

RENEWABLE



ENERGY

An Introduction to

*Solar*

# Water Heating Systems



Natural Resources  
Canada

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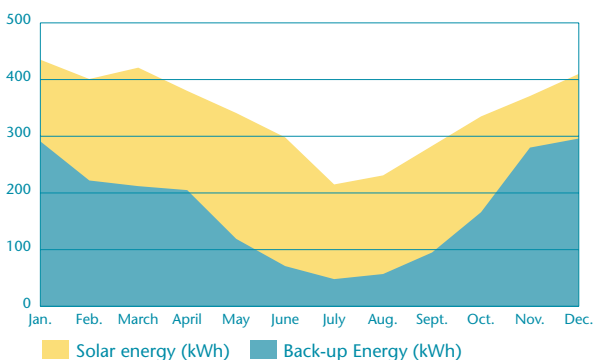
Canada

## Solar Water Heating Systems

Solar energy is a clean and abundant energy resource that can be used to supplement many of your energy needs. Solar energy can be utilized as a form of heat, such as solar water heating, and as electricity, such as solar photovoltaics. Solar water heating systems are commonly referred to in the industry as Solar Domestic Hot Water (SDHW) systems.

Consumers often ask if there is enough sunlight in Canada to support solar applications such as water heating. In fact, there is enough solar energy to deliver an average of 2500 kWh of energy per year. This means that a solar water heater can provide enough solar energy to meet about one half of the water heating energy needs for a family of four.

### Example of Annual Solar Energy Contribution



Water heating is one of the most cost-effective uses of solar energy, providing hot water for showers, dishwashers and clothes washers. Every year, several thousands of new solar water heaters are installed worldwide.

Canadian manufacturers have developed some of the most cost-effective systems in the world. Consumers can now buy “off-the-shelf” solar water heaters that meet industry-wide standards, providing a clean alternative to gas, electric, oil or propane water heaters. Freeze-protected solar water heaters manufactured in Canada have been specifically designed to operate reliably through the entire year, even when the outside temperature is either well below freezing or extremely hot.

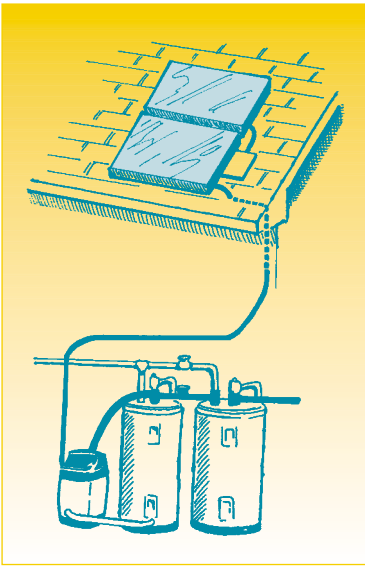
## **Benefits from Solar Water Heating**

A solar water heater reduces the amount of fuel you need to heat water because it captures the sun’s renewable energy. Many solar water heaters use a small solar electric (photovoltaic) module to power the pump needed to circulate the heat transfer fluid through the collectors. The use of such module allows the solar water heater to operate even during a power outage.

Solar water heaters can also be used in other applications, for example, car washes, hotels and motels, restaurants, swimming pools, and laundry mats.

There are many possible designs for a solar water heater. In general, it consists of three main components:

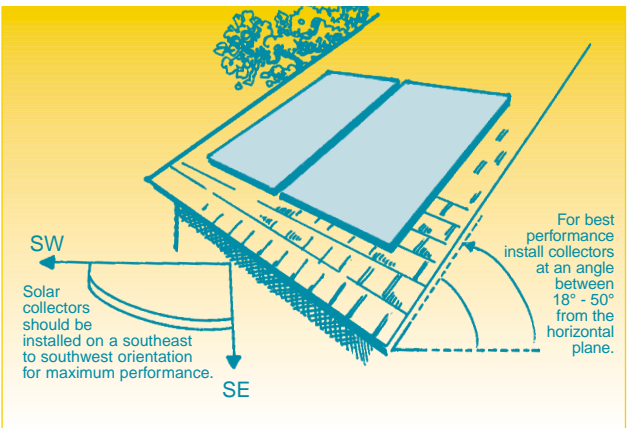
1. Solar collector, which converts solar radiation into useable heat.
2. Heat exchanger/pump module, which transfers the heat from the solar collector into the potable water.
3. Storage tank to store the solar heated water.



▲ *Most medium to large systems have both an auxiliary tank and a solar preheat tank with a heat exchanger.*

The most common types of solar collectors used in solar water heaters are flat plate and evacuated tube collectors. In both cases, one or more collectors are mounted on a southerly-facing slope or roof and connected to a storage tank. When there is enough sunlight, a heat transfer fluid, such as water or glycol, is pumped through

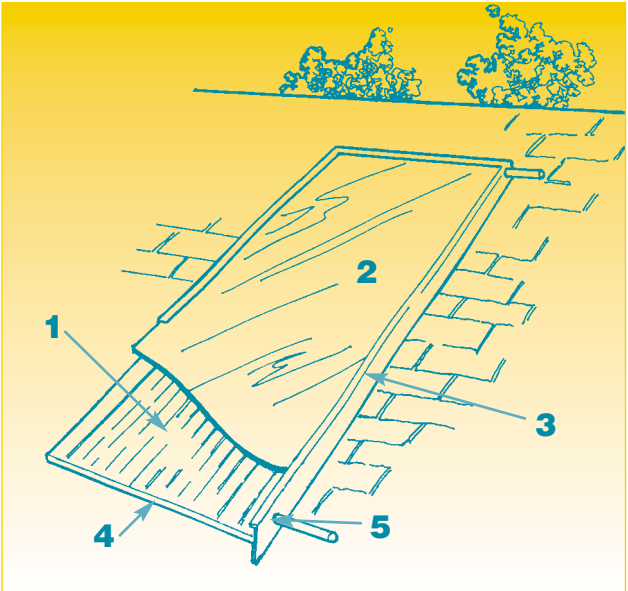
the collector. As the fluid passes through the



▲ *Solar collectors should be positioned facing southeast to southwest.*

For best performance install collectors at an angle between  $18^{\circ}$  -  $50^{\circ}$  from the horizontal plane.

collector, it is heated by the sun. The heated fluid is then circulated to a heat exchanger, which transfers the energy into the water tank.



▲ *Cutaway view showing glazed flat plate solar collector components*  
1. Metallic Absorber 2. Glazing 3. Housing  
4. Insulation 5. Heat transfer fluid inlet

When the homeowner uses hot water, cold water from the main water supply enters the bottom of the solar storage tank. Solar heated water at the top of the storage tank flows into the conventional water heater and then to the taps. If the water at the top of the solar storage tank is hot enough, no further heating is necessary. If the solar heated water is only warm (after an extended cloudy period), the conventional water heater brings the water up to the desired temperature.

## Categories of Solar Water Heaters

Solar water heaters available in Canada fall into two categories: year-round and seasonal.

Year-round systems are designed to operate reliably through the entire year, in all extremes of weather. These systems are generally more expensive than seasonal systems, and usually provide more energy savings.

Seasonal solar water heaters are designed to operate only when outdoor temperatures are above freezing. Seasonal systems must be shut down during the winter months, when the temperature drops below the safe operating range stated by the manufacturer. Compared to year-round systems, these systems tend to be less expensive since they do not include the additional freeze protection equipment. These heaters also produce less energy annually because they operate for a shorter duration. Seasonal systems are ideal for summer vacation homes and areas that do not experience freezing conditions.

## Summary

Solar water heaters are designed to last many years with little maintenance. A solar water heater can reduce your water heating energy needs by one-half, giving you significant dollar savings as well as clean energy.

## Further Information

If you would like more information on solar water heaters or are interested in purchasing one, obtain a copy of Natural Resources Canada's *Solar Water Heating Systems: A Buyer's Guide* or speak with a Canadian Solar Industries Association representative.

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To order a copy of the *Solar Water Heating Systems: A Buyer's Guide* or other renewable energy publications, please call NRCan's toll free line at 1-800-387-2000. You can also download a copy from our web site at <http://www.nrcan.gc.ca/es/erb/reed>.

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Aussi disponible en français sous le titre :  
*Introduction aux chauffe-eau solaires*