

Solar Water Heating

Overview

Solar water heating is a clean, reliable and cost-effective technology that is reducing utility bills for thousands of homes and businesses. Today, Americans across the country are at work manufacturing and installing these systems that significantly reduce our dependence on imported fuels. We need smart policies to expand this fast-growing, job-producing sector.

Solar water heating is included within the term “solar heating and cooling technologies,” along with solar pool heating, solar space heating, solar cooling, and solar industrial process pre-heating. Simply put, a solar water heating system collects the thermal energy of the sun and uses it to heat water for use by a home or business, rather than using electricity or natural gas.

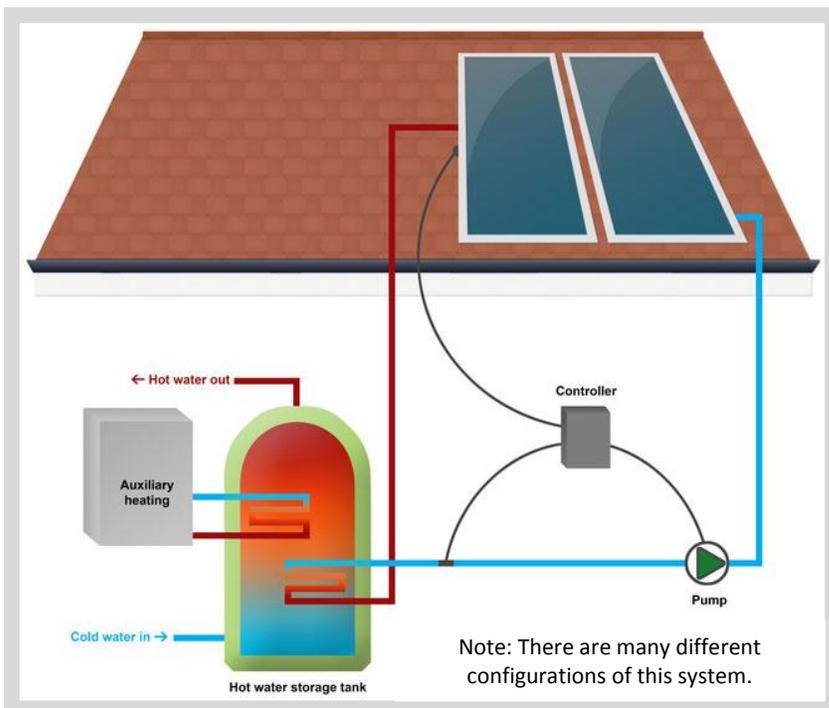
Solar water heating systems¹ can be installed on every home in the U.S. and are composed of three main elements: the solar collector, insulated piping, and a hot water storage tank.

Electronic controls can also be included, as well as a freeze protection system for colder climates. The solar collector gathers the heat from solar radiation and transfers the heat to potable water. This heated water flows out of the collector to a hot water tank, and is used as necessary; this type of system is called open-loop, or a direct system. Auxiliary heating can remain connected to the hot water tank for back-up if necessary.

In colder climates with the possibility of freezing temperatures, an indirect system is used. (See diagram to the right). An antifreeze solution, such as non-toxic propylene glycol, is heated in the solar collector and circulated to the hot water storage tank via a heat exchanger. The potable water in the storage tank is warmed by the hot, antifreeze-filled heat exchanger, and the heated water can then be used as necessary, while the cooled glycol is piped back to the solar collector to be heated again.



A residential solar water heating system.
Source: EnerWorks



An active solar water heating system.
Source: Emerald Energy Solutions.

Another common type of solar water heating system design for cold climates is called “drainback.” This type of solar energy system typically uses water as the heat transfer fluid, and is designed to allow all of the water in the solar collector to “drain back” to a holding tank in a heated portion of the building it is used on. When no sunlight is available for heating, the solar pump turns off and the water flows into the drainback tank by means of gravity.

No matter which type of solar energy system is employed, a properly designed and installed solar water heating system can be expected to provide a significant percentage (40 to 80 percent) of a building's hot water needs.²

Solar Water Heating Collectors

Solar water heating collectors produce heat, and are different from photovoltaic (PV) modules, which produce electricity. There are several types of collectors: flat plate, evacuated tube, Integral Collector Storage (ICS), thermosiphon, and concentrating. Flat plate collectors are the most common type of collector in the US; copper pipes create a matrix of risers and are affixed to an absorber plate contained in an insulated box covered with a tempered glass or a polymer cover plate. Evacuated tube collectors consist of rows of parallel, transparent glass tubes that have been "evacuated" of air, creating a highly efficient heat insulator for the fluid that runs inside the length of the tube.³ Evacuated tube systems are generally used when higher temperatures or higher volumes of water are needed, as well as for process heating and solar air conditioning systems.

While both solar water heating systems and solar photovoltaic (PV) systems involve collector panels, they are very different technologies. Solar water heating systems use radiation from the sun to generate heat for water, whereas solar electric systems use solar radiation to directly generate electricity.⁴

Did You Know?

Solar water heating systems are affordable for families. The return on investment can be as little as 3-6 years, the lowest of any solar technology. Commercial systems help companies reduce and manage their energy bills, managing long-term costs. Meanwhile, fossil fuel prices constantly fluctuate and are expected to rise tremendously over the next decade.

Water heating, space heating, and space cooling accounted for 69 percent of the energy used in an average household in the U.S. in 2005- representing a huge market potential for solar heating and cooling technologies!⁵



*Evacuated tubes are installed on a home.
Source: SEIA*

About the Solar Energy Industries Association

Established in 1974, the Solar Energy Industries Association® is the national trade association of the U.S. solar energy industry. Through advocacy and education, SEIA and its 1,000 member companies are building a strong solar industry to power America. As the voice of the industry, SEIA works to make solar a mainstream and significant energy source by expanding markets, removing market barriers, strengthening the industry and educating the public on the benefits of solar energy.

For a referenced version of this factsheet and more information, please visit www.seia.org.

¹ Solar water heating systems can be either active (relying on electric pumps to circulate water) or passive (relying on thermodynamics). The most common type of system for use in commercial and residential buildings is an active system.

² http://apps1.eere.energy.gov/buildings/building_e2_news/pdfs/41157.pdf

³ Two tubes are fitted within together to create one larger tube, and the space between these two tubes is “evacuated” of air. As the fluid inside the larger tube heats it rises to the top, where a heat exchanger transfers the heat to water that is then pumped back to the storage tank, and distributed as necessary.

⁴ Regarding energy metrics: The energy from solar water heating technologies is generally measured in British Thermal Units (BTU), which can be converted to kWh through an industry accepted conversion factor.

⁵ Call out box: <http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=2.1.9>