Kent Osterberg of Blue Mountain Energy demonstrates solar panels at Burns High School. Photo by Randy Parks/Burns Times-Herald.

Synergy With The Sun

High schools get a boost from solar power

By Debby Schoeningh

Albert Einstein's simple explanation of how light energy is converted to electrical energy helped him win the Nobel Prize in 1921.

His research into the photoelectric effect is still applied today as the basis for photovoltaic (PV) cells that turn sunlight into electricity.

These silicone-based solar cells power everything from massive satellites orbiting Earth to hand-held calculators.

As solar and other renewable energy become more a part of our daily lives, it is important to help people understand how to use them, says Steve Schauer, member services manager of Oregon Trail Electric Cooperative (OTEC).

OTEC began a renewable energy education program in 2006. Its goal is to install a permanent 1 kilowatt (kW) PV electric generation system in at least six high schools in its four-county service area.

PV systems have been installed at high schools in Baker City, Burns and Cove. Three more schools will be selected, and those PV installations will occur in the 2008-2009 school year.

"Renewable energy is very important because it's energy that is produced by resources that are replenished naturally and minimize harm to the environment," Steve says.

With the PV system, students learn how the sun makes electricity, and how a fixed array—a system of PV modules that function as a single electricity-producing unit—generates energy in relation to the position of the sun.

The system also has an online monitoring tool that allows students to track solar energy production and correlate the data to weather conditions and positions of the sun.

Through the high school curriculum, students also learn the economics of installing solar generation. Each 1 kW system placed in the schools costs about $13,000.

Lesson plans are created by the University of Oregon Solar Radiation Monitoring Laboratory.

Energy Options Available

A focus group consisting of Steve, Chris Perry of Oregon Rural Action and Kent Osterberg of Blue Mountain Energy, which is installing the PV systems, will meet with high-schoolers every year to explain how the photovoltaic system operates and to discuss current energy-related topics.

During a lecture by the group in May at Baker High School, Steve emphasized OTEC's involvement in several areas of renewable energy, including the addition of green power to the utility's grid.

The green power OTEC purchases is "environmentally preferred" by the Bonneville Power Administration. It is generated from sources that have low impact on fish and wildlife and do not pollute the environment.

OTEC members can purchase green power on a voluntary basis. One unit, which is 200 kilowatt-hours, will add $3 to a consumer's monthly electric bill. To date, OTEC members have purchased about 450 units of the 660 units available.

OTEC also offers net metering to people who generate their own solar or wind energy. Consumers receive credit for any unused energy they generate. The surplus is uploaded to the OTEC system for their neighbors to use. When the sun or wind is not generating enough power, the meter automatically supplements the consumer from the OTEC grid.

Conservation in Practice

Steve told students about other OTEC conservation projects, such as gymnasium lights installed about a year ago in most of the schools in OTEC's service area.

The old 458 kW lights had to cool off for 15 minutes before they could come on again.

"This meant that if there was an early morning P.E. class, you couldn't shut off the lights for most of the day or students would have to stand around in the dark waiting for them to come on," Steve says. "Now, with the new 298 kW lights and motion sensors on the fixtures, the lights come on immediately any time someone enters the gym. And to conserve energy, since the lights are all on separate sensors, only the lights in areas being used come on."

Students also learned about the mechanics of the PV system from Kent, who explained that each array of six panels is capable of producing enough electricity to power 10 100-watt light bulbs at optimum generation, which amounts to about $100 worth of electricity a year.

Chris told students about two pending mandates to address carbon emissions and global warming. A federal mandate proposes that 20 percent of all electricity be derived from renewable sources by 2020. Oregon proposes a minimum of 25 percent.

Oregon Governor Ted Kulongoski has said hydroelectric energy should not be considered in the percentage of renewables because of the problems it poses for migrating salmon.

OTEC hopes this debate will continue and hydropower at some point will be considered renewable, Steve says.

Beyond the Textbook

Alan McCauley, a science teacher at Baker High School, says the PV system and curriculum was introduced in the last unit of the past school year. His classes spent 2½ weeks studying renewable energy.

Installation of the in-class monitoring system was not complete before the end of the school year, but Alan says, "We had some good discussion, and the kids were very receptive. I think the program is going to get bigger and better as we continue to use it each year."

He says hands-on learning is a valuable way to present information to students.

In Eastern Oregon, with the recent introduction of a windmill farm and proposals for a hydroelectric power plant on the Powder River, Alan says it will become even more important to include renewable energy lessons in the classroom.

Steve agrees.

"OTEC is pleased to offer this renewable education program that benefits so many consumers," he says. "Since the PV systems in the schools are permanent, students will be able to utilize them year after year." ■

How it works

A solar energy system has two essential components: the solar—or photovoltaic (PV) cells—and the inverter.

PV cells convert sunlight to direct current (DC electricity) using the photovoltaic phenomenon: A photon of light strikes an electron in the solar cell, giving it energy and increasing its potential by about 0.5 volts.

The exact voltage depends on temperature and the amount of current (in amps) flowing through the cell. The amount of current depends on light intensity.

A solar panel is a group of cells wired in series to produce 35 volts and about 5 amps in full sunlight.

In a PV array, six panels—or modules—are wired in series to produce about 210 volts and about 1,000 watts of power.

The inverter converts DC power to 120-volt, 60-hertz alternating current (AC electricity). It also provides protection so the current can be uploaded safely to the electrical grid.

The PV system sends power directly to each school's existing electrical system. It will save each school about $100 worth of electricity a year.