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Renewable Energy Fact Sheet

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Solar Water Heating
Using the sun's energy to heat water

Key Facts

- Solar water heating systems use the sun's energy to provide hot water, space heating, and air conditioning.
- More than 1.5 million homes and businesses currently use solar water heating in the United States, representing a capacity of over 1,000 megawatts (MW) of thermal energy generation. Another 400 MW is likely to be installed over the next 3-5 years, according to the US Department of Energy.
- Assuming that 40 percent of existing homes in the United States have sufficient access to sunlight, 29 million solar water-heating systems could be installed. Solar water heaters can operate in any climate. Performance varies depending on how much solar energy is available at the site, as well as how cold the water coming into the system is. The colder the water, the more efficiently the system operates.
- Solar water heaters reduce the need for conventional water heating by about two-thirds and pay for their installation within 4 to 8 years with electricity or natural gas savings. Compared to those with electric water heaters, Florida homeowners with solar water heaters save 50 to 85 percent on their water heating bills, according to the Florida Solar Energy Center.

Solar Water Heating Technology

- Solar water heating systems have two major components: a solar collector and a storage tank. The solar collector, usually a thin, black plate, is mounted on a building's roof. Water or antifreeze runs through small tubes under this plate and is heated by the sun. The hot water or antifreeze then flows into a well-insulated storage tank. In household systems, a solar water heater usually connects to the existing water heater, which only turns on when needed.
- *Direct and indirect systems:* Direct systems heat water under the solar collector. If temperatures drop below freezing, the water must be drained from the collector to avoid damaging the system. These systems are used where freezing temperatures occur at most once or twice per year, because draining the water more frequently is expensive and wastes energy. In cold climates, the solar collector heats liquid antifreeze, which then runs through tubes inside a water storage tank to heat water indirectly.
- *Passive and active systems:* Passive systems, known as thermosiphons, circulate water or antifreeze from the solar collector to the storage tank using the warm liquid's natural tendency to rise. Active systems use electric pumps to increase the efficiency of the water circulation.
- *Swimming pool systems:* Solar swimming pool heating systems are simpler and less expensive than household heating systems. The pool's existing filter pump is used to move water to the solar collector, where it is heated, and then back into the pool. Solar heating systems can provide 50 to 100 percent of the energy needed to heat a pool.

Costs and Benefits

- *Energy cost savings:* Residential solar water heating systems initially cost between $1,500 and $3,500, compared to $150 to $450 for electric and natural gas water heaters. With savings in electricity or natural gas, solar water heaters pay for themselves within 4 to 8 years. They last 15 to 40 years—the same as conventional water heating systems—so solar heating systems result in significantly lower electricity or natural gas bills for many years.
- *Incentives:* The US Department of Energy, builders, and utilities have collaborated in several regions to offer tax incentives and rebates to reduce the initial cost of solar hot water systems.
- *Pollution prevention:* Solar water heating does not generate greenhouse gases or other pollutants. During a 20-year period, one solar water heater can prevent over 50 tons of carbon dioxide emissions that would have been emitted by an electric or natural gas water heater.
- *Jobs and security:* The energy for solar water heating is produced domestically, providing manufacturing and installation jobs for Americans and helping to reduce energy security concerns associated with depending on foreign countries for oil and natural gas.

Issues

- Consumers have difficulty verifying the performance claims of solar manufacturers. However, the Solar Rating and Certification Corporation (SRCC) and the Florida Solar Energy Center (FSEC) now offer independent testing and certification for solar water heating systems, and many tax incentives are tied to this certification.

For More Information

Florida Solar Energy Center http://www.fsec.ucf.edu
National Renewable Energy Laboratory http://www.nrel.gov/clean_energy/solarhotwater.html
DOE Office of Energy Efficiency and Renewable Energy http://www.eere.energy.gov/solar/solar_heating.html
DOE Office of Energy Efficiency and Renewable Energy http://www.eere.energy.gov/RE/solar_hotwater.html

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