

# Solar Energy

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**The sun is probably the most important source of renewable energy available today.**



Traditionally, the sun has provided energy for practically all living creatures on earth, through the process of photosynthesis, in which plants absorb solar radiation and convert it into stored energy for growth and development. Scientists and engineers today seek to utilize solar radiation directly by converting it into useful heat or electricity.

Two main types of solar energy systems are in use today: photovoltaics, and thermal systems. There is a great deal of opportunity for using these systems in the state of Pennsylvania, and ongoing work at Penn State is seeking to improve the available technology and increase the utilization of solar energy systems in the keystone state.

## Solar photovoltaics

Photovoltaic systems convert solar radiation to electricity via a variety of methods. The most common approach is to use silicon panels, which generate an electrical current when light shines upon it. Penn State University is involved in several projects to demonstrate and encourage the use of solar energy at appropriate locations within Pennsylvania. Solar photovoltaics are especially valuable for remote rural applications where it would be prohibitively expensive to supply electricity from a utility line.

## Solar thermal systems

Solar Thermal Systems seek to store heat from the sun that can be used for a variety of purposes. Many different approaches can be employed here, including active systems, such as solar hot water heaters, and passive systems, in which careful engineering design results in a building that automatically stores and utilizes solar energy. Greenhouses are a prime candidate for passive solar design, in which they collect solar energy on sunny days in winter and utilize it to keep the house warm at night.

The main advantages of solar energy are that it is clean, able to operate independently or in conjunction with traditional energy sources, and is remarkably renewable. The main disadvantages are that it is currently more expensive than traditional energy, and the availability of solar radiation varies from day to day, and from season to season. In fact, some parts of Pennsylvania are among the cloudiest spots in the United States. In spite of this, there is still opportunity for using solar energy effectively in Pennsylvania.

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