**Electricity From The Sun – A Solar Energy Primer**

Thank you for inquiring about the Minnesota Solar Rebate Program. The Department has developed this solar energy primer to inform you of the basic information about solar electricity.

The common term for solar electricity is "photovoltaic." Photovoltaic (PV) cells are able to convert the sun's energy into small amounts of electricity. Common examples of single PV cells being used to provide power are calculators and landscape lighting. To produce larger amounts of electricity PV cells are combined to make PV panels. Combining two or more photovoltaic panels becomes a PV array. PV panels are being used to provide sufficient electricity to power RV's, cabins, water pumping irrigation systems, radio stations, and residential homes. All of Minnesota's highway construction warning lights are powered by solar electricity.

The photovoltaic industry has developed standardized testing, certification, and installation procedures to protect the consumer. Each panel has a "rating" that lists its maximum output in full direct sunlight. Full sunlight is not always available so the real power output is typically 60% of the rated output of the panel. Shading due to trees, utility poles, and buildings will significantly reduce performance of a PV array. A thorough evaluation of your site is the first step in considering a photovoltaic system. A roof mounted system will require approximently a 10 ft. by 15 ft. area for each 1 kW of produced power. A 2 to 4 kW array will provide 50 to 80% typical household electricity needs.

Minnesota Valley Transit Authority (10.0 kW)
Burnsville, MN

In most cases the solar electric panels will be mounted on a roof and have a clear view of the the southern sky. Roof mounting systems may have a fixed angle or adjustable for the winter to summer sun angle changes. The best performance is achieved with a mounting system that tracks the sun on a minute by minute basis, at an additional cost.

A grid intertied system consists of the PV array and a device called an inverter. The inverter changes the DC electricity of the solar panels to AC electricity of your home. When the solar electric system produces more power than is needed in the house, the excess electricity flows through the electric meter for use by the electric utility

A typical Minnesota home consumes around 700 kilowatt-hours (kwh) of electricity each month or 25 kWh per day. If you have an electric heating system, an electric hot water heater, an electric stove, and/or older appliances you could be averaging 30 to 45 kWh per day. If you use natural gas for these items and have energy efficient appliances, you might be averaging 5 to 20 kWh per day. Look at your past 12 months of electric bills. Your utility can provide you a summary of your consumption for the past year. Call your utility for this information.

Solar electricity is expensive and has long payback periods. The installed cost of a 1 kilowatt (kW) grid-intertied solar system will range from $6,000-10,000, the lowest cost being someone who has the skills to install it themselves and the highest being a system that actively tracks the sun and is installed by a solar dealer. Larger systems cost more in total but less per kilowatt.

The Minnesota Solar Rebate Program, which is only for grid-intertied systems, would reduce these costs by $2,000 per kW. The minimum size required to receive a rebate is 0.5 kW and the maximum that can be rebated is $20,000 for a 10 kW system.

Before you decide to invest in a solar electric system, you should invest in efficient electric appliances and compact fluorescent lighting. Most homeowners with PV systems reduce their electricity consumption into the 5 to 15 kWh per day first. Contact your electric utility and request an energy audit for your home or business. The energy auditor will identify the costs and savings of replacing appliances and lights for you. The Energy Information Center website has Home Energy Guides to provide information to consider in preparing for these purchases.

The next step would be to call the Energy Information Center to request additional materials on solar electricity and the solar rebate program. A renewable energy dealer can assist you in assessing your home or business' solar potential and give you an estimate of costs.

**For More information:**
Minnesota Dept of Commerce, Energy Info Center
651-296-5175 or 1-800-657-3710
www.commerce.state.mn.us
energy.info@state.mn.us

US Department of Energy, Office of Energy Efficiency and Renewable Energy (EERE)
1-800-DOE-3732.
www.eren.doe.gov/RE/solar.html

Home Power Magazine
800-707-6585 or 541-512- 0201
www.homepower.com

Residential Installation (3.3 kW)
Solar Shingles in Northfield, MN
Photo Courtesy: National Renewable Energy Laboratory

Residential Installation (2.1 kW)
Solar Panels in White Bear Lake, MN
Photo Courtesy: Solar Electric Power Association