



BIOMASS



GEOTHERMAL



HYDROPOWER

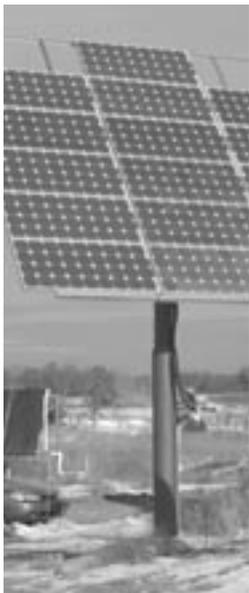


SOLAR



WIND

Call Focus on Energy to learn about renewable energy options for your home, business or organization. The Renewable Energy Information Center can help with many renewable energy topics. Call 1.800.762.7077 or visit www.focusonenergy.com for additional information.



LARRY KROM

A solar tracker is one option for generating solar electricity at an off-grid site.

A growing number of residential solar electric systems are located on homes in remote locations far from a utility distribution network. These homes are known as “off the grid.” Off-grid homes typically use solar electric panels with battery storage systems simply because it costs less than running a power line to the home. Solar electricity is reliable and quiet, its components are easily transported and installed, and it is easy to maintain. It also allows for energy self-sufficiency.

SOLAR ELECTRIC SYSTEM COMPONENTS

Solar electric systems consist of photovoltaic modules, a battery bank, and control and safety equipment. Photovoltaic modules can be mounted on a south-facing roof, on a frame at ground level or on a tracker.

In Wisconsin a pole-mounted solar electric system that follows the sun across the sky (using a dual-axis tracking rack) will generate about 30 percent more kilowatts than an optimally oriented fixed panel. A typical house-sized system uses about 200 to 400 square feet of photovoltaic panels.

Batteries store energy for use when the sun is not providing power. The batteries used in a solar electric system are deep-cycle batteries, similar to those that power electric golf carts. The number of batteries required depends on the type of battery used and the storage needs.

Other required equipment includes battery charge controllers to protect the battery from overcharging or draining too low, and inverters to convert direct current to alternating current, the type used for standard appliances. Systems are now available with prewired panels, making installation easier and more reliable.

ADVANTAGES OF REMOTE PV POWER

- A well-designed and maintained solar electric system provides highly reliable (and clean) energy independence.



FLYING CAT ENTERPRISES

This off-grid Wisconsin home generates its own electricity with solar panels on the roof.

- The further a building site is from an existing utility line, the more cost effective a solar electric system becomes. Typical utility line extensions cost \$4 to \$5 per linear foot. The installed cost of a typical home system ranges from \$10,000 to \$45,000 depending on size.
- Solar electric systems can replace gas-powered generators in remote locations, displacing the costs of generator fuel, maintenance and replacement, and eliminating the necessity to transport fuel.
- Solar electric systems can be integrated easily with other renewable energy sources, such as wind and biomass power, to take advantage of other resources on the site.

OTHER CONSIDERATIONS

System maintenance. No solar electric system is completely maintenance-free. Regular system inspections are necessary to ensure that the wiring and contacts are free from corrosion, the modules are clear of debris, and the mounting equipment has tight fasteners. Power output should be monitored and batteries maintained.

Energy efficiency. Because remote power is expensive, it is essential to begin planning a system by assessing household electricity needs.

Photovoltaic, or solar, electricity

The word *photovoltaic* comes from the Greek *phos* meaning “light” and from the word *volt*, for Alessandro Volta, the man who first devised apparatus for developing electric currents. Photovoltaic materials have the ability to generate a current of electricity when exposed to light. Photons, which make up light, knock electrons from the front to the back of the photovoltaic material, creating an electrical current. Electrical generation within a photovoltaic cell is nonmechanical. There are no moving parts, only moving electrons, and therefore it is silent and clean, and it continues indefinitely as long as the light source is present.

Solar electric panels are constructed of photovoltaic cells, the basic components required to produce solar electricity. These cells are made of specially formulated silicon materials. Photovoltaic cells can be built into frames and installed on roofs or on freestanding racks installed on the ground. Recent solar technology includes building components that incorporate solar cells into walls, windows and roofing systems.

Small solar electric systems are not practical for powering electric space heating systems or water heaters, air conditioners, electric stoves, or electric clothes dryers. Water requirements can be reduced with low-flow fixtures and a front-loading clothes washer. Such solutions will reduce both water pumping and hot water requirements.



WISCONSIN SOLAR USE NETWORK

Off-grid homes may require many modules, making a ground-mounted installation a practical strategy.

Back-up power. Many owners of off-grid solar electric systems feel the need for a back-up fossil fuel generator to ensure that they have power during long periods of cloudy weather and to better maintain their batteries.

Site requirements. For maximum daily power output, photovoltaic modules should have southern orientation free of obstructions such as trees, hills and buildings that might shade the modules, especially during the peak sun hours of 10 a.m. to 2 p.m. Consider both summer and winter paths of the sun, as well as the growth of trees and future construction that may cause shading.

FOR MORE INFORMATION

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Focus on Energy

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