

## WHY SOLAR ELECTRICITY?

Clean, renewable and reliable, solar photovoltaic (PV) panels are an increasingly important means of generating electricity, for both commercial and residential use. With over 300 sunny days per year and new financial incentives available to help decrease the cost of installation, Colorado is a great place to reap the benefits of solar power generation.

## THE BENEFITS OF SOLAR POWER

The amount of energy from the sun that reaches the Earth in one day is enough to meet the entire planet's power needs for an entire year! With unstable and increasing energy prices, and the economic and health effects of pollution and global warming becoming more prominent, the benefits from solar power generation are many.

Solar energy reduces the need to generate power from more polluting methods, such as coal-fired power plants. Solar energy reduces our dependence on fossil fuels and promotes a healthier economy, creating good, high-paying jobs in a renewable industry. For every megawatt of solar PV installed, more than 7 jobs are created, compared to about 1 job for every megawatt of coal-fired energy.

Solar electric systems are among the most reliable power sources available, and in addition, they require very little maintenance, few spare parts and no fuel. Solar energy is immune to rising or unstable energy prices. Although the cost of solar is still significant, rebates and tax incentives are making it more affordable than ever. Over time, a solar system will pay for itself in energy savings, as well as increase the value of your home.

## THE MECHANICS OF SOLAR PV

The term “photovoltaic” literally means, converting light to electricity. PV cells are comprised of semi-conducting material, usually silicon, which absorbs light energy and converts this energy into DC electricity. PV cells are generally combined to make modules, more commonly known as PV panels, which are combined into solar arrays. A solar array can be designed to meet almost any electric power need, large or small, provided a few important criteria are met to ensure maximum efficiency.

- ☀ **Siting.** To generate electricity efficiently, solar panels should be oriented toward the southern sky, with a clear line of sight to the sun. There should be no obstructions (such as roof overhangs or trees) that impede direct sunlight at any time of the year as the position of the sun moves across the sky.
- ☀ **Tilt & Mountings.** As the sun travels across the sky from east to west and the sun's angle changes during different seasons, a solar array's output and efficiency varies as well. Special mountings can automatically adjust a solar array for these variations, but these add to cost and maintenance; most home solar systems forego these add-ons. Instead, most panels are installed at the optimum average tilt angle of 35° to 40°, which will allow the system to maximize power generation across all seasons.
- ☀ **Irradiation.** Irradiation is a measurement of energy given off by sunlight in a given area, based on climate and geography. Colorado's dry, sunny climate provides above average irradiation levels that make it the 5th most productive state in the country for solar generation.
- ☀ **Inverter.** The PV array must be connected to an inverter, which converts the D/C electricity produced by PV modules to A/C electricity, the type of electricity we commonly use. The inverter is generally connected directly to the home's utility meter.

## TYPES OF SYSTEMS

- ☀ **Grid Connected:** Most often, household solar arrays are connected to the utility-owned power-grid. In this case, the grid stores excess power when the PV system generates more than is needed and the meter runs backwards (this is known as net-metering). If more power is needed than the PV system is generating, electricity can also be provided from utility power source.
- ☀ **Off-Grid:** In remote locations, connection to a conventional power grid may be impractical or impossible. In this case, a stand-alone solar array with battery storage can provide sufficient electricity to power to a whole household.
- ☀ **Battery Storage:** Battery storage is an essential component of a stand alone system. Many people are opting to use battery storage with grid connected solar electric systems. In grid connected applications, excess output from the PV array can be directed first into a backup battery before flowing into the grid. Homeowners often install battery backup systems to power essential systems (such as the refrigerator or computer) in case of blackouts. The number and size of batteries depend on the system and the user's needs.

## COMMON QUESTIONS AND CONCERNS

*Will my solar panels still produce electricity, even when it is cloudy?*

Solar panels are still able to produce energy even without direct sunlight but the best operating performance is under direct sunlight.

*How long do solar panels last? Are they reliable?*

Today's solar panels last much longer than their predecessors from the 1970's and 1980's. Most panel manufacturers provide 20 to 30 year warranties.

*Aren't solar panels only suitable in a rural environment?*

While solar panels have become known as a great option in places where a connection to the grid is impossible, solar panels are great for urban environments too. In fact, solar is at its most affordable and effective in areas where grid connection is available.

*What about aesthetics?*

Solar panels are now available in various applications, sizes and even colors. They can be mounted on the ground or concealed on the roof, or be integrated directly into roof panels, exterior walls, or window overhangs.

*My homeowners association won't allow solar systems in my neighborhood.*

Colorado Statute 38-30-168 significantly limits the right of homeowners associations to restrict the installation of solar systems on the basis of aesthetic considerations.

## LEARN MORE

The Center for ReSource Conservation [www.ConservationCenter.org](http://www.ConservationCenter.org)

Skinny on "Amendment 37" "How to Select a Solar Contractor" "Federal Incentives" "Local Incentives"

National Renewable Energy Laboratory (NREL) [http://www.nrel.gov/learning/re\\_solar.html](http://www.nrel.gov/learning/re_solar.html)  
Solar Energy Basics