



# RENEWABLE ENERGY

a series on alternative energy sources

---

## Small-Scale Solar Energy Systems

Residents of Montgomery County are looking to the sky for an alternative way to power their homes and businesses. Solar energy systems are not a new technology, but in today's social and economic climate they are becoming a more attractive energy production option. Recent advances have made solar energy systems more efficient and economical. A variety of solar technologies are available to consumers, and a growing number of residents are taking advantage of solar energy for its cost and environmental benefits.

### The Technology

All solar energy systems use sunlight to create energy in the form of electricity and/or heat. Solar technologies can be used to supplement or replace your electrical supply or to heat water for space heating, home water use, and pools and spas. This publication focuses on small-scale solar systems that produce



*Solar panel array at the Schuylkill Center for Environmental Education.*

*Courtesy of Joanne Donohue*

2 to 5 kilowatts (kW) per hour (1 kilowatt equals 1,000 watts) and does not consider the larger issue of commercial solar energy production or solar farms.

There are two major forms of solar energy—photovoltaic systems (PV systems) and solar thermal systems. PV systems use panels of photovoltaic cells to convert sunlight into direct current (DC). Since homes and businesses use alternating current (AC) supplied by the electric grid, the DC current flows through an inverter to become the AC flow that will power buildings.

Solar thermal systems harness sunlight in flat-pane collectors or glass tubes. This energy is used to heat a liquid such as water or a safe antifreeze-based liquid. The heated liquid is then pumped into the system to be used in a heat exchanger or into a storage tank to heat the day's supply of hot water.

It is important to realize that either type of solar energy system can be installed in a variety of forms and in different locations. Rooftop-mounted systems are quite common, as are pole-mounted or rack systems on the ground. As the technology becomes more advanced, different types of applications are being developed. Solar collectors are being integrated into actual building construction. Buildings or just windows can be covered in a thin film of PV cells and companies are now producing roof shingles that form a connected PV system. These technologies continue to evolve, and municipalities should be prepared to adjust with the changing times.



*Thin film solar  
Courtesy of Energy Conversion Devices Inc.*

## Benefits and Considerations

### Clean Energy and Reduced Carbon Emissions

A PV system that produces 150 kWh each month:

- Prevents 150 lbs. of coal from being mined.
- Prevents 300 lbs. of CO<sub>2</sub> from entering the atmosphere.
- Keeps 105 gallons of water from being consumed during standard electricity production.
- Keeps NO and SO<sub>2</sub> from being released into the environment.

**Cost Versus Savings.** Solar energy systems can be expensive and quite large. Studies show that for every kW generated, 100 square feet of PV panel is required. The typical cost for solar panels is \$7 to \$9 per watt installed. That means a 5 kW PV system can cost \$35,000 to \$45,000, and a larger 8 kW system can cost up to \$75,000. In Pennsylvania, there are state rebate programs and federal tax credits available that can reduce the final cost of solar energy systems by 50 percent. It is important to note these programs can change, and most require the consumer to pay the full cost of the system before reimbursement.

**Net Metering Benefits.** Net metering is a way of metering the energy consumed and produced on a site containing its own alternative energy generator, such as a PV system. Using net metering, the excess electricity produced by the PV system will spin the electricity meter backwards, effectively banking the electricity until it is needed by the customer. This allows the owner of the solar system to be financially compensated for any excess electricity produced. Net metering is required of utilities in Pennsylvania and is an important motivator for the implementation of alternative energy systems.

**Increased Property Value.** A study done by Appraisal Journal shows that property resale values can increase \$10 to \$20 for every \$1 saved annually in electricity.

**Emergency Backup Power.** Solar energy systems can continue to produce electricity even if the primary utility source may fail.

**Less Pressure on the Power Grid.** Solar energy systems produce the most electricity during daylight hours of the summer when the demand is highest.



*Top photo: Solar panels on a house at The Links at Raven's Claw, a Dewey Homes development in Limerick, PA.*

*Middle photo: Solar panels at the Schuylkill Center for Environmental Education.*

*Bottom photo: Solar panels on a home, installed by SunPower Builders of Collegeville, PA.*

**Maintenance and Lifespan.** Most manufacturers place a 25-year warranty on solar panels, and reputable contractors will guarantee their work. It is important to find registered installers who have been approved by the federal or state government to help ensure quality of work. All solar systems will require a certain amount of regular maintenance, such as cleaning the panels, to ensure efficiency.

## Regulatory Considerations

Solar access concerns the availability of, and access to, unobstructed direct sunlight. For regulatory considerations, the issue is divided into two defined areas—solar easements and solar rights.

**Solar Easements.** A solar easement is defined as a restriction on adjoining properties to prohibit obstruction of direct sunlight from buildings or vegetation. Solar easements:

- Must be in writing.
- Must be recorded as any other real property interest.
- Express the horizontal and vertical angles of the easement.
- Include provisions relating to the granting or termination of the easement.
- Provide compensatory arrangements for the grantor and/or grantee.

**Solar Rights.** Solar rights are defined as the ability to install solar energy systems on residential and commercial property that is subject to private or governmental restrictions. It is important that regulatory language does not prohibit solar energy systems.

### Regulatory Methods of Implementing Solar Rights.

**Solar Fence.** A hypothetical “fence” completely encloses the lot with its foundation running along the lot lines. No object or structure is allowed on any neighboring lots that would shade the “fenced” lot to a greater degree than the lot would be shaded by a solar fence 12-25 feet in height, as determined through computer modeling.

**First come, first served.** Many ordinances recognize prior existence as the key to solar access. An existing building, structure, or vegetation cannot be required to be removed

to provide solar access for a new solar system. New buildings, structures, or newly-planted vegetation cannot deny solar access of an existing solar system. A petition process can be instituted to handle disputes.

**Solar districts.** This regulatory tool assigns regulations specific only to certain areas of a municipality. Districts may prohibit solar systems in certain areas, strictly regulate systems in others, and allow more-relaxed regulations in other areas, depending on the needs and desires of the community.

to prohibit the sale of excess power generated at times from the system, it simply defines the intended primary purpose of the system. An ordinance can also require that a solar energy system only be permitted as an accessory use on the same lot as the principal use.

## Other Regulatory Considerations.

**Visual.** It is possible to regulate the visual impact of solar energy systems. They can be prohibited from the front of a building or any area visible from the street. To ensure a solar system can be a viable means of producing energy, many regulations include the language “unless such installation is proven to be ineffective or impossible” to allow installation in a visible area. Screening regulations can be included for ground-array systems, and provisions can be included to regulate glare from the system.

**Setbacks.** Regulations for roof-mounted systems may include a setback from the edge of the roof or prohibit systems from extending beyond the roof edge. Ground-array systems may have a setback of 10-20 feet from property lines, be allowed only on parcels of 1 or more acres, and/or not cover more than 20 percent of the lot.

**Height.** Roof-mounted systems are usually regulated by zoning height allowances and are usually no more than 6 inches to 3 feet off the roof surface. Ground array height can be limited to a range of 6 feet to 12 feet from the ground.

**Exclusions.** A municipality may want to exclude single solar panels under 2 square feet in size so as to not interfere with the installation of small solar lighting, etc.

**Use of energy.** An ordinance can require that the primary purpose of the solar energy system is to provide power for the principal use of the property on which the system is located and not for commercial sale of the energy. This is not intended

---

## RENEWABLE ENERGY

For more information, please contact the Montgomery County Planning Commission at 610.278.3722 or visit our site online at [www.planning.montcopa.org](http://www.planning.montcopa.org) to see the complete renewable energy series and other resources.



We're going green!  
Sign up for our Online Publications Service at [www.planning.montcopa.org/Subscriptions](http://www.planning.montcopa.org/Subscriptions). We'll send you a pdf/electronic link instead of a printed publication.



**Montgomery County Planning Commission**  
Montgomery County Court House  
PO Box 311, Norristown, Pennsylvania 19404  
website: [www.planning.montcopa.org](http://www.planning.montcopa.org)