California Solar Initiative
Thermal Program

Contractor & Self-Installer Workshop
Housekeeping

• Please sign in
• Turn off/silence cell phones
• Recycle
• Restrooms
• In case of emergency....
Today’s Agenda

• Introduction to the Program
• Incentives
• Eligibility Requirements
• Overview of Technologies
• Application Process & the Calculator
• Technical Requirements & Inspection Checklist
• Distribution of Contractor Keys
Purpose of Workshop Training

- Training is required for contractors and self-installer participation in CSI-Thermal
- Provide details of CSI-Thermal Program

...not a “how-to” install/design/sell SWH systems.
INTRODUCTION TO CSI THERMAL PROGRAM

Welcome…
Major Program Goals

- Significantly **increase the market size** of the Solar Water Heating (SWH) in CA

- **16% reduction in the cost** of SWH systems by 2018

- **Reduce barriers to adoption**
  - high permitting costs, lack of trained installers, lack of consumer knowledge and confidence in technology
Important Program Updates

Recent changes as of 2015:

• Increased incentives for SF & MF/Comm
  Retroactive to July 23, 2014

• MF/Comm cap from $500,000 → $800,000

• Incentive Cap on Pools...50% system cost
INCENTIVES
Incentive Budget

Total: $305,000,000 (all utilities)

- **Natural Gas:** $180M
  - 60% Multi-Family/Commercial
  - 30% Solar Pools
  - 10% Single-Family Residential

- **Low-Income:** $25M

- **Electric:** $100.8M (funds exhausted)
Incentive Steps

• 4-Step declining incentive structure
• Steps move independently by
  • Customer Class
  • Program Administrator

Trigger Tracker: www.csithermal.com/tracker
## Incentive Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Single-Family</th>
<th>Multi-Family/Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Capped at: $3,710</td>
<td>Capped at: $4,741</td>
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<tr>
<td>3</td>
<td>$14.30</td>
<td>$21.35</td>
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<tr>
<td></td>
<td>Capped at: $2,091</td>
<td>Capped at: $3,122</td>
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<tr>
<td>4</td>
<td>$3.23</td>
<td>$10.28</td>
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<tr>
<td></td>
<td>Capped at: $472</td>
<td>Capped at: $1,503</td>
</tr>
</tbody>
</table>
CSI THERMAL PROGRAM:
Definitions, Eligibility & Other Requirements
Definitions of Project Stakeholders

“Host Customer”:  
- Utility “customer of record”  
  - Natural Gas Customer of PG&E, SDG&E, SCG  
    - Residential = Residential utility rate  
    - MF/Commercial = Appropriate rate

“Solar Contractor”:  
- A, B, C-4, C-36, C-46 or C-53 License  
- Must attend one day workshop (today!)
Definitions of Project Stakeholders

“Self-Installer”:

- Homeowners or building-owners who choose to install a SWH system on their own property.

- *Host Customer + Applicant.*
End Use Eligibility: SF Residential

**Domestic Hot Water (DHW):**

- Water used, in any type of building, for domestic purposes.
  - Drinking
  - Food Preparation
  - Sanitation
  - Personal Hygiene

*Water that goes down the drain.....does not include space heating/cooling, or swimming pool heating*
End Use Eligibility: MF/Comm

**Consumed End Uses:**
- SWH applications that directly consume the solar heated potable water, as opposed to using the solar heated water as a medium to carry heat for some other end use. **PBI req. >250kWth**

**Process Heat:**
- Solar water heat that is transferred for another use; not directly consumed. For ex. Space heating, cooling, other processes. **PBI**

**Commercial Combination Systems:**
- Any combination of consumed and process heat end uses. **PBI**

**Non-Residential Pools:**
- As of 1/15/2014. **No PBI option.**
Definitions of “Site”

- Each “Site” is considered its own project.
- Each project has capped incentive amounts.
- So there’s no confusion about the application of the incentive caps, there are specific definitions of “Site” for *Multi-Family and Commercial* projects.
Definitions of “Site” – MF/Comm

**Multi-family/Commercial:**

- **The Host Customer’s premises**, consisting of all the real property and apparatus employed in a single enterprise on an integral parcel of land undivided, *except* in the case of industrial, agricultural, oil field, resort enterprises, and public or quasi-public institutions divided by a dedicated street, highway or other public thoroughfare or railway.

- Automobile parking lots constituting a part of and adjacent to a single enterprise may be separated by an alley from the remainder of the premises served.

- **Separate business enterprises** or homes on a single parcel of land undivided by a highway, public road, and thoroughfare or railroad would be considered for purposes of CSI-Thermal Program as separate sites.

**Note:** *The total incentives for multiple systems on one multi-family/commercial site cannot exceed the incentive cap per customer class*
Energy Efficiency Requirements

Energy Efficiency Survey: Audit required for all existing residential and commercial buildings

-or-

Title 24 energy efficiency compliance

- Must have been performed during the past three years

- Acceptable surveys: online, telephone, or onsite audit provided by the utilities, Program Administrators, or a qualified independent vendor or consultant
SF Low-income Qualification

- Site must be occupied by the homeowner and/or applicant
- System must be owned by the homeowner
- Registered in a Energy Savings Assistance Program (ESAP)
- Resale restriction: property will be required to remain low-income for at least 10 years from the time of the SWH system installation
MF Low-income Qualification

- The benefits of the SWH system must be passed to the low-income residents through reduced energy costs
  - Applicant will need to provide an Affidavit explaining how
  - The total value of the benefits provided to the tenants shall be no less than 30% of the total incentive amount

- Property Must meet one of the following:
  - Definition of low-income residential housing in Public Utilities Code (PUC) Section 2861(e)
  - At least 50% of all units are occupied by ratepayers that are participating in a Energy Savings Assistance Program (ESAP)
Metering Requirements – 2 types

- **Customer Performance Metering**
  - System owner knowledge of system performance
  - Required for systems >30kWth

- **PBI Monitoring**
  - Required for systems >250kWth, Process, Combination
  - Metering Plan required with Application; PE sign-off
  - Performance Data Provider (PDP) must collect metering data and submit to program monthly for 2 years
Permit Requirements & Notes

• All SWH projects must receive a permit*
  • *Some jurisdictions do not require a permit for certain types of work. A letter from the AHJ stating no permit required would suffice.

• Contractors should be familiar with local code requirements

• Eligibility for applying for incentive is valid up to **24 months** after date on final permit sign-off
Single-family Residential: SRCC OG-300 or IAPMO System Certification

- Installation must match OG-300 configuration exactly
  
  With the following Exceptions:
  
  - Allow for tank → tankless
  - Allow for Solar Storage tank substitution if Gallons and R-Value ≥ certified tank

Multi-Family/Commercial: SRCC OG-100 Collector Certification

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SRCC = Solar Rating & Certification Corp: www.solar-rating.org

IAPMO = International Association of Plumbing and Mechanical Officials: www.IAPMO.org
Eligible Equipment

All SWH Components must be new and unused, *except* for the following components:

- De-scaled copper piping & used racking
- Existing Storage tanks in multi-family/commercial projects
  - The tank must be in **workable condition** with no leaks.
  - The tank must have **at least R12 insulation**.
  - The tank can be **plumbed to the solar system without impairing the functioning of the solar or auxiliary systems**
Warranty Requirements

Collector Manufacturer: 10-year minimum

Contractor:

• 1-year minimum on installation labor and workmanship
• 10-year minimum to protect the purchaser against an excess of 15% degradation of system performance due to faulty installation
OVERVIEW OF SOLAR WATER HEATING TECHNOLOGIES
Basic Components

a) Solar Collector
b) Sensors, Controller
c) Pump (Active Systems)
d) Solar Storage Tank

Source: Schuco
Unglazed Flat-Plate Collector
(typically used for pool heating)

Solar pool heating systems eligible for multifamily/commercial as of Jan. 2014

Source: FAFCO
Son Energy
Pools: Unglazed Solar Thermal Collector
Glazed Flat-Plate Collector

Source: EERE

Butler Sun Solutions
Evacuated Tube Collector

Source: Apricus

www.apricus-solar.com

CleanTech
Concentrating Collectors
Air Heating – New!
Solar Water Heating Process Map

Solar Water Heater Types

Open Loop (Direct)
- Active
  - Direct Forced Circulation
  - Direct Drain back (pools only)
- Passive
  - Integral Storage Collector (ICS)

Closed Loop (Indirect)
- Active
  - Indirect Forced Circulation
- Passive
  - Thermosiphon

Not eligible systems for incentives
Passive System: Integral Collector Storage (ICS)

- Passive System
- Open loop

Source: EERE
Passive System - Thermosiphon

Closed loop glycol –
Eligible

Open Loop potable
NOT eligible

Source: FSEC
Active System – Direct Forced Circulation

• Open loop system (aka Recirculation)

Not eligible

Direct Forced Circulation
Open Loop

Source: FSEC
Active System – Indirect Forced Circulation: Closed Loop Glycol or Water

Closed Loop High Pressure, Built In Heat Exchanger
Active System – Indirect Forced Circulation Closed Loop Drain Back
Active System – Direct Drain back
(Typical pool system)

POOL

✓ Eligible
Ineligible Systems (not eligible for incentives)

Combination systems that violate the OG-300 certification or single family residential sizing guidelines.

Direct Forced Circulation, Open Loop Thermo-siphon systems

Recipients of previous incentives

*A SWH system that replaces a SWH system which previously received an incentive through the CSI-Thermal Program
Sizing Parameters
System Sizing: **Single Family**

- Single Family Projects – size according to Gallons of hot water used per day (GPD)
  - Number of occupants
    - 1\textsuperscript{st} person = 20 GPD; 2\textsuperscript{nd} person = 15 GPD; Each person thereafter = 10 GPD

- Collector Sizing
  - Cannot exceed 1.25 ft\(^2\) of collector area per GPD
System Sizing: Single Family

Single Family project example:

- 3 occupants
- 45 gallons of hot water per day (20+15+10)
- Collector Area: Cannot Exceed 56.25 (45 X 1.25)
System Sizing: MF/Commercial

There are several options that can be used for GPD sizing of Multi-family/Commercial projects...
Option 1 – Use Handbook

- Multi-family (MF)/Commercial Projects – Annual average GPD is estimated based on the Maximum GPD Guideline Table (Appendix E) of the CSI-Thermal Handbook.

- SWH systems for the building types listed in Maximum GPD Guideline Table may be sized using the GPD value in this table. The GPD values in the table are maximum values. Systems may be sized using a lesser GPD assumption.
System Sizing: MF/Commercial

Option 2

- Building types **not** listed in the Maximum GPD Guideline Table must do one of the following (may also be used for building types in Maximum GPD Table):
  
  - **Meter hourly actual hot water consumption** using a flow meter with accumulator for an appropriate period of time to capture the full range of usage and adjust for seasonal variability to obtain an annual average GPD and hourly usage profile. Hot water consumption calculation and explanation must be stamped by a P.E. Refer to Appendix H for more information.
  
  - **Meter hourly natural gas, electric, or propane consumption** at the water heater for an appropriate period of time to capture the full range of usage and adjust for seasonal variability to obtain an annual average GPD and an hourly usage profile. Water heater gas, electric, or propane meter consumption calculation and explanation must be stamped by a P.E. Refer to Appendix H for more information.
Option 3

- New Construction Only
  - Since metering cannot be performed, estimated annual average GPD and hourly usage profile calculations may be submitted. Estimates must be stamped by a P.E. Refer to Appendix H for more information
System Sizing: MF/Commercial

Option 4

• Small Systems for Building Types not in Appendix D
  • For systems with less than 85 square feet of collector area which are not OG-300 certified.
  • Applicants may select the “Small Commercial System” option in the CSI-Thermal database and calculator.
  • The applicant must then select the building type whose load profile best represents the building hot water usage.
    • For example; if the business has 9:00 am -5:00 pm weekday hours, the Office Buildings load profile should be selected. The calculator will assume a hot water load of 64.3 GPD
Custom Load Profile

- A load Profile must be created from the metered data
- The load profile must show hourly hot water gallon demand for a typical year (8760 hours)
  - Hourly Hot Water Gallon Demand: Hour number one must represent the first 60 minutes of the first day of the year from midnight-1:00 am
  - Hot Water Draw, Gallons Per Hour: Gallons consumed in a given hour
  - Recirculation Loop Pump Status: On (1) or off (0) in a given hour
- Data file is uploaded to the multifamily/commercial calculator in tab delimited format
Collectors and Tank Sizing: MF/Comm

- Collector square footage cannot exceed 1.25 times the GPD
- Storage tank volume minimum of one gallon of storage per square foot of collector
- One-tank systems must have a minimum of 1.25 gallons of storage per square foot of collector
Storage Exceptions: MF/Comm

• Reduced solar storage tank volume may be justified under some circumstances as long as overheat protection is maintained.

• For systems not meeting the solar storage volume requirements:
  • Must provide documentation justifying the reduced storage and indicating how overheat/stagnation will be prevented
  • Must be stamped and signed by a State of California licensed Professional Engineer (P.E.)
PBI System Sizing

- Any system >250kWth, process or combination systems, shall be sized by applicant with documentation that justifies sizing and estimated savings
  - Must be stamped and signed by a State of California licensed Professional Engineer (P.E.)
INCENTIVES CALCULATIONS & APPLICATION PROCESS
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Incentive Tracker

www.csithermal.com/tracker
Incentive Payments

Residential (all) and MF/Comm (≤ 250kWth)

Lump Sum Payment

- One-time payment to the designated Payee
- Based on estimated therm savings provided by the CSI-Thermal Calculator
- Paid after project is completed, approved, and inspected (if applicable)
- Includes non-res pool projects
PBI Incentive Payments

- **Systems > 250kWth**
- **Process Heat & Combination Systems**

**PBI Payment:**

- Payment made over 2 years:
  1) Paid Quarterly based on monitored, metered performance
     - Performance Data Provider (PDP) must collect metering data and submit to Program monthly for 2 years
  2) Program will not pay >100% of estimated incentive in Application (Reserved Incentive in RRF)
# PBI Incentive Payments

- **Systems > 250kWth**
- **Process Heat & Combination Systems**

<table>
<thead>
<tr>
<th>Step</th>
<th>Incentive per therm displaced</th>
<th>Maximum Incentive for Commercial/Multifamily solar thermal projects</th>
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<tr>
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<tr>
<td>4</td>
<td>$1.57</td>
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HOW IT WORKS:

SINGLE FAMILY 0G-300 SYSTEMS - INCENTIVE CALCULATOR
Calculation of Single Family Incentive

4 Factors:
1. SRCC estimated annual energy savings, based on the CEC climate zone of the project site
2. Incentive at the time the Incentive Claim Form is approved
3. Surface Orientation Factor (SOF), which includes the azimuth and tilt of the collectors
4. Shade Factor

**Incentive Calculation Formula:**

\[(SRCC \text{ OG-300 estimated annual energy savings}) \times (\text{Incentive}) \times (\text{SOF}) \times (\text{ShadeFactor})\]

\[= \$ \text{ Incentive Amount}\]
Example: SF Incentive Formula

1. Annual Energy Savings = 125 therms
2. Step 1= $29.85/per therm saved
3. Surface Orientation Factor= 1.0
4. Shade Factor= 98% solar availability

**Calculation:**

125 therms x $29.85 x 1.0 x 0.98 = $3,656

✓ The CSI Database makes this calculation for you! Just enter the correct information.....
Shade Factor

- Measures the average annual solar availability of the collector(s) between 10am to 3pm.
- For each percentage below 100% on the collector(s) between 10am and 3pm, there will be an equal percentage reduction in the system incentive payment.

*Example*: 95% solar availability between 10am and 3pm = 5% incentive reduction
Shade Tools: Solmetric SunEye
Shade Tools: Solmetric SunEye

- Visually demonstrates seasonal sun path and shading effects of obstructions
- Summary tabular data
Tilt and Azimuth

**Tilt**

**True Azimuth**

Magnetic North on a Compass

Ex. 30°
Magnetic Declination Correction

Look up magnetic declination for specific location at: www.ngdc.noaa.gov/geomagmodels/Declination.jsp

Enter in zip code, and it will calculate the magnetic declination for that location.

For example:

If you are in San Francisco and your compass shows you a reading of 180° you would look up the zip code (e.g. 94105) and add the given correction for magnetic declination of 14° to get a true azimuth of 194°
OG-300 SF Incentive Calculator

www.csithermal.com

Fill in one of these

<table>
<thead>
<tr>
<th>Field</th>
<th>Options</th>
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<tbody>
<tr>
<td>System SRCC Number</td>
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<td>Manufacturer</td>
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<tr>
<td>System type</td>
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<tr>
<td>Application Type</td>
<td>Single Family Residential, Multi-Family Residential or Commercial</td>
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<tr>
<td>Site zipcode</td>
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<tr>
<td>Backup Water Heater Type</td>
<td>Gas, Electric</td>
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<tr>
<td>Azimuth (using True north)</td>
<td>Azimuth is the horizontal angular distance between the vertical plane containing the plane of the panel and true north. Azimuth within the CSI-Thermal Program, unless expressly stated otherwise, refer to true, not magnetic.</td>
</tr>
<tr>
<td>Tilt</td>
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<tr>
<td>Annual Average Access</td>
<td>(le 85) Please enter the average annual percentage of access to sun from the floor to the roof in section 2.3 of the handbook for more information.</td>
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<tr>
<td>Gas Utility</td>
<td>Pacific Gas and Electric, San Diego Gas and Electric, Southern California Gas Company</td>
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<tr>
<td>Electric Utility</td>
<td>Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison</td>
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OG-300 SF Incentive Calculator

<table>
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<th>Incentive Details</th>
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<td>Maximum Incentive</td>
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Results

Incentives for Custom Systems using OG-100 Collectors can be configured at the Commercial and Multi-Family Incentive Calculator.

Fill in one or more of the following filtering fields and click "Next" to see matching models.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Heliodyne, Inc. - Heliopak (*)</th>
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<tbody>
<tr>
<td>Zipcode</td>
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<td>Backup Water Heater Type</td>
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<td>Tilt</td>
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<tr>
<td>Annual Average Access</td>
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<td>Gas Utility</td>
<td>[Pacific Gas and Electric, San Diego Gas and Electric, Southern California Gas Company]</td>
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<tr>
<td>Electric Utility</td>
<td>[Pacific Gas and Electric, San Diego Gas and Electric, Southern California Edison]</td>
</tr>
</tbody>
</table>

Recalculate
HOW IT WORKS:

MF/COMM 0G-100 INCENTIVE CALCULATOR
OG-100 MF/Comm Incentive Calculator

- Not a design tool
- It is strictly a tool to estimate the incentive
- Run by TRNSYS energy simulation software
- May take 15 + minutes to obtain results
- Available at www.csithermal.com
# Commercial and Multi-Family Residential Incentive Calculator

Please download the User Guide for explanations of the inputs below.

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>[ ]</th>
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<tbody>
<tr>
<td>Collector</td>
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</tr>
<tr>
<td>Number of Collectors</td>
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</tr>
<tr>
<td>Collectors Per Flowpath</td>
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<tr>
<td>Total Solar Storage Capacity</td>
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<tr>
<td>Total Number of Solar Tanks</td>
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<tr>
<td>Total Backup Capacity</td>
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<tr>
<td>Total Number of Backup Tanks</td>
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<tr>
<td>Backup Fuel Source</td>
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<td>Maximum Auxiliary Heat Capacity</td>
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<td>CEC Climate Zone</td>
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<td>Hot Water Demands (gal/day)</td>
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<td>Load Profile</td>
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<td>Recirculation Loop</td>
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<td>Set Point Temperature for Backup Water Heater</td>
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<tr>
<td>Set Point Temperature for delivered water</td>
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<td>Array Tilt</td>
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<tr>
<td>Array Azimuth</td>
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<td>Average Annual Access</td>
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<td>Project Name</td>
<td>[ ]</td>
</tr>
<tr>
<td>Email Address</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Submit For Calculation
Let’s run through a Scenario:

- Multi-family Building
- 10 units
  Max per unit is 42 GPD

42 x 10 = 420 GPD (maximum)
OG-100 MF/Comm Incentive Calculator

Demonstration:

www.csithermal.com/calculator/commercial
Incentive Calculator
Thank you. The results for project "Workshop_Jan2013" are ready.
Annual Energy Savings: 822 Therms
Incentive Rate: $14.53 / per therms
Incentive Step: 1
Incentive Amount: $11,944.00
Peak Collector Temperature: 137 °F
Simulation Status: Your simulation is complete.

Applying for an incentive for this system?
If you plan to apply for an incentive for this system, simply log in and retu

Project Details
Heat Exchanger(s): Immersed Supply Side, No Load Side
Fluid Option: Indirect Forced Circulation, Glycol
Tank Configuration: Solar Storage and Auxiliary Tanks are separate
Collector: SunEarth, Inc. - EC-40 (2006024E)
Number of Collectors: 8
Average Collector Module Area: 40.86
Number of Collectors in Series per Flow Path: 1
Total Solar Storage Capacity: 360
Total Number of Solar Tanks: 3
Total Backup Storage Capacity: 120
Total Number of Backup Tanks: 1
Backup Fuel Source: Gas
Maximum Auxiliary Heat Capacity: 199000
CEC Climate Zone: 203
Hot Water Demands (gal./day): 420
Load Profile: Apartments/Condos
Load Profile Description File:
Measurement for GPD benchmark: 10
Recirculation Loop: True
Set Point Temperature for Back-up Water Heater: 125°
Set Point Temperature for delivered water: 125°
Tracking: Fixed Surface
Array Tilt: 28°
Array Azimuth: 194°
Average Annual Access: 100%
Project name: Workshop_Jan2013
Email Address: johnson@kw-engineering.com
The Application Process
Application Protocols

- Application must be completed using the CSI-Thermal online database:
  
  www.csithermal.com

- Eligible Contractor completes the application for the customer

- Documents may be submitted online or by mail

- Online documents must be in PDF format
One-Step Process:
Incentive Claim Form and supporting documentation are submitted after the final signed-off building permit obtained.
Supporting Docs:

- **Incentive Claim Form (ICF):** Complete with signatures (originals not required)
- **Energy Efficiency Audit or Title 24 documentation:** Must be within the past 3 years
- **Executed Agreement to purchase and install an eligible SWH System:** Contracts must be legally binding and clearly spell out the scope of work, terms, price, and SWH system components to be installed.
- **Final Signed-off Building Permit:** Must be after July 15, 2009
Two-Step Process:

1. **Prior** to installation: Reservation Request Form and supporting documentation submitted
   - Incentive rate locked-in (Confirmed Reservation)
   - Confirmed Reservation valid for 18 months

2. **After** the final signed-off building permit obtained: Incentive Claim Form (ICF) and supporting documentation are submitted
STEP 1. **Prior** to installation:

- **Reservation Request Form (RRF):** Complete with signatures (originals not required)
- **Energy Efficiency Audit or Title 24 documentation:** Must be within the past 3 years
- **Signed Contract**
- **Application Fee (>30 kWth)**
- **Executed Alternative System Ownership Agreement:** If System Owner is Different from Host Customer
- **GPD justification:** signed by P.E. if customer’s building type is not on the Maximum GPD Guideline Table, see Appendix D.
- **Solar Storage Tank Volume Justification:** signed by P.E. if tank volume is less than requirements.
- **Estimate of savings and Monitoring Plan (signed by PE) required for PBI**
STEP 2. **After** the final signed-off building permit obtained:

- **Incentive Claim Form (ICF):** Complete with signatures (originals not required)
- **Final Signed-off Building Permit**
Application Process: How-to GET STARTED
www.csithermal.com
California Solar Initiative Thermal Program

- Home
- Register
- Calculators
- Program Information
- Eligible Contractors

The California Solar Initiative - Thermal Program is now accepting incentive applications for solar water heating systems for:

- Installed single-family residential systems.
- Multi-family residential and commercial systems.
- Low-income single-family and multi-family systems.

If you are not a licensed contractor or are not planning to install a system yourself, your contractor will submit and process a rebate application for you.

User Registration

All contractors or self-installers participating in the CSI-Thermal Program are required to attend a no-cost one-day training workshop. At the completion of the workshop, you will be issued a registration key that you can enter below to create an account to submit rebate applications for systems you install.

Please visit the links below for a schedule of workshops in your area and to sign up for a workshop. Once you have received a registration key, return to this page to register for an account. Successful registration is the final step to becoming an eligible contractor or self-installer in the CSI-Thermal Program.

Installer Workshops

For information about Installer Workshops, please visit:
- California Center for Sustainable Energy (SDG&E Territory) - http://www.energycenter.org/swh
- Southern California Edison - http://www.sce.com/csthermal

User Registration

Enter Your Registration Key

Submit
The California Solar Initiative - Thermal Program is now accepting incentive applications for solar water heating systems for:

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**Installer Workshops**

For information about Installer Workshops, please visit:

- California Center for Sustainable Energy (SDG&E Territory) - http://www.energycenter.org/sw
- Southern California Edison - http://www.sce.com/csiternal

**User Registration**

- **Installer Type**: Licensed Contractor
- **Contractor License Number**
- **Submit**
Registration Complete!
www.csithermal.com
Start new app
Save = not done, I'll be back
Submit = done, all info complete
Remember....

After “Submitting”, you will need to go back into Application to upload any required supporting documents.

- ICF
- Permit
- etc...
Application Submission
After Submission of App - MF/Comm

STEP 1

PA receives new Reservation Request for review:

- Documentation COMPLETE =
  - Application Approved
  - Incentive amount locked in
  - Contractor and System Owner notified
**STEP 1**
**After Submission of App - MF/Comm**

X Documentation **INCOMPLETE** =

- Application Suspended
- Contractor notified of incomplete documentation
- 20 days to submit corrections
- Corrections not submitted within 20 days=Cancelled project; Contractor must re-submit application
- Incentive amount **NOT** locked in until all documentation is complete
STEP 2
Once Project is Built – MF/Comm

PA receives new Incentive Claim for review:

- Documentation COMPLETE =
  - Application Approved
  - Incentive amount locked in (Single-family residential)
  - Project is processed for payment
  - Contractor and System Owner notified
PA receives new Incentive Claim for review:

X Documentation **INCOMPLETE** =

× Application Suspended
× Contractor notified of incomplete documentation
× 20 days to submit corrections
× Corrections not submitted within 20 days = Cancelled project; Contractor must re-submit application
Application Fees

- Required for certain MF/Comm & Pool projects
- Must be submitted within 30 days of Reservation Request receipt
- Invoice will be issued as part of the Reservation Request submittal
- Failure to submit payment within 30 days will result in cancellation of application
### Application Fee: MF/Comm

<table>
<thead>
<tr>
<th>Capacity (kWth)</th>
<th>Capacity (kWth)</th>
<th>Application Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>260</td>
<td>= $1,250</td>
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<tr>
<td>261</td>
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<tr>
<td>521</td>
<td>780</td>
<td>= $5,000</td>
</tr>
<tr>
<td>781</td>
<td>1,040</td>
<td>= $10,000</td>
</tr>
<tr>
<td>1,041</td>
<td>No Limit</td>
<td>= $20,000</td>
</tr>
</tbody>
</table>
## Application Fee: Pools

<table>
<thead>
<tr>
<th>Capacity (kWth)</th>
<th>Capacity (kWth)</th>
<th>Application Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>-</td>
<td>= $1,250</td>
</tr>
<tr>
<td>261</td>
<td>-</td>
<td>= $2,500</td>
</tr>
<tr>
<td>521</td>
<td>-</td>
<td>= $5,000</td>
</tr>
<tr>
<td>781</td>
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<td>= $20,000</td>
</tr>
<tr>
<td></td>
<td>No Limit</td>
<td></td>
</tr>
</tbody>
</table>
Refund of Application Fee

Application fees **will be refunded** in the following cases:

- Once systems are complete, the application fee will be refunded. No interest will be paid on refunded application fees.

- If upon eligibility screening the project does not qualify for the CSI-Thermal Program. No interest will be paid on refunded application fees.
Application fees **will be forfeited** in the following cases:

- Failure to meet adequate proof of project milestone or reservation expiration date.
- Project is cancelled or withdrawn by the Applicant and/or Host Customer.
- If a project reservation is allowed to lapse and the project is later built under a new reservation, the application fee for the previous reservation will be forfeited.
- If a confirmed reservation is granted and the incentive level has been reduced (due to Commission directive, moving to the next step, etc.), the Applicant and Host Customer will be notified and given 20 calendar days to submit request to withdraw their reservation request without losing their application fee. If the application is not withdrawn within the 20-day period, the Applicant will forfeit the application fee if it subsequently withdraws or fails to pursue its project.

All forfeited application fees will be re-allocated to the PAs CSI-Thermal Program budget.
CSI THERMAL PROGRAM
INSPECTIONS
Onsite Field Inspection Process

• **Required:**
  - First 3 ICFs for projects

• PAs will inspect a random sample of projects thereafter

• Contractors are encouraged to attend inspections
Onsite Field **Inspection Results**

- **Infractions**: Items that do not require corrections, but are identified as educational items for improvements on future projects.

- **Failure items**: Items that do require corrections and will delay the incentive payment. Failure Sanctions will be imposed.

(Failure items will be discussed in detail in the technical Section of this presentation)
Onsite Field Inspection Results

- PAs notify System Owner and Contractor of Inspection Results
- Inspection may uncover incorrect SOF or shading, resulting in a change in the estimated incentive amount
- Results:
  - Pass = Process Payment
  - Fail = Failure Sanctions
Failure Sanction Process: Notification

Applicant will either accept or dispute the results:

Accepted results:
- 30 days to correct the failure item(s)
- Re-inspection may be onsite or via photos of corrections
- Failure to correct items may be grounds for removal from the program

Disputed results:
- Appeal in writing to the PA within 30 calendar days of notification
- Panel will review and notify of the decision within 60 days
Failure Sanction Process

Three failures* in a rolling 12-month period=
• Probation for 6 months
• Re-attend Contractor/Self Installer training workshop
• Additional program applications will not be processed until completion of the workshop

Five failures* in a rolling 12-month period=
• Disqualification from the program for a minimum of 6 months.

*Failures are tracked across all PA territories
Failure Sanction Process

- **High Volume Installers** – 30 or more projects in 12 month rolling period
  - 5 failures = 6 month probation
  - 8 failures = 6 month suspension

- **Low Volume Installers** – less than 30 in 12 month rolling period
  - 3 failures = 6 month probation
  - 5 failures = 6 month suspension
CSI THERMAL PROGRAM
TECHNICAL REQUIREMENTS
Technical Requirements

• Inspection Checklists
  • Residential/Multifamily/Commercial
    [Link to document]
  • Pools
    [Link to document]
Inspection Checklist

• Condensed from SRCC OG-300
• MF/Commercial system designers must follow SRCC OG-300 Standards
• Extracts exact language relevant to installers and commercial designers
• Explains CSI-Thermal Program interpretations
Collectors

Must be **New** and **Unused**
Failures Items: Collectors

- Must:
  - Be SRCC certified, labeled, and consistent with Incentive Claim Form
  - Have stagnation control measures
  - Have freeze protection measures
  - Balance collector Flow Rate/Distribution: In multiple collector arrays
    (the instantaneous flow rate variations between collectors shall not exceed 10% of the array average flow)
Failure Item: Freeze Protection

- Collectors may freeze at ambient temperatures of 42°F or higher (every CA climate zone has had these temperatures)
- 2 freeze protection mechanisms shall be provided on each system where the collector fluid is water. Manual intervention (draining, changing valve positions, etc.) is suitable as one mechanism
- Pipe slope for gravity draining shall have a minimum 1/4 inch per foot vertical drop
- Freeze protection information should be labeled
- See handbook for more information.
Failure Item: Operating Limits

Stagnation/Overheat Protection

- High collector fluid temperatures (over 200°F) can be generated in the collector

- This heat may damage glycol and/or critical system components, and may pose a serious risk of scald injury to humans
ICS Freeze/Overheat Protection

- Thermal Mass = Freeze and overheat protection
- Freeze protection generally limited to infrequent or light freeze climates
- Summer Vacation overheat protection - Drain collectors

Source: SunEarth
Thermosiphon - Freeze/Overheat

Freeze Protection = Antifreeze (Glycol)
Overheat Protection = Expansion Valve

(Open passive thermosiphon is not eligible for an incentive)
Closed Loop Glycol – Freeze/Overheat

**Freeze Protection**
- Anti-freeze fluid (Propylene Glycol) with a heat exchanger
- Very good freeze protection

**Over Heat Protection**
- Summer Vacation- Advanced Controller with vacation/holiday mode
- Advanced Controller w/ thermal cycling
- Heat Dump Radiator
- Steam Back
- Pressure Stagnation Protection
Drain Back - Freeze/Overheat

• System designed to drain water from the collector when pump stops = Freeze and Overheat protection

• Simplest and most reliable freeze and overheat protection measures if continuous drainback slope can be obtained
Failure Item: Collector Flow Rate

In multiple collectors arrays the instantaneous flow rate variation between collectors shall not exceed 10% of the array average flow.
Failures Items: Piping

- All accessible hot water piping must be insulated
- Last 5’ cold water piping must be insulated
- All exposed pipe insulation must be UV protected
- Back thermosiphon prevention
- Expansion joints for plastic piping
Failure Item: Pipe Insulation

All accessible hot water piping and the final 5 feet of metallic cold water supply pipe leading to the system shall be insulated with R-2.6 °F-ft²-hr/Btu or greater insulation.

Insulate over fittings
Poor Insulation Technique
Failure Item: Protection from UV Radiation

Insulation must be protected from UV by jacketing or at least two coats of the insulation manufacturer's recommended UV coating, or at least two coats of exterior grade latex paint.

Source: Sunlight and Power
Insulation Protection

Unprotected  Protected
Was plastic and not protected...
Should miter & cover...
Failure Item: Back Thermosiphon Prevention

Prevention is required for undesired escape from storage through thermosiphoning action.

Acceptable means are check valves, solenoid valves, and/or 18" heat traps.
Failure Item: Leaks & Water Damage Protection

- All potable water sections of a solar water heating system shall not leak when tested.

- SWH systems shall be installed so water flowing off the collector surface or pressure relief valve shall not damage the building or cause premature erosion of the roof.
Failure Item: Solar Tank

- Capacity, make, and model must be in compliance with SRCC OG-300* system or in compliance with SRCC guidelines for OG-100 systems

*Tank substitutions permitted as long as size (gallons) and R-value are of substituted tank are equal or greater than certified tank
Failure Item: Waterproofing

- Underground and above ground unsheltered storage tanks shall be waterproofed to prevent water seepage.

- Storage tanks used outdoors shall be rated for outdoor use.
Failure Item: Collector Circulation Control

- The collector subsystem control shall be designed to be compatible with control requirements of the system.
Structural
Failure Item: Structural Supports

Wind loading and filled collector weight should not exceed load ratings of building, roof, roof anchorage, foundation or soil.

Wrong mount clip method

Proper mount clip used, but still not properly clipped.
Structural Challenge...
Failure Items: Control Line and Sensors

- Shall be sufficiently protected from degradation or from introducing false signals.

- Weather-exposed wiring must be rated sunlight and moisture resistant and comply with NEC Articles 340 and 690. Sensor wiring shall be separated from hot collector piping and shall be protected from UV.
Wire nuts not weather protected
Strap-on Sensor
Do not do this!
Poor Sensor Placement
Poor Sensor Placement

Sensor is not attached to the collector absorber or return pipe.
Must use stainless steel hose clamp or immersion well.
Believe it or not, this sensor was attached to the outer wall of the solar tank!
Failure Item: Owner's Manual

An owner's manual or manuals shall be provided with each SWH system and should contain the following:

- The name, phone number and address of the system supplier
- The system model name or number
- A description the operation of the system and its components
- The procedures for operation and maintenance
Summary of Infraction Categories

- Missing details in owner’s manual
- Mixing Valve
- Bypass valves, air traps, and pressure relief valves
- Operating indicators
- Fluid / safety labeling
- Rain / snow build-up
- Expansion tank sizing

- Appropriate pumps and controllers
- Main shut-off valve
- Maintenance accessories
- Protection of buried components
- Pipe hangers and supports, pipe sloping
- Thermal expansion protection
- Appropriate building penetrations
CLOSING REMARKS
Program Admin’s **Contact Information**

**Pacific Gas and Electric:**
Phone: (877) 743-4112  
Email: solar@pge.com  
Website: [www.pge.com/csithermal](http://www.pge.com/csithermal)

**California Center for Sustainable Energy** *(SDG&E territory):*
Phone: (877) 333-SWHP  
Email: swh@energycenter.org  
Website: [www.energycenter.org/swh](http://www.energycenter.org/swh)

**Southern California Gas Company:**
Phone: (800) Gas-2000  
Email: CSIThermalProgram@SoCalGas.com  
Website: [www.socalgas.com/rebates/solar/](http://www.socalgas.com/rebates/solar/)

**Southern California Edison:**
Phone: (866) 584-7436  
Email: CSIGroup@sce.com  
Website: [www.sce.com/csithermal](http://www.sce.com/csithermal)
Resources

**Slides**
www.pge.com/solareducation

**Classes/Workshops**
www.pge.com/solarclasses

**PG&E Energy Survey**
www.pge.com/energyanalyzer

**CSI-Thermal Application Database & Trigger Tracker**
www.csithermal.com

**General**
www.pge.com/solarwaterheating

www.gosolarcalifornia.ca.gov/solarwater/

**Solar Rating and Certification Corporation**
www.solar-rating.org

**CPUC**
www.cpuc.ca.gov/PUC/energy/Solar/swh.htm
PG&E Thermal Program

Steve Whitworth
Program Manager

Email: s3w0@pge.com
Phone: 415.973.1589

Thank you!