Solar Water Heater System Design and Eligibility Requirements

Developed by Energy Trust of Oregon

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1.0 Purpose

The following document outlines the criteria for a solar water heating ("SWH") system ("System") to be eligible for Energy Trust of Oregon incentives. Energy Trust maintains a list of system models that have been reviewed by the Program and deemed eligible for incentives when installed in accordance with the ***Solar Water Heater Installation Requirements*** and the ***Program Guide for Solar Water Heating Trade Allies.*** This list is accessible in PowerClerk®, the online project management and tracking system used by the Program. It is also posted on the Energy Trust website.

System models may be added to this list but shall be submitted to the Program for review prior to the submission of an incentive application. This document represents a minimum standard and systems may be rejected based on criteria beyond the scope of this document. System approval requests should be submitted via email to Program Staff at swh@energytrust.org.

2.0 Requirements for All Systems

2.1 General

Residential systems serving a single family shall be OG-300 certified by the Solar Rating and Certification Corporation (SRCC). This certification includes estimated performance ratings that are used to calculate Energy Trust incentives. Energy Trust reserves the right to require compliance with installation specifications that may exceed manufacturer's instructions and SRCC standards.

2.1.1 System shall include a means of determining proper operation such as a sight glass flow meter on any pumped piping loops and thermometers indicating solar fluid and preheat water temperatures.

2.1.2 The system shall incorporate freeze and overheat protection strategies that:

- Require no manual operations on the part of the building occupant.
- Result in no lost electrical or gas energy due to re-circulation of heated water during cold winter conditions.
- Result in no lost electrical or gas energy due to drain of heated water.
- Limit possible high water temperature in the solar storage tank to no more than 180°F.
- Possess demonstrated or theoretical reliability in weather conditions common to climates of the Pacific Northwest.

2.2 Heat Exchanger

2.2.1 Heat exchanger shall be copper, stainless steel, or cupronickel.

EXCEPTION: When used in a pressurized antifreeze system with a properly stabilized heat exchange fluid, the heat exchanger may be carbon steel coated with enamel or glass.

NOTE: Single wall heat exchangers are allowed, but require additional precautions to meet code. Installer must comply with additional requirements as specified in the ***Solar Water Heater Installation Requirements.***

2.3 Residential Backup Water Heater

2.3.1 If compliance with the system's OG-300 certification requires the installation of a new backup water heater it shall be either:

- Electric with minimum tank capacity of 40 gallons and sized according to ***Oregon Plumbing Specialty Code***
- Gas with tank capacity and firing rate appropriate to household size according to ***Oregon Plumbing Specialty***.
- Tankless gas water heater with a variable firing rate thermostatically controlled based on water temperature and not flow rate.

2.3.2 Systems that utilize a single combined tank (solar and backup) shall have a minimum backup storage volume of 40 gallons.

2.4 Solar Storage Tank

2.4.1 The ratio of solar storage tank capacity per square foot of net collector area shall be a minimum of:

- 1.0 gallons of storage capacity per square foot of collector area for all drainback systems.
- 1.25 gallons of storage capacity per square foot of collector area for all other typical installations.

EXCEPTION: Non-residential system that have loads that are coincident with solar collection may reduce the storage volume accordingly.

NOTE: Systems that utilize a single combined tank may count each gallon of water heated by the backup as 0.3 gallons of solar storage for the purposes of determining the minimum solar storage requirement.

2.5 Solar Collectors

2.5.1 Solar Collectors must be OG-100 certified by the SRCC. Solar collector eligibility for domestic water heating systems is based on the SRCC OG-100 collector certification values for slope and y-intercept established for the standard efficiency equation. These values may be read directly from the collector's SRCC OG-100 certification page.

- Minimum y-intercept is 0.30.
- Minimum slope (numerical value) is -1.50 (BTU/hr·ft^2·ºF)
- ICS collectors / systems are not eligible for incentives.

3.0 Requirements for Non-residential and Multifamily Systems

Unless noted in an exception, non-residential and multifamily residential systems shall meet the applicable eligibility and installation requirements in the other sections of this document and the ***Solar Water Heating Installation Requirements***. In addition, the system design shall be documented to allow for Energy Trust or third-party review, as detailed in ***Section 3.1***.

Energy Trust recommends that custom-designed systems also comply with the following guidelines established by the American Society of Heating, Refrigerating, and Air conditioning Engineers (ASHRAE) for solar heating systems:

- Active Solar Heating System Design Manual
- Active Solar Heating Systems Installation Manual
- Guide for Preparing Active Solar Heating Systems Operation and Maintenance Manuals.

The documents are available online from the SRCC website[1].

3.1 System Design and Savings Estimate

3.1.1 Estimate of baseline annual water heating energy consumption shall be documented. Allowable methods for estimating energy load are direct metering, utility bill analysis, or calculations using ASHRAE standards. Seasonal loads shall be estimated by month.

3.1.2 Estimate of annual energy savings from the system shall be calculated using the F-Chart method or RETScreen, T*Sol or equivalent software.

3.1.3 System shall be designed to supply no more than 65% of the estimated annual water heating energy load.

3.1.4 System shall be documented with an elevation drawing of the system showing relative position of components, pipe sizes, and pipe run lengths.

3.1.5 System design shall be documented with specifications for all key components, including: pump(s), storage and expansion tank(s), controls, heat exchanger(s), valves, and backup heater. Pipe, pump, and heat exchanger sizing calculations shall be provided on request.

[1] http://www.solar-rating.org/