

Solar in Schools Partnership

What is the partnership?

Solar in Schools is an educational partnership between Madison Gas and Electric and area school districts. It offers students the opportunity to become more aware of electric energy use, the environment and solar power. The MGE Foundation donated approximately \$310,000 to purchase, install and maintain solar photovoltaic (PV) systems at 10 high schools in MGE's electric service area. MGE paid an additional \$58,000 to cover costs to create educational materials, train teachers and publish solar energy information on it's Web site.

Each school uses the electricity produced by its system. The amount of electricity produced by the 10 PV systems can meet the annual electricity needs of 3.5 Madison homes.

How do students get access to the data?

Each solar system includes equipment to record energy output, solar insolation and weather at the site. Data is transmitted by phone lines to mge.com, where it is displayed both as real-time and historical information. Students can view and use the data from any site. MGE provides the staff and equipment to maintain school and community access to this information.

Which schools are involved?

Schools that have PV systems include:

1. Abundant Life Christian School
2. Edgewood High School
3. James Madison Memorial High School
4. La Follette High School
5. Madison East High School
6. Madison West High School
7. Malcolm Shabazz High School
8. Middleton High School
9. Middleton Alternative High School (MASH)
10. Monona Grove High School
11. Waunakee High School (WHS)*

*PV data monitoring equipment was donated by MGE. WHS purchased and installed this PV systems.

What are the educational benefits?

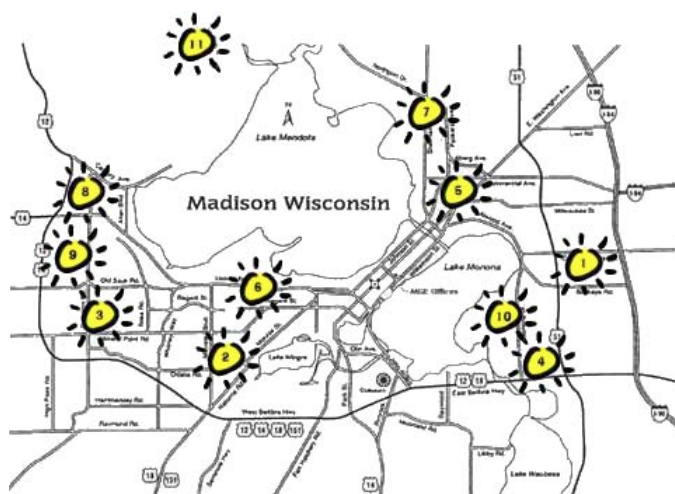
Subjects impacted by Soar in Schools include:

- Science and math: converting energy to electricity through a PV process
- Technology: current and developing technologies used in PV and other energy systems
- Environment: effects of generating and using electricity
- Economics: costs and benefits of electricity generation
- Social studies: impacts of energy production and use on world communities

Who developed the educational materials?

School districts, teachers and MGE worked together to develop educational materials about energy, renewable energy and solar PV systems. Teachers have the opportunity to attend training on the technology and how to use the educational materials in their classrooms.

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How are the teachers involved?

Solar energy is an important renewable energy resource. Teachers can use the solar systems to help students understand how they operate and fit into the electric generation system.

After the systems were installed, MGE helped to form a team of teachers from each school. They worked with representatives from Wisconsin's K-12 Environment Education Program and our Community Education Manager to develop solar and renewable energy education materials. Teachers now use these materials as a basis for energy education.

Are any additional funds involved?

Yes. The Wisconsin Environmental Education Board awarded a \$14,525 grant to assist with funding educational materials and teacher training. The Wisconsin Solar Use Network (WisconSUN) awarded a \$1,500 grant for equipment costs.

MGE helps to promote continued energy education by providing sponsorships to the Wisconsin K-12 Energy Education Program (KEEP). Through this program, teachers learn how to enhance student understanding of energy and energy concepts. We offer local KEEP courses to teachers in our service area.

What equipment is being used?

Each system consists of:

- 2 to 2.5 kW solar PV array
- DC disconnect switch
- Inverter to convert power from DC to AC
- AC disconnect switch
- Electric meter
- Weather station (anemometer, thermometer and a pyranometer to measure the amount of solar energy reaching the array)
- Data acquisition system
- Internet broadcast device
- Solar energy information on the Web

How was the equipment installed?

- PV Systems and Related Equipment - Eight systems were mounted on school roofs. One is a "solar shingles" system and one was mounted on a southern wall like an awning.

H&H Industries Inc. of Madison installed the solar equipment. MGE engineering staff worked with H&H and the schools on installation design issues.

- Power Monitoring Systems - Electric power, energy output and weather data from each system is automatically recorded by equipment installed by H&H.

How do these systems work?

PV systems convert light energy from the sun into electrical energy. This process is called the PV effect.

Each PV system contains several modules, with many PV cells. The PV effect takes place in the cells. PV cells also are used to power calculators and watches.

PV cells are made of semiconducting materials, usually silicon. When sunlight is absorbed by these materials, electrons are knocked loose from their atoms. The electrons flow through the material to produce an electric current.

The electrical current produced in the PV cells is direct current (DC). It must be converted to alternating current (AC) to use in our homes. This is done in a device called an inverter.

Why did MGE do this?

Within a few years, the high school students in our area will be making their own energy decisions. They are the energy consumers of the future, and their choices will affect our environment and economy. MGE provides these educational resources to help inform their decisions about energy.

Is more information available?

For more information, contact MGE at 252-7222 or visit mge.com/solarschools. The curriculum for this program is available at mge.com/solarschools/curriculum.