



Center for  
**Sustainable Energy**  
CALIFORNIA

# Solar Water Heating Pilot Program Handbook

**OCTOBER 12, 2007**

## Updates and Changes to the SWHPP Handbook

\* If necessary, the SWHPP Handbook will be updated each Friday.

<b>August 03, 2007</b>	<ol style="list-style-type: none"> <li>1. Shading criteria: Consistent time and percentage requirements throughout the handbook - no shading 10am to 3 pm.</li> <li>2. Area Method: Program Application Requirements (section 4.1)</li> <li>3. Solar Orientation Factor: Improved parameters (Appendix B)</li> <li>4. Eligible Equipment: Participants must submit a Program Application prior to installation. (section 2.2.1)</li> <li>5. Warranty: Balance of System warranty must be no less than 1 year and provide up to 5 years, based on manufacturer's warranty (section 2.3)</li> </ol>
<b>August 31, 2007</b>	<ol style="list-style-type: none"> <li>1. Exception to "all new" equipment requirement for existing copper piping (section 2.2.1)</li> <li>2. Added items on the Inspection Checklist regarding existing piping and flushing (Appendix D, Transport)</li> <li>3. Adjusted Solar Orientation Factor (Appendix B)</li> <li>4. Restricted maximum incentive payment based on submitted estimate on the Program Application ( section 4.1 and 4.2)</li> <li>5. Reserved incentive estimate based on a SOF of 0.95 if the submitted Program Application estimate is inaccurate (section 4.1 and 4.2)</li> </ol>
<b>September 7, 2007</b>	<ol style="list-style-type: none"> <li>1. Area Method load determination and sizing calculation documentation revised. Professional engineer requirements changed to "qualified" engineer. (section 2.2.4)</li> <li>2. Incentive Reservation submittal documents added for Area Method (section 4.1)</li> <li>3. Inspection Checklist items #26 and 27 revised. (Appendix D, Storage)</li> </ol>
<b>October 12, 2007</b>	<ol style="list-style-type: none"> <li>1. Reduced maximum square footage of collector requirement per GPD hot water draw from 0.7 to 0.6 (Section 2.2.4)</li> <li>2. Changed PE to QE (qualified engineer) (Section 4.1)</li> <li>3. Revision of Forms (Appendix C, refer to version date)</li> </ol>

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# **1 Introduction to Solar Water Heating Pilot Program**

## **1.1 Program Background**

The Solar Water Heating (SWH) Pilot Program provides incentives to residential and non-residential customers who install qualifying solar water heating systems that offset energy used by an existing water heater or boiler. It also provides necessary education and training. The 18 month pilot is available to existing residential, commercial and industrial electricity 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 energy component. It will be the first ratepayer funded program that tangibly connects energy efficiency to renewable technology. Additionally, solar water heating is a measure that speaks to the concept of sustainability and specifically climate change.

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, The California Center for Sustainable Energy (CCSE), formerly the San Diego Regional Energy Office, was directed to develop a SWH Pilot Program. CCSE 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, 2007<sup>1</sup>.

The SWH Pilot Program is designed to encourage the adoption of SWH technologies by providing financial incentives to assist with installation costs, training for contractors 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 design of a statewide SWH incentive program.

The program incorporates stakeholder input. CCSE conducted a public workshop in March 2006 on SWH to solicit stakeholder input and comments. In 2007, focus groups with potential customers, installers and others provided input to refine the program design. CCSE also conducted its own engineering, administration and marketing evaluations, and interacted extensively with industry, DOE, NREL and other interested stakeholders to ensure the Pilot's approach and implementation details are reasonable, streamlined and effective.

## **1.2 Program Budget**

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<sup>1</sup> "Assigned Commissioner's and Administrative Law Judge's Ruling Approving Solar Water Heating Pilot Program", Rulemaking 06-03-004, filed 2-15-07.

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

### **1.3 Program Goals**

The SWH Pilot Program is consistent with the CPUC directive of funding programs to produce hard energy savings. Evaluation of the SWH Pilot Program will identify the actual energy savings that accrue from solar water heating.

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. These energy savings and associated emissions reductions will be calculated based on metered data and pre/post billing analysis.

### **1.4 Incentive Structure**

Customers will be provided with two incentive options: Prescriptive Method and Area Method. Residential and Small Commercial installations must use the Prescriptive Method, which is calculated on the Solar Rating and Certification Corporation (SRCC) rated savings of the system, and a design-based Solar Orientation Factor (SOF) (see Appendix B). Large Commercial installations must use the Area Method, which is calculated on the type of system installed, SRCC rated savings of collectors in various Climate Zones, and SOF. The two methods were designed to make participation easy while ensuring installed systems perform correctly. Additional details on each method are provided in Section 3 and Appendix A.

## **2 Program Eligibility Criteria and Requirements**

### **2.1 Participants in the SWHPP**

Any retail electric customer of SDG&E is eligible to install a solar water heating project and receive incentives from the SWH Pilot Program. Any class of customer (industrial, agricultural, commercial, or residential) is eligible for the incentive. The project Site must be within the service territory of, and receive, retail level electric service from SDG&E.

Participants will be required to show proof of electric 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. The preferred option will be to provide access to SDG&E Energy Waves online account information service for the relevant account.

Additionally, participants must consent to being surveyed by CCSE and/or the Independent Program Evaluator, and must sign the Program Application Form and the final Project Cost Affidavit.

This program is designed for retrofit applications. SWH systems must assist existing water heaters. All fuel sources are acceptable such as: natural gas, propane, diesel and electricity. New construction is not eligible for the program due to evaluation requirements for energy usage history.

The following are *not* eligible for incentives under the CSI program:

- Publicly owned or investor-owned gas, electricity distribution utilities or any electrical corporation (ref. Public Utility Code 218) that generates or purchases electricity or natural gas for wholesale or retail sales.
- Experimental applications of solar or solar cooling or space heating

### **2.1.1 Customer**

The Customer is the owner of the solar water heating system at the time the incentive is paid. For example, when a vendor sells a turnkey system to a property owner, the property owner is the Customer. The Customer should be designated on the Program Application Form and on the Incentive Claim Form. In the case of a third-party-owned system (or leased system, for example), the third party (or leaser) is the Customer. See section 4.1.1, Incentive Reservation for Third Party Purchases, for more details.

### **2.1.2 Contractor**

All systems must be installed by appropriately licensed California contractors in accordance with rules and regulations adopted by the State of California Contractors State Licensing Board (CSLB) or self-installed by the purchaser. Installation contractors must have an active A, B, C-4, C-36 or C-46 license. Self-installers are not required to be licensed, but must attend a one-day training workshop.

To participate in the Pilot program, eligible Contractors must qualify and be listed with CCSE. Contractors must submit the Contractor Participation Application (Appendix C), along with insurance and warranty documentation. To remain eligible, a company must resubmit this information annually by March 31. This annual submittal is required even if the information identified in the company's prior submittal has not changed. In addition, a company must submit updated information any time its reported information has changed. The updated information must be submitted to CCSE within 30 days of the change of any reported information.

Contractors are also required to attend a 1-day training workshop. Only contractors who participate in the workshop will be allowed to collect incentives from the program. CCSE will post a list of eligible contractors on the SWH Pilot Program website. Self-Installers must also attend the workshop.

The training workshop provides an overview of the SWH Pilot Program handbook, forms, requirements and resources. The inspection checklist and program metering requirements, including specific guidelines for metering equipment installation for each type of SWH system, will also be provided to the contractors. The first three sessions will be conducted by technical staff of the SRCC, Department of Energy, or other agency dedicated to quality control in the

SWH market. Remaining sessions will be conducted by CCSE staff. Technical training will be an integral part of the workshop.

Training workshops will be held monthly for the first three months, then bimonthly there after. Contractors should designate a Pilot Program Supervisor to attend at least one workshop and serve as an interface with CCSE. Contractors are encouraged to attend multiple workshops and to send multiple employees. Prior registration is available on CCSE's website and is encouraged.

Although not required, installation contractors are encouraged to become certified by the North American Board of Certified Energy Practitioners (NABCEP). For additional information on NABCEP, go to [www.nabcep.org](http://www.nabcep.org).

In all cases, systems must be installed in conformance with the manufacturers' specifications and with all applicable electrical, plumbing and building codes and standards.

The Contractor becomes the incentive reservation holder. The Customer will retain sole rights to the incentive reservation and corresponding incentive reservation project number. A reservation for a specific Site is not transferable to another address. A reservation may be transferable between the Contractor and Customer or product manufacturer, if written notification is provided of reassignment with signatures from both the Customer and Contractor.

### **2.1.2.1 Installation 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 the SWH Pilot Program function properly for their expected lifetime.

CCSE will conduct contractor/customer training to be held at the CCSE Learning Center on a monthly basis for the first three months of the program and on a bimonthly basis there after. CCSE will create a program website which includes a Program Handbook and Technical Handbook containing program requirements and guidelines. In addition CCSE will create a technical advisory board and perform system inspections using SRCC criteria (Appendix D).

### **2.1.2.2 Insurance Requirements for Contractors**

Contractors must have valid workers' compensation, commercial general liability, and business auto insurance. Valid certificates of insurance must be submitted with the Contractor Participation Application. Certificates must indicate the coverage limits, current coverage period, and Contractor's name and address. Insurance must meet the following requirements:

- General Liability - \$1,000,000 for each occurrence and \$2,000,000 aggregate.
- Workers compensation insurance or self-insurance indicating compliance with any applicable labor codes, laws or statutes, state or federal, where Installer performs work.
- Auto coverage shall be at least as broad as the Insurance Services Office California Business Auto Coverage Form (CA 00 01 03 06) covering Automobile

Liability symbols 7, 8, and 9. Specifically described autos shall include any and all autos that will be used in connection with the project. The limit shall be not less than \$1,000,000 each accident for bodily injury and property damage.

### **2.1.3 Equipment Sellers**

Equipment Sellers may be the same as the Contractor. If the Equipment Seller is not the Contractor, indicate the contact information for the Seller on the Program Application.

## **2.2 Equipment Eligibility and Requirements**

### **2.2.1 Eligible Equipment**

All system components (collectors, piping, valves, tanks, pumps, insulation and controllers) must be new and must not have been previously placed in service in any other location or for any other application. Rebuilt, refurbished, or relocated equipment is not eligible to receive SWH Pilot Program incentives. There is one exception to this rule: Replacement of an existing solar water heating system may utilize the existing copper piping, if proper rinsing and descaling is provided before the installation of the new SWH system.

Systems installed on new construction are not eligible. Participants must submit a Program Application prior to installation as based on final permit sign-off. CCSE highly encourages contractors and self-installers to receive incentive approval prior to installation of the SWH system: installation before approval of the incentive runs the risk of being disallowed.

Major system components must be listed in the submittals to SRCC for each certified system. Contractors are responsible for insuring they use only make, model and size components listed or allowed by each certification package as substitutes. Certified SRCC system components are available from the collector manufacturer. CCSE does not maintain or provide these lists.

Residential, commercial and industrial SWH systems that offset energy used by an existing water heater or boiler are eligible. All displaced fuels, natural gas, electricity, propane and diesel are allowed, so long as the client is an SDG&E electric customer.

Prescriptive Method systems must have SRCC OG300 certification. SRCC system ratings must identify the following minimum offsets to qualify for the program:

- Gas Offset – 60 Therms
- Electric Offset – 1,200 kWh

While single family residential solar water heating systems generally require use of OG300 systems, if a contractor installs a combined space and water heating system, he/she may not be able utilize an OG300 system intact. If this is the case, use of OG100 collectors is acceptable. Please see Section 4, Incentives, below for details.

Area Method systems must utilize collectors that are SRCC OG100 certified and must demonstrate sound design, as indicated by a PE's signature and supporting documentation.

Under special circumstances, systems that are SRCC OG300 certified may use the Area Method incentive calculation. See the Technical Handbook (Appendix E) for details.

Contact CCSE for clarification on any questions of system eligibility before installation. System certification ratings are found on the SRCC<sup>2</sup> website. **Please note, OG300 rated systems must be installed with only certified components. Collector manufacturers have certified component lists.**

## 2.2.2 Required Freeze and Scald Protection

All installed systems must meet freeze protection requirements set forth by SRCC. Climate Zone 7 may have recirculation loops, while Climate Zones 10, 14, and 15 require a more reliable freeze protection method. Additional freeze protection requirements will be implemented at CCSE's discretion due to San Diego's complex climate zones. Additional requirements for adequate freeze protection, PRV location, water flow, drain back, collector isolation for system maintenance, thermal bleed valves, and associated equipment are detailed in the Technical Handbook (Appendix E).

All installed systems must have scald protection. For specific equipment and design requirements, see the Technical Handbook (Appendix E).

## 2.2.3 Shading

It is strongly recommended that Contractors use a Pathfinder, Solmetric SunEye, or similar device to determine shading at the site. No portion of the collector(s) may be shaded between the hours of 10 am and 3 pm year-round. This is a minimum bar. Only systems passing this test will receive an incentive.

## 2.2.4 System Sizing

Prescriptive Method system sizing is based on the SRCC system rating:

- Normal sizing will be one SRCC OG300 system per house
  - Assumes the first bedroom in a unit consumes 20 GPD, the second bedroom 15 GPD, and each additional bedroom within the unit consumes 10 GPD.
  - If less than three persons/residence, may base sizing on number of persons, at 20 GPD/person for the first person, plus 15 GPD for the second person. Must submit proof of number of persons.

Area Method System load determination can be based on any of the following GPD water draw calculations:

- ASHRAE method - The ASHRAE method can be found in the Applications ASHRAE handbook.
- 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.

Area Method System sizing can be based on any of the following:

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<sup>2</sup> <http://www.solar-rating.org/ratings/RATINGS.htm>

- CCSE Approved Engineering Calculations – Building GPD calculations must be signed by a registered qualified engineer, verified and approved by CCSE.
- FCHART (or equivalent) software may be used to support this. If used, the Solar Fraction must be equal or exceed 60%.

Large Area Method systems can use FCHART simulations, coupled with ASHRAE or other supportable estimates of daily hot water demand. In order to prevent system oversizing, an Area Method system tank size must be at least 1.1 gallons for every square foot of collector installed. Exceptions to this requirement may be allowed if adequately defended by a qualified engineer. As a general rule of thumb, for water at 140°F, about 1.5 to 2.0 gallons of storage per square foot of collector is ideal. The maximum collector size allowed for Area Method systems in the program is calculated at 0.6 ft<sup>2</sup> of collector per GPD hot water draw.

### **2.2.5 Ineligible Equipment and System Applications**

Solar pool heating systems of all types, including spas, 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 are excluded.

Combined space and water heating systems are eligible, so long as the solar water heating portion of the system is SRCC certified.

## **2.3 Warranty Requirements**

All systems must have a minimum of a 10-year manufacturer's warranty on the solar collector(s), minimum of 1-year and up to 5-years based on manufacturer's warranty on the individual balance of system components, and 1-year warranty on installation labor and workmanship.

Standard warranty information must be submitted with the Contractor Participation Application. Manufacturer's warranties are acceptable for collectors (10 years) and tanks (5 years). Owner's manual and/or contract warranties are acceptable for collectors (if manufacturer document not provided, 10 years), balance of system components (1-5 years) and labor (1 year). Documents written by the Contractor must state the warranty coverage period, a clear description of item covered by warranty, and the Contractor's name. Warranty documentation will also be required for each submitted Program Application.

Model contractor warranties will be published on the CCSE website for consumer information and education.

## **2.4 Metering and Monitoring Requirements**

All Area Method systems and 100 Prescriptive Method systems will be metered for at least one year post-installation. At least three systems installed by each contractor will be metered. Systems will be selected for metering based on geography and type of SWH system to ensure data is collected from a diverse population of systems. 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, CCSE will implement 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.

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. Metering costs for required equipment will be covered by the SWH Pilot Program except pipe studs. CCSE 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 within a reasonable time after program rollout. CCSE will coordinate installation of metering equipment with the contractor and customer. Installation of data acquisition hardware may be performed by either an independent third party or CCSE staff.

Metering and monitoring equipment will include the following:

- Data logger/Communications module
- Flow Meter at the cold water supply
- Temperature Sensors at cold water supply, solar storage outlet, and hot water draw
- Infrared Sensor at burner of conventional gas heating source or CT on electric source
- CT or State Meter at electric load of pump, where present

Systems selected for metering will require a one-foot section of pipe be place between flanges in the cold supply for the future installation of a flow meter.

Area Method systems must demonstrate 30 days of system operation performance, via metering, prior to receiving an incentive.

## **2.5 Inspection Requirements**

CCSE will inspect 100% of the systems installed through the SWH Pilot Program in accordance with the inspection checklist in Appendix D. The inspection checklist is a quality assurance measure designed to guarantee that systems are installed and functioning properly prior to incentive payment.

The SRCC criteria are very important and contractors should read, study and incorporate all relevant criteria into their work.

### **2.5.1 Failed Inspections**

Failure to comply with program requirements results in expulsion from the program. Strikes will be issued for fraud, gross oversizing, and unresolved system malfunction, including neglecting to remedy errors in failed inspections and continued and/or repeated customer complaints.

Systems that fail inspections will be given 30 days to make corrections to bring the system in compliance with program requirements. If corrections are not made within 30 days, a strike will be issued to the Contractor. Contractors will be expelled from the program after receiving three strikes. CCSE reserves the sole right to determine what constitutes a strike.

## **2.5.2 Owner's Manual**

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

A properly designed Owner's Manual will help the customer maintain and troubleshoot the system so that it performs better and fewer calls are made to the contractor. Please see the Technical Handbook (Appendix E) for points to be covered in the Owner's Manual.

## **3 SWHPP Incentive Structure**

The Program utilizes two incentive options (Prescriptive Method and Area Method) which were developed to make participation straightforward while ensuring installed systems perform correctly. Additional details on each method are provided in Appendix A.

One contractor can have no more than \$150,000 in incentive reservations at any given time.

### **3.1 Prescriptive Method**

The Prescriptive Method applies to residential or small commercial SWH incentives and is based on estimated system performance. Estimated system performance will be calculated using the 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 or propane water heater. The incentive will be paid within 30 days upon final inspection of the system. The incentive will be capped at \$1,500 per each Prescriptive Method systems.

CCSE will allow use of the Prescriptive Method for small multifamily or commercial domestic hot water applications when such use is appropriate. However, the contractor must comply with SRCC guidelines and must not modify the certified system or substitute components, unless otherwise approved by SRCC. CCSE reserves the sole right to determine eligibility for participation and incentive amount. Written requests for consideration of unusual system applications will be considered if received before the signing of a contract.

#### **3.1.1 Prescriptive Method Incentive Calculation**

How to calculate an incentive amount for the Prescriptive Method:

**Electricity Offset** – used if existing hot water system uses electricity  
Incentive (\$) = \$1,500 x SOF\* x SRCC kWh Savings Rating<sup>+</sup>

**Natural Gas Offset** – used if existing hot water system uses natural gas  
Incentive (\$) = \$1,500 x SOF\* x SRCC Therms Savings Rating<sup>+</sup>

How to calculate the SRCC Savings Rating:

**SRCC kWh Savings Rating = (SRCC kWh savings) / (3200 kWh)**  
**Max Value = 1.0**

**SRCC therms Savings Rating = (SRCC therms savings) / (160 therms)**  
**Max Value = 1.0**

\* Please see section 3.3 for information on the Solar Orientation Factor (SOF).

+ Please see <http://www.solar-rating.org/ratings/annuals/annuals.htm> for SRCC Annual Performance of OG-300 Certified Systems

## 3.2 Area Method

The Area Method will be used for larger and/or innovative systems. Incentives will be calculated on factors of system type, collector rating, 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 before payment of incentive is made. Area Method systems must be appropriately designed and sized for their intended purpose. Applications for non-domestic water heating use must be accompanied by appropriate design and engineering calculations. Incentives will be paid within 30 days after final approval. The incentive will be capped at \$75,000 per project for Area Method systems.

### 3.2.1 Area Method Incentive Calculation

How to calculate an incentive for the Area Method:

**Open Loop Systems** –  
Incentive (\$) = \$15 x SOF\* x SRCC Collector Performance<sup>+</sup>

**Closed Loop systems** –  
Incentive (\$) = \$20 x SOF\* x SRCC Collector Performance<sup>+</sup>

How to calculate the SRCC Collector Performance:

**SRCC Collector Performance** = (Clear day performance in kBtu from SRCC OG100 ratings)

\* Please see section 3.3 for information on the Solar Orientation Factor (SOF).

+ Please see [http://www.solar-rating.org/SUMMARY/Dirsum\\_20070607.pdf](http://www.solar-rating.org/SUMMARY/Dirsum_20070607.pdf) for the Summary of SRCC Certified Solar Collectors and Water Heating System Ratings

### 3.3 Solar Orientation Factor (SOF)

The Solar Orientation Factor is assumed to be 1.0 if system is orientated within  $\pm 20^\circ$  of south and within  $\pm 20^\circ$  of  $30^\circ$  tilt. If either dimension is not within the designated parameters, a 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.

## 4 Incentive Application Process for SWHPP

Contractors are expected to file the Program Application and Incentive Claim forms. CCSE requires that a Contractor first submit a Contractor Participation Application and attend a Training Workshop.

### 4.1 Requesting an Incentive Reservation

After a Contractor has filed the Contractor Participation Application and has been approved by CCSE, the following documents must be submitted for application to the SWHPP:

- Completed Program Application (Appendix C)
- Copy of Signed Contract with Customer
- Warranty
- Preliminary Design (Area Method only)
- Load Calculation (Area Method only)
- Size Calculation (Area Method only)

The Program Application requires input of an estimated incentive. This is an estimate which may change depending on installation details and equipment. CCSE requests that estimates be as close as possible to proposed as-built systems. **CCSE will not pay out an incentive amount higher than the estimated incentive submitted on the Program Application.** Please be as accurate as possible in this calculation. If the requested incentive estimate is inaccurate, the reserved incentive estimate will be based on an assumed SOF of 0.95.

Area Method system applications must also include ASHRAE, F-Chart and QE-reviewed design documents with the Program Application. Innovative systems submitted under the Area Method will be considered on a case by case basis in regards to technical substantiation and merit.

#### 4.1.1 Incentive Reservation for Third Party Purchases

Third party purchase reservation applications should fill out the form as follows:

- Customer – Third party purchaser who is paying for the system
- Site Information, Contact name – Person contracted with Third party to purchase energy generated by the SWH system

- Contractor – Company installing the equipment
- Seller – Company selling the equipment, if different from the Contractor

The contract between the Customer and Contractor should be provided with the reservation application.

## **4.2 Incentive Reservation Approval**

CCSE will review reservation applications for completeness and current contractor registration before approval. After approval, CCSE will determine if the system will be metered. Reservations are valid for 3 months after the approval date. An Incentive Confirmation letter and Incentive Claim Form will be sent to the Contractor and the Customer. The Incentive Confirmation letter will identify the project site address, Customer, Contractor, estimated incentive level, and expiration date of the incentive. The estimated incentive level on this letter will not exceed the estimated incentive level submitted by the contractor. An incentive payment is limited by the estimated incentive level. If the submitted estimate is inaccurate, an assumed SOF of 0.95 will be used to calculate the reserved incentive amount.

A correction notice will be sent to the Contractor regarding any missing or incomplete documents. CCSE may send correction notices by fax or email, and will specify the nature of the deficiency.

## **4.3 Changes to Reservations**

### **4.3.1 Installed Equipment**

Installed equipment must be listed on the Incentive Claim Form. Any manufacturer approved substitutions to SRCC OG300 rated systems must also be listed. Any equipment changes or substitutions must be on the SRCC certification list.

### **4.3.2 Extending the Reservation Expiration Date**

Reservations may receive up to two 1-month extensions for permitting delays. Extensions require a written request from the Contractor, which identifies the reason for the delay, and must be received before the expiration date. If a project is canceled due to not meeting the reservation period (3 months), the applicant must reapply to the program.

## **4.4 Requesting an Incentive Payment**

Incentive Payment requests must include the following documents:

- Completed Incentive Claim Form (Appendix C)
- Final Inspection from City
- Project Cost Affidavit (Appendix C)
- Project Cost Summary (Appendix C)

In order to demonstrate compliance with local and state building codes, all incentive claims will require a copy of the final building permit.

The Project Cost Affidavit is signed by the Customer and Contractor and shows the total system cost and the incentive amount. Project total costs will be published on a regular basis on CCSE's website.

The Project Cost Summary will not be released locally, but will be provided to the CPUC for their program evaluation. The contractor is asked to break the cost categories down based on actual costs wherever possible. When not possible to break down by dollars, estimate the applicable cost as a percent of the total project cost so that all the costs add up to the contract amount plus rebate.

## **4.5 Incentive Payment Request Approval**

Prior to receiving incentive payment, all systems must pass final CCSE 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, CCSE will issue incentive payments within 30 days.

Incentive payments will be sent to the Contractor, unless a letter indicating otherwise is on record. Self-installers will receive the incentive directly, but must comply with all applicable laws, codes, regulations, permits, and the installation requirements herein.

## **5 Self-Installation**

Self-installations are allowed in the SWH Pilot Program. Homeowner's who choose to install a system must attend a one day training workshop on installation standards. Self-installers are also required to comply with all applicable laws, codes, regulations, permits and installation requirements listed in this handbook. Self-installers must submit proof of material purchase for the solar collector(s) and tank(s) in place of a contract with the Program Application. Self-installers will receive the incentive directly from CCSE upon successful inspection and incentive payment request submittal

## **6 Definitions and Glossary**

### **Acronyms**

**AB:** Assembly Bill

**CCSE:** California Center for Sustainable Energy (formerly the San Diego Regional Energy Office)

**CPUC:** California Public Utilities Commission

**CSI:** California Solar Initiative

**CSLB:** California State Licensing Board

**CT:** Current Transformer  
**DOE:** Department of Energy  
**GPD:** Gallons Per Day  
**kWh:** Kilowatt-hour  
**NABCEP:** North American Board of Certified Energy Practitioners  
**NREL:** National Renewable Energy Laboratory  
**PE:** Professional Engineer  
**PRV:** Pressure Relief Valve  
**SB:** Senate Bill  
**SDG&E:** San Diego Gas and Electric  
**SOF:** Solar Orientation Factor  
**SRCC:** Solar Rating and Certification Corporation  
**SWH:** Solar Water Heating  
**SWHPP:** Solar Water Heating Pilot Program  
**UL:** Underwriter's Laboratory

## **Definitions**

**Site:**

Any eligible site must be an existing building with an existing water heater. The Site must have a unique electric meter and must be an electric customer of SDG&E.

**Customer:**

An eligible customer must be the owner of the system.

**Innovative Area Method Systems:**

An innovative system includes, but is not limited to, systems which address domestic hot water demands and space heating within the same system. Innovative systems receive incentives under the Area Method.

## **7 Program Contact Information**

Mail Contractor Participation Application, Program Application, and Incentive Claim Forms to:

California Center for Sustainable Energy  
Solar Water Heating Pilot Program  
8690 Balboa Avenue, Suite 100  
San Diego, CA 92123-1502

For questions on the program call or email:

Main Office – (858) 244-1177

Program Manager, Annie Henderson

Direct - (858) 244-7290

Email - [annie.henderson@energycenter.org](mailto:annie.henderson@energycenter.org)

Energy Engineer – Skip Fralick

Direct - (858) 244-4868

Email – [skip.fralick@energycenter.org](mailto:skip.fralick@energycenter.org)

## **APPENDIX A – Incentive Description**

## Incentives for Prescriptive Method

---

**Electricity Offset** – used if existing hot water system uses electricity  
Incentive (\$) = \$1,500 x (SOF) x (SRCC kWh Savings Rating)

**Natural Gas Offset** – used if existing hot water system uses natural gas  
Incentive (\$) = \$1,500 x (SOF) x (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  $30^\circ$  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.

**(SRCC kWh Savings Rating)** = (SRCC kWh savings) / (3200 kWh)  
Max Value = 1.0

**(SRCC therms Savings Rating)** = (SRCC therms savings) / (160 therms)  
Max Value = 1.0

Systems must be SRCC OG300 rated.

SRCC savings ratings for various climate zones are found on the SRCC website<sup>3</sup>.  
The climate zone is determined by zip code table provided by the California Energy Commission.<sup>4</sup>

### Minimum SRCC system ratings to qualify for program:

Gas Offset – 60 therms  
Electric Offset – 1200 kWh

**Max incentive** - \$1,500

### Example Prescriptive Method Electric Incentive Calculation

- Helio-Flo HF 1408 G 80 AC S E
- One 4' x 8' collector, one 80 gallon tank
- SRCC Energy savings = 2900 kWh
- Assume SOF = .9
- Incentive = \$1500 x .9 x 2900/3200 = \$1,223

### Example of Prescriptive Method Gas Incentive Calculation

- Cascade ECRD-40-80-2G
- One 4' x 10' collector, one 80 gallon tank
- SRCC Energy Savings = 105 Therms
- Assume SOF = .9
- Incentive = \$1500 x .9 x 105/160 = \$886

---

<sup>3</sup> <http://www.solar-rating.org/ratings/annuals/annuals.htm>

<sup>4</sup> [http://www.energy.ca.gov/maps/building\\_climate\\_zones.html](http://www.energy.ca.gov/maps/building_climate_zones.html)

## Incentives for Area Method

---

### Open Loop Systems –

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

### Closed Loop systems -

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

### 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  $30^\circ$  tilt. If either dimension is not within the designated parameters, an SOF of less than 1.0 will be applied according 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<sup>5</sup>

Collectors must be SRCC OG100 rated.

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

### Example of Area Method Open Loop Incentive Calculation

- AE-40 Collector. Area = 39.8 sf
- Assume SOF = .9
- Clear C kBtu/Day = 42
- Incentive =  $\$15 \times .9 \times 42 = \$567/\text{panel}$

### Example of Area Method Closed Loop Incentive Calculation

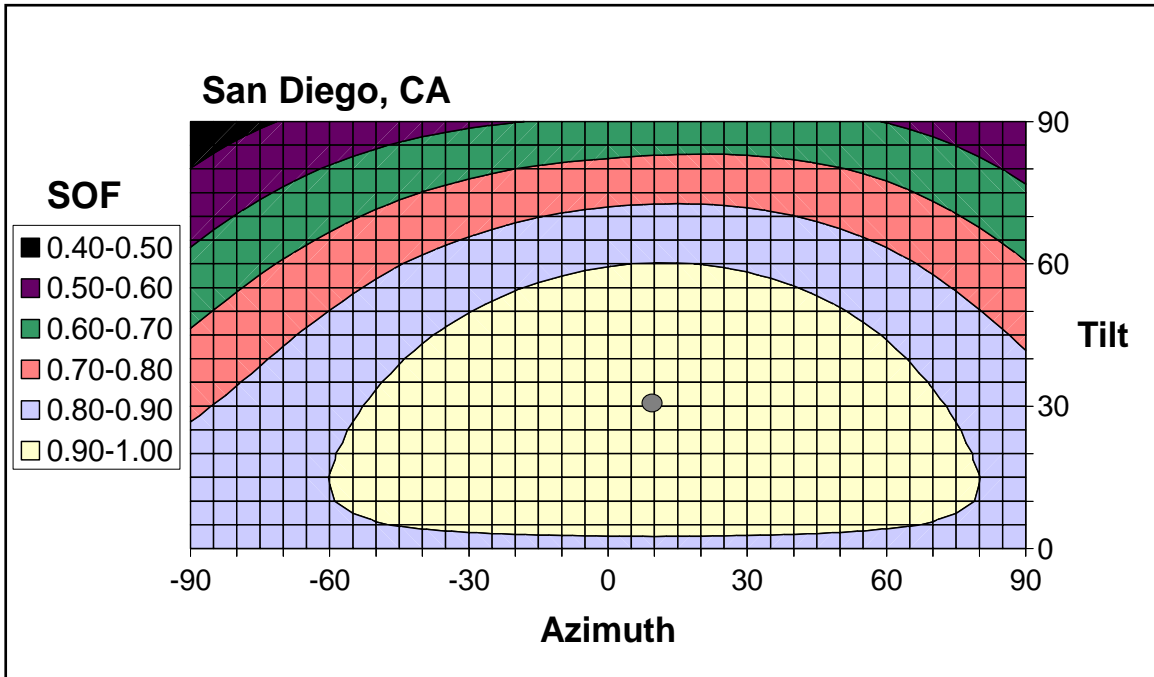
- Gobi 410 Collector. Area = 40.3 sf
- Assume SOF = .9
- Clear C kBtu/Day = 46
- Incentive =  $\$20 \times .9 \times 46 = \$828/\text{panel}$

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

## **APPENDIX B – Solar Orientation Factor**

### Example of Solar Orientation Factor Chart for San Diego



### Solar Orientation Factor Table

This table is derived from the "Solar Orientation Chart" developed by NREL.

<b>Azimuth</b>	<b>Tilt</b>	<b>SOF</b>
160°-200° True	10°-50°	1.0
135°-159° True 201°-225° True	10°-50°	0.95
90°-134° True 226°-270° True	10°-30°	0.9
90°-134° True 226°-270° True	30°-50°	0.85
135°-225° True	50°-70°	0.8

## **APPENDIX C – Program Forms**

## CONTRACTOR INFORMATION

Business Name \_\_\_\_\_ Type of Business (Corporation, LLC, Sole Proprietor) \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip code \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_

Email \_\_\_\_\_ Website \_\_\_\_\_

Owner or Principal \_\_\_\_\_ Title \_\_\_\_\_

Installation Supervisor \_\_\_\_\_ Cell phone \_\_\_\_\_

Personnel who attended mandatory Training Workshop (at least one must attend):

Name \_\_\_\_\_ Name \_\_\_\_\_

Name \_\_\_\_\_ Name \_\_\_\_\_

Business Licence #: \_\_\_\_\_

Reseller's Permit #: \_\_\_\_\_

CA Contractor's License #: \_\_\_\_\_ Date of expiration: \_\_\_\_\_

Liability Insurance Policy #: \_\_\_\_\_ Amount: \_\_\_\_\_  
(at least \$2,000,000)

Please attach a copy of:

- Standard Warranty offered with all systems
- Workman's Compensation Insurance Policy
- Liability Insurance Policy showing at least \$2,000,000 limit
- Auto Insurance proof of coverage

(over)

## TERMS AND CONDITIONS

**Indemnification:** To the fullest extent provided by law, Contractor agrees to defend, indemnify, protect and hold harmless the California Center for Sustainable Energy (CCSE), its agents, officers, managers, directors and employees, from and against any claim, action, losses, liability, proceeding, suit or liability for general, special, incidental and consequential damages, costs (including reasonable attorneys' fees) or expenses, including:

- (a) injury or death of persons, including but not limited to employees of CCSE and Contractor;
- (b) injury to property or other interests of CCSE, Contractor or any third party;
- (c) violation of any local, state or federal common law, statute or regulation, including but not limited to, environmental laws or regulations;
- (d) strict liability imposed by any law or regulation; so long as such injury, violation, or strict liability (as set forth in (a) – (c) above) arises from or is in any way connected with Contractor's performance of, or failure to perform any obligation under this Agreement, however caused, regardless of any strict liability or negligence of CCSE, whether active or passive, excepting only such loss, damage, cost, expense, liability, strict liability, or violation of law or regulation that is caused by the sole negligence or willful misconduct of CCSE, its officers, managers, or employees.
- (e) Contractor further agrees that the indemnification, including the duty to defend CCSE, requires Contractor to pay reasonable attorney's fees and any cost CCSE incurs associated with the defense of any claim, demand, action, cause of action or complaint arising from work performed by Contractor pursuant to this Agreement as well as any such fees or costs incurred by CCSE in the enforcement of this indemnification provision.
- (f) CCSE may, at its own election, conduct its defense, or participate in the defense of any claim demand related in any way to the Agreement. If CCSE chooses at its own election to conduct its own defense, participate in its own defense or obtain independent legal counsel in defense of any claim, demand or liability related to Contractor's acts or omissions under this Agreement (including without limitation, Contractor's failure to indemnify as required herein), Contractor agrees to pay the reasonable value of attorney's fees and all of CCSE's costs associated with its defense.
- (g) I understand that all single family residential systems installed for incentives must be SRCC OG300 certified, and that all commercial systems require collectors that are OG100 certified, or if appropriate, systems that are OG300 certified, and that all systems must have automatic freeze protection. I agree that I will not substitute components, or change configuration of systems from data submitted to SRCC for system or collector certification. I understand each system requires an Owner's Manual, a 10-year Collector warranty, five year warranty on other parts, and a one year Labor warranty. I agree to allow my warranty to be published to facilitate comparison by customers.

We agree not to use CCSE's logo for any profitable purpose.

## SIGNATURE

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

CCSE will notify you if your application is accepted for participation.

### FOR CCSE USE ONLY

- CA Contractors License Current
- Workman's Compensation Insurance Policy Attached
- Standard Warranty offered with all systems Attached
- Liability Insurance Policy showing \$2,000,000 limit Attached
- Auto Insurance proof of coverage
- Approved       Denied

Notes:



# SAN DIEGO SOLAR WATER HEATING PILOT PROGRAM PROGRAM APPLICATION

Project #: \_\_\_\_\_  
(for CCSE use only)

**CUSTOMER INFORMATION**  Residential  Commercial

Name Telephone Fax

**SITE INFORMATION** Owner occupied?  Yes  No • Number of occupants in proposed site: \_\_\_\_\_

Address City State Zip code

Contact Name Title Telephone

Email SDG&E Account Numbers: Electric Gas

Internet Access:  DSL/Cable Broadband  Dialup  Other  None • Wireless Network?  Yes  No Meter #: \_\_\_\_\_  
Is the system within 20 feet of a 110V power outlet?  Yes  No Electric Gas

**CONTRACTOR INFORMATION**  Self-Installed

Company Name Telephone Fax

Address City State Zip code

Project Officer Email Website

**SELLER INFORMATION** (If different from Contractor) (Use additional pages if needed)

Name Telephone Fax

Address City State Zip code

**EXISTING SYSTEM** Water Heater:  Electric  Natural Gas  Propane  Other: \_\_\_\_\_

Make Model Capacity (Gallons)

**PROPOSED SYSTEM**

Pick One:

SRCC OG300 Rating: \_\_\_\_\_ SRCC System Model Name: \_\_\_\_\_ SRCC OG300 System Number: \_\_\_\_\_ SOF: \_\_\_\_\_  
 SRCC OG100 Rating (Clear Day C): \_\_\_\_\_ SRCC Supplier: \_\_\_\_\_ SRCC Model: \_\_\_\_\_ SOF: \_\_\_\_\_

System Type: (Choose active or passive and system type)

- Active
  - 2 Tank Gas  2 Tank Electric
  - 1 Tank Gas  1 Tank Electric
- Passive
  - 2 Tank Thermosyphon  2 Tank Electric Thermosyphon
  - 1 Tank Electric Thermosyphon  2 Tank Gas ICS
  - 2 Tank Electric ICS

Is there a recirculation loop?  Yes  No  
Is this part of a hydronic heating system?  Yes  No

Collectors: Name/Model Number Storage (gallons) Type of Freeze Protection  
(Recirculation, ICS, Glycol System, Drainback)

Estimated Incentive \$ Installed Cost \$ Estimated Completion Date

# Go Solar California!

The Solar Water Heater Pilot Program is brought to you by the California Solar Initiative, a partnership between the State of California's Public Utilities Commission and the California Center for Sustainable Energy (CCSE). For information on this and other California Solar Initiative Programs, please visit [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov) or [www.energycenter.org](http://www.energycenter.org).

## CUSTOMER TERMS AND CONDITIONS

I agree to the following terms and conditions required for participation in the Solar Water Heating Pilot Program:

- (a) I understand the Program requires inspections and may require Measurement & Verification of the performance of the Measures installed. Therefore, I agree to provide access to the Project Site for these purposes to the Contractor, California Center for Sustainable Energy (CCSE), and/or its agents or assignees during the term of the SWH Pilot Program related to the Project, and to allow installation of any required M&V equipment. I also agree to allow system performance data to be transmitted over my existing internet connection, if present.
- (b) I authorize the release of my SDG&E account information to CCSE for the period commencing with the date of execution until **December 31, 2011**. Limited in duration to three years from the date of execution. Requests for account information will be accepted and processed each time requested within the authorization period specified herein.
- (c) I understand that CCSE may publish information, photos and/or performance data about my system, and my identifying information will be kept confidential.
- (d) I understand that CCSE has made no warranty or representation regarding the qualifications of the Contractor, and that I am solely responsible for the selection of the Contractor to implement the Project. I understand that the Contractor is an independent contractor and is not authorized to make any representations on behalf of CCSE.
- (e) I agree that CCSE will have no role in resolving any disputes between me and the Contractor.
- (f) I have authority to contract, on behalf of the legal owners of the Project Site, for installation of the Solar System and Monitoring Equipment, if required, or I have obtained the permission of the legal owner of the Project Site to install the Solar System and/or Monitoring Equipment under my contract with the Contractor.
- (g) I understand that the Solar System is supplied and installed by \_\_\_\_\_. I further understand that the role of CCSE is limited to making incentives for systems that qualify under the Program. CCSE does not choose or certify, and is not affiliated with, the person or entity responsible for installing the Solar System for which I am seeking an incentive.
- (h) I understand and acknowledge that CCSE, its affiliates, subsidiaries, officers, directors, agents and employees shall have no liability for general, special, incidental, indirect or consequential damages, incurred by me, or anyone claiming under me, arising from, or in any way connected with the installation or performance of any device for which an incentive is paid under the Solar Water Heating Pilot Program or CCSE's performance of, or failure to perform, this Agreement, however caused, regardless of CCSE's negligence, whether active or passive.
- (i) I further agree to indemnify, defend and hold harmless CCSE, its affiliates, subsidiaries, parent companies, officers, directors, agents and employees, from and against all claims, demands, costs, expenses and liability (legal, contractual or otherwise) which arise from or are in any way connected with any (i) death or personal injury to me or any third party; (ii) injury to my property or the property of any third party; or (iii) violation of local, state, or federal law, regarding the installation or performance of any device for which an incentive is paid under the Solar Water Heating Pilot Program or CCSE's performance of, or failure to perform, this Agreement, however caused, regardless of CCSE's negligence, whether active or passive.
- (j) I understand that the Contractor will receive the incentive payment in accordance with the terms and conditions of the San Diego Solar Water Heating Pilot Program. If I prefer, in coordination with the Contractor, I may request in writing to CCSE reassignment of the incentive payment to me.
- (k) I understand that the incentive that is shown on the reverse is an estimate only.

## CUSTOMER SIGNATURE

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

I am interested in assisting in promotional, marketing activities pertaining to this installation if requested.

## CONTRACTOR SIGNATURE (Self-sponsoring customers must sign here as well)

The undersigned participant in the San Diego Solar Water Heating Pilot Program agrees that participation in this program and receipt of any incentive payments requires the Contractor follow all guidelines and procedures established in the San Diego Solar Water Heating Pilot Program. I agree that eligibility for incentive payments is contingent on meeting the program requirements.

\_\_\_\_\_  
Name (please print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

**ATTACHMENTS:**     Signed Contract     Warranty

## FOR CCSE USE ONLY

- Contract Attached
- Warranty Attached
- Contractor Registration Current
- Approved       Denied

Notes:  
  
Selected for Metering?     Yes     No



# SAN DIEGO SOLAR WATER HEATING PILOT PROGRAM INCENTIVE CLAIM FORM

Project #: \_\_\_\_\_

**CUSTOMER INFORMATION**  Residential  Commercial

Name Telephone Fax

**SITE INFORMATION**

Address City State Zip code

Contact Name Title Telephone

Email SDG&E Account Numbers: Electric Gas

Internet Access:  DSL/Cable Broadband  Dialup  Other  None • Wireless Network?  Yes  No Meter #: Electric Gas

Is the system within 20 feet of a 110V power outlet?  Yes  No

**CONTRACTOR INFORMATION**  Self-Installed

Company Name Telephone Fax

Address City State Zip code

Project Officer Email Website

**SELLER INFORMATION** (If different from Contractor) (Use additional pages if needed)

Name Telephone Fax

Address City State Zip code

**EXISTING SYSTEM** Water Heater:  Electric  Natural Gas  Propane  Other: \_\_\_\_\_

Make Model Capacity (Gallons)

**INSTALLED SYSTEM INFORMATION**

Pick One:  
 SRCC OG300 Rating: \_\_\_\_\_ SRCC System Model Name: \_\_\_\_\_ SRCC OG300 System Number: \_\_\_\_\_ SOF: \_\_\_\_\_  
 SRCC OG100 Rating (Clear Day C): \_\_\_\_\_ SRCC Supplier: \_\_\_\_\_ SRCC Model: \_\_\_\_\_ SOF: \_\_\_\_\_

System Type: (Choose active or passive and system type)

- Active
  - 2 Tank Gas  2 Tank Electric
  - 1 Tank Gas  1 Tank Electric
- Passive
  - 2 Tank Thermosyphon  2 Tank Electric Thermosyphon
  - 1 Tank Electric Thermosyphon  2 Tank Gas ICS
  - 2 Tank Electric ICS
- SRCC-Approved Component Substitutions
  - 1) \_\_\_\_\_ Model #: \_\_\_\_\_
  - 2) \_\_\_\_\_ Model #: \_\_\_\_\_
  - 3) \_\_\_\_\_ Model #: \_\_\_\_\_

Is there a recirculation loop?  Yes  No

Is this part of a hydronic heating system?  Yes  No

Collectors: Name/Model Number Storage (gallons) Type of Freeze Protection

Installed Cost \$ Completion Date (over) Prepped for flow meter installation?  Yes  No



The Solar Water Heater Pilot Program is brought to you by the California Solar Initiative, a partnership between the State of California's Public Utilities Commission and the California Center for Sustainable Energy (CCSE). For information on this and other California Solar Initiative Programs, please visit [www.gosolarcalifornia.ca.gov](http://www.gosolarcalifornia.ca.gov) or [www.energycenter.org](http://www.energycenter.org).

### INCENTIVE CALCULATION

Use the appropriate formula below:

For the appropriate electric or gas savings per year, refer to the California Center for Sustainable Energy (CCSE)'s website, [www.energycenter.org](http://www.energycenter.org). Click on Programs, Solar Water Heating Pilot Program link. Select the Climate Zone (by zip code), and the OG100 or OG300 summary chart.

#### Residential (based on OG300 Rating)

Electric:  $\$1,500 \times \text{SOF} \times \frac{\text{SRCC kWh Savings}}{3200} = \$$  \_\_\_\_\_  
(ratio max value = 1.0)

SOF: \_\_\_\_\_

SRCC kWh savings: \_\_\_\_\_

Gas:  $\$1,500 \times \text{SOF} \times \frac{\text{SRCC therms Savings}}{160} = \$$  \_\_\_\_\_  
(ratio max value = 1.0)

SOF: \_\_\_\_\_

SRCC therm savings: \_\_\_\_\_

#### Commercial (based on OG100 Rating)

Open Loop System: Rebate =  $\$15 \times \text{SOF} \times \text{SRCC clear day kBTU/panel/day} = \$$  \_\_\_\_\_ x # of panels = \$ \_\_\_\_\_ (total)

SOF: \_\_\_\_\_

SRCC kBTU savings: \_\_\_\_\_

Closed Loop System: Rebate =  $\$20 \times \text{SOF} \times \text{SRCC clear day kBTU/panel/day} = \$$  \_\_\_\_\_ x # of panels = \$ \_\_\_\_\_ (total)

SOF: \_\_\_\_\_

SRCC kBTU savings: \_\_\_\_\_

### SEND CHECK TO THE FOLLOWING ADDRESS

Name	Title	Phone
Address	City	State      Zip code
Payee		

### CONTRACTOR SIGNATURE

Name (please print)	Signature	Date
Title		

### ATTACHMENTS

- Final Inspection from City
- Project Cost Affidavit
- Project Cost Summary

### FOR CCSE USE ONLY

- City Inspection passed
- Contractor Registration Current
- Project Cost Affidavit attached
- Project Cost Worksheet attached
- CCSE Inspection passed. Date: \_\_\_\_\_

Approved       Denied      Rebate Amount: \$ \_\_\_\_\_

Notes:

PROJECT INFORMATION

System Supplier: \_\_\_\_\_

SRCC System or Collector Model: \_\_\_\_\_

SRCC System Number (OG300): \_\_\_\_\_

SRCC System Rating (OG300): \_\_\_\_\_

SRCC Collector Rating (OG100, Clear Day, Category C): \_\_\_\_\_

System Cost, including Incentives: \_\_\_\_\_

Incentive Amount, Paid to Contractor, if Contractor-Installed: \_\_\_\_\_

Contractor Company Name: \_\_\_\_\_

Contractor License #: \_\_\_\_\_

CONTRACTOR SIGNATURE

\_\_\_\_\_  
Contractor Representative

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

CUSTOMER SIGNATURE

\_\_\_\_\_  
Customer Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Title

## INSTRUCTIONS

Contractors shall breakdown each project's costs by the following categories, the sum of which must equal the amount contracted with the customer, plus the incentive amount. The purpose is to identify cost barriers (such as permit costs) that need attention. Enter values that apply to your project.

## PROJECT COST

Permit: \_\_\_\_\_

Collector(s): \_\_\_\_\_

Tank(s): \_\_\_\_\_

Balance of System Components: \_\_\_\_\_

Labor (Installation Only): \_\_\_\_\_

Freeze Protection: \_\_\_\_\_

Warranty: \_\_\_\_\_

Other Costs: \_\_\_\_\_

**TOTAL COST:** \_\_\_\_\_**INCENTIVE AMOUNT:** \_\_\_\_\_

This information will be confidential between Contractor, CCSE, and the CPUC; however, Total Cost and Incentive Amount will be public information.

## PROJECT SITE

\_\_\_\_\_  
Customer Name\_\_\_\_\_  
Address City State Zip code

## SIGNATURE

\_\_\_\_\_  
Contractor Name\_\_\_\_\_  
Contractor Signature\_\_\_\_\_  
Date\_\_\_\_\_  
Phone

## **APPENDIX D – Inspection Checklist**

# Solar Water Heating Pilot Program Installation Checklist

Date \_\_\_\_\_

This is a copy of the final inspection by CCSE for the solar water heating system at

\_\_\_\_\_

Incentive Reservation # \_\_\_\_\_

Existing Water Heater \_\_\_\_\_  
Manufacturer Model

Please note any failed items and correct these within 30 days. Notify Skip Fralick, Energy Engineer at CCSE, by email at [skip.fralick@energycenter.org](mailto:skip.fralick@energycenter.org) or call (858) 244-4868, when corrections are complete. If CCSE is not notified within 30 days of the above date, you may lose your right to the incentive and receive a strike. After three strikes, a contractor is no longer eligible for the program.

Solar Rating and Certification Corporation (SRCC) criteria are referenced by applicable sections (e.g. 6.1.2.1) on the Instruction Sheet. Criteria can be found at [www.solar-rating.org/education/criteria.htm](http://www.solar-rating.org/education/criteria.htm)

<b>System Level</b>				
		Yes	No	n/a
1	Is the installed system consistent with the Incentive Claim Form?			
2	Are the installed components consistent with SRCC certification? See SRCC Checklist			
3	Does the system have an approved final permit inspection?			
4	Is the Owner's Manual available and adequate?			
5	Is the Warranty available?			
6	Is the system operational?			
7	Is the system protected from freeze damage? If so, how?			
8	Does the system have adequate control against overheating?			
9	Commercial only: Is the design satisfactory and signed by a PE?			

<b>Collectors</b>				
		Yes	No	n/a
10	Are the collectors unshaded between 10am and 3pm year-round?			
11	What is the Solar Orientation Factor (SOF)?	Azimuth:		
		Tilt:		
12	Are the collectors plumbed in parallel, reverse return, are balancing valves used or is alternate plumbing certified?			
13	Are the collectors supported properly?			
14	Are the collector mounting brackets secure and properly attached to roof members?			
15	Are the mounting materials non-corrosive?			
16	Are the collectors elevated above the roof?			
17	Are all roof penetrations properly attached and sealed?			
18	Are collector sensors properly attached and sealed?			
19	If storage is on the roof, are engineered roof calculations available?			

<b>Controls</b>				
		Yes	No	n/a
20	UV protection: Are sensor wires protected from UV degradation?			
21	Temperature protection: Are sensor wires separated from hot return pipe, unless rated for high temperature?			
22	Is the installed controller consistent with application?			
23	Is the installed controller consistent SRCC certification?			

## Transport

NOTE: Piping criteria are referenced by SRCC in their guidelines under the section, "Transport Subsystem Guidelines", located at the following web address:

<http://www.solar-rating.org/education/criteria/transport/transport subsystem.htm>

There are 57 specific criteria for everything from the collectors to the storage tank. They are listed in the Guidelines by Section Number and Title. Items listed below are required. See the Technical Handbook for more information.

	y	n	n/a		y	n	n/a		y	n	n/a
Operating indicators				Expansion tanks				Incompatible materials			
Solar isolation loop				Service connections				Protection from leaks			
Back thermosyphon protection				Permanent maintenance accessories				Fluid Compatibility			
Protection from UV radiation				Piping systems				Deterioration of fluids			
Heat Exchanger				Operating conditions				Buried components			
Insulation				Sound & vibration control				Underground piping			
Water shut-off				Pipe & component supports				Water hammer			
Freeze Protection				Pitch or angle of piping installation				Protection against auto-ignition of combustibles			
Fluid safety labeling				System failure prevention				Protection from thermal deterioration			
Toxicity				Contamination of potable water				Heated components			
Waste Disposal				Fire stopping				Backflow			
Combustible liquids				Penetration through fire-rated assemblies				Auxiliary system			
Liquid flash point				Fluid system sizing				Space use			
Entrapped air				Different metallic materials				Emergency egress and access			
Pressure relief				Thermal shock protection				Accessibility			
Building penetrations				Airborne pollutants				Maintenance and servicing			
Penetration of structural members				Effects of decomposition products				Protection from foreign substances			
Vacuum-induced pressure protection				Coupling hoses				Filters			
Thermal expansion				Solar degradation				Deterioration protections			
Used Existing Piping				Existing Piping Flushed and De-scaled							
24	Are the above provisions, when applicable, satisfactorily applied?										

<b>Storage</b>				
		Yes	No	n/a
25	Operating limits: Are there means to limit high temperature that could cause damage or injury?			
26	Size of auxiliary tank or heater? (0 indicates no auxiliary heater)			<u>gal</u>
27	Auxiliary tank fuel type? (Electricity, Natural Gas, Propane, None)			
28	Thermal storage: Is the installed solar storage tank consistent with SRCC certification?			
29	High Temperature Control: Is a high limit control installed on active systems? Is it set properly for the auxiliary heater?			
30	Are tanks plumbed properly?			
31	Is the expansion tank on the suction side of the pump?			
32	Is the tank accessible for maintenance?			
33	Does plumbing allow bypass of the solar system?			

Other remarks: \_\_\_\_\_

Overall result: Pass\_\_\_\_\_ Fail\_\_\_\_\_

\_\_\_\_\_  
CCSE signature

\_\_\_\_\_  
Date

CCSE Technical contact:

Skip Fralick, Energy Engineer

Direct: 858-244-4868

Email: [skip.fralick@energycenter.org](mailto:skip.fralick@energycenter.org)

## Reference Sheet

### Checklist Item

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1. Ref: 6.1.2.1 - Use only the system certified by SRCC OG-300.
2. Ref: 6.1.2.1 - Use only components or substitute components listed in the SRCC-approved installation manual
3. Every system requires a permit with a final inspection approval.
4. CCSE requires an owner's manual with specific information (See Program Handbook).
5. CCSE requires a warranty of 1 year labor, 10 years collector, and 5 years for major components (tank, pump, controller).
6. Indicated by pump running when it should, warm tank and collector return.
7. Every system must be protected from freeze damage. Recirculation freeze protection is acceptable in Climate Zone 7 if supplemented by a freeze drain valve at the collectors. Inland areas require more reliable freeze protection. ICS or thermosyphon systems may not require added protection if the SRCC Freeze Tolerance Level (FTL) is below 41°F.
8. Ref: 6.3.5, 6.1.1.1, 6.1.5.6, 6.2.1, plus code - Requires at least a high limit control, plus anti-scald device between the water heater and points-of-use.
9. No notes
10. Ref: 6.5.13 - Use a Solar Pathfinder or equivalent device to confirm no shading between 9 am and 3 pm year-round.
11. Ref: 6.5.12 - Use an inclinometer, and mag compass (available at hardware stores). Correct to True South - subtracting 13° from the mag compass reading.
12. Ref: 6.1.2.4 - If more than two collectors, must be balanced or parallel reverse return flow, unless SRCC certification allows other piping.
13. Ref: 6.5.8 - Use mounting & braces per SRCC submittal.
14. Ref: 6.5.8
15. No notes
16. Must be at least 1-inch clearance.
17. Ref: 6.5.5 – Must be per SRCC-approved manual and code.
18. Ref: 6.5.18, 6.1.2.2, 6.1.5.5 - Attached per installation manual, secure and protected from UV and rain.
19. Ref: Code - Thermosyphon and ICS systems require roof load calculations signed by a PE.
20. No notes
21. Ref: 6.1.5.2 - PV pumps must have an On/Off switch.
22. Ref: 6.1.2.7
23. No notes
24. Piping References – Clarification on item requirements can be found at <http://www.solar-rating.org/education/criteria/transport/transportsubsystem.htm>
25. Ref: 6.1.1.1 - P/T valves at tanks and isolatable collector loops. Installed per code, with proper drains.
26. Ref: 6.1.1.4 – Back-up heater must be safe.
27. No notes
28. Ref: 6.2.9
29. Ref: 6.3.5.
30. Anti-thermosyphon measure. System must have heat loop or check valve to prevent heat migration
31. No notes
32. No notes
33. Ref: 6.1.2.2

## **APPENDIX E – Technical Handbook**



Center for  
**Sustainable Energy**  
CALIFORNIA

# Solar Water Heating Pilot Program Technical Handbook

**OCTOBER 12, 2007**

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# 1 Introduction

The California Center for Sustainable Energy appreciates your participation in the San Diego Solar Water Heating Pilot Program (SWHPP). Together, we can help to combat global warming. The incentives offered through the Program are intended to improve the quality, reliability and cost effectiveness of solar water heaters in California.

CCSE strongly supports the utilization of solar energy, and we will work with contractors to improve system quality. The goal of the program is to display cost effectiveness of SWH technologies for future statewide expansion of the Program.

To be successful, every contractor must do the utmost to ensure a high quality of installation. Therefore, we have developed a tough set of requirements and a checklist, which is the key tool to ensure compliance. The checklist represents lessons learned from the past and criteria developed by the Solar Rating and Certification Corporation (SRCC), who test and certify SWH systems and collectors. The technical requirements of the SWHPP were drawn from past program experience, NREL, SRCC, and stakeholder input.

Above all, the technical requirements represent our goal that the vast majority of systems will be reliable and professional. The checklist will be enforced firmly. Contractors are urged to accompany the CCSE's inspector on the first one or two installation inspections. Contractors are also required to attend a one-day training workshop at CCSE, and are encouraged to attend more as new information will be continuously incorporated.

To understand the technical requirements and how we will interpret checklist items, please visit the following websites:

[www.solar-rating.org/education/video/2069-4-transcript.htm](http://www.solar-rating.org/education/video/2069-4-transcript.htm)

[www.solar-rating.org/education/og300education.htm](http://www.solar-rating.org/education/og300education.htm)

Key interpretations follow, but do not necessarily represent everything you need for a quality installation: SRCC's guidelines must be understood and incorporated into the system design and installation. SRCC printed documents are available at CCSE's Energy Resource Center library.

## 2 Design and Installation Criteria

System design criteria extracted from SRCC "OG-300 System Design and Installation Guidelines for Solar Water Heating Systems" provided the basis for CCSE's system design and installation requirements, as well as the SWHPP inspection checklist. At a minimum, installers must comply with the criteria necessary for OG-300 certification.

The Guidelines are divided into Collector, Transport, Controls and Storage. Please refer to the appropriate section for clarification on program requirements.

The SWHPP Inspection Checklist (Appendix D) provides a list of items to be covered in the program inspection. CCSE comments on specific SRCC Guideline items are listed below:

Reference	Comment
6.1.1.1	These provisions include of high temperature limit control, temperature and pressure relief valves, and anti-scald valves or fittings.
6.1.1.3	Glycol thermal expansion tanks must be on the suction side of the pump.
6.1.1.4	The backup heater must be safe.
6.1.1.5	A one-foot piping loop, or check valve will normally suffice.
6.1.1.6	Avoid oversizing pumps that cause over 2-3 ft/sec fluid flow.
6.1.1.9	Design to withstand extended Stagnation conditions. Design to withstand freezing conditions with power outage.
6.1.1.11	Use corrosion-resistant materials.
6.1.2.1	OG-100 certified collectors are required for large commercial systems. All other systems require OG-300 certification.
6.1.2.2	Paint or otherwise protect components from UV and weather degradation.
6.1.2.4	Plumb as shown in the Installation Manual certified by SRCC.
6.1.3.2	Add a heater blanket if insulation value is less than R-16.
6.1.3.6	Ethylene glycol systems require 2-wall heat exchangers, with leak visibility. Food grade propylene systems and distilled water systems require a one-wall heat exchanger.
6.1.5.2	Provide labels and guidance per SRCC-approved installation manual.
6.1.5.4	If not high temperature wire, must not be in contact with hot pipe.
6.1.5.6	Must use anti-scald valve or devices at points-of-use.
6.1.6.3	Paint exterior pipe insulation with exterior latex paint or better.
6.1.6.5	Provide a bypass of the solar system.
6.1.6.6	As depicted on the SRCC-approved system schematic.
6.2.1	Open systems are most vulnerable to stagnation blow-off or leakage.
6.2.3	Use temperature-limiting devices to reduce stress on components.
6.2.4	Use dielectric unions on copper/iron connections. Use components and materials that will not cause dissimilar metal corrosion.
6.2.5	Freeze protection is required in all areas of the SDG&E service area. The type of freeze protection required must be more reliable as one proceeds inland to the mountains.
6.2.7	Fluids that may deteriorate over time must be identified, with adequate instructions for periodic servicing.
6.2.8	Use only fluids specified in the SRCC-approved installation manual.
6.2.10	Buried piping must be protected from leaking ground water.
6.3.4	Recirculation freeze protection will be allowed in Climate Zone 7 only, and must be supplemented with a dribble-type freeze valve at the collector.
6.3.5	A high temperature limit control is required on active systems
6.3.9	Must be as shown on SRCC-approved system schematic.
6.3.16	Required on open collector loop if isolatable, plus auxiliary heater.
6.4.5	Give instructions for collector cleaning in the owner's manual.
6.5.2	Especially do not bypass the anti-scald valve.
6.5.13	There must be no shade between 10am and 3pm year-round.
6.5.14	Hangers must not pose a dissimilar metal corrosion threat.
6.5.15	Required for drainback systems.

## **3 Freeze Protection**

Automatic freeze protection is required in all areas of the San Diego Region. Freezing can occur in collectors when the ambient temperature is as high as 42 °F. Recirculation freeze protection is required in Climate Zone 7. Drainback or closed-loop glycol are the required freeze protections for Climate Zones 10, 14 and 15.

### **3.1 Recirculation**

Recirculation freeze protection will be acceptable in Climate Zone 7 (Coastal) only, if accompanied with a dribble valve. Recirculation freeze protection entails two risks:

- if the winter temperatures are cold and/or the freeze sensor is inaccurate, the energy losses can be high due to the frequent nighttime running of the pump
- if power is lost in near-freezing conditions, the pump will not operate and freeze damage might occur.

There is a greater risk of freezing and loss of power with higher elevation and the more remote the location of the installation.

Another risk associated with recirculation freeze protection systems (open systems) is stagnation during summer or periods of low use. This risk is discussed in Section 6, Stagnation, below.

### **3.2 Drainback**

The most reliable freeze protection may be a drainback system, if properly sloped to drain back to a small reservoir. Drainback systems drain the water from the collectors when the pump shuts down. The added benefits of a drainback system include the elimination of scalding, scaling, and collector relief valve blowoff, which might occur during vacations or times of low use especially in the summer. In sunny conditions, drainback systems pump water through the collectors, and heat is then transferred from the collector water to the potable water supply via a heat exchanger.

### **3.3 Glycol System**

Another option is a glycol system (closed loop), which uses glycol in the collector loop. Most jurisdictions require a double-walled heat exchanger if the fluid is toxic (like ethylene glycol) because the glycol must be separated from the potable water supply to prevent intermixing of the fluids if leaks occur. If FDA Food Grade nontoxic propylene glycol is used in San Diego City, only a one-wall heat exchanger is needed. An expansion tank is required for pressurized fluid in the closed loop. Glycol systems require periodic maintenance, and are subject to breakdown if exposed to high temperature. Maintenance requirements must be clearly explained in the owner's manual, and maintenance service should be included in the contract.

### **3.4 Integrated Collector/Storage**

Integrated Collector/Storage (ICS) systems may not require freeze protection due to their large thermal mass. However, all systems require additional automatic freeze protection if their SRCC OG-300 system rating for the climate zone of the site shows a Freeze Tolerance Level (FTL) above 41°F. Thermosyphon systems or ICS systems may not use electric resistance freeze protection.

## **4 Shade**

There must be no shade between 10am and 3pm year-round. Contractors are urged to invest in a Solar Pathfinder, SolMetric SunEye or similar shade calculating device for sites where there might be shade. These devices show times of day and seasons when the collector will be shaded, and estimate the percentage of annual loss. CCSE will inspect with a Solar Pathfinder. The no-shade requirement will be strictly enforced.

## **5 Scalding**

Anti-scald protection is required for all systems receiving an incentive under the SWH Pilot Program. It may also be required for a plumbing permit in some jurisdictions.

Scalding is a serious risk. Over 23,000 children under age 4 were scalded by shower or bath water in 2006. This was with conventional water heaters and normal temperature set points. A solar heating system can add 10°F to 50°F to the set point temperature.

Scalding is an especially high risk for young children, senior citizens, or invalids. A person can suffer third degree burns in 3 to 5 seconds if exposed to 140°F water. The worst case is a solar system that feeds hot water to end use points with no intermediate anti-scald valves. This effect is especially a concern when a system is oversized. This can happen with either a single tank or a two-tank system. It is most dangerous in summer during a period of low hot water use and hot air temperatures. Solar temperatures can reach as high as 180°F (higher if it is an evacuated tube installation).

In the past, it was common to see Watts tempering valves installed on the hot out pipe from the auxiliary water heater. These provided some degree of scald protection, but are not true "anti-scald" valves. To be called "anti-scald", the valve must have been certified to ASSE 1016 standard. True anti-scald valves respond more safely to pressure or temperature changes.

Anti-scald devices have improved over the years and, in addition to anti-scald mixing valves, there are simple faucet and showerhead fittings that protect against scalding, and are easily attached. Modern mixing valves may be capable of higher temperatures before failing. Contractors are required to install anti-scald devices, either as a mixing valve downstream from the water heater, or at points-of-use. To reduce call-backs due to "no hot water", it

behooves the Contractor to spend a bit more for devices that can withstand higher temperatures.

## **6 Stagnation**

Stagnation is also a serious risk. It may lead to equipment damage or injury from scalding. Stagnation occurs in open systems when the pump stops running in a hot condition, and the water in the collector boils off. This hot water can damage roof asphalt tiles or sealant used for roof penetration. If there is a risk of this happening, a temperature and pressure relief valve is required at the collector, with a drain to a safe area that won't cause damage to the roof or injury to persons.

Conditions conducive to stagnation are:

- Hot summer days, with little or no hot water consumption
- An efficient collector
- A high limit control shutting the pump off when the sun is heating the collector

A risk of scalding occurs when the collector stagnates and boils off. If the pump comes on while someone is using hot water, a plug of scalding water could be sent through the hot water line to the point of use.

The ideal protection is a drainback system. Drainback systems allow the water in the collector loop to drain back into a small storage tank whenever the solar loop pump is shut down (e.g., when the high temperature limit is reached). If there is no water in the collector loop, boil off can't occur.

Another way to reduce the risk of stagnation in an open system is to require the owner to partially drain the collector loop whenever the risk is high (e.g., going on vacation and periods of less use) If this is the only means of preventing stagnation, it must be clearly explained in the owner's manual.

## **7 Roof Loading**

San Diego code officials require a structural engineer to sign calculations for roofs if the roof load exceeds 5 lbs/ft<sup>2</sup>. The roof load limit is not a factor for active systems: systems with only the collector and mounting and plumbing hardware on the roof. However, thermosyphon and ICS require roof load calculations based on the roof structural layout. Information on roof mounting can be found at SRCC's website, <http://www.solar-rating.org>.

## **8 Metering**

Metering protocols will be implemented by CCSE to attain the necessary information to analyze system performance. This data will be analyzed by a third party and presented to the CPUC.

Systems selected for metering must install a one-foot length of pipe between flanges for the future installation of a flow meter.

## 9 System Sizing

The Solar Water Heating Pilot Program relies on SRCC collector ratings (OG-100), System ratings (OG-300), and system installation guidelines. SRCC collector testing and system certification procedures are useful for comparing one residential system to another on a Btu's per dollar basis, but should not be used to predict performance for any one person or family.

All system designs submitted to SRCC for OG-300 certification are evaluated using a sophisticated computer program and assuming a daily hot water draw of 62.4 gallons a day, typical for a family of about 4. A client's consumption and draw pattern may differ from test conditions and result in a difference in annual savings. If there is only one person using 20 GPD, a system that shows a large annual savings compared to other SRCC certified systems, may cause overheating. It is suggested that a smaller or less efficient system be selected, if a client consumes considerably less than the typical home. Many manufacturers and system integrators have numerous systems certified. This is done, in part, to cover a range of household demands.

## 10 Owner's manual

A manual or manuals must be provided with each SWH system. The manual should contain the following items:

- Name, address and phone number of the system supplier
- System model name or number
- Description of the operation of the system and its components
- Procedures for installation, operation and maintenance, including start-up, routine maintenance and special conditional operations such as drain-down
- System diagram showing the components
- Instructions for emergency valve shut off for different sections of the system
- Instructions for leaving the system unused for long periods of time
- A comprehensive maintenance plan
- If appropriate, identify the fluid(s) used in the SWH system and state whether or not the fluid(s) are toxic or hazardous and proper procedures for handling, safe disposal, and first aid. Provide a technical data sheet for each non-water fluid used in the system. Provide a description for maintaining the heat transfer fluid's chemical composition at levels adequate to prevent unacceptable deposits on the heat transfer surfaces, corrosion of the heat transfer surfaces or loss of freeze resistance.
- A copy of the warranty

## 11 Contacts

Program questions contact:  
Annie Henderson, Program Manager  
858-244-7290  
[Annie.henderson@energy.org](mailto:Annie.henderson@energy.org)

Technical questions contact:  
Skip Fralick, Energy Engineer  
858-244-4868  
[Skip.fralick@energycenter.org](mailto:Skip.fralick@energycenter.org)