Evaluation results from the Pilot will be central for the determination of whether California will implement a statewide SWH incentive program and, if so, what its central design characteristics will be.

In the development of the pilot program design, SDREO conducted a public workshop in March 2006 on SWH to solicit stakeholder input and comments. SDREO has also conducted its own engineering, administration and marketing evaluations, and has interacted extensively with industry, DOE, NREL and

¹ “Assigned Commissioner’s and Administrative Law Judge’s Ruling Approving Solar Water Heating Pilot Program”, Rulemaking 06-03-004, filed 2-15-07.

other interested stakeholders to ensure the Pilot's approach and implementation details are reasonable, streamlined and effective.

1.3 Program Rationale

In California, approximately 10% of residential hot water is heated using electricity; 78% is heated using natural gas. For single family residences the proportion is 90%—the highest of any US state.² NREL estimates that in California, about 40% of all natural gas used to heat water (105 of 258 trillion Btu) could be saved through the use of SWH systems. Indeed, the reduction of area source emissions from natural gas combustion is one of the greatest potential benefits to arise from SWH systems. SWH programs can be an effective strategy for states such as California to reduce greenhouse gas emissions.³

According to a 2003 PG&E study,⁴ solar water heating systems represent the largest untapped therm savings potential remaining in California with a savings potential of over 800 million therms, compared to the next largest savings opportunity of 300 million therms for horizontal clothes washers. In addition to financial savings and energy savings, SWH systems can help protect end users against future gas and electricity shortages and price increases. SWH systems also help preserve the environment by avoiding carbon dioxide emissions and reducing criteria pollutants such as nitrogen oxides and sulfur dioxide. At the same time, SWH systems installed in place of existing electric water heating systems can reduce electricity consumption, avoiding generation-related emissions and potentially reducing the need for new power plants.

1.3.1 Current Market Penetration Barriers

According to the above-referenced PG&E study, fewer than 1% of consumers purchase SWH systems. Annual installations of residential SWH systems number less than 1000 for the entire state of California. SDREO has identified the following reasons for this lack of market penetration.

- **High Initial Costs**

While SWH systems can be cost-effective over their total life cycle, many consumers lack the up-front capital needed or simply cannot afford the lengthy payback periods. Customers have a “first cost” bias which favors purchasing the least expensive equipment without factoring in total life cycle costs. At the same time, the installed cost of SWH is lower than some other options

² CEC RASS, 2004, via Tim Merrigan, NREL.

³ Denholm, P. “The Technical Potential for Solar Water Heating to Reduce Fossil Fuel Use and Avoid Greenhouse Gas Emissions in the United States.” NREL, February 2007.

⁴ P.E-9&10, Coito, Fred and Mike Rufo, California Statewide Residential Sector Energy Efficiency Potential Study, April 2003. and California Statewide Commercial Sector Natural Gas Energy Efficiency Potential Study, Study ID#SW061, prepared for PG&E, Fred Coito and Mike Rufo KEMA-XENERGY Inc. Oakland, CA, July 2003.

consumers may consider; for example, when compared to PV, SWH systems have a much lower initial cost. The Pilot will assess the actual barrier that initial cost presents to the penetration of SWH systems and the need for incentives to assist in overcoming any barrier that does exist.

- **Lack of Information; Cost of Search**

Consumers lack knowledge about the financial and social benefits of solar water heaters. Currently, potential SWH customers have to solicit information from many sources including libraries, websites, local utilities, contractors, etc. There is a high cost in time and effort to identify proven equipment and locate experienced contractors. There are various system types and topologies which can be very confusing for customers. Information obtained from contractors and manufacturers is not unbiased. Customers want a trusted source of information in order make informed decisions. The Pilot will assess the importance of the information barrier and determine the potential for outreach to overcome it.

- **Negative Public Perception**

Another potential market barrier is the negative experience that many users have had with SWH systems. Long-term residents may still remember the often low-quality, poorly designed and badly installed systems used in the 1980s. These systems had many problems including low performance, high failure rates and poor technical support. The Pilot program will determine to what extent these perceptions still exist and influence customer decision making, and will seek to overcome them where they do exist.

1.3.2 Program Strategies to Address Market Barriers

The following primary strategies will be used to overcome the market barriers identified above:

- **Financial incentives**

The SWH Pilot Program will provide financial incentives to help customers offset the initial cost of a solar water heating system.

- **Information and education**

The SWH Pilot Program will reduce the information and search costs for customers interested in purchasing and installing SWH systems by:

- Maintaining a website that provides up to date information on solar water heating technology and applications
- Maintaining and providing public lists of licensed installers who are trained to fulfill installation and rebate requests
- Providing information on cost effectiveness, reliability and safety of SWH systems.

- **Awareness**

The SWH Pilot Program will include extensive education, outreach and marketing activities to increase customer awareness of the features and benefits of solar water heaters. This is further addressed in Section 3 – Education, Outreach and Marketing.

1.4 Program Objectives

1.4.1 Short-term objectives

- Identify local perceptions of and interest in SWH technology
- Qualify installers for program participation
- Compile a vendor list for SWH technology and installers in San Diego
- Establish information pages on the SDREO website that help customers choose the right system based on needs and cost effectiveness
- Develop installation standards and protocols
- Achieve 750 installations in the SDG&E service territory
- Evaluate the usefulness of a SWH incentive program
- Evaluate the levels of incentive required to develop a sustainable SWH market in California
- Use knowledge gained from SWH Pilot Program administration, metering data and program evaluation to produce a program model that can be applied statewide

1.4.2 Other Objectives

The SWH Pilot Program is innovative in nature, bridging the gap between energy efficiency and renewable energy programs. As such, SDREO also plans to include the benefits that will be achieved by this program in energy efficiency terms. Listed below are the objectives from the CPUC Energy Efficiency Policy Manual that the SWH Pilot Program positively addresses:

- **Energy Savings**
The SWH Pilot Program is consistent with the CPUC directive of funding programs to produce hard energy savings. This SWH Pilot Program will set the precedent for California by identifying the actual energy savings that accrue from solar water heating.
- **Governor's and State's goals of greenhouse gas emissions reduction**

This program pursues the Governor's and State's goal of greenhouse gas emissions reduction by lowering the usage of natural gas and electricity for water heating. There are greenhouse gas emissions reductions associated with the displacement of these traditional fuel sources. These energy savings and associated emissions reductions will be calculated based on metered data and pre/post billing analysis.

- **Minimizing lost opportunities**

Customers will receive an energy efficiency information packet that includes energy saving ideas and practices, as well as information on technical assistance and incentive programs to help them implement the opportunities.

Commercial customers will be offered an energy-saving audit via existing energy efficiency and/or demand response programs. The outreach and marketing campaign aimed at attracting customers will also help make them aware of energy efficiency opportunities.

The SDREO website, which customers may need to visit in order to download the appropriate forms and information, also contains energy efficiency ideas for the home and office.

The affordable housing sector will likely require outreach that is specifically tailored to reach its owners and consumers. SDREO will look for opportunities to promote SWH to these potential participants.

- **Targeted Outreach and Education to Low-Income and Affordable Housing Sectors**

SDREO has already met with SDG&E to discuss ways to coordinate SWH Pilot Program outreach efforts with the IOU's Affordable Housing and Low Income programs.

2 Program Implementation

2.1 Program Timeline

The SWH Pilot Program will accept project applications over the course of 18 months beginning on July 1, 2007. Application submittal will be required prior to installation. The application period will end on

December 31, 2008. Incentive funding can be reserved for a period of 6 months. All systems must be installed and all final claim documentation submitted by June 30, 2009.

The following timeline of activities will occur prior to program roll-out on July 1:

- Program application process development (April 2007)
- Development of Installer Qualification Criteria (April 2007)
- RFP for Program Monitoring & Evaluation services (Independent Program Evaluator) (April 2007)
- Focus group(s) with 1) potential residential users of SWH systems, and 2) selected SWH vendors and installers (April, May 2007)
- Development of Performance Data Acquisition Protocol, together with the Independent Program Evaluator (May 2007)
- RFP for Metering Hardware and System Performance Data Acquisition Services (May 2007)
- Final Program Handbook development, including all forms and requirements (May 2007)
- Finalization of Inspection Checklist (May 2007)
- Development of Program application materials, collateral and web site content (April-June, 2007)
- Program Orientation Workshop(s) for SWH Contractors (May, June 2007)
- Applications accepted – beginning July 1, 2007

2.2 Program Reports

SDREO will follow the reporting process set forth by the CPUC.

2.2.1 Periodic Program Reporting

- SDREO shall submit a quarterly progress report to the Commission's Energy Division tracking expenditures against budget, as well as system commitments and installations.
- SDREO shall meter for the duration of the pilot, and at least 12 months post-installation, all larger systems that receive incentives on the "area method" and no fewer than 100 smaller systems paid on the "prescriptive method." The raw data and any analysis performed by the Metering Services contractor will be available for Program evaluation purposes.
- Information provided on customer affidavits, as discussed in section 2.6.7, will also be available for Program evaluation purposes.

2.2.2 Program Evaluation Reports

SDREO will hire an independent entity to evaluate the performance of the pilot program; this Independent Program Evaluator will perform technical and process evaluations and will produce assessment reports. Reporting requirements for the Independent Evaluator are detailed in Section 4 below.

2.3 Customer Eligibility

Program participation will be limited to residential, commercial and industrial customers of SDG&E. Applicants will be required to show proof of electric and/or gas distribution services provided by the utility. As a condition of participation and in order to receive incentives, customers will be required to make available their SDG&E billing data for a minimum of 12 months pre-installation and 12 months post-installation. Additionally, participants must consent to being surveyed by the Independent Program Evaluator, and must sign the final Project Cost Affidavit.

2.4 Eligible Technologies

Residential, commercial and industrial SWH systems that offset energy used by an existing natural gas or electric water heater or boiler are eligible.

Ineligible Technologies for the Pilot

Solar pool heating systems of all types, whether residential, commercial or institutional, are excluded from the SWH Pilot Program. Additional solar thermal technologies such as solar heating, ventilation and air conditioning equipment, etc. are excluded per D.04-03-017.

2.5 Incentives

Customers will be provided with two incentive options (Prescriptive Method or Area Method) to make participation easy while ensuring installed systems perform correctly. Additional details on each method are provided in Appendix A.

2.5.1 Prescriptive Method

The Prescriptive Method will be used for residential or small commercial SWH incentives and is based on an estimated system performance. Estimated system performance will be calculated using the Solar Rating Certification Corporation (SRCC) OG300 system ratings, solar orientation factors, and other inputs. In order to participate in the prescriptive method, a system must have a minimum system rating of 1,200 kWh if the solar water heating system is offsetting an electric water heater or 60 therms if the solar water heating system is offsetting a natural gas water heater. The incentive would be paid upon final

inspection of the system. 100 Prescriptive Method systems will be metered as part of the SWH Pilot Program. Incentive shall be capped at \$1,500 for prescriptive method systems.

2.5.2 Area Method

The Area Method will be used for larger and/or innovative systems. Incentives will be calculated on a “per square foot of collector” basis incorporating factors for system type and solar orientation. Collectors must have an SRCC OG100 rating. 100% of projects using the Area method will be metered and one month of successful meter data will be required to demonstrate the system is working properly.

Incentives will be paid after final inspection and verification of system performance. Incentive shall be capped at \$75,000 for area method systems.

2.5.3 Incentive Budget

The SWH Pilot Program proposes an overall incentive budget of \$1,500,000, of which \$900,000 will be allocated for prescriptive systems and \$600,000 for area method systems. SDREO will offer incentives on a first-come, first-serve basis within each category. Pending approval by the CPUC, SDREO reserves the right to shift funds if either incentive method does not perform as anticipated.

2.5.4 Incentive payment

Prior to receiving incentive payment, all systems must pass final inspection and receive final approval of incentive claim documentation. Area Method systems must also demonstrate 30 days of system performance via metering. Upon meeting final program requirements and metering requirements, if applicable, SDREO will issue incentive payments within 30 days.

2.6 Quality Assurance

Malfunctioning systems were a problem during the SWH program of the early 1980s. Several methods will be used to ensure systems installed through this SWH Pilot Program function properly for their expected lifetime.

2.6.1 Inspections

SDREO will inspect 100% of the systems installed through the SWH Pilot Program in accordance with an inspection checklist to be finalized prior to program roll-out. A draft checklist, modeled after those used by other SWH incentive programs, is provided in Appendix C. The inspection checklist is a quality assurance measure designed to guarantee that systems are installed and functioning properly prior to incentive payment.

2.6.2 Incentives paid to Installer

Incentives disbursed via the SWH Pilot Program will be paid to installers/contractors. The purpose of this is to ensure systems are functioning properly before incentives are paid. If incentives were paid directly to the homeowner, they would assume responsibility for quality assurance for a system for which they already paid their installer. Since the installer is directly responsible for system quality and performance, withholding the incentive until the system is performing as designed serves as motivation for the installer to do the job correctly. If a homeowner demonstrates an adequate reason as to why the incentive should be paid directly to them and wishes to assume responsibility for proper system operation, a payment reassignment form must be filed with SDREO.

2.6.3 Recording Project Costs

The Project Cost Breakdown is important for both the Customer and the Program Administrator to know. The Customer must be made aware of the availability of a rebate to be paid to the installer, in the expectation that this incentive will be reflected in the purchase price. Additionally, this information is required for program evaluation. SDREO will require the submission of a Project Cost Breakdown worksheet and a Project Cost Affidavit. These documents will be required prior to the issuance of any rebate. The Project Cost Breakdown requires specific detail about material costs, labor costs, permitting, inspections, etc. The Project Cost Affidavit is to be signed by both the installer and the host customer validating the accuracy of the costs listed in the Project Cost Breakdown, and will include at a minimum the installer's state contractor license number, the installed system efficiency, total system cost, and amount of the incentive payment to be paid to the installer. Information from the Project Cost Affidavit will be posted on SDREO's SWH Pilot web page and will be updated at least monthly throughout the term of the Pilot.

2.6.4 License and Permit Requirements

All systems must be either installed by appropriately licensed California contractors in accordance with the rules and regulations adopted by the State of California Contractor's State Licensing Board or self-installed by the purchaser (system owner). Self-installers are not required to be licensed, but must attend the one-day training workshop,

In order to demonstrate compliance with local and state building codes, all system will be required to submit a copy of the final building permits.

2.6.5 Installer/Contractor Training

In order to participate in the SWH Pilot Program, installers will be required to attend a 1-day training workshop. Only installers who participate in the workshop will be allowed to collect incentives from the

program. Owners who elect to self-install will be required to attend the training. SDREO will post a list of eligible installers on the SWH Pilot Program website.

The training workshop will provide an overview of the SWH Pilot Program handbook, forms, requirements and resources. The required inspection checklist and program metering requirements, including specific guidelines for metering equipment installation requirements for each type of SWH system, will also be provided to the installers. As part of the training, SDREO may require participating vendors to undergo a technical session aimed at improving the standardization of systems installed under the Pilot Program. This session would be conducted by technical staff of the SRCC, Department of Energy, or other agency dedicated to quality control in the SWH market.

2.6.6 Metering

All Area Method systems and 100 Prescriptive Method systems will be metered for at least one year post-installation. The first 3 systems installed by a given contractor will be metered. Metered systems will be selected thereafter through a process to be defined by SDREO in conjunction with the Independent Program Evaluator.

SDREO will develop the applicable metering protocols in conjunction with the Independent Program Evaluator; metering costs for required equipment will be covered by the SWH Pilot Program. SDREO will perform an RFP or RFQ for Metering Hardware and System Performance Data Acquisition Services in a time frame to allow metering equipment (i.e. in-line flowmeters and other required sensors) to be installed with the first systems upon program rollout. SDREO will coordinate installation of metering equipment with the contractors; depending on the complexity of the communications devices required, installation of data acquisition hardware may be performed by either the SWH installer or the System Performance Data Acquisition Services contractor.

As described in Section 4, metered data will be used to evaluate system performance, energy savings and appropriateness of the incentive structures. This will further aid in a determination of extending and/or expanding the SWH Pilot Program.

2.6.7 Owner's Manual

SDREO will verify that the contractor/installers have provided a detailed operation and maintenance manual to the customer at the time of the final inspection. The owner's manual should contain detail on system design and operation, including a maintenance schedule, a sequence of operations for system shutdown, warranty information and contact information for follow-on service.

2.7 Potential Program Synergies

- SDREO will investigate offering on-bill financing (OBF) through SDG&E. SDG&E's OBF program may provide important benefits to Area Method SWH systems that have a project simple payback of less than 5 years.
- SDREO will investigate partnering with SDG&E's Affordable Housing and Low Income programs.
- SDREO will look into the applicability of using low-interest CEC loans for financing larger commercial systems, and will incorporate those findings in the education and outreach efforts of the program.
- SDREO will investigate partnering with local building departments to streamline the permitting process for SWH systems. Local installers have indicated permitting can be a major road block to a timely installation.
- SDREO will investigate the use of Renewable Energy Credits (RECs) in residential applications. RECs have the potential to make SWH systems more cost effective.

3 Education, Outreach and Marketing

The SWH Pilot Program will be promoted to potential customers through a combination of education, community outreach and marketing. Due to the fact that this is a new program with untested communications channels and messages, strategies and tactics will remain flexible to allow for mid-course corrections and modifications.

SDREO will actively monitor results from these activities to determine what works best. These "lessons learned" can then be applied to any future SWH programs to improve efficiency. If one particular channel proves much more successful than others, it may be possible to improve cost effectiveness mid-program by redirecting resources toward these from activities in other channels.

3.1 Objectives

- Explain the features and benefits of solar water heating to consumers.
- Educate contractors, installers and other implementers about the SWH Pilot Program.
- Provide contractors with standardized installation approaches that will improve installation quality and uniformity for the duration of the Pilot program.
- Overcome negative public perceptions about SWH systems that persist from the early 1980's.

- Actively support manufacturer, contractor and installer marketing efforts.
- Generate qualified leads and produce actual installations.

3.2 Target Customers

- Homeowners (matched to appropriate income levels and suitability of building for SWH)
- Condominium associations
- Apartment building owners
- Commercial and public facilities and facilities managers
- SWH contractors and installers
- SWH manufacturers

3.3 Education Tactics

- Develop educational materials and curricula to support target markets.
- Conduct technical seminars, workshops and trainings for contractors and installers
- Conduct non-technical seminars for potential customers.
- Provide technical and program information on SDREO website
- The SWH technologies will be featured extensively during SDREO's "Solar Energy Week" events in 2007 and 2008.
- Highlight homes with SWH on 8th and 9th Annual Solar Homes Tours
- Workshops and trainings at SDREO Solar Energy Weeks
- Feature a large-scale installation during Commercial Solar Tour.

3.4 Outreach Tactics

- Promotion at San Diego Energy Resource Center related workshops and technical sessions
- Co-marketing with SDREO's CSI-Photovoltaic outreach efforts
- Email blasts to SDREO's internal mailing lists
- Coverage in SDREO's monthly newsletter *Energy Connection*
- Co-marketing with SDG&E outreach activities where possible. Discussions with SDG&E have identified opportunities for leveraging its contact with customers through community outreach events and CFL exchanges, on the SDG&E web site, through municipal partnership programs and other channels,
- Attendance at local and regional events in San Diego County including Earth Fair, environmental events, home improvement shows and the San Diego County Fair
- Press conference and media event for initial program launch

- Media releases and story pitches to target publications
- White papers and case studies.

3.5 Marketing Tactics

- Develop and produce program brochures or other collateral for potential customers, contractors, and program participants.
- Place print advertisements in local newspapers, home and garden magazines and trade publications.
- Provide special contractor support including materials, “identify kits”, case studies, etc.
- Web advertising on targeted local sites
- Develop commercial and PSA-type radio and television spots. Place on targeted local media.
- Cooperative marketing with other organizations including:
 - o Home improvement stores
 - o Offer to conduct education events
 - o Equipment manufacturers and installers
 - o Industry trade groups
 - o Local environmental groups
 - o SDG&E
 - o Local governments and public agencies

3.6 Other Tactics

The following activities will be closely integrated with education, outreach and marketing activities.

- All necessary forms will be available on the SDREO SWH Pilot Program website and hardcopies will be available at the SDREO office.
- To improve program efficiency and customer access, an online application system may be developed and implemented.

4 Monitoring and Evaluation

The final M&E plan will be developed in conjunction with the Independent Program Evaluator and the CPUC in accordance with R. 06-03-004.

4.1 Required Evaluation Reporting

Specific areas of interest for the Commission are stated on page 9 of the February 15 ruling; M&E reports required include the following:

- “A market impact report for the first 12 months of the pilot that includes a review and analysis of project and participant characteristics, market changes, rebate effects, supplier and installer participation, market potential, and an empirical analysis of price elasticity of demand and barriers to increasing penetration.
- An impact evaluation report to measure energy savings based on the metered data. This will include an analysis of the technical efficiency of installed systems, including reductions in billed kWh or therms, heat/energy transfer performance, and system degradation after one year.
- Cost-effectiveness evaluations as directed by the Commission in a future order on a distributed generation cost-benefit methodology.
- An examination of customer satisfaction with system performance and program administration.
- An analysis of system costs before and after the pilot program, including system payback period and return on investment and, as described in D.06-01-024, a comparison of solar water heating prices in regions with and without incentives over the course of the pilot program.

Completed program evaluation reports should be submitted to the Commission’s Energy Division within one year of contract finalization.”

4.2 System Performance Monitoring

Performance monitoring is required to fulfill a basic requirement of the Pilot: to ensure that the installed systems indeed perform up to expectations and provide real savings. 100 residences will be monitored for a period of between one and two years including at least 12 months post-installation. Metering will cover the variety of technologies installed and will capture a representative geographical distribution of the installations. In addition, all of the larger “proscriptive method” systems will be monitored. The monitoring plan is designed to promote quality control by ensuring that installations of each participating contractor are included. As part of the metering strategy, SDREO is developing metering protocols that will capture the necessary information for calculating actual energy savings for each of the main SWH system topologies available in the market. These protocols will be finalized together with the Independent Program Evaluator, potentially with assistance from the SRCC and NREL.

5 Budget

The following table details the 2007-2009 SWH Pilot Program Budget.

SWH Pilot Program			
		TOTAL	Percent
Administration and Implementation			
	Labor	\$ 638,430	25%
	Travel	\$ 5,000	0.2%
	Metering Equipment	\$ 110,000	4.2%
	Mileage	\$ 29,000	1.1%
	Incentives	\$ 1,500,000	58%
Education/Outreach			
	Marketing Materials	\$ 96,300	3.7%
	Installer Training	\$ 12,000	0.5%
Monitoring & Verification			
	M&V Contracts	\$ 200,000	7.7%
Total Program Budget		\$ 2,590,730	100%

6 APPENDIX A – Incentive Description

Incentives for Prescriptive Method

How to calculate an incentive amount for a prescriptive OG300 system:

Electricity Offset – used if existing hot water system uses electricity

$$\text{Incentive (\$)} = \$1,500 \times \text{SOF} \times \text{SRCC kWh Savings Rating}$$

Natural Gas Offset - used if existing hot water system uses natural gas

$$\text{Incentive (\$)} = \$1,500 \times \text{SOF} \times \text{SRCC Therms Savings Rating}$$

Inputs:

(SOF) – Solar Orientation Factor, assumed to be 1.0 if system is orientated within $\pm 20^\circ$ of south and within $\pm 20^\circ$ of 30° tilt. If either dimension is not within the designated parameters, an SOF of less than 1.0 will be applied according to the table in Appendix B. If multiple panels are oriented at different angles, they can be incentivized at different rates.

$$\text{(SRCC kWh Savings Rating)} = (\text{SRCC kWh savings}) / (3200 \text{ kWh})$$

Max Value = 1.0

$$\text{(SRCC therms Savings Rating)} = (\text{SRCC therms savings}) / (160 \text{ therms})$$

Max Value = 1.0

Systems must be SRCC OG300 rated.

SRCC savings ratings for various climate zones are found on the SRCC website⁵.

Climate zone determined by zip code table provided by the California Energy Commission.⁶

Minimum SRCC system ratings to qualify for program:

Gas Offset (60 therms)

Electric Offset (1200 kWh)

Max incentive - \$1,500

⁵ <http://www.solar-rating.org/ratings/annuals/annuals.htm>

⁶ http://energy.ca.gov/maps/climate_zone_map.html

Incentives for “Area” Method

How to calculate an incentive via the “Area” method:

Open Loop Systems –

$$\text{Incentive (\$)} = \$15 \times (\text{Collector area}) \times (\text{SOF}) \times (\text{SRCC Collector Performance})$$

Closed Loop systems -

$$\text{Incentive (\$)} = \$20 \times (\text{Collector area}) \times (\text{SOF}) \times (\text{SRCC Collector Performance})$$

Inputs:

(Collector Area) – Actual total area of panels to be installed.

(SOF) – Solar Orientation Factor, assumed to be 1.0 if system is orientated within $\pm 20^\circ$ of south and within $\pm 20^\circ$ of 30° tilt. If either dimension is not within the designated parameters, an SOF of less than 1.0 will be applied according to the tabulated chart in Appendix B. If multiple panels are oriented at different angles, they can be incentivized at different rates.

(SRCC Collector Performance) = (Clear day performance in kBTU from SRCC OG100 ratings) / (1,000 x Gross Area according to SRCC rating)

Collectors must be SRCC OG100 rated. Collector performance ratings are found on the SRCC⁷ website.

Installed equipment must meet freeze protection requirements set forth by SRCC. Additional freeze protection requirements may be implemented at SDREO's discretion due to San Diego's complex climate zones.

⁷ <http://www.solar-rating.org/ratings/annuals/annuals.htm>

In order to prevent system over sizing, tank size must be 1.10 gallons for every square foot of collector installed. The max collector size allowed in the program is calculated at 0.7 ft² or collector per GPD water draw. The following GPD Water draw calculations will be accepted:

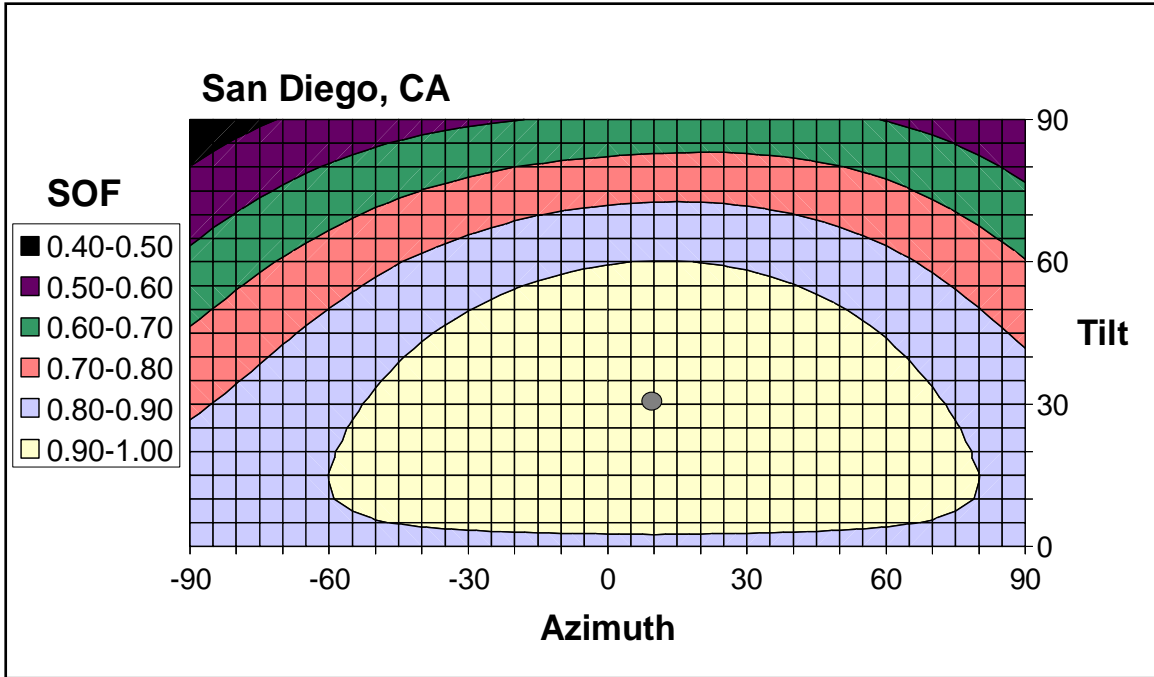
- 1. ASHRAE method - The ASHRAE method can be found in the Applications ASHRAE handbook.*
- 2. Bedroom Method - Assumes the first bedroom in a unit consumes 20 GPD, the second bedroom 15 GPD, and each additional bedroom within the unit 10 GPD.*
- 3. SDREO Approved Engineering Calculations – Building GPD calculations must be signed by a registered professional engineer, verified and approved by SDREO.*

Additional requirements for adequate freeze protection, PRV location, water flow, drain back, collector isolation for system maintenance, thermal bleed valves, etc will be detailed in the program handbook.

Max incentive closed loop and open loop- \$75,000

7 APPENDIX B – Solar Orientation Factor

Example of Solar Orientation Factor Chart for San Diego



8 APPENDIX C – Draft Installation Checklist

Draft SWH Pilot Program Installation Checklist

SWH Pilot Program Proposed Installation Checklist		
Line	Description	Requirement
1	Collector Exposure	Unshaded / Orientation
2	Multiple Collector Collection Method	Parallel
3	Collector Mounting Brackets	Manufactured / Number / Sealed / Fasteners / Secure
4	Collector Leg Sets	Manufactured / Braced / Fasteners / Secure
5	Collector Support Structure	Non-Corrosive / Spacing / Fasteners
6	Support Structure Anchoring Fasteners	Number / Location / Frequency / Secure
7	Collector Sensor Attachment	Clamped / Sealed / Taped / Location
8	Clearance from Roof	Collector / Support Structure
9	Collector Pressure Relief Valve	Watts 3L, Other
10	Roof Penetration Sealed	Piping / Electric / Fasteners
11	Roof Sealing Method	
12	Roof Piping	Supports / Adhered / Frequency / Bands
13	Roof Piping Insulation	UV Protected
14	PV Make / Model / Wire Size	
15	Collector Mounting Method	Lag / Lag with Cup / Hanger / Rod / Other
16	Tank # 1 Make / Model / Age	
17	Tank # 2 Make / Model / Age	
18	Tank # 3 Make / Model / Age	
19	Multiple Tank Collection Method	Series / Check Valve / Location
20	Tank Cover Plates / Warning Labels	Accessible / Visible
21	Tank Heat Loop	< or = to 12" / Secure
22	Tank Sensor Connection	Clamped / Sealed / Taped / Stud / Location
23	Tank Thermostat Setting	< or = to 120 deg. Farenheit
24	Tank Support	Slabs / Bricks / Shims / Stable
25	Tank TPR	Watts 100XL Other / Tight
26	Tank Overflow Line	Attached / Tight
27	Pump	UP15-18SU 0068C4 Other / Accessible
28	Controller	DOT94 GL30-LCO Other / Accessible
29	Controller Setting	Automatic
30	Time Switch	WH-40 4004-71 Other / Accessible
31	Time Switch Setting	On Off / On Off
32	Temperature Gauge / Temperature	Litro SL2D Pasco 1449 Other
33	Plumbing Material	Piping / Fittings / Valves
34	Isolation Valve Type	Ball / Isoflange
35	Isolation Valve Location	CWL / LSSL / USSL / SRL
36	Check Valve	Swing / Horizontal / Location
37	Pipe Supports	Material / Frequency / Bends
38	Fastening Hardware	Stainless Steel
39	Piping Insulation	SSL / SRL / HWL / CWL / Overflow Line
40	Wall / Ceiling Penetrations	Pipe / Wire
41	Isulation Joints	Sealed / Butted / Packed
42	System Design Type	Top / Side / Bottom / Multiple / Other
43	Overall Installation	Workmanlike
44	System	Operational
45	Inspection Results	System