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JON AND JANELLE WILCOX

A garden shed doubling as a solar power plant. The 36 solar electric panels on the roof provide enough power to run all the appliances in the Wilcox home—including air conditioning. Surplus electricity is sold back to the local utility.

Solar electric systems are considered a potentially important source of electricity for the 21st century. When looking toward the future it is hard to imagine not using them. These systems can easily be located in urban areas and integrated attractively into buildings. They are silent, produce no emissions, require no fuel other than sunlight and have no moving parts. They are modular, relatively easy to transport and install, and have very low maintenance requirements. Furthermore, with a grid-connected solar electric system, it is not necessary to depend totally on solar power. Many grid-connected residential systems provide half or less of the power required yet still contribute to offsetting fossil fuel electricity production.

Solar electric panels are frequently used to provide power to remote homes far from utility lines; batteries store power for nighttime or cloudy day use. Now, however, many Wisconsin electric utilities allow their distribution grid to be used like a battery through a process called “net metering.” Net metering allows owners of small grid-connected solar electric systems to direct surplus power back to the grid when their system is generating more power than they require, and draw from it when more is needed. It is also possible to combine a grid-connected system with batteries to create an uninterrupted power supply system.

SITING SOLAR ELECTRIC SYSTEMS

For existing homes and buildings it is easiest to locate photovoltaic panels on the roof, on a separate pole or other structure, or to attach them as awnings. But for new buildings and homes, solar electric systems can be installed as part of the roof by replacing standard roofing products. (Solar electric modules are available as shingles, standing metal roofing and slate-type roofing). The roofing panels are more expensive than rack-mounted panels, but many people feel that they are much more attractive. Solar electric panels can also replace windows and facades.

SOLAR ELECTRIC SYSTEMS

Solar electric systems, also called photovoltaic systems or “PV,” use panels made from semiconductor materials that convert sunlight into electricity. The sun’s photons strike the semiconductor material, dislodging electrons and creating a direct flow of electrons or electrical current. That “direct” current of electrons is converted by an inverter to the standard “alternating” current provided by electric utilities.



(top) Installing solar electric shingles: a recent technology that looks like conventional shingles but generates electricity.

(right) The Ritger Law Office in Random Lake, Wisconsin, is connected to the grid but stores solar electricity from its solar roofing panels to provide uninterrupted power for computers, telephones and lighting.



SYSTEM SIZE AND COSTS

- A 1-kW solar electric system will generate one kilowatt hour (kWh) of electricity after exposure to one hour of sunlight. In Wisconsin, an unshaded 1-kW panel, facing roughly south and inclined between 25 degrees and 50 degrees, will generate about 1,200 kWh per year. A 1-kW pole-mounted, dual-axis tracking system, which keeps the panels constantly facing the sun, will produce about 1,600 kWh/year.
- A simple grid-connected solar electric system costs \$8,000 to \$9,000 per kW installed for a roof-mounted system, and \$9,000 to \$10,000 per kW installed for a dual-axis tracking system.
- The average home in Wisconsin consumes 8,500 kWh of electricity per year, which would require a

6-kW to 8-kW solar electric system. Reducing power needs by installing efficient appliances and lights—and by replacing electric water heaters, clothes dryers and stoves with natural gas or propane models—will increase the practicality of a solar electric system. Solar water heating is an additional sun-powered option.

- Off-grid solar electric homes offer comfortable lifestyles with 1-kW to 3-kW solar electric systems. A grid-connected home need not supply the total electricity load to be a solar energy producer.

OTHER CONSIDERATIONS

- A grid-connected solar electric system is not cost effective when compared to current utility power prices. The value of these systems is based on the desire to use and support renewable energy, develop self-reliance, reduce utility power load, and improve power reliability and quality.
- To install a solar electric system that will be interconnected with the utility grid, an agreement must be made with the local utility. Check with the utility before purchasing any equipment.
- Check about home insurance requirements, and check community codes, covenants and restrictions before purchasing or installing equipment.
- For optimum performance, some maintenance will be required, such as keeping the panels clean.

Careful planning will provide the greatest value from a solar electric system. Such planning includes evaluating electricity needs, incorporating energy saving measures, and working closely with an experienced and knowledgeable solar power contractor to ensure a safe and reliable system.

FOR MORE INFORMATION

focusonenergy.com

We have fact sheets and case studies featuring solar water heating, solar electricity, passive solar design and wind turbines. Renewable energy incentives are also available. Call 800.762.7077 for more information.

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This Web site, created by the Wisconsin Solar Use Network (WisconSUN), contains comprehensive information about grid-connected solar systems, including case studies, technical overviews and contacts with dealers and installers.

Focus on Energy is a public-private partnership offering energy information and services to energy utility customers throughout Wisconsin. The goals of this program are to encourage energy efficiency and use of renewable energy, enhance the environment and ensure the future supply of energy for Wisconsin. For information about the Focus on Energy services and programs, call 800.762.7077 or visit focusonenergy.com.