

The Oil Drum: Campfire

Discussions about Energy and Our Future

Solar Hot Water Heating

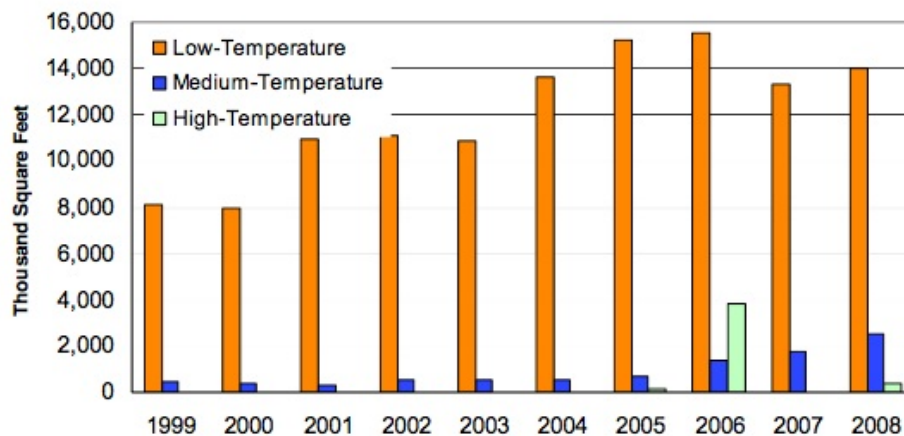
Posted by [Gail the Actuary](#) on January 21, 2010 - 10:12am in [The Oil Drum: Campfire](#)

Topic: [Alternative energy](#)

Tags: [hot water heating](#), [solar hot water](#), [solar thermal](#) [[list all tags](#)]

We often hear that solar thermal is quite cost effective, but if a person looks into the situation, it appears that solar thermal's primary use is for heating swimming pools and hot tubs. A [recent publication](#) by the EIA shows this chart:

Figure 2.2 Solar Thermal Collector Shipments by Type, 1999-2008



Source: U.S. Energy Information Administration (EIA)
Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

In the chart above, the low-temperature solar heating units (140 degrees F or lower) are primarily used to heat swimming pools. Medium temperature solar thermal units (140 to 180 degrees F) are primarily used for heating hot water. High temperature collectors (over 180 degrees F) are primarily used to generate electricity for the grid.

In this Campfire post, we will talk about solar thermal hot water heating--the major part of the little blue bars in the above chart. Sales of solar hot water heaters have been growing since a tax credit for home installation became available in the USA in 2006. I will share some of what I found on the Internet, and ask what your experiences have been.

Tax Credits

Solar hot water heating has been growing in recent years, at least in part because a [30% tax credit](#) which is available from the US federal government on systems that are certified by the Solar Rating Certification Corporation. State and local programs may be available as well. The tax credit is available both for units installed on primary residences and on secondary homes.

Active vs. Passive

There are two basic types of hot water heaters--**active**, which uses electricity to pump water through the system, and **passive**, which uses no pumps or electrical equipment. According to [Real Green](#),

Because of their design, passive systems are the simpler of the two. They work essentially like a garden hose left out in the sun, except the container for the water is much, much larger. The sun directly heats the water in a large, rooftop tank, which then flows down into your plumbing system. If the water has not yet reached the temperature you've selected on your thermostat, your conventional water heater will need to kick in to finish the job. Passive systems are best suited for warm climates where your rooftop storage tank is in no danger of freezing.

Because of their simplicity, passive systems are usually cheaper and can last longer than active systems. The drawbacks are that they can be less reliable, and require a heavy water tank, or collector, to be mounted on your roof. (Depending on your roof's design, this may require structural support.)

An active system stores water in a tank inside your house, and uses its pump to move either water or a "heat exchange" fluid through a "collector" on your roof. Collectors are the components of your solar water heating system it to heat your water. Used in freezing climates, the heat-exchange fluid is a non-freezing liquid that carries the sun's heat from the roof to your tank, where it transfers the heat to your water. The fluid recirculates to the roof to be heated again, while the water flows on to your tap. (This fluid is usually propylene glycol, which the FDA has approved as an additive in food and medicine. However, it is a suspected neuro- and respiratory toxin, according to the National Institute of Occupational Health and Safety.)

Although active systems are more expensive but more reliable than passive ones, you may still wish to keep your conventional water heater for a back-up. In fact, in many areas, local building codes require conventional back-ups, so be sure to check with your contractor or local government. Active systems using the "heat exchange" method are best for areas where freezing temperatures are likely.

Among the active solar water heating systems, there are two types, according to the [US Department of Energy](#):

Direct circulation systems

Pumps circulate household water through the collectors and into the home. They work well in climates where it rarely freezes.

Indirect circulation systems

Pumps circulate a non-freezing, heat-transfer fluid through the collectors and a heat exchanger. This heats the water that then flows into the home. They are popular in

climates prone to freezing temperatures.

According to the same source, there are two kinds of passive hot water heating systems:

Integral collector-storage passive systems

These work best in areas where temperatures rarely fall below freezing. They also work well in households with significant daytime and evening hot-water needs.

Thermosyphon systems [require roof collection units]

Water flows through the system when warm water rises as cooler water sinks. The collector must be installed below the storage tank so that warm water will rise into the tank. These systems are reliable, but contractors must pay careful attention to the roof design because of the heavy storage tank. They are usually more expensive than integral collector-storage passive systems.

Obstacles to Installation

According to the [US Department of Energy](#), there are a variety of obstacles homeowners can run into. This is a list they note:

The matter of building code and zoning compliance for a solar system installation is typically a local issue. Even if a statewide building code is in effect, it's usually enforced locally by your city, county, or parish. Common problems homeowners have encountered with building codes include the following:

- Exceeding roof load
- Unacceptable heat exchangers
- Improper wiring
- Unlawful tampering with potable water supplies.

Potential zoning issues include the following:

- Obstructing sideyards
- Erecting unlawful protrusions on roofs
- Siting the system too close to streets or lot boundaries.

The systems do require maintenance, and occasional replacement parts, especially if they contain electrical components.

Economics of Systems

How economic these units prove to be will vary by the part of the country, but one would expect them to always be significantly more economic than solar PV. [This site](#) says that solar water

heating produces energy at 1/3 to 1/4 the cost of solar PV.

When you consider the cost, you will want to include the cost of the back up system as well. (Some hot water systems seem to be specially made as backup to solar hot water systems--for example this [propane back-up](#) unit for \$599.) Besides geographical location, cost savings will depend on the local price of electricity or natural gas that your current system uses.

To get an idea about prices, I looked at the website of [Solar Direct](#). The site lists three types of systems:

1. Warm Climate ProgressivTube - Solar Hot Water Passive System - No moving parts \$1,700 to \$2,600.
2. Moderate Climate Helio-Pak - Active Solar Hot Water, flat plate type - Tanks do not need to be installed above collectors - Uses electricity - \$2,200 to \$5,200
3. Cold Climate Trend Setter - Solar Hot Water Active, evacuated tube - Price range (including commercial) \$6,000 to \$17,000.

This is the map for which types of this particular vendor's products can be used where:



Obviously this is not intended as a recommendation for the above site--it just had some convenient cost figures available.

Questions for Readers

1. What has your experience with solar hot water heaters? Is it easy to find a contractor, and get around local ordinances?
2. Are the units proving to be cost effective?
3. What parts of the country / world should these units be considered for? It seem like these would be especially useful in parts of the world where temperatures don't freeze and a simple passive solar unit would work.
4. Are there any special issues that readers who want to try this idea should watch out for?

5. Are there any particular vendors or brands you have had good experience with?

6. Have you found any particularly good references on solar hot water heaters?

Also, readers who haven't installed solar hot water heaters, but have thought about the idea, may want to raise questions as well.



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