

# I want my own solar system!

solar thermal

## What is solar thermal energy?

Solar thermal technologies use sunlight to provide heat for domestic hot water, space heating, industrial process heat and heating swimming pools. Solar thermal systems generally fall into two categories: passive solar design, which allows heat from the sun to be absorbed and stored by building components (like concrete or stone surfaces) and active systems, which use collectors and mechanical components to provide thermal energy to a building. Solar thermal systems are meant to supplement a building's primary hot water and space heating systems; they are not intended to replace them.

## Is solar thermal energy effective in Minnesota?

Solar energy is plentiful in Minnesota. For example, a typical solar water heating system in Minnesota can provide 50 to 75% of the total energy required for domestic hot water. Space heating requires a larger system, but is effective in significantly reducing a building's need for other energy resources like natural gas, fuel oil, or propane. Space heating can be achieved with solar hot water or solar hot air panels (which use solar radiation to heat air inside the collector and transfer warmed air into the interior space). Minnesota has manufacturers of both technologies.

## What are the benefits of solar thermal energy?

Solar thermal energy is a renewable, sustainable energy source and can be a cost effective and reliable way to provide hot water and heat for buildings. Passive solar building design can make your building more comfortable. In addition, solar thermal is a strategy for addressing climate change, diversifying our energy supply, increasing Minnesota's energy independence, and boosting the state's economy.

## Where should solar thermal systems be located?

Not every site is well suited for solar thermal applications. Still, solar thermal siting requirements are much more forgiving than those of solar electricity. Therefore, solar thermal is more versatile and appropriate for a greater number of locations. If you have a roof (for solar thermal) or vertical wall space (for solar hot air) with good southern exposure, free of trees, buildings and other obstructions, your site might be suited for a solar installation. A more formal site assessment done by a solar contractor can more accurately determine the solar potential of your site.

## How much do solar thermal systems cost?

Solar hot water is one of the most cost-effective solar technologies available; solar hot air collectors can be cost-effective, too. The installed cost of a solar hot water system is approximately \$8,000 - \$12,000 for a typical residential installation (before

incentives). For a residential system that combines both water and space heating, the range is \$18,000 - \$25,000 or more. Solar hot air installations for space heating start at \$5,000.

Energy efficient mortgage financing is one way to make a solar thermal system more affordable. Rolling the cost of the system into a mortgage alleviates the need for a large upfront expense and distributes the cost of the system over a number of years. The FHA 203(k) program enables a home buyer or investor to obtain a single loan to finance both property purchase and complete major improvements (like a solar thermal system) after closing.

## What incentives exist for solar thermal technologies?

The Office of Energy Security has a new residential solar hot water program to assist with up to 25% of the cost of a solar hot water system. There is also a personal federal tax credit of 30% of the cost of a residential solar thermal system (up to \$2,000) or a business tax credit of 30% of the cost of a solar thermal system for commercial systems installed between January 1, 2006 and December 31, 2008. In addition, the state of Minnesota exempts solar equipment from sales and property tax. For a current list of government and utility incentives for solar thermal and other renewable energy technologies, visit the Database of State Incentives for Renewable Energy.



*A solar hot air installation at the Little Earth Housing Development in Minneapolis.*

(over)

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solar electric

## What is solar electricity?

Solar electricity or photovoltaics is the use of sunlight to generate electricity. The process, although somewhat complicated, is familiar to most of us in the form of solar powered calculators which use small photovoltaic (PV) cells to power the device.

## Does solar electricity make sense in Minnesota?

Virtually every region in the United States has sufficient solar energy to produce electricity from the sun, and Minnesota is no exception. Today, there are approximately 1,000 kilowatts of installed solar electric capacity in Minnesota. In 2008, the U.S. Department of Energy named Minneapolis-St. Paul as one of 25 Solar America Cities.

## What are the benefits of solar electricity?

Solar electric systems have low maintenance and operating costs and can produce electricity for 30-50 years. Solar electric is a source of non-polluting power and helps mitigate climate change by reducing fossil fuel consumption. It also diversifies the energy supply and increases Minnesota's energy independence. Solar electric investment creates local jobs and stimulates the local economy, as well.

## What are the challenges of solar electricity?

The single biggest barrier to solar electricity is the initial cost of installation. However, the costs of solar electric installations are expected to decline, perhaps by up to 50% by 2015. Siting a solar electric system can be a challenge since any shading from obstructions significantly reduces the system's performance. State law allows local zoning

boards to create solar access easements to protect a property owner's solar investment from shading caused by new development.

## What does solar PV cost?

The first step in a solar electric project is to implement efficiency and conservation measures to reduce overall energy use. Solar investment can be reduced by thousands for every 1,000 kWh per year eliminated. The cost of a so-

lar electric system varies with the size and type of system and available incentives. A typical 2 kW residential system (which might provide 2,400 kWh per year) costs about \$17,000-\$20,000 installed, before incentives.

## What is the Minnesota Solar Rebate Program?

The Solar Rebate Program was established in July 2002 to provide rebates for grid-connected photovoltaic (solar electric) systems in Minnesota. The program offsets the cost of installing new solar electric systems by \$2 per watt, up to 10 kilowatts. This in effect reduces the cost of a system by about 20-25% for consumers. To qualify, the application must be approved prior to starting installation. Funding availability for the rebates is determined by legislative allocations.

## What other incentives exist for solar electricity?

There is a personal federal tax credit of up to \$2,000 for residential systems and a business tax credit of 30% of the cost of a solar electric system for commercial systems installed between 1/1/06 and 12/31/08. In addition, Minnesota exempts solar equipment from sales and property tax. Many solar electric systems will also qualify for Energy Efficient Mortgages through the FHA. Some utilities offer a rebate as well.

## For more information...

To learn more about solar energy options, check out:

National Renewable Energy Laboratory: [www.nrel.gov](http://www.nrel.gov)

Department of Energy: [www.eere.doe.gov](http://www.eere.doe.gov)

Database of State Incentives for Renewables and Efficiency: [www.dsireusa.org](http://www.dsireusa.org)

Minnesota Renewable Energy Society: [www.mnrenewables.org](http://www.mnrenewables.org)

Minnesota Office of Energy Security: [www.energy.mn.gov](http://www.energy.mn.gov)



*A house in Finland, MN that has a solar electric system in the front yard which generates enough electricity to power most of the home's energy needs. The system is grid-connected and excess energy is sold back to the utility company.*



*A building integrated solar photovoltaic (BIPV) system installed in the skylights at the Marjorie McNeely Conservatory at Como Park in St. Paul, Minnesota.*

