

Solar Photovoltaics

Solar Photovoltaics at Northwestern Michigan College

In 2005, NMC received grant monies to build a 10 kilowatt solar array for the Energy Demonstration Center. The solar array is used as part of a learning lab for students both in the construction technology certificate programs and in related courses through the NMC Extended Education.

NMC's solar power system provides training and education for the community as well as power for the MTEC campus. A fixed 8 kw array is positioned and operational at the MTEC building site with an additional 2 kw portable array ideal for technical training. The power generated from the panels is used for construction tools, heating and cooling equipment, computers, lights, and general construction lab needs.



What are Solar Photovoltaics (PV) or Solar Cells?

In simple terms, solar cells convert sunlight to electricity through semi-conducting material such as silicon. The sun shines on the solar cells knocking electrons loose from their atoms. This creates an electrical field where electricity begins to flow. The greater the intensity of sunlight, the greater the flow of electricity.

Solar cells are often put together in modules of up to 40 cells. Modules are placed together to create solar arrays. Solar modules or arrays are positioned to receive the most direct and intense light from the sun. Sometimes tracking devices are used to follow the sun throughout the day. Otherwise, solar cells face south and are usually tilted to receive maximum intensity. A quick rule of thumb is to tilt a solar cell to the same angle as the earth's latitude on which it is placed. Here in Northern Michigan, we would place a solar array at about a 45-degree angle.

The size of a system is determined based on need. A 10 kilowatt system produces 10 kilowatts of power per hour at peak production.

Center Contact Information

For more information about course options or the Energy Demonstration Center, contact:
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History of Solar Photovoltaics (PV) or Solar Cells

Conventional solar cells were first developed in the 1950s and used primarily for satellites. In the 1970s, improved quality and manufacturing opened the doors for other uses such as navigational devices and power uses in remote locations. With the energy crisis, households wanting energy independence off the main power grid became a force for improving PV applications. In the 1980s, solar cells became a popular energy source for consumer electronic goods and were built into calculators, watches, lanterns, radios and other small battery charging devices. Today the industry production of PV modules is growing by 25% annually. New applications, such as solar roof shingles, are continually being developed.

Changes in the efficiencies of PV applications have been significant in its short history as well. Since 1970, the cost of a PV watt of energy has gone from \$100 per watt to \$4 per watt. Likewise, the actual cell efficiencies in capturing energy from solar radiation have gone from 4% or less to 15% or more.

Considerations for PV Applications in Today's World

While it is true that PV systems require upfront expenditures and are currently less competitive with power plants in producing conventional residential electricity, there are advantages worth considering.



1. Installing a PV system locks in electricity costs. Owning a power source eliminates a household from market fluctuations and provides energy independence.
2. Solar cells are reliable and rugged. Consider that they are the power source of choice for satellites and remote locations. Solar PV systems function long term and need little maintenance, going 20 to 30 years without need for repair.
3. Solar cells provide a clean and renewable source of energy. With the threat of global warming, there is an ever-increasing need to invest in clean and renewable sources of energy.

Northern Michigan Homes Utilize Solar Cells

Many households in Northern Michigan use solar cells as a source of electricity for their homes and cottages. Along with a wind generator, the PV system at the right installed on a garage/storage shed roof, provides the power needed for all the lighting and appliances of the Ruterbusch cottage in Benzie County. The Ruterbusch family of four does try to turn things off when not in use, but have not had to alter their lifestyle or give up conveniences in utilizing renewable sources of energy.



solar cells on the Ruterbusch garage