

SOLAR TODAY

**Why the Car of Tomorrow
May Be Solar-Powered**



It Takes a Village

How the community of Crested Butte, Colo., pulled together to bring solar learning to students.

By Molly Murfee

The pole-mounted photovoltaic array at Crested Butte Community School is a small one — just 1.55-kilowatts, expected to provide 1 percent of the K-12 school's electricity. But it represents a large effort, comprising the skills and donations of the Crested Butte, Colo., community and beyond.

The project began with a \$10,000 donation from local utility Gunnison County Electric Association. GCEA offered the money to the school as a challenge grant for a solar education project, asking

Crested Butte's Office for Resource Efficiency (ORE) to coordinate fundraising with Carbondale, Colo.-based Solar Energy International (SEI) and the school. A grassroots nonprofit organization, ORE promotes renewable energy to reduce utility costs and decrease emissions and to create a more sustainable economic and energy future for Gunnison Valley. With Executive Director Gesa Michel at the helm, ORE spearheaded the effort.

Using SEI's "grocery list" of items needed for the photovoltaic (PV) installation,

Michel sought support from the community. Several organizations and individuals contributed the remaining \$10,000 needed for the project. BP Solar donated the solar panels. The combined \$20,000 was used to purchase the rack, pole, inverter, combiner box and breakers, disconnect switches, data monitoring system, wire and conduit, the Solar in Schools Program and all fees, and shipping costs. Michel then sought in-kind contributions from the community: a 21-foot steel pole, an excavator, bags of concrete, and welding, pole-installation and electrical-wiring help. Community members, electricians, construction workers, lumber businesses, welders and backhoe operators all donated time, resources and expertise.

The PV system was installed in September, and its benefits are also extensive. Crested Butte students are learning first-hand about how solar photovoltaics can reduce the nation's reliance on polluting fossil energy. In addition, each year the system is projected to offset 8,023 pounds of carbon dioxide and 980 gallons of water



Students from the fifth, eighth and 10th grades took part in the installation of a 1.55-kilowatt array at Crested Butte Community School in September.

Tips for Raising Funds

Here are some strategies for seeking support in your community:

- **Create a handout** for potential donors, detailing project parameters.
- **Split up** the funding needs.
- **Create advocates** and a networking team in parents and teachers.
- **Send press releases** and articles to the local media.
- **Remind donors** that in-kind and monetary donations are a tax write-off.
- **Reward donors** and volunteers through an article, a party or a plaque.
- **Be persistent.**

that otherwise would be used to cool off a coal-fired power plant to generate the unneeded electricity.

Safe Learning Guides Installation

During the installation, students from the fifth, eighth and 10th grades in turn gathered on the school basketball court to lay hands on the iridescent solar panels. While one screwed modules into the panels, another tested the modules, tilting them sunward. A third group placed panels on the rack with instructions from a student leader.

SEI, which promotes alternative energy through system-installation assistance and its Solar in Schools education

program, led the installation. SEI selected the appropriate system and installation methods for the school, focusing on user-friendly capabilities and safety — the foremost consideration.

In preparation for the installation, SEI presented a one-hour lesson on RE basics to all students. Then, before students arrived on the scene, licensed electricians did initial wiring. Because wired panels immediately begin conducting electricity when exposed to the sun, project leaders took precautions to prevent shock. Likewise, though a pole-mounted solar-electric array typically would be built on top of the pole with scaffolding, much of the panel and rack work was done on the ground so that students could participate.

Project leaders involved students in the installation as much as possible, to create a sense of ownership. Ten 155-watt modules were mounted in two columns of five. Factory-installed multicontact connectors on each module enabled students to safely wire the modules in two series strings, five modules each. A licensed electrician handled all live wiring.

With the array and rack assembly complete, a boom truck arrived to lift the entire assembly onto the pole. SEI staff

POWER-RAIL™ TOP-CLAMP MOUNTING SYSTEM



POWER-FAB
Quality Hardware for the PV Industry

4000-B Vassar Drive NE • Albuquerque, NM 87107 • 800-260-3792 • Fax 505-889-3548 • Email jrandall@directpower.com

The only one-stop, full-service wholesale distributor you'll ever need!

AEE Solar Has It All!

Plenty of PV Modules - Grid-Tie & Off-Grid
Wind & Hydro Systems • All Balance-of-System Items:

At AEE Solar, we offer our dealers and installers:

- Competitive prices on all the top brands
- Unsurpassed technical expertise
- The widest selection in the business, including all items necessary for NEC-compliant installations
- A 27-year industry-wide reputation for delivering the highest standards in dealer satisfaction

Call 1-800-777-6609

8:30 - 5:00, Pacific Time, Mon-Fri

1155 Redway Drive

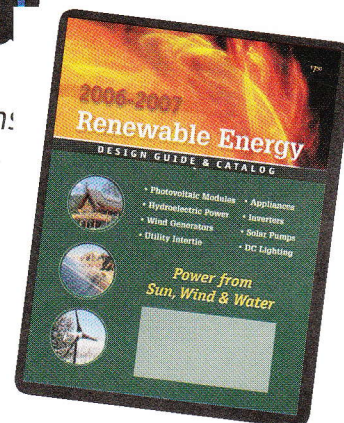
PO Box 339, Redway CA 95560

707-923-2277 tel • 707-923-3009 fax

www.aeesolar.com • info@aeesolar.com



Bringing Power to the People Since 1979



AEE Catalog Available -

with space for your
name and logo!

**Order Online at
www.aeesolar.com**

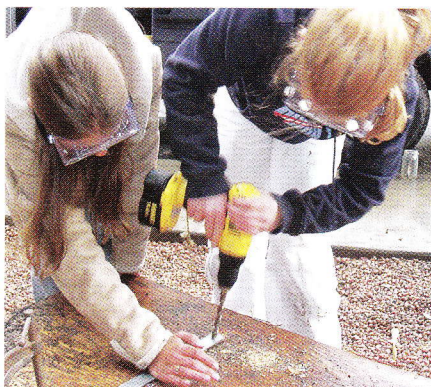
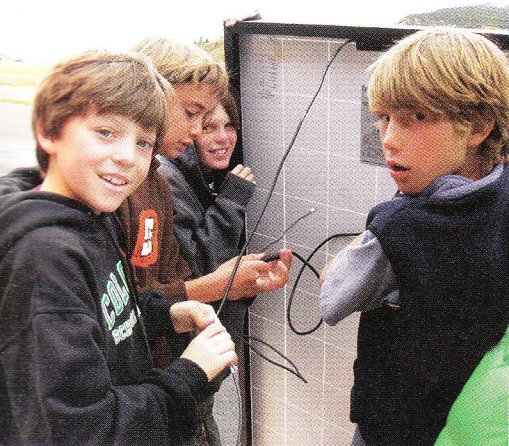
*Makes ordering and tracking easier than
ever - call for a password and a quick demo!*

Teaching RE

Project leaders took care to ensure that activities were age-appropriate, allowing younger students to tighten nuts, while high school students handled power tools.

members completed wiring to the DC disconnect switch and inverter.

The project demonstrated that student installation tasks don't have to be complicated to be engaging. For students, simply being able to see and touch the panels was exciting. Project leaders took care to ensure that activities were age-appropriate,



ALL PHOTOS BY SOLAR ENERGY INTERNATIONAL STAFF

allowing younger students to tighten nuts, while high school students handled power tools. Once the panels were mounted on the rack, organizers and professionals triple-checked the student work.

The Lessons Continue

The PV system installation was just the beginning. During a three-hour workshop in September, SEI presented its RE curriculum to teachers. The curriculum covers



Project Shopping List: 1.55-Kilowatt Photovoltaic Array

10 155-watt BP Solar PV modules	\$9,700
(donated by BP Solar)	
1 pole-mounted rack	\$1,275
1 8-inch schedule 40 steel pole	\$600
1 "Ready Watt" package	\$2,800
including 1,800-watt inverter, AC and DC disconnect switches and mounting plate	
1 PV combiner box and breakers	\$150
1 data-monitoring system	\$3,500
Wire and conduit	\$350
Shipping allowance	\$850
Estimated permit fees	\$380
Estimated taxes	\$400
TOTAL	\$20,005

"SOLAR WAND"
SOLAR ASSISTED HOT WATER
Closed Loop Antifreeze System

"Solar Makes Dollars and Sense"
Energy - Savings Pay For System
Employment - Create American Jobs
Environment - Reduce CO₂ Emissions

Straight Forward Installation, Single Pump,
40 Sq.Ft. of Solar Collectors, Either ACR Fireball
2001, Double Glazed/Selective Absorber (Shown)
or Thermomax Evacuated Tubes (Not Shown).
Kits Including Anti-Scald Valve From \$2,500

www.butlersunsolutions.com

Butler Sun Solutions
Since 2003 "Dedicated to conserving the
earth's energy and water resources."

**OG-300
Certified**
"Solar Wand"
Double-walled
heat exchanger
screws into
your tank

858-259-8895
*Patents Pending

**Blue Sky
ENERGY** Industry Leaders in MPPT
Solar Charge Controllers

**At Last a Reliable Low Cost Solar
Charge Controller That works!!!**

Blue Sky Energy is
proud to unveil it's latest
products. The SB2512i
& the SB2512iX. A fully
automatic 12V 25A self-
optimizing MPPT Solar Charge Controller.
Patented technology extracts all the power
your solar panels can deliver up to 30% more.

**For all the features & more products
go to blueskyenergyinc.com**

E-mail: sales@blueskyenergyinc.com
Web: blueskyenergyinc.com

Contact us today for more information.
800-493-7877 or 760-597-1642

The Project Team

The Office for Resource Efficiency,
Crested Butte, Colo.: www.resourceefficiency.org

Solar Energy International:
www.solarenergy.org

Gunnison County Electric Association:
www.gcea.coop

BP Solar International:
www.bpsolar.com

Fat Spaniel Technologies:
www.fatspaniel.com

Energy Outfitters Ltd.:
www.energyoutfitters.com

Crested Butte Community School:
www.gunnisonschools.net

conservation and energy efficiency, as well as RE, with grade-appropriate textbooks and technology demonstration kits for use in the classroom. Teachers were encouraged to integrate the PV system lessons throughout their course plans.

An important teaching tool is the real-time data-monitoring system for the PV array. The system, from Fat Spaniel

Technologies, enables students to see in real time how the solar resource and weather affect the solar array's electricity production and how much that energy offsets the school's electricity demand. Because the system is Web-based, data can be made available to schools around the world for monitoring, analysis and learning.

On the day of installation, ORE's Michel looked on with satisfaction to see the efforts of the entire community realized. "How can you go wrong?" she asked. "You're talking about kids learning

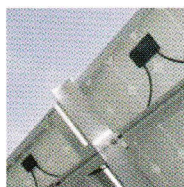
about renewable energies. It just has positive written all over it." ●

Molly Murfee is a professional freelance writer residing in Crested Butte, Colo. Her work has been published in Telemark Skier, Patagonia-Japan, The Mountain Gazette, Backcountry Magazine, Cross Country Skier Magazine, Crested Butte Magazine, Gunnison Country Magazine and The Crested Butte Weekly. For more information about this installation, access the websites of ORE, www.resourceefficiency.org, and SEL, www.solarenergy.org.

closer contacts



- outstanding environmental seals
- excellent strain relief
- unsurpassed ruggedness



Wiring solutions for photovoltaic power systems

- high resistance to mechanical stress
- high degree of protection
- secure grip, ergonomically-friendly
- overmolded
- excellent strain relief
- optional locking with securing clip
- pre-assembled and tested, ready-to-plug cable sets, **no need for crimping**

Lumberg's pre-assembled, fully-tested solar connectors redefine solar panel installation with easy to handle plug and play technology. Questions?

USA · Phone +1 (804) 379-2010
GERMANY · Phone +49 (0) 23 55 - 83-01
SINGAPORE · Phone +65 - 67 76 87 55
www.lumberg.com/solar



lumberg

See us at
Solar 2006, Denver
Booth 160 · July 8-13

Pacific SolarTech

Affordable
Solar Power
Concentrator Solar Modules
are available

now



Pacific SolarTech
Tel. 1-510-979-0112
sales@PacificSolarTech.com
www.PacificSolarTech.com