

Solar Energy in Canada

Solar energy can meet three distinct applications: **heating water, heating air, and generation of electricity** in any residential or commercial setting. In most cases, solar energy provides the lowest lifecycle cost, and the lowest environmental impact from the release of greenhouse gases (GHG).

The Cost of Solar Water Heating System

Solar thermal is the most cost-effective way to use the sun's energy. In Canada, a single 4 x 8' glazed solar thermal collector will capture between 1,500 and 3,000 kWh of energy per year (depending on consumption and climate). At current electricity rates, that energy is worth \$150 to \$300 a year. In most residential homes, water heating is the second largest energy consumer next to space heating, costing anywhere from \$180 to \$480 per year. For hot water intensive commercial operations, water heating can be the largest annual expense.

So why is it that when so much solar energy strikes the earth each day, there are not more people using solar thermal energy? Often, because people are deterred by the higher initial cost.

There are several different residential applications that are economically attractive.

The most cost-effective is solar pool heating. It is not uncommon for Canadians to spend as much money heating their pool in the summer as they do heating their home in the winter, and solar energy can provide a major contribution in this application. With annual savings of \$700 possible with the use of solar collectors, the initial outlay of \$2,000 to \$4,000 for a pool heating system can be recovered in six years.

The following table outlines the lifetime cost comparison between solar and oil, based on 2000 cost estimates. As the price of fossil fuel energy, including oil and natural gas, continues to rise, this cost differential becomes even more significant.

	Solar	Oil
Initial Cost	\$3,500	\$1,500
Operating Cost	\$0/yr	\$700/yr
15-year cost	\$3,500	\$12,000

Residential solar pool heaters are such good value because they are only used seasonally. As such, they are not required to produce the higher temperatures or have the freeze-protection measures of year-round solar water collectors. Consequently, solar pool collectors are less than the cost of domestic water heating solar collectors.

Heating water for domestic use is another residential solar application with strong economic potential. Such systems are usually designed to operate year-round, but seasonal solar water heaters are also available and can be cost-effective at the cottage or other areas where the need for hot water is coincident with non-freezing outside temperatures. Seasonal solar water heating systems have lower initial costs and are more efficient. However, this is tempered with their reduced time in annual service, since they are not used during the winter freeze.

A year-round solar water heater system will provide 35 to 55% of annual water heating needs. In summer, it will provide 75 to 100% of hot water and in winter it will provide 10 to 25%. At 2001 energy prices, in most Canadian homes, that is a savings of \$150 to \$500 per year. A system would be expected to pay for itself in 8 to 12 years, although the actual payback period depends on system size and future energy prices. However, the larger a consumer of hot water you are the more you stand to gain

financially from a solar thermal water heating system.

If solar thermal is so cost-effective for large consumers of hot water, why do houses not use solar to heat with?

Ideally, a year-round solar thermal water heating system would get the most benefit of each collector's capacity, as is the case with domestic solar water heaters. In cases where there are larger demands for heat during summer, such as outdoor swimming pools or water heating at a cottage, there will be excess winter capacity if the design maximizes collector efficiency for summer use. This excess winter capacity could be dumped as winter heat into your home. While it is technically feasible to design a system to provide plenty of winter solar heat, the system would be economically unattractive, as the majority of the collectors would only be used for a short time in winter. A qualified solar professional should be used to investigate the possibility for solar space heating on a case-by-case basis.

Commercial

As mentioned above, larger consumers of hot water have larger economic advantages to gain by investing in solar technology. Large consumers of hot water, especially those who consume most of their annual hot water during the summer months, can take advantage of the economies of scale of a

larger system. Commercial solar thermal users can take further advantage of federal government subsidies of 25% offered through NRCan's Renewable Energy Deployment Initiative (REDI).

Large commercial hot water users have a further advantage in that they often consume the majority of their hot water during the daytime, when the sun is shining. This reduces the need for large storage systems and further reduces system costs. With creative financing, commercial solar thermal users can have payback periods approaching zero years. If businesses borrow the money to cover the capital cost of the solar thermal system, the energy savings can be large enough to cover the loan payments.

Some applications are well suited for solar water heating, such as pool heating and domestic water heating. Commercially, anyone who uses a great deal of hot water year round, and especially those industries that use more hot water during the summer months have a lot to gain from an investment in solar water heating technology. With rising energy prices, and financial incentives available for commercial applications, more companies are investigating an inevitable transition to less expensive and less polluting sources of energy.

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The **Canadian Solar Industries Association (CanSIA)**, with assistance from **Natural Resources Canada**, has produced this series of bulletins to explain the feasible applications of solar energy in Canada. To demonstrate how you can put the sun to work for you, CanSIA has posted these bulletins on its internet homepage, with additional information on solar energy and a comprehensive directory of companies that are involved in the design, sale and installation of solar energy across Canada. Members of CanSIA comply with a Code of Ethics. Please go to www.CanSIA.ca, or contact our office:

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