# A Brighter Future: Solar for Schools

With the latest advancements, solar energy may be an effective way for schools to save money and contribute to sustainability.

#### By Ryan Stout

olar power has long been touted for its environmental impact. But with the latest advancements in technology and quicker return on investment, solar energy may now be the best way for schools to shine.

An estimated 4 million students in the United States attend a school that uses some form of solar power. Nearly 5,500 schools currently use solar energy systems, and that number will continue to increase as solar panel efficiencies improve and manufacturing costs decline, according to a Solar Energy Industries Association 2017 report.

A fundamental reason for solar power's success in K–12 schools is its wide range of benefits: it is clean, stable, and cost-effective. School districts see a reduction in utility costs and contribute to their green initiatives; students and teachers can take advantage of a host of educational opportunities.

#### **How Solar Power Works**

The photovoltaic (PV) cells in solar panels use particles of light to knock electrons free from atoms and generate a flow of electricity. The resulting electrical current then runs through a device called an inverter, which converts it to usable power in a building. Because of its limited production, solar power is often insufficient to fully meet the requirements of some users and is considered an alternate source.

When a solar-powered school exceeds its solar system's production, the building alternatively uses electricity supplied by the local utility company. At the end of the billing cycle, the school's electric bill reflects the total energy consumed minus the electricity that was produced by the solar power system. The sum of the calculations is called net metering. Grid-connected systems typically operate via a net metering agreement with the



local utility company. Rules governing how the customer is credited for excess generation vary by state.

From beginning to end, adopting the solar process requires a comprehensive approach using energy usage trends, records of electricity consumption, and a thorough understanding of the facilities. The selected solar power system must meet the financial and energy needs of the school, both current and future. The solar power process includes assessment, design, approval, installation, commissioning, and interconnection along with performance assurance.

### Weather's Effect on Solar Energy Production

Solar energy is inherently affected by the weather and available sunlight; however, historical weather data show solar energy can be reliably produced almost anywhere. If the sun is shining, solar panels will generate energy whether outdoor temperatures are high or low. In fact, solar panels are more efficient on cool sunny days than on hot sunny days. Even on cloudy days, the panels produce some power.

"The Mukwonago School District has a bright future. With our new solar array, the high school will be able to generate power from the largest power source in the universe, the sun. Along with these savings, we are excited about all the learning activities this project will foster for our students in the years to come." — Andy Wegner, Operations Manager, Building and Grounds, Mukwonago Area School District.

### **Locating the Solar Panels**

The design of solar panel arrays depends on the setting for each installation. For example, solar panels should face south to maximize the amount of sunlight they collect. They can be installed on a roof or on the ground, but no trees or other tall objects should shade the panels. A system installed on a pitched roof may be viable, but its performance may be less than optimal.

Ideally, if suitable land is available, it is beneficial to ground-mount panels in an open space. Groundmounted systems produce more power than roofmounted systems, and are less expensive. Solar carports are also an option to provide a rain shelter and shade in the parking areas, but they are more expensive than ground mounted arrays.



Mukwonago (Wisconsin) High School. The 300 kW solar array will generate an average of 471.7 megawatt hours each year and save the district an estimated \$1.8 million in energy costs over 30 years.

#### **Solar Power Costs**

The benefit most often associated with solar power systems is the opportunity to save money and energy. Although they may be expensive, solar PV systems are a long-term investment that will save on energy costs in the long run. The recent decline in installation prices, coupled with increasing electricity costs, can make solar one of the most cost-effective ways to save energy.

The cost of commercial grade solar varies by state, size, location, and complexity of the system and installation; however, solar systems generally cost between \$1.75 and \$2.75 per watt installed. This rate includes the engineering, materials, installation, system size permits, and interconnection with the electrical grid. Incentive programs are available to offset project costs, but can vary significantly by utility and state.

## **Solar's Educational Benefits**

Solar power is now a viable renewable option to reduce electricity costs and put schools back in control of their utility bills. These benefits can be even greater when combined with an energy savings project that tracks, measures, and guarantees a building's energy savings performance.

Utility-grade and demonstration installations can provide hands-on learning experiences that can be integrated into a school's STEAM (science, technology, engineering,



Krueger Middle School, Michigan City, Indiana. This 345.6 kW solar array is one of seven school arrays at Michigan City area schools totaling 2.83 megawatts and will save MCAS \$704,672 annually. The district was the 2018 recipient of the Governor's Award for Environmental Excellence in the Renewable Energy Category by the Indiana Department of Environmental Management.

arts, and math) programs. The National Energy Education Development Project offers some excellent teacher and student learning resources (www.need.org).

Overall, understanding the production and consumption of a facility's energy usage will help maximize solar power's energy savings and help public school districts truly shine.

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