CSI Thermal
Pool Heating Incentive Calculator
User Guide

1   INTRODUCTION

1.1 Guide Overview

The CSI Thermal Pool Heating Incentive Calculator User Guide provides a detailed explanation of how the CSI Thermal pool heating incentive is determined. The CSI Thermal Program Administrators developed the pool heating online calculator, which blends a set of fundamental design assumptions with the inputs described in this guide. The pool heating calculator is accessed at www.csithermal.com/calculator/pool. Two versions of the calculator are available: the public calculator, which is separate from the application process; and the calculator embedded in the application form.

The sole purpose of the calculator is to determine a CSI Thermal pool heating incentive amount based on a number of key inputs for a given proposed system. Results may not match those you assume or have estimated using different models. The calculator should not be used as a performance guarantee. Actual performance of a solar thermal pool heating system may differ from the results of the CSI Thermal Pool Heating Incentive Calculator. If you have a performance-estimating tool that you like, continue to use it. However, the CSI Thermal Pool Heating Incentive Calculator must be used to determine your CSI Thermal incentive amount.

Final incentive amounts are subject to change based upon the configuration of the as-built system and other program requirements detailed in the CSI Thermal Handbook.

1.2 TRNSYS Engine

The calculator uses Transient Energy System Simulation (TRNSYS) software to model each system and produce an incentive, based on conventional energy displaced by solar energy. The TRNSYS Tool is a flexible tool designed to simulate the transient performance of thermal energy systems.

The development of TRNSYS began in 1975 as a joint project between the University of Wisconsin-Madison Solar Energy Lab and the University of Colorado Solar Energy Applications Lab. More than 35 years later, TRNSYS is a well respected energy simulation tool under continual development by a joint team made up of the Solar Energy Laboratory (SEL) at the University of Wisconsin-Madison, The Centre Scientifique et Technique du Batiment (CSTB) in Sophia Antipolis, France, Transsolar Energietechnik GmBH in Stuttgart, Germany and Thermal Energy Systems Specialists (TESS) in Madison, Wisconsin.

The CSI Thermal Program Administrators have contracted with TESS to develop the CSI Thermal Pool Heating Incentive Calculator, which uses TRNSYS type 344 to estimate the annual displaced conventional energy in order to calculate the incentive amount for each pools project.

2   FIELDS

2.1   Project Name

Enter the project name and reservation ID (if available). This is used for your reference and will be included on the results email. This input field only applies to the public version of the calculator.

2.2   E-Mail Address

Enter your email address. This input field only applies to the public version of the calculator. After you submit your calculation for procesing, you will receive an e-mail when your results are ready.

2.3   Flow Type

Choose "Direct" or "Indirect". Direct flow collectors circulate the water intended for end use, which is directly heated by the sun. Indirect flow collectors use heat exchangers to indirectly heat the fluid in the collector circuit, which then heats the water intended for end use.

2.4   Freeze Protection

Choose "Drainback (water)" or "Glycol". Drainback systems allow water to flow out of the system when it is not in use. Glycol systems are protected from freezing by the glycol in the loop.

2.5   Collector

The Collector field automatically matches your input to a valid collector in the system. The field matches based on manufacturer, model number, or rating ID. To enter the collector you would like to simulate, start typing the collector manufacturer, model number, or rating ID. A list containing all matching entries will appear. The calculator obtains data from IAPMO and the SRCC online directory of certified collectors on a regular basis. This includes glazed, unglazed, and concentrating collectors.

The calculator is unable to model Integrated Collector Storage (ICS) and Thermosiphon systems because they are only provided a standard-300 certification and not an individual standard-100 collector certification. ICS and Thermosiphon systems for multifamily and commercial projects may be eligible for a CSI Thermal pool heating incentive, but a manual simulation must be run by the Program Administrators to model these projects. Please contact the Program Administrator for the project site's utility service territory.

- For newly-certified collectors that are not yet on the list, please contact the SRCC or IAPMO to determine when the equipment will be available. Unfortunately, your project cannot be calculated or applied for until the equipment information is made available by the rating agency.

2.6   Number of Collectors

Enter the total number of collectors, not the square footage

2.7   Average Collector Module Area

When you make a selection in the Collector field, the Average Collector Module Area is automatically populated. This value should only be edited if the SRCC or IAPMO certification for that specific collector states "ALL SIZES OF THIS COLLECTOR MODEL ARE CERTIFIED" and the average size of collectors used differs from the default value of the database.
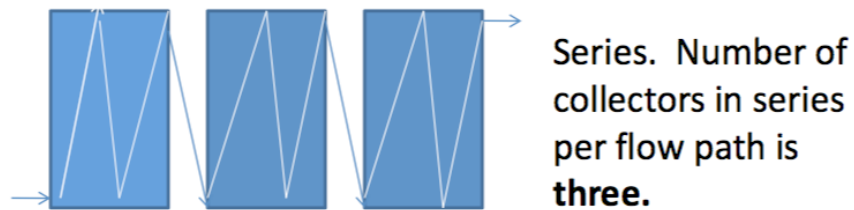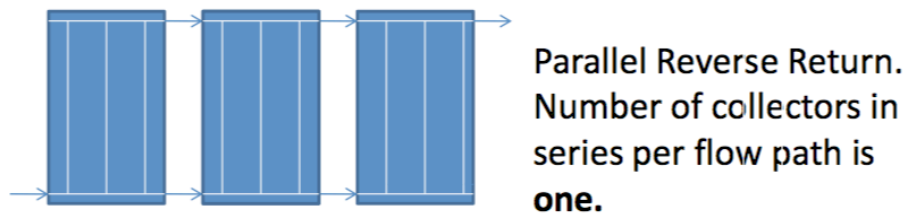
2.8   Total Collector Area

Total Collector Area = Number of Collectors x Average Module Collector Area. For example, if a system uses 3 collectors with an average collector module area of 25 square feet, the total collector area is 75 square feet. This field is automatically calculated and cannot be modified.
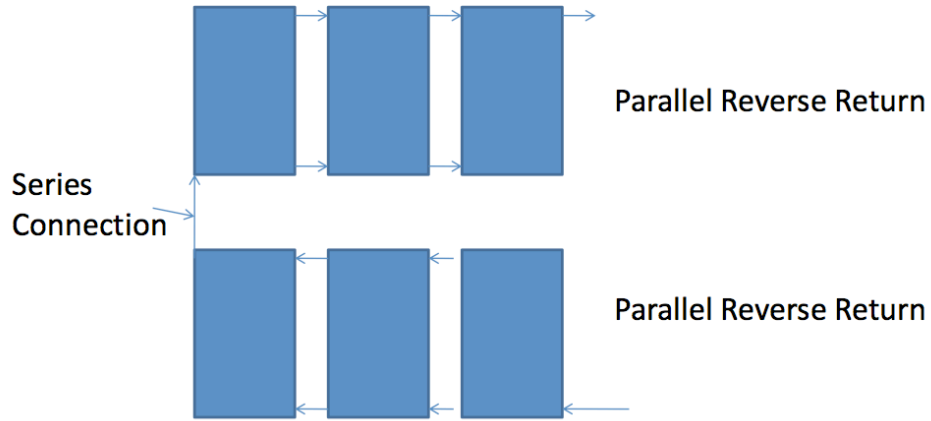
2.9   Number of Collectors in Series Per Flow Path

"Number of Collectors in Series Per Flow Path" refers to the number of collectors or banks of collectors that are heating the same drop of water in the flow path. This is an important parameter for the calculator; every time a drop of water is heated by more than one collector, some efficiency is lost because the water is warmer as it enters the second collector. This field is not asking for the number of collectors in each bank.
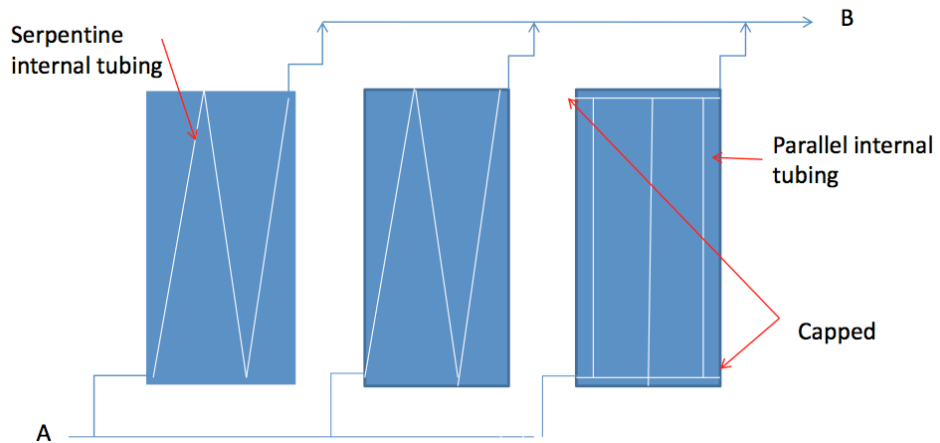
The following examples represent different flow path configurations to help you understand this field.

Parallel Reverse Return. Number of collectors in series per flow path is **one.**

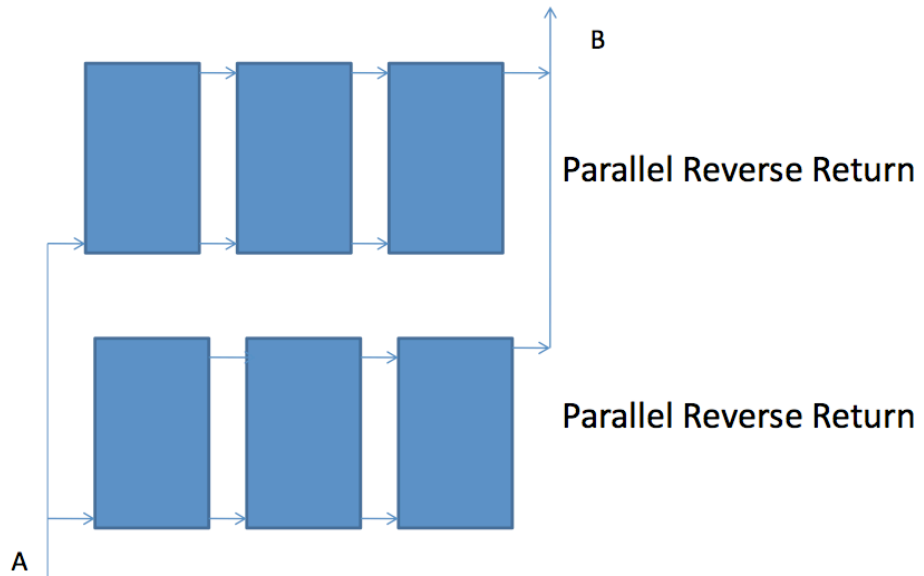Series. Number of collectors in series per flow path is **three.**

Note: The number in the flow path depends on how many times a drop of water is heated, i.e. it depends on the external piping configuration, not the internal piping configuration.
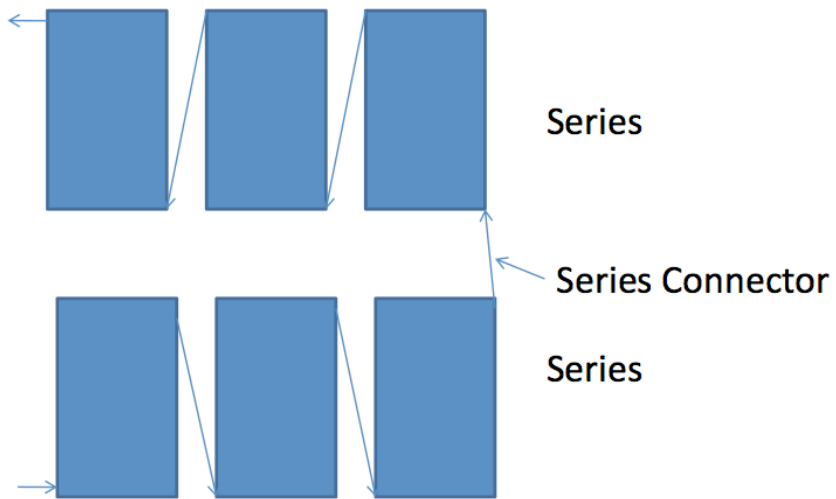
Series
Connection

Parallel Reverse Return

Parallel Reverse Return

The number of collectors in series per flow path is
two.

Serpentine
internal tubing

B

Parallel internal
tubing

Capped

A

These collectors may have internal parallel piping or internal
serpentine piping. Either way, the parallel external manifolds cause
each molecule of water passing from A to B to flow through only
one collector. The number of collectors in series per flow path is
one.

B

Parallel Reverse Return

Parallel Reverse Return

A

The number of collectors in series per flow path is **one.**

Series

Series Connector

Series

The number of collectors in series per flow path is **six.**

2.10 Backup Fuel Source

Choose the Backup Fuel Source from the list of options. Only Gas and Gas Tankless systems are eligible for CSI Thermal pool heating incentives.

2.11 CEC Climate Zone

Choose the CEC Climate Zone of the project site from the available options. If you do not know the climate zone of your project site, refer to the CEC Climate Zone Manual posted on www.gosolarcalifornia.org/solarwater.

To search the PDF for your project site, enter the zip code of the project site in the "Find" box at the top of the PDF in Adobe Acrobat or Reader, and hit the "Enter" key. Some zip codes are in multiple climate zones. Hit "Enter" multiple times to find all climate zones for that zip code. You may select the appropriate climate zone in these cases.

2.12 Tracking

Choose the Tracking type from the available options.

- **Fixed Surface**: Non-tracking collector with a fixed tilt and azimuth.
- **Single Verticle Axis, Fixed Slope, Variable Azimuth**: Collector rotates on a vertical axis with a fixed tilt.
- **Azimuth Tracking**: Collectors track on a single axis oriented north to south. Collectors track east to west throughout the day.
- **Altitude Tracking**: Collectors track on a single axis oriented east to west. Collectors track the altitude of the sun in the sky throughout the day.
- **Dual Axis Tracking**: Collectors track on a dual axis. Collectors track the location of the sun in the sky througout the day (altitude and azimuth).

2.13 Array Tilt

Enter the degree tilt from horizontal of the collector array. Depending on the collector used and the Tracking type chosen, this field may be hidden.

2.14 Array Azimuth

Enter the True Azimuth; True South is 180 degrees. To find True Azimuth in California, add the magnetic variation to the magnetic compass reading of the collector array (13 degrees in Southern California, 15 degrees in Northern California). Depending on the collector used and the Tracking type chosen, this field may be hidden.

2.15 Average Annual Access

Enter the integer percent for the average annual solar access to the collector array between the hours of 10am and 3pm. For a pool with seasonal use, enter the seasonal access value. Use a shade analysis device to determine this value.

2.16 Pool Type

Choose "Indoor" or "Outdoor" depending on the type of pool.

2.17 Pool Operating Schedule

Choose "Year-Round" or "May 1 through October 31". If the pool is open for more than 6 months out of the year, choose "Year-Round"; the project will also have to comply with the program requirements for year-round pools.

2.18 Pool Cover Use

This field is only required if the pool is open year-round (it is assumed that seasonal pools are not being heated when they are not open to the public). If the pool is covered, it is assumed to be covered at least 12 hours per day on average from November through April.

If the pool has a cover, choose "Pool cover assumed 12 hours/day from November 1 through April 30".

If the pool is not covered, choose "No pool cover". However, all pools are required to be covered for 12 hours per day from November through April unless an exception waiver has been specifically granted. Additional documentation will be required to show compliance with this requirement. Please contact your Program Administrator with questions.

2.19 Pool Setpoint Temperature

Enter the setpoint temperature of the pool. Must be a number between 32 and 82 degrees Fahrenheit.

2.20 Pool Surface Area

Enter the surface area of the pool in square feet.