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Solar Water Heaters

System Design

Deciding on which solar water heater system is best.

An integrated system is the simplest and most economical to install, keeping high efficiency, simplicity and freeze protection by using heat pipes integrated into a storage tank. An integrated system can be assembled by anyone in a few hours. It is not economical to provide 100% solar fraction of hot water from solar in winter, as the collector area would be much too large in summer. An elegant solution is an on-demand gas water heater in series with a solar heater. With electricity available, a heater-controller package provides constant-temperature hot water. See www.freefuelforever.com/index_files/completesolarheaters.htm for complete systems.

To have the hot water tank in the building rather than outside, or for applications such as in-floor heating, a circulating system using panels of tubes is needed. Panels of solar tubes with circulating systems require more installation skill and are more complex, but eliminate the water tank on the roof. Pump size required can be calculated with the aid of the pressure drop calculator program; a 40 W pump is typical for a house. See www.freefuelforever.com/index_files/panelsoftubes.htm for panels of tubes available.

Hotel, apartment and industrial hot water can use either of the above solar systems in series, while solar swimming pool heating generally uses larger-scale panels.

Designing a Solar Domestic Hot Water System:

To calculate how much money can be saved for various proposed solar systems at your location, download a free program from Natural Resources Canada at www.retscreen.gc.ca. This program uses a global weather database and your water usage rates to calculate solar savings for different types and numbers of solar collectors. For example, 12 tube U-Pipe units use area=1.1 m², FrUL=2.41 W/m² and Fr(τ_α)=0.883. The most economical size of solar installation for a given location and hot water usage is calculated based on the efficiency of the units.

Examples: House, 2 persons, Vancouver: one 27-tube unit or one premium 21-tube unit or three 12-tube units. For 4 persons, use two 21-tube units, two 27 tube units or five 12-tube units. Add tubes for colder locations or greater hot water usage. Payback time is about 5 years

Swimming pools: 1 m² of solar collector for every 3 m² of pool surface area, for example, three 5 m², 50-tube panels for a 45 m² surface area swimming pool. Add more tubes for colder locations or more wind.

See www.freefuelforever.com/index_files/downloads.htm for installation manuals, efficiency test reports, certifications and the pressure drop program needed for designing a solar hot water system.