

# California Solar Initiative Thermal Program

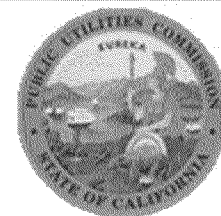
## *Proposed Requirements:*

- *Metering for PBI*
- *Commercial/Multifamily Pools*

*Workshop  
April 23, 2013*



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# Agenda

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- Introduction**
- Purpose**
- Other End-Uses and PBI**
  - Background
  - Define End-Uses to be metered
  - Define Metering Plan Contents
  - Meter Requirements Proposal
  - Data Handling

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- Solar Pool Heating**

**10:00-2:00\***

**\*12:00-1:00 Lunch**

**2:00-4:00**

# What is the purpose of this workshop?

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## Other End-Uses and PBI

- Outline expanded eligible end-uses
- Present PBI Payment Process
- Discuss requirements proposal for PBI Metering
- Solicit industry feedback

## Solar Pool Heating

- Strawn Proposal
- Incentive Amounts
- Incentive Structure
- Calculations
- Industry feedback



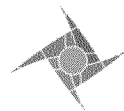
# Other End-Uses



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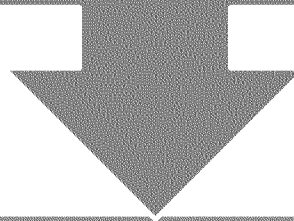


# Background

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**PAs/Commission focused initial program launch on traditional solar water heating end-uses with the goal of expanding the program at a later date.**

Uncertainties in modeling energy output of non-SWH end-uses for purposes of paying incentives during program start up.

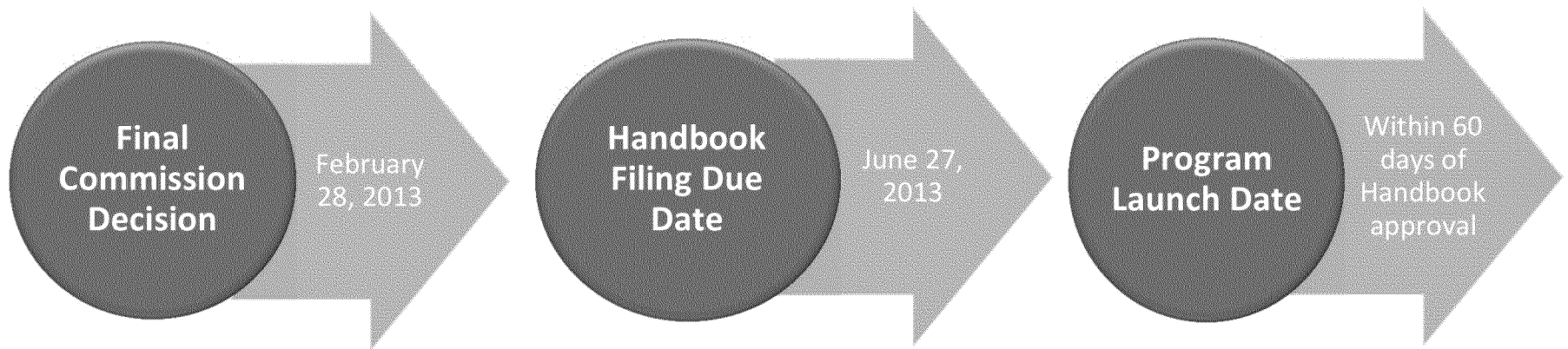


**February 23, 2011: The Energy Division held a workshop on issues related to the eligibility of non-SWH end-uses and how to pay incentives for these applications.**

Workshop report released on July 7, 2011 summarizing the issues discussed and parties' post-workshop comments.

# Implementation Timeline: Other end-uses

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# Summary of Changes

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In accordance with Decision 013-02-018, the following changes will occur:

- Expanded End-Uses (Commercial/Multi-family)
  - Process heat applications
  - Absorption Chilling
  - Space Heating
  - Combination systems
- Allows for PBI (originally prohibited)
  - Required for expanded end-uses (not including pools)
  - Required for DHW > 250 kWth (replaces 70/30 true-up)
  - Opt-in for commercial/multi-family DHW  $\leq$  250 kWth
  - Payments based on energy delivered

# Summary of Changes (cont.)

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- PBI paid quarterly over two years
  
- Capped at 100% of estimated incentive amount for the two year period
  - Estimated annual savings provided by applicant
  - Reviewed by Program Engineers
  
- Retroactivity: System must receive final sign-off permit after Handbook approval date



# PBI Incentive Structure: Natural Gas

<b>NATURAL GAS</b>		
<b>Multi-Family General Market /Commercial</b>		
<b>Step</b>	<b>Incentive Rate (\$/therm)</b>	<b>Maximum Incentive</b>
1	\$7.27	\$500,000
2	\$4.94	\$500,000
3	\$3.28	\$500,000
4	\$1.57	\$500,000

Decision 013-02-018, Page 18



# PBI Incentive Structure: Low Income

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<b>Multi-Family Low Income</b> (Natural Gas Only)		
<b>Step</b>	<b>Incentive Rate</b> (\$/therm)	<b>Maximum Incentive</b>
1	\$9.62	\$500,000
2	\$7.70	\$500,000
3	\$5.77	\$500,000
4	\$3.53	\$500,000



# PBI Incentive Structure: Electric / Propane

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<b>Electric / Propane</b>		
<b>Multi-Family/Commercial</b>		
<b>Step</b>	<b>Incentive Rate (\$/kwh)</b>	<b>Maximum Incentive</b>
1	\$0.21	\$250,000
2	\$0.15	\$250,000
3	\$0.10	\$250,000
4	\$0.05	\$250,000

Decision 013-02-018, Page 19



# Current CSI-Thermal Metering Requirements

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## Customer Performance Metering

- Required for projects 30kWth - 250 kWth
- For customer information only, not revenue grade
- Can be monitored at collector loop
- Accuracy
  - Flow meter: < 2% at Full Scale
  - Temperature Sensors: <  $\pm 1$  ° C
- This requirement was not affected by D. 013-02-018



# Current CSI-Thermal Metering Requirements

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## 70/30 True-up metering

- Required for projects > 250 kWth
- True-up incentive payment after one year of actual system production
- Must be metered on load side (potable water)
- Must be capable of recording Btu calculations only when there is established flow
- Accuracy (Based on OIML R75 Class 1)
  - Flow meter: < 1% at rated flow range
  - Temperature Sensors (matched pair): <  $\pm 0.5\%$
  - BTU Calculator: < 0.5%

**70/30 True-up will be replaced with**

**PBI**

# PBI Metering

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- PBI system is created in order to pay incentives on energy delivered.
  - Per D. 013-02-018, required to pay based on displaced energy...not heat produced by collectors
- No US Heat Meter Standard exists today, only international recommendations (OIML R75) and European Standard (EN 1434)
  - ASTM/IAPMO Effort underway
- CSI-Thermal Program: Will create program metering requirements until a US standard is established



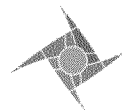
# Meter Requirements Proposal



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# Commercial/Multi-family End Uses Requiring PBI

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- Water Consuming End-uses >250 kWth
  - Formerly required to participate in 70/30 True-up
- Non-Water-Consuming End-uses (any size)
  - Space Heating
  - Solar driven absorption cooling (gas backup)
  - Non-consumed process heating
- Any combination of consumed and non-consumed loads




# PBI Metering Equipment

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- Meter Location: Must be metered on load side as near to end-use as feasible
- Meter Capability:
  - Must be capable of recording Btu calculations only when there is established flow
  - Must account for negative energy flows in the calculator or assure no negative flow possible
  - Must account for solar heat that is dumped
- Meter Accuracy (Based on OIML R75 Class 1)
  - Flow meter:  $< \pm 1 \%$  throughout the rated flow
  - Temperature Sensors (matched pair):  $< 0.25^{\circ} \text{F}$
  - BTU Calculator:  $< \pm 0.5 \%$

# Data Handling

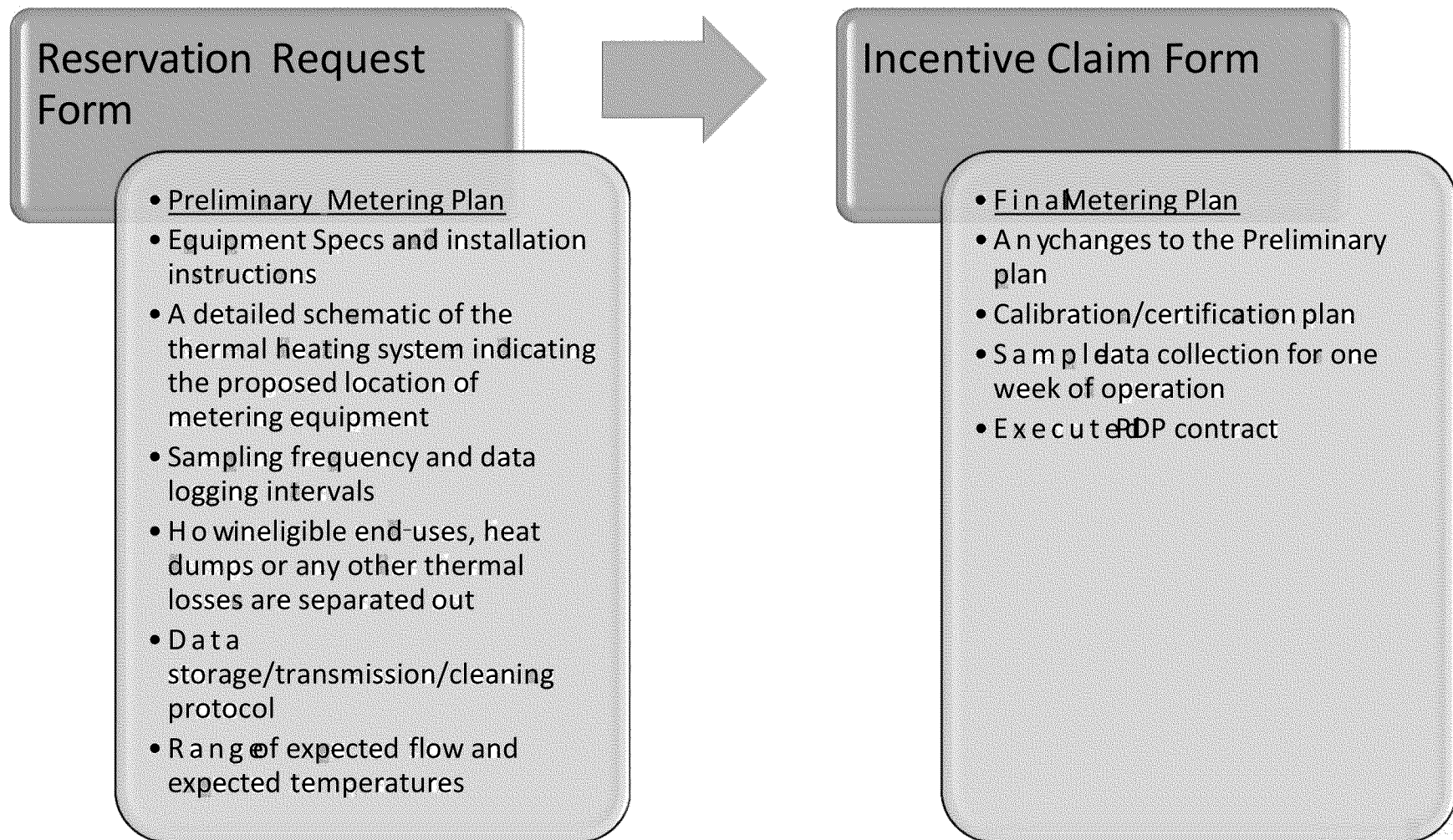
FEATURE	RESPONSIBLE PARTY
15 Minute Interval Btu data submitted to the PAs	PDP
Uploading data to PDP website on a daily basis	PDP
Submitted to PAs on a Quarterly basis <ul style="list-style-type: none"> <li>• PDP must validate all data prior to submitting to PAs</li> </ul>	PDP
Format: TBD	PDP
Data Sampling: What are meter capabilities?	Question for Meter Manufacturer
Onboard Storage Required: 7 days minimum	Meter Manufacturer
In event of communication failure, past data stored on logger can be used <ul style="list-style-type: none"> <li>• Lost data cannot be estimated</li> <li>• <u>No incentives will be paid for periods of lost data.</u></li> </ul>	Needs to be specified in PDP Contract 

# Reporting Requirements

<b>Data Field</b>	<b>1-Tank System</b>	<b>2-Tank System</b>
<b>Date</b>	Required	<b>Required</b>
<b>Time</b>	Required	<b>Required</b>
<b>Cumulative gallons of hot water consumed</b>	If Available	<b>If Available</b>
<b>Solar Btus delivered (2-tank system)</b>	N/A	<b>Required</b>
<b>Total Btus delivered (1-tank system)</b>	Required	<b>N/A</b>
<b>Back-up gas consumption (therms)</b>	Required if gas	<b>N/A</b>
<b>Back-up electric consumption (kWh)</b>	Required if electric	<b>N/A</b>
<b>Back-up propane consumption (therms)</b>	Required if propane	<b>N/A</b>

\*We will assume an 82% efficiency for natural gas boilers and 98% efficiency for electric boilers

# Proposed Metering Requirements: Application Process





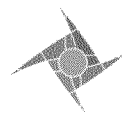
# Sample Schematics



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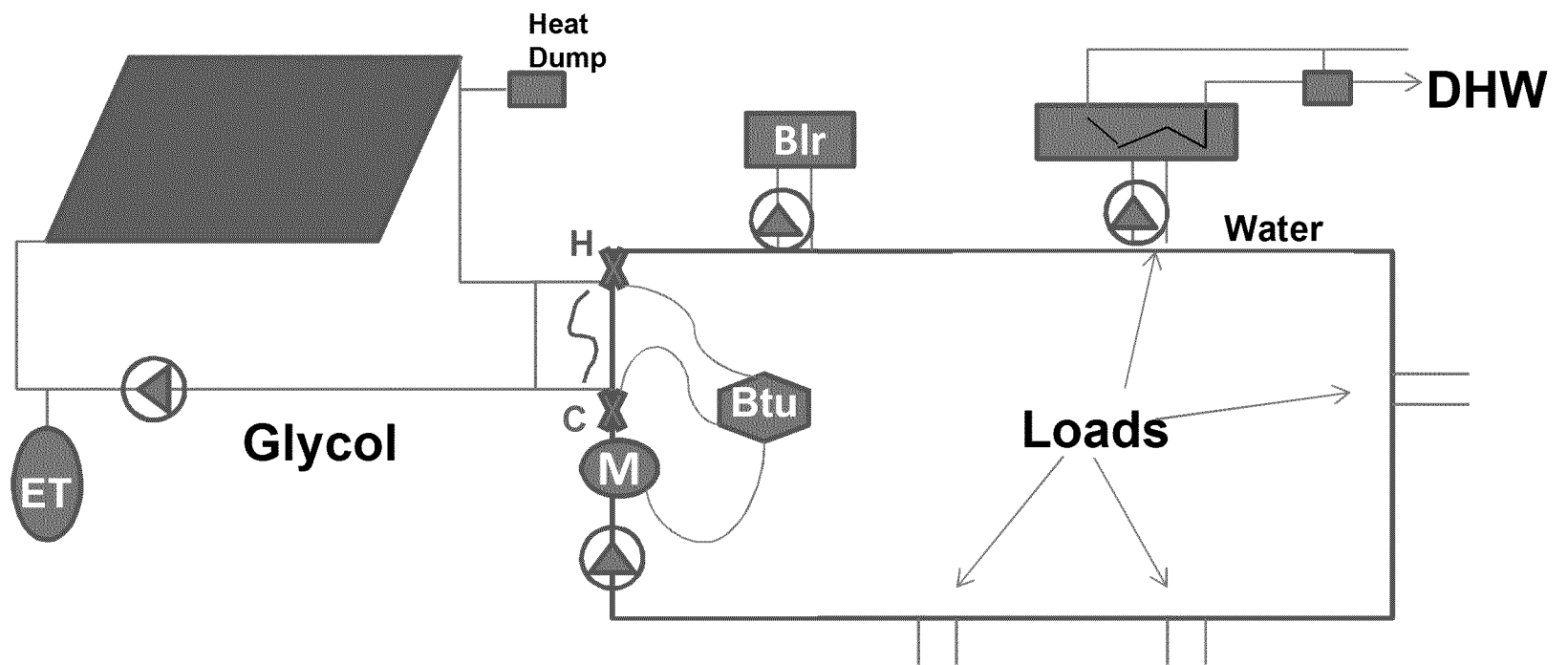
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# Campus District Heating





# What is open for comments

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1. Do you see any potential weakness or gap in the PBI and/or metering proposal that we outlined today?
2. Is there anything that you would like to recommend to enhance the PBI and metering proposal?
3. Is the cost of metering (equipment and PPD service) a significant barrier for small/medium projects?  
What about large projects?
4. What is the biggest barrier, if any, for customers to participate in the PBI program?



# Next Steps

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Informal Comments Due:  
May 2nd

Handbook Submitted:  
June 28

Protest Period:  
20 Days

Program Launch:  
60 days after handbook approval

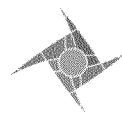
# Solar Pool Heating



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# Solar Pool Heating Background

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- AB 2249 signed into law by the Governor on 9/27/12.
- The definition was expanded for “Solar water heating systems”:
  - To include multifamily residential, governmental, educational, and nonprofit solar pool heating systems, but not single-family residential solar pool heating systems.
  - PAs required to hold a workshop to solicit industry feedback in order provide recommendations to PUC for program implementation.
- AB 2249 to be implemented no later than July 1, 2013
  - May 8, 2013 – P A file implementation plan
  - May 22, 2013 – Comments on implementation plan due
  - May 31, 2013 – R e p l y comments due

# Proposed Policy Recommendations

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- Swimming pool program budget cap of \$40 million.
  - Approx. 50% of commercial gas incentive budget allocated proportionally per each utility.
- We are proposing to allow for incentives with or without gas backup.
  - This will require PUC approval.
- Incentives for natural gas customers only.
- No PBI metering requirement.

# Proposed Policy Recommendations

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## Sizing Option 1

- Maximum collector array sizing will be set to 75% of pool coverage in sq. ft. with overheat protection.
  - Rebate cap based on 75% of pool coverage.
  - Based on common practice and will prevent oversizing of pool systems.
  - Overheat protection can be temperature limit setting in the control, or mixing valve.

# Proposed Policy Recommendations

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## Sizing Option 2

- Maximum collector array sizing will be set to 100% of pool coverage in sq. ft. with overheat protection.
  - Rebate cap based on 75% of pool coverage.
  - Oversizing justification required.
  - Based on common practice and will prevent oversizing of pool systems.
  - Overheat protection can be temperature limit setting in the control, or mixing valve.



# Proposed Policy Recommendations

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## Sizing Option 3

- Maximum collector array sizing will be set to 100% of pool coverage in sq. ft. with overheat protection.
  - Rebate cap based on of pool coverage and pool temperature.
  - Overheat protection can be temperature limit setting in the control, or mixing valve.

# Proposed Installation Requirements

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- Prevent pool water feed from collectors exceeding 100°F.
- Use only OG-100 collectors and components that are rated for the highest expected collector loop temperature.
- Install parallel reverse return plumbing or properly adjusted flow balance valves for the array.
- Paint or jacket all exposed plastic tubing and sensor wiring to and from the collector to protect from UV degradation, or show that the tubing is UV-resistant.
- Install operating status indicator.
- Provide Owner's Manual .
- Ensure pH of pool won't harm collector tubing.

# Proposed Incentive Amounts

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- \$4/therm displaced is proposed incentive level, from following assumptions:
  - Installation cost range of pool systems are estimated at \$25-\$40/sq.ft. for unglazed collectors.
  - Typical generation is 3 therms/sq.ft.
  - Goal is to offset 30% of installed system costs (from Decision 10-01-022).
- Incentive step reduction in similar percentage to existing CSI Thermal program.

# Swimming Pool Incentive Level

<b>Swimming Pool Incentive Level</b>		
<b>NATURAL GAS only</b>		
<b>Does not apply to single family residential customers</b>		
<b>Step</b>	<b>Incentive Rate</b> (\$/therm displaced per year)	<b>Maximum Incentive</b>
1	\$4.00	\$500,000
2	\$2.72	\$500,000
3	\$1.83	\$500,000
4	\$0.88	\$500,000



# Calculator Inputs –Proposed Assumption Factors

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We will use TRNSYS swimming pool profile with a combination of contractor inputs and built in assumptions.

- TRNSYS Type 344 indoor and outdoor pool model.
- Assumptions:
  - Pool temperature limited to 80F.
  - For indoor pools, we will assume air temperature and relative humidity factor.
  - Pool cover required as energy efficiency mandate, with justification for exemption.
    - 12hours/day coverage
    - Cover material
    - TRNSYS model calculator will always assume pool cover

# Calculator Inputs – TRNSYS

## Proposed Assumption Factors

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- Makeup water (TRNSYS internal evap. calculation)
- Occupancy/splash factor
  - Max occupancy of 0.25 person/m<sup>2</sup>, and activity level as a function of max occupancy
- Hygiene makeup water (none)
- Wind, ambient temperature and insolation
  - TRNSYS internal weather calculation
- Wind shielding on pool (factor of 3)
- Pool dead band (1 F)
- Pump (GPM based on OG-100 test)
- Gas backup pool heater (82% efficiency)
- Usage per day (12 hours)
- Pool cover (12hours/day coverage)
  - Assumed cover material (Thickness = 8 mill; Emissivity = 0.4; Absorptance = 0.6; Conductivity = 0.1 W/m.K)



# Database Calculator Inputs

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## Current inputs:

- Climate zone
- Tilt and azimuth
- Shade factor (both on the pool and the collector array)
- Collector (OG-100) model
- Number of collectors
- Fluid type (glycol or water or salt water)
- Show how the collector system will be protected from freeze damage.
  - Drainback; glycol; salt

## Added pool inputs:

- Pool surface area
- Schedule of use
  - Seasonal or year round
  - Usage at 12 hours per day

# Pool Savings Example

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## Commercial Pool

- Surface area: 3125 sq. ft.
- Solar collector area:  $(0.75 \times 3125) =$  2350 sq. ft.
  - (75% of pool surface area)
- Cost of installation at \$40/sq.ft.:  $(40 \times 2350) =$  \$94,000
- Estimated therms offset by solar system: 7850 therms/year
- Incentive at \$4/th:  $(4 \times 7850) =$  \$41,400

# Pool Savings Example

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## Olympic Pool

- Surface area: 13,303 sq. ft.
- Solar collector area:  $(0.75 \times 13,303) =$  9900 sq. ft.
  - (75% of pool surface area)
- Cost of installation at \$40/sq.ft.:  $(40 \times 9900) =$  \$396,000
- Estimated therms offset by solar system: 33,070 therms/year
- Incentive at \$4/th:  $(4 \times 33,070) =$  \$132,281

# Combinations Systems

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## Option 1

- No combination systems
  - Minimizes complexity
  - Different incentive rates
  - Expense of PBI metering requirements

# Combinations Systems

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## Option 2

- PBI metering will be required for each application.
  - See PBI metering requirements.
- Must show overheat protection method used on swimming pool to prevent danger to pool occupants and equipment.
- For multiple applications on one collector array, PBI metering will be required for each application.

# Combinations Systems

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## Option 3

- PBI required for whole system.
- PE to provide ratio of domestic hot water load to pool heating load.
- PAs review during RRF application process.
- Pool collector area cannot exceed 75% of pool surface area.
- Require heat exchanger for swimming pool loop.
- Must show overheat protection method used on swimming pool to prevent danger to pool occupants and equipment.
- Swimming pool incentive will be prorated from domestic hot water incentive.



# Comments

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