

THE SKINNY

Solar Power for Domestic Hot Water and Heat



In Colorado the sun shines 300 days a year! Solar power is an efficient, economical and sustainable way to heat your home and provide hot water. Approximately 1.5 million homes and more than 250,000 commercial and industrial buildings in the United States use solar thermal technology to provide consistent, reliable hot water.

A solar thermal system is an up-front investment in 30 years of clean, reliable, fossil free power. Because its fuel the sun is free, a solar thermal system will provide hot water or heat long after it has paid for itself in monthly energy savings. Even as energy prices rise, the cost to heat water or your home will never increase over the life of the system. When properly maintained, a solar thermal system can last 30 years or more.

HOW DOES SOLAR THERMAL WORK?

On a sunny winter day the air inside a parked car will heat up despite the temperature outside. Solar thermal collectors or panels work the same way. Collectors measuring 4 x 8 or 4 x 10 are mounted on a south-facing roof or on the ground. Sealed tubes containing a heat transfer fluid pass through the solar collectors to absorb and trap the sun's heat. The heated fluid then passes through a heat exchanger in a well-insulated water storage tank where it heats water for domestic use.

Solar thermal usually supplements rather than replaces existing hot water heaters, so the solar storage tank is connected to a conventional water heater or boiler to provide additional backup heat, as needed, on cloudy days or when large amounts of domestic hot water are in demand. A very large solar storage tank can be used without backup heater, but this approach is more expensive and can be less reliable if there are several consecutive cloudy days and heavy hot water demand.

There are two types of solar thermal systems most commonly installed in Colorado, both referred to as flat-panel collectors. One is a closed loop system using a mix of glycol (antifreeze) and water as the heat transfer fluid. The other uses distilled water as the heat transfer fluid and a drainback storage tank and pump system to prevent the water from freezing on very cold days. Each of these has slightly different cost structures and maintenance requirements because of the different equipment involved.

Another type of solar thermal system uses evacuated tube collectors. A relatively new technology, these collectors perform better than flat plate collectors in cloudier or colder climates and can achieve higher water temperatures. Evacuated tube systems have higher up-front costs, but considering performance, the installed cost is close to that of flat-plate collectors.

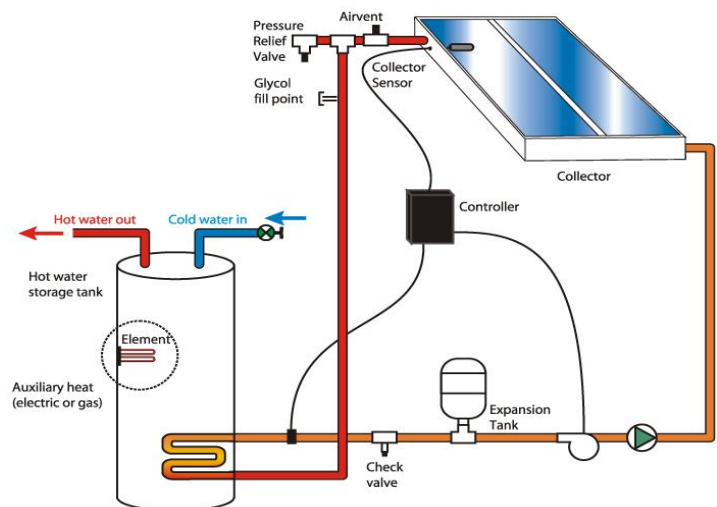
Domestic Hot Water

Solar thermal can be used to heat domestic hot water (DHW) for bathing, dishwashing, clothes-washing, cleaning or any other domestic need. In Colorado, Solar thermal systems for DHW generally replace natural gas or propane water heaters. Hot water heating is one of the biggest energy uses in the home, so using sunlight to heat water can cut utility bills substantially. A well-sited 2 panel system (about 64 sq. ft. of surface area) with an 80-120 gallon storage tank can provide about 70-80% of average DHW needs for a family of four about 100 gallons per day.

Domestic Heating

Solar thermal systems can provide heat as well as DHW, but this requires more panels and a larger storage tank. System size for both heating and DHW depends on factors such as home size, indoor temperature settings, plumbing requirements, and the amount of heat you want solar to provide. Solar heating requires additional plumbing equipment

Closed Loop, Freeze-Protection System



and labor costs and may not be cost effective unless the home has a summer-season use for heat, such as a pool. Most systems used for heating and DHW are sized to meet between 65-75% of the homes heating demand and 80% of DHW.

Most solar heating systems use plumbing in the floor (radiant heating) or baseboards (hydronic heating) to circulate hot water. Radiant and hydronic heating systems are quieter than typical forced air heating systems (no noisy furnace cycling); they heat the home more evenly with humidified air providing greater comfort and reduce airborne dust, drafts and indoor air movement. Because they are designed to meet only a portion of the heating demand, solar heating systems must interface with another heating system, such as an existing forced air or hydronic baseboard system, which can be sized smaller to accommodate the reduced demands put on them.

COSTS AND OTHER DETAILS

Whether you re installing a solar system for just hot water or for heat *and* hot water, it is important to first make your home as efficient as possible. Utilizing water-efficient appliances, low-flow showerheads and faucets, and lowering the hot water temperature set point will substantially reduce your hot water demand. Similarly, if you are considering a solar system for heat, sealing your home s shell and making certain it is adequately insulated will reduce space heating demands. Implementing these efficiency measures first will allow for a smaller solar system to meet your needs.

A good time to consider installing a solar thermal system is if you are:

- Building a new home or remodeling. Over a 20 year mortgage loan, monthly energy savings could be greater than the added payment to cover the cost of your solar system.
- Replacing a furnace or hot water heater.
- Heating a pool or spa.
- Using propane or electricity to heat water.
- Installing hydronic heating.

Homeowners that install solar thermal systems before December 31, 2007 can receive a Federal tax credit of 30% of the system cost to a maximum of \$2000.

	Domestic Hot Water (DHW) only	Radiant Heat and DHW
Collector area required south-facing	64 sq. ft	192 sq. ft
Collector size	Two 4 x 8 panels	Six 4 x 8 panels
Water storage capacity	80-120 gallons	350-400 gallons
Average annual heating requirement provided	70-80% of DHW depending on usage	65-75% heating depending on several factors; 80% of DHW
Total installed cost	\$6,000 - \$7,000	\$17,000 - \$20,000
Federal tax credit available	30% of total up to \$2,000	30% of total up to \$2,000
Annual estimated energy production	17-20 MMBtu (170-200 therms)	50-60 MMBtu (500-600 therms)
Annual estimated costs savings (based on 100 gallons daily usage, average efficiency of conventional heating equipment, and May 2006 energy costs)	If replacing: Electric: \$625 (at \$.10/kWh) Propane: \$575 (at 1.70/gal) Natural gas: \$240 (at \$.87/therm)	
CO2 emissions avoided annually and over the system lifetime (30 years), in tons	If replacing: Electric: 6 tons/yr, 180 tons lifetime Propane: 2.2 tons/yr, 66 tons lifetime Nat. gas: 1.6 tons/yr, 48 tons lifetime	

LEARN MORE

Colorado Solar Energy Industry Association (COSEIA) www.coseia.org/
 U.S. Department of Energy www1.eere.energy.gov/solar/solar_heating.html
 National Renewable Energy Laboratory www.nrel.gov/learning/re_solar_hot_water.html
 Smart Energy Living smartenergyliving.org/ecm/Solar/Solar_Hot_Water.html

THE CENTER FOR RESOURCE CONSERVATION

Please visit our website www.conservacioncenter.org (click on Energy) for homeowner resources including upcoming workshops, events and the contractor referral list.

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