



## ONEDORLD SUSTAINABLE

Technology for sustainable living

### **Myth 1: Solar panels make electricity from the sun's heat.**

There are two major types of solar panel technologies. When it comes to how they work, they couldn't be more different from each other.

Solar hot water panels, also known as solar thermal panels or solar "collectors" capture the sun's *heat* to provide hot water for domestic use or home heating. These are large, dark, rectangular panels usually measuring around 4 by 8 feet (1.2 x 2.4 m). They look like very shallow rectangular boxes, and have been around and in use on residential rooftops for decades.

The second type of solar panel is the photovoltaic (PV) panel, also known as a solar-electric panel or module. These smaller and much lighter-weight panels use the sun's *light* to make electricity via what's known as the "photovoltaic effect." PV modules perform best in cool temperatures under bright sunlight. They come in all different sizes (including some that are cleverly disguised as roofing materials) and are turning up in a wide variety of residential, commercial, industrial, and scientific applications.

So you can get hot water from the sun's heat and electricity from the sun's light. If you've got sunshine, there's nothing keeping you from choosing both!

—Scott Russell, Home Power Magazine

### **Myth 2: It takes more energy to build PV modules than they can ever produce.**

Some skeptics of solar energy claim that it takes more energy to make a photovoltaic module (PV) than it can ever produce in its lifetime. The truth is that PV modules typically recoup their embodied energy in two to four years. According to an article published by the National Renewable Energy Laboratory (NREL), today's single and multicrystalline modules have an energy payback of about four years, and thin-film modules about two years.

Most PV modules in the field are made from hyper-pure crystalline silicon. Purifying and crystallizing the silicon consumes the most energy in making these modules. Thin-film modules are made from considerably less semiconductor material, and therefore have less embodied energy in them. Most of the energy consumed is in the thin-film surface. The aluminum frame on any PV accounts for about six months of its payback time.

Solar energy is an amazing technology considering that modules will produce clean, pollution-free energy for at least 25 to 30 years after they have achieved payback.

—Eric Grisen, Home Power Magazine

## **Myth 3: Solar module production is toxic to the environment.**

A while back, there was a media barrage claiming that photovoltaic (PV) manufacturing was extremely hazardous to the environment. PV manufacturing does require the use of chemicals that are designated as toxic by the U.S. Environmental Protection Agency (EPA). Employee safety is paramount during the manufacturing process, and chemicals used must be disposed of in an environmentally sound manner.

The federally funded National Renewable Energy Laboratory (NREL) researched the media claims and concluded, “By using well-designed industrial processes and careful monitoring, PV manufacturers have minimized risks to where they are far less than those in most major industries. All of these risks fall well within the range already protected by OSHA and similar regulations.”

A thorough analysis of the environmental impact that various energy sources have on the environment must take into account the net effect of a given source over the source’s operational lifetime. When you compare the environmental impact of PV technology to traditional energy sources like coal and nuclear energy, PV comes out on top - hands down.

Nukes produce nuclear waste, and even after spending billions of taxpayer and ratepayer dollars, no acceptable disposal solution has been brought to the table. Fossil-fuel-based energy sources like coal produce air pollution over the power plant’s entire operational lifetime—as long as it’s running, it’s polluting. Burning coal releases sulfur dioxide, which results in acid rain; nitrogen oxide, which results in smog; carbon dioxide, which results in global warming; particulates, which result in lung damage; and an array of heavy metals like arsenic, lead, and mercury, which result in birth defects and brain damage.

On the other end of the spectrum, PV modules produce no emissions and require no use of finite fuel sources. Modules manufactured today are expected to be producing energy 50 years from now. Solar modules offset all the energy used to manufacture them (embodied energy) in two to four years in most locations.

Fossil, nuclear, or solar—which energy source would you want in your backyard?

—Joe Schwartz, Home Power Magazine

## **Myth 4: Solar electricity is too expensive.**

There is a huge public misconception that solar energy is simply too expensive to bother with. The reality is that, both on and off-grid, solar energy is cost effective in many applications.

Right out of the gate, it’s important to understand that with on-grid electricity a substantial amount of “smoke and mirrors” is going on behind the scenes, making true energy cost comparisons unfair at best. The historical trend shows U.S. federal energy subsidies favoring mature energy sources like coal and nuclear over renewable sources by a factor of one hundred to one. A report based on U.S. Department of Energy (DOE) data by the Congressional Research Service (CRS) states, “Because the great bulk of incentives support mature fossil and nuclear equipment, the existing subsidy structure markedly distorts the marketplace for energy in a direction away from renewables.”

The bottom line is that renewable energy *appears* to be more expensive than traditional electricity generation sources, but the reality is that you pay the difference every year come tax time. If you include the costs of increased pollution, habitat destruction, health care costs, etc., then RE looks even better. Fortunately, many individual states are doing what the feds refuse to do, and are implementing rebate programs for renewables that serve to even out the financial playing field a bit.

—Joe Schwartz, Home Power Magazine

## **Myth 5: Lead-acid batteries wind up as toxic disasters in our landfills.**

Hardly any other industry does a better job at recycling than the lead-acid battery industry - this includes aluminum, glass, paper, and plastics. More than 90 percent of spent battery lead is recycled, which is two to four times higher than many other major recyclable commodities. And 60 percent of the lead used in manufacturing lead-acid batteries is derived from recycled lead. Most of the lead used in your car's battery has probably ridden around in three or four other cars before it got to yours.

Worn out lead-acid batteries are accepted for recycling by all outlets that sell these batteries - it's the law. From there the batteries are broken open and the lead is removed and resmelted for reuse in new batteries. The only way a lead-acid battery winds up in a landfill is if a careless user dumps it there.

—Richard Perez, Home Power Magazine

## **Myth: Grid-tied PV is hazardous to utility line workers.**

Although this may be one of the most pervasive myths in the electricity industry, I was unable to locate a single documented instance of injury or death to a utility worker from a grid-tied inverter. The reasons for this are twofold— modern inverter design and line worker safety protocol.

Inverters are perhaps the most highly scrutinized piece of electronics used in residential applications. Their safety and proper functioning are certified by some of the same agencies that verify the safe operation of all the other appliances in your home.

Inverters for use in grid-tied systems are required (by IEEE, the *NEC*, and UL) to disconnect from the grid for any number of conditions. These include grid outage, high or low voltage, high or low frequency, and inverter malfunction.

Inverters are required to have several redundant safety devices built into their electronics to ensure that they disconnect from the grid if anything at all is wrong. Nonetheless, utility companies and line workers are quite safety conscious, and leave nothing to chance.

Line workers are trained to always ground any potentially energized conductors when performing utility line maintenance. In addition, grid-tied systems are routinely required to have a safety disconnect available for the line worker's use to lock out any solar electricity generation from being backfed onto the grid.

Line worker safety protocols make a great deal of sense. During utility outages, many people use engine generators to keep the electricity on in their homes and businesses. Most engine generators do not have the intricate electronics that inverters have to ensure line worker safety. If they are not correctly hooked up with a transfer switch to isolate selected circuits in the home from the utility grid, the generator can backfeed electricity to the grid through the utility's transformer, which converts it to extremely high voltage.

Line workers have been killed by engine generators, so it's a good thing they practice safety rigorously. In fact, the problems with engine generators are the reason utilities have been so cautious about allowing any other customer-owned generating sources on their lines at all.

Since inverters have such a strong safety record, some day soon they will be a common and accepted part of many home electrical systems. They will outlast the urban myths of line worker lore.

—Linda Pinkham, Home Power Magazine