

Western's bi-monthly energy efficiency and renewable energy newsletter dedicated to customer activities and sharing information on energy services.

## Minnesota student center lightens up with cutting-edge windows

A highly efficient window technology is letting the sunshine into the new Student Center Complex at Southwest Minnesota State University without letting in heat in the summer—or letting it out in the winter.

The university cut the ribbon on the bright new facilities in April, in time to test the windows in the hot, humid Minnesota summer. Now Facilities Director Cyndi Holm is almost looking forward to the winter heating bills. “We started getting excited about the windows during construction last winter,” she explained. “When we got them in, we could maintain a 55-degree temperature in 108,929 square feet with only five industrial space heaters.”

Dan Williamson of Horty Elving and Associates, the project architect, shares Holm’s anticipation. “These windows have remarkable insulation properties,” he said.

The Visionwall window system was included in a complete renovation following a major fire the school suffered a few years ago. The fire destroyed SMSU’s food service building and caused heavy smoke damage in the adjacent Student Center and Student Center West buildings.

Built in the ‘60s, the walls of the student center complex lacked proper insulation and the buildings were very dark. “The university president asked for a modern design that brought in lots of natural light,” recalled Williamson.

### Design standards

The renovation also had to comply with the design standards specified by the Minnesota State College and University System. The standards require remodeling projects and new construction to incorporate sustainable design principles.

The MnSCU Facilities Division had heard of a window technology



Visionwall windows give SMSU Student Center a clean, modern look and plenty of natural lighting while saving money on heating and lighting. (Photo by Jim Tate, SMSU University Relations)

that could reduce heat loss 50 to 90 percent over conventional windows. Some members visited the plant in Edmonton, Alberta, to learn more about the system. What they saw convinced them to recommend Visionwall windows to Horty Elving.

The Swiss window technology consists of two low-emissivity films suspended inside two panes of glass for an R-value performance between R-4 and R-7.1. A standard, single-pane window averages R-.9, while double-paned units filled with argon or another gas achieve around R-3.

The Visionwall system also reduces outdoor noise and eliminates condensation and ultra-violet degradation, so there was no need to tint the glass. They are built to institutional standards so they don’t need to be replaced any more often than standard windows. “The glazing units will last

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# Water provider takes green power leadership seriously

East Bay Municipal Utility District has gained attention for its long-standing commitment to renewable energy as one of the Environmental Protection Agency's Green Power Partnership top 25 green power purchasers.

The Oakland, Calif., water and wastewater utility became a partner in 2002 as part of what EBMUD Public Information Representative Andrea Pook calls, "an aggressive push across the board to increase the sustainability of our operations."

## Cogeneration advantages

The Green Power Partnership provides assistance and recognition to organizations that demonstrate environmental leadership by choosing green power. "Leader" certainly describes EBMUD, which has been generating electricity from biogas at its main water treatment facility since 1983. The Elmer E. Ross Cogeneration Plant produces 75 percent of its own electricity, earning EBMUD 18th place on the partnership's most recent quarterly list.

Biogas captured from the treatment process fires three dual-fuel engines rated at 2.15 MW each. The plant is capable of generating 6.5 MW, but operations require only 5.5 MW on an average dry weather day. During peak production, the system puts 10 percent of its generation onto the grid.

Powering the plant with biogas-generated electricity saves EBMUD about \$2,000,000 annually. Self-generation fits EBMUD's mission statement to promote environmental responsibility, said Pook. It also kept the plant online during the rolling blackouts of the California energy crisis.

## Plan sets example

The energy crisis spurred EBMUD to improve on an already sound environmental record. EBMUD saw that wide adoption of renewable energy technologies would be in the utility's best interest. But more than that, "We want to set an example as good environmental stewards," Pook said.

Joining the Green Power Partnership was part of that effort, as was commissioning a plan for EBMUD's role in facilitating renewable energy use. A technical advisory committee concluded that the best way for EBMUD to promote renewable energy was to "green" its own operations.

EBMUD adopted an overall sustainability program that included water recycling and conservation, converting its sedan fleet to hybrid



**EBMUD's main water treatment facility, produces 75 percent of its own electricity from biogas captured during the treatment process. (Photo by East Bay Municipal Utility District)**

electric cars and buying from green vendors whenever possible. "Basically, we've been working our way through the district to see where we can do a better job," said Pook.

The TAC also recommended public outreach to communicate EBMUD's achievements and policy to its customers. "We did market surveys as part of the plan, said Pook. "We found that customer's didn't realize how environmentally conscious East Bay MUD is."

Green Power Partnership tools are helping EBMUD spread the word about the benefits of renewable energy use to its ratepayers. The tools

*See WATER PROVIDER, page 3*

## Energy Services Bulletin

The Energy Services Bulletin is published by Western Area Power Administration for its power customers. The mailing address is Western Area Power Administration, P.O.Box 281213, Lakewood, CO 80228-8213; telephone (720) 962-7451.

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## Water provider

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include the Communications Guide for Green Power Partners, press releases and media kits, sample Web pages and fact sheets. “The bill stuffers and press releases we’ve sent out have been very useful,” commented Pook.

### Customers’ gain

Appearing twice on the partnership’s top 25 list doesn’t hurt either, and the distinction will likely continue as EBMUD builds on past successes. When the cogeneration system went online, it provided about 40 percent of the power

needed for wastewater treatment. That figure has grown to 75 percent, said Pook, “Because we’re getting smarter about energy generation and conservation.”

Efforts to save energy at the wastewater treatment plant are continuing. An equipment upgrade to be completed in 18 months is expected to further reduce power consumption 200,000 kWh per year for an additional cost savings of \$150,000. Also, replacing air blowers in the aerated grit system with air pumps that use centrifugal force will cut the system’s energy use by 70 percent.

A recent increase in trucked-in waste is resulting in more biogas

generation that could be used to fire a fourth co-generator. EBMUD is conducting a feasibility study on adding another unit to the plant’s system. The long-term goal is full energy self-sufficiency at the district’s main wastewater treatment plant.

Beyond the goal is EBMUD’s vision: using its renewable energy experience to help water customers to increase their own renewable energy use. East Bay Municipal Utility District has spent years earning its stripes as a green power leader, and it is eager to show others the way. ⚡

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Visit [www.wapa.gov/es/pubs/esb/2005/august/aug052.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug052.htm)

## Windows

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about 30 years or so, and the aluminum mullions will last forever,” said Williamson.

### Many measures used

Williamson estimates a seven-year payback for the Visionwall windows. “If you factor in avoided cost for supplemental power, it’s much less than that,” he noted. “And that’s without calculating the money saved by optimizing natural lighting.”

As a Western firm power customer, SMSU pays more per unit for supplemental power when it

exceeds its hydropower allocation. In an area where natural gas is the fuel of choice, the campus stands out for its use of electricity for heating and cooling, and for its efforts to save energy.

Other measures will increase the efficiency of the student center building envelope. The new roof has an up-to-code R-25 value. Cavity wall construction and two-inch rigid insulation bring the walls up to R-19. The renovation also included the automated energy management system that SMSU has been installing in campus buildings over the last four years to control electrical loads.

Holm expects to see an improve-

ment in the electric consumption over the old food service building and student centers. Nevertheless, she pointed out, comparing the renovated buildings with the old structures won’t give an accurate picture of energy savings. “The old food service building is gone, and we added a floor to the Student Center as part of the renovation, so it’s really a different animal,” said the facilities director.

A bright, modern animal with a cutting-edge, energy-efficient shell, that is. ⚡

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Visit [www.wapa.gov/es/pubs/esb/2005/august/aug051.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug051.htm)

# School's efficiency helps pay for wind energy

Rocky Mountain High School earned high marks for environmental citizenship last Earth Day by taking its reward for reducing energy consumption and investing it in enough wind energy to power the school for the month of April.

## District's commitment

The reward money came from the Energy Rules program, created by Poudre School District and the city of Fort Collins Utilities to encourage energy conservation in its schools. Under the program, Poudre District high schools can earn \$500 for participation, and a \$3,000 performance award for conservation measures.

"The schools can spend the rebate any way they want," said Sharon Held, key accounts manager with the municipal utility.

"Their commitment reflects our district's philosophy to provide leadership, conservation and support to our community through public education and awareness," said PSD Energy Manager Stu Reeve.

Poudre School District has been named Energy Star Partner of the Year twice, and has 17 buildings that qualify for the Energy Star label.

Rocky Mountain received the districtwide award of \$3,000 for energy conservation in both spring 2003 and spring 2004. The money was earmarked for a recycling center at the school. Luckily, the center fell within the construction budget, said David Swartz, a science teacher and sponsor of the school's Environmental Club. "It allowed us to redirect the money to other projects."



**The Rocky Mountain High School Environmental Club, with advisor David Swartz (right), celebrates its success cutting energy costs to buy wind power for one month's worth of the school's energy needs. (Photo by Poudre School District )**

## Utility supports school

The Environmental Club had just such a project in mind—buying enough wind power to meet the school's energy needs for one month. The school administration agreed to put \$1,000 toward the purchase and PSD came up with a matching grant.

Matching the students' wind power purchase is a good investment for the school district, said Reeve, noting that the Rocky club's recycling and conservation programs saved approximately \$30,000 from 1999 to 2004. "These things have a pretty good sized impact to our school district in the form of costs," he said.

With \$2,000 to buy 200,000 kWh, the Environmental Club faced two challenges. First, Fort Collins usually sells wind power blocks in one-year contracts rather than on a monthly basis. "We could have spread the purchase out over one year, but some students might not even be there in a year," observed Held.

Immediate gratification would make the purchase more meaningful to the students, she added, so Fort

Collins Utilities agreed to a one-month "contract" for the green power block.

## Conservation aligns use

The second problem with the wind power purchase was that 200,000 kWh was just short of meeting the school's actual monthly use. Rocky Mountain's mid-70s facility requires more energy to heat, cool and light.

Not about to settle for close enough, the Environmental Club launched a push to reduce the school's energy use by 5 percent. Reeve offered suggestions for saving energy in the older building. "We primarily focused on lighting," said the energy manager. "We were also tightening up the HVAC schedule as the weather warmed up."

Reeve and utility representatives did walk-through classroom audits with the Environmental Club members. Surveying equipment and lighting in each classroom, along with the traffic and occupancy, "really raised awareness that it was up to individual teachers and students to save energy," said Schwartz.

Signs posted by light switches and announcements in the daily bulletin reminded everyone that saving energy was a school-wide effort. "Our information systems department graciously agreed to let us turn off the computers all but one night a week," said Swartz.

On that night, the department updated the system's virus protection. In the past, turning off computers allowed serious viruses to enter Rocky

*See SCHOOLS EFFICIENCY, page 15*

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# Murray City Power meets its match in landfill powerplant

One of the tricks to adding renewable energy to a power supply portfolio is finding the right fit. Murray City Power found the low-cost, reliable source of renewable electricity it was looking for at the dump.

By the end of the year, the only public power agency in Utah's Salt Lake Valley expects to be receiving 3 megawatts of electricity from the Salt Lake Valley Solid Waste Management Facility.

A lot of people think that landfill-gas-to-energy is a good match for Murray. "I've gotten encouraging calls from residents, and strong interest from the media. The Sierra Club wants to do an article on the project for their newsletter, and the Salt Lake Tribune has given us a lot of positive coverage," General Manager Gary Merrill said.

Giving credit where credit is due, he added, "It took a lot of stakeholders to make this project happen, especially Murray's City Council for their approval of the contract, and the joint owners of the landfill, Salt Lake City and Salt Lake County."

## Buyer needed

City officials signed the contract with Salt Lake Energy Systems, LLC earlier this summer. "There are still a few hurdles to clear," said Merrill, "but we've done our part."

Murray City Power's part was to provide a market for the state's third landfill-gas-to-energy project. The other two facilities tapping landfill gas are Hill Air Force Base and a South Jordan, Utah, brick manufacturer that uses the gas to fire its brick furnaces.

Salt Lake Energy Systems bought the gas harvesting rights and is in-

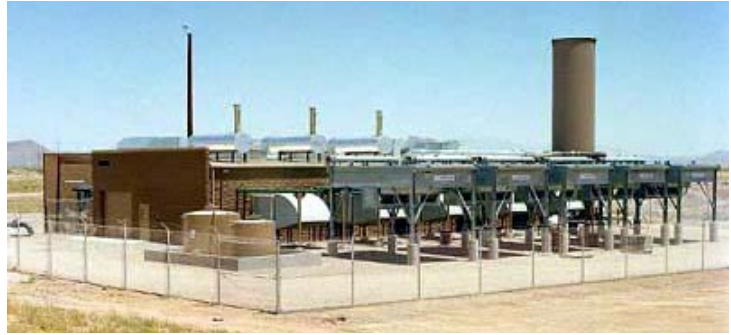
stalling the necessary equipment at the landfill to generate electricity from the methane.

The company is a partnership between two out-of-state companies with proven experience in landfill development, Landfill Energy Systems of California and Michigan-based DTE Energy. "Our power purchase contract provides the revenue stream which enabled them to invest in the generating equipment with a reasonable return on the investment," Merrill explained.

Merrill first learned of the landfill project at a meeting of Utah Associated Municipal Power Systems. Salt Lake Energy Systems presented a proposal to UAMPS members to see if any of them were interested in buying electricity from this renewable resource. The projected 3-MW capacity divided up wouldn't amount to much. "Other than Murray, there wasn't a lot of interest, so we forged ahead on our own," he said.

## Resource fits needs

For a utility with only 16,000 customers, 3 MW will be a significant addition to its renewable portfolio. The city already owns a run-of-river small hydro plant that supplies 5 MW that it blends into its power supply. Other sources include hydropower from Western, coal-fired plants in Utah and New Mexico, power con-



**This 4-MW landfill-gas-to-energy facility built by Landfill Energy Systems of California for Western customer Salt River Project is similar to one that will be built in Murray, Utah. (Photo by Landfill Energy Systems)**

tracts from Idaho, and a city-owned, natural gas peaking plant in Murray.

The landfill gas will not be marketed separately either, said Merrill. "The added administrative costs of a green marketing program are not worth it to a utility of our size," he explained.

The purchase will only add about 45 cents annually to customers' electric bills, compared to other resource options. The power supply's accessibility helped to make it affordable. "I knew we wouldn't have to negotiate a stand-alone transmission agreement to get it," said Merrill.

Another thing that made landfill energy attractive was that it is an incremental addition to existing resources to meet continued load growth. Intermountain Healthcare Corp. is building a six-building hospital complex in the center of town. When completed in fall 2007, the campus will add eight to 10 MW to the utility's current 100-MW load, with a load factor of more than 80 percent.

## Big commitment

The hospital is only a single customer, though, said Merrill, and

*See MURRAY CITY POWER, page 11*

# Silicon Valley Power's renewable energy option takes off

Santa Clara Green Power, Silicon Valley Power's voluntary renewable energy program seems poised to earn Rookie of the Year status.

In the seven months since the Santa Clara, Calif., municipal utility launched its offering, 2.3 percent of its customer base, or 1,124 subscribers have signed up. But it is only a start, according to Public Benefits Coordinator Joyce Kinnear. "We think we have a good shot at reaching the goal of 5 percent participation by the first anniversary," she said.

One reason for Kinnear's optimism is that the green power option was the customers' idea. "People were approaching our representatives at events and calling our conservation hotline to ask if they could buy renewable energy," she recalled.

Annual customer surveys indicated even greater interest. "Somewhere between 70 and 80 percent of the customers responded favorably when asked if they thought SVP should offer some kind of green option," said Kinnear.

## Consultant designs program

To improve its chances for success, SVP enlisted the aid of an experienced partner. California-based 3 Phases Energy developed an offering for the City of Palo Alto Utilities that ranked on the National Renewable Energy Laboratory's list of top utility green pricing programs two years in a row.

"The company has good experience in developing and marketing renewable energy credit green rate programs with municipal utilities and our type of customers," Kinnear explained.

The renewable energy service provider developed pricing and marketing for Santa Clara Green Power, and negotiated renewable energy certificate purchases. The resource mix is 97.5 percent wind power and 2.5 percent solar power from developments in southern and northern California. Participants pay about \$7 more per month for the average household's electric bill.

The marketing strategy SVP uses include tools familiar to every utility. In November 2004, April 2005 and June 2005, SVP used bill inserts to promote Santa Clara Green Power. In December, a "bill coupon" was printed directly on the customers' statement to save paper.

SVP and 3 Phases representatives bring information about the program to community events like street fairs and Christmas tree lightings. Other subscribers have enrolled at the utility's customer service window or on its Web site.

## Policies encourage purchases

Commercial accounts are playing a small but important role in Santa Clara Green Power's success. So far, 41 businesses have purchased renewable energy blocks. The program's two largest subscribers, Santa Clara University and Agilent Technologies, each committed to purchase 1,608 MWh annually.

Agilent is an EPA Green Power Partner and supports renewable energy at two San Francisco Bay Area facilities. Also a Green Power Partner, Santa Clara University supports renewable energy as part of its mission

of community service and leadership.

Because of their strong sustainability policies, both organizations were able to sign up for the program as soon as SVP launched it, said Kinnear.

She added that smaller companies, like many residential consumers, have to figure out their budgets before they can make the commitment. That segment of the market has responded well to the bill inserts, Kinnear said.

## Commitment breeds success

Expecting the demand for certified green power to continue, SVP recently signed a contract with Oregon-based PPM Energy to add up to 75 MW of wind power for the next 20 years, beginning January 2006.

The Neighborhood Solar Program launched in 2002 promotes additional solar development. Last October, SVP dedicated the program's first completed project, a 4.6-kW solar array on Santa Clara's Haman Elementary School.

The recent projects and purchases are only the latest examples of a long-term commitment to green power. Even before SVP offered a green option, 24 percent of its power (in 2004) came from eligible renewable resources including geothermal, biomass and small hydro plants. Also, a large hydropower allocation from Western accounts for more than 40 percent of the utility's mix.

That may be the most important factor in the seemingly rapid growth of a new renewable energy option. Silicon Valley Power has been preparing for years to make Santa Clara Green Power an overnight success. ⚡

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# Colorado rancher takes waste-to-energy to new level

A resource is an asset that lies ready for use, while “resourceful” is the ability to deal with a problem promptly and effectively. The two meanings intersect at Teague Diversified, Inc.; a Ft. Morgan, Colo., cattle feeding business; where resourcefulness is turning waste into a valuable resource.

Owner Gary Teague is joining a small but growing group of feedlot operators who generate electricity from manure, and he will do it with cutting-edge technology. Instead of the conventional covered pit, the innovative technology employs an above-ground, stainless steel tank that processes waste in a quarter of the usual time. “That’s what makes the project profitable,” said Teague.

After several years of phased development, the completed system could produce as much as 8 MW of electricity, and up to \$2.5 million in annual income from energy and compost sales.

Teague knows a thing or two about turning waste into profit. For the past 10 years, he has disposed of the manure from his 20,000 to 25,000 head of cattle by composting it. Local farmers and Denver landscaping companies buy more than 153,000 cubic meters of high-quality, organic compost from him each year.

## Innovation changes economics

It is no wonder, then, that the condensate rising off the compost piles got Teague to thinking about extracting another product from waste—energy. About 40 confined animal operations in the United States convert animal waste to methane with anaerobic digesters, and use the gas to fuel electric-

ity generators.

Teague decided to attend a meeting on anaerobic digesters hosted by the Colorado Governor’s Office of Energy Management and Conservation last spring. The meeting focused on setting up digesters in rural communities to accept different types of waste streams, recalled OEMC Senior Deputy Director Ed Lewis. “We also talked about a digester vessel that cut the hydraulic retention time from 20 days to five,” he said. “That got Gary’s attention.”

To learn more, Teague visited the Center for Profitable Uses for Agricultural Byproducts at Utah State University where Center Director Conly Hansen had developed the technology.

Unlike conventional plug digesters, where the mixing occurs around the top of the lagoon, the tank churns the waste vertically. “It keeps the bacteria in contact with all the material, so it processes much faster,” explained Lewis.

## Issues change

Another advantage of the above-ground units is that they are cheaper to build because no excavation is necessary to install them. Teague is financing the first six units himself with OEMC contributing the first stainless steel tank. Over the next few years, he plans to scale up to 12 units.



**An above-ground stainless steel tank, like this one built by American Structures, Inc., is the key to making the Teague biogas generator project profitable. (Photo by American Structures, Inc.)**

The modular approach will allow him to work bugs out of the smaller system and negotiate a contract to sell excess generation. “I don’t envision selling power before the first of the year,” said Teague.

The first units are expected to produce one to two MW—well beyond the 500 kW Teague’s operation consumes. Teague pays his utility, Morgan County Rural Electric Association, the retail price of 6 to 8 cents for the 500 kW of electricity farm operations use. Tri-State Generation and Transmission Association, MCREA’s wholesaler, will pay Teague 3 to 4 cents per kWh for the electricity his system generates.

MCREA is installing a net meter and upgrading the power line to the ranch. If the completed system generates the anticipated 8 MW, the utility will have to build a new substation, as well.

*See COLORADO RANCHER, page 11*

# San Francisco Giants go to bat for solar power

Those sunny summer days spent basking in the bleachers may take on a new meaning for baseball fans, thanks to a sponsorship agreement between the San Francisco Giants Baseball Club and Sharp Solar Corporation.

“The Giants want to be in the forefront spreading the word about solar power,” explained Jason Pearl, Giants’ vice president of corporate sponsorship.

Shortly before the 2005 season began, Sharp installed a solar array on the roof above the team offices at SBC Park. In left-center field, a Sharp Solar sign is on display. “That’s the only sponsorship sign with the word ‘solar’ on it that you will see in an outdoor athletic facility,” Sharp Vice President Ron Kenedi noted proudly.

## Learning experience

As important as the electricity the solar array produces is the opportunity to educate 3 million fans. “Once we entered the agreement, we came to understand the ballpark’s place in the community, how highly regarded it is,” explained Kenedi.

During the three-year sponsorship, the Giants and the solar panel manufacturer will develop other promotions to draw attention to solar energy. “The team happens to play for a city where there is already a great interest in renewable energy,” said Pearl.

“SBC Park is located in what we call the ‘Golden Triangle,’” Kenedi concurred. “The Moscone Center a few blocks away has a 600-kW system, and the Oakland Federal Express office, in a direct sightline from the ballpark, is generating one MW. Sharp also does a big residential business in the area.”

Sharp placed a multimedia kiosk in the leftfield concourse to monitor the system’s output. Fans can learn how solar energy works and request information from the manufacturer. The kiosk shows the system operating, describes its components and gives historic production figures for power generated in a day and CO<sub>2</sub> emissions avoided.

During selected games, the “Crowd Noise Meter” will broadcast the solar system’s output. “Instead of urging fans to pump up the volume, it will tell them to pump up the power,” said Pearl.

## Potential to expand

For the Giants, the sponsorship offers a chance to “put a toe in the water,” said Pearl. “It’s an experiment to learn more about how solar technology works logistically.”

The 4.5-kW array transfers energy directly into the ballpark’s electrical grid. The system, which consists of 27 160-watt Sharp solar modules, is typical of California residences, but only slightly offsets the facilities’ electricity use.

Of course, the park’s peak use occurs during night games, when the ballpark lights consume a huge amount of energy, Pearl noted. But he conjectured that solar power might eventually provide more of the energy used for cooling locker rooms, offices and restaurants during the day.

The parapet roof that surrounds the top level of the ballpark has the square footage for a large installation. “There is room to add hundreds of kilowatts,” Kenedi said.

He noted that the point of solar



**The 4.5-kW solar array Sharp installed for the San Francisco Giants Baseball Club helps power team offices and raises fans’ awareness about solar energy. (Photo by Sharp)**

generation is not to supply an entire load, but to offset it. “There are only 100 or so events each year, so there is plenty of time when the system would be making power that the park would not be using it,” said Kenedi.

## Ball club shows leadership

The solar demonstration is not the first project the ball club has undertaken to improve the sustainability of its operations. SBC Park recycles the usual glass, metal, aluminum, plastic and paper, and sends soil and sod back to the sod farm for mulching and recomposition. After each game, a local recycling company collects grass clippings and food scraps for composting.

Park staff is working with maintenance personnel from other ballparks to implement similar programs at those facilities. Also, park management is looking to get more fans to assist with recycling efforts. Pearl asserted, “We’re proud of our ‘first-of-their-kind’ efforts to enhance SBC Park.”

Kenedi envisions another “first” for the Giants. “I’d love to see SBC Park become the first solar ballpark in the country,” he stated. ⚡

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# Tomorrow's scientists partner on sustainable hydrogen project

While designing a sustainable hydrogen production unit for the Environmental Protection Agency's first annual P3 competition, University of Utah undergraduate researchers may have created something else—high school students with a passion for renewable energy.

## Public perception

The P3 program provides grants to teams of college students to research, develop and design sustainable solutions to environmental challenges. Air pollution in Salt Lake City is a serious challenge, said Keith Roper, an associate professor in the university's Chemical Engineering department. He explained, "City buses running on hydrogen produced with solar power would eliminate all greenhouse gases from the equation."

A project where students built a photovoltaic hydrogen production prototype seemed like a good candidate for the competition. But Roper realized that communities aren't going to invest in hydrogen sustainability until they understand more about it. "Right now, the public perception of the technology is far behind its development," he said.

A colleague told Roper that the charter high school Academy for Math, Engineering and Science was looking for a partnership for its science students. So in his application, Roper proposed a research team of 12 undergraduate researchers and 12 AMES students. The EPA funded the university's proposal—possibly, Roper thinks, because of the high school's involvement.



**The Hydrogen Sustainability project team displays their photovoltaic hydrogen production prototype at the P3 competition in Washington, D.C. Undergraduates from the University of Utah teamed with high school students from the Academy of Math, Engineering and Science for the competition. (Photo by U.S. Environmental Protection Agency)**

## System, outreach plan

Student teams designed and built the PHPP from commercially available components. The system included a solar still, an 4W solar panel, an electrolytic cell, coalescers, flashback arrestors, recombination catalyst and storage system. The unit cost \$5,651 and produces three to 30 liters of fuel per day. "The efficiency was lower than we expected, but we have ideas for ways to improve it," said Roper.

In phase II, the research team plans to scale up the photovoltaic hydrogen generator 10- to 100-fold and couple it to a fuel cell to create a portable energy source for sustainable vehicles. A public outreach effort will promote the technology for use in mass transit in the Salt Lake City area.

Public outreach in phase I included creating a Hydrogen Sustain-

ability Website that evaluated aspects of hydrogen sustainability. Students also prepared a public relations kit, participated in lectures and presented results to the state legislature, university officials, other students and the media. Honing their presentation skills paid off when the team traveled to Washington, D.C., for the first annual P3 awards.

## Education component

The competition was held May 16 on the National Mall. To win, a team had to successfully describe how their project related to P3 – people, prosperity and the planet.

The University of Utah received an honorable mention. "Most of the winning projects focused on technologies that could be mass-produced cheaply for use in Third World

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*See TOMORROW'S SCIENTISTS, page 15*

## Workshop highlights many uses of IR cameras

**A**t a recent workshop cosponsored by Western and Tri-State Generation and Transmission Association, utilities learned more about a technology that can increase system reliability and add value to customer service programs.

Those are high priorities for Western customers, so it is no surprise that more than 40 participants turned out for the May 19 infrared camera seminar at Tri-State headquarters in Westminster, Colo. Participants included representatives from large and small utilities, some with IR scanning experience and some who were picking up a camera for the first time. Several utilities brought along facility managers from their large key accounts.

Energy Services Representative Peggy Plate, of the Rocky Mountain region, organized the event in response to customer requests. "The camera is the most popular piece in our Equipment Loan Program," she said. "As our customers have become aware of all its uses, they've wanted to learn more."

Al Teal, director of marketing for Wheatland Rural Electric Association, was one of those asking for the training. "When I see something that is this useful to me, I want other utilities to know about it, too," he said.

### Across-the-board benefits

From the transmission system to small factories, IR cameras can identify hot spots and heat leaks before they turn into costly outages and breakdowns. That function alone is so valuable that Western recently launched a program to upgrade its own IR capabilities.

While anything that helps prevent power outages is valuable to consumers, home and facility audits yield direct benefits that customers can easily relate to. An IR scan can show homeowners energy leaks that are driving up their electric bills. C&I customers, especially those with big electric equipment systems, can cut operating costs with a power quality audit.

Audits are great for building customer relationships and managing loads, too. When utilities show their key accounts how to plug energy leaks and identify preventive maintenance opportunities, everybody wins.

### Different features

Many who attended the workshop already owned cameras or were considering buying one, noted Plate. The price of a camera generally ranges from \$11k to more than \$50k. "The lower priced models can often accomplish most of what utilities need," said Plate. Knowing more about the capabilities of popular models can help them make a decision, she added.

Camera manufacturers FLIR Systems and Mikron Infrared, Inc. were on hand to supply that information. Teal said, "I liked that both major vendors were there. We got to hear two different perspectives, instead of feeling like it was a sales pitch for one product."

Wheatland has an active residential auditing program, Teal explained, and is considering purchasing its own camera. Right now, he borrows cameras from High Plains Power, Inc. or Western's Equipment



**The infrared camera ISI model 94 (top) can be borrowed from Western's Equipment Loan Program. It comes with a portable VCR to make a tape that customers can reference for repairs and maintenance.**

Loan Program.

Through the Equipment Loan Program, customers can test drive a selection of IR scanning tools ranging from the basic to the sophisticated. The simpler ISI models 91, 94 and 96 require less experience to operate. With the optional VCR, the user can make a video recording of heat leaks that homeowners can reference for repairs. The ISI models 380 and 2000 both come with an 8 mm VCR in the kit.

For more complicated inspections and experienced operators, several FLIR ThermoCAMs and the recently

*See WORKSHOP, page 15*

## Murray City Power

from page 5

he doesn't talk about how many homes 3 MW can power, either. He prefers to point out that the landfill is generating twice as much power as it takes to run Murray's municipal buildings and streetlights. "That links the purchase to the city's commitment to proactive environmental stewardship," he said.

Environmental stewardship, Merrill explained, "simply means that we recognize the challenge of balancing the community's power needs with least-cost and least-impact options."

Those options include continuing to look at other alternative energy sources. Going through the economic analysis for the wind power project made the value of renewable energy clear, Merrill said.

The utility has implemented rates that promote energy conservation and efficiency, and all the vehicles in its administrative fleet are hybrids. In the past 25 years, Murray City Power's tree-planting program has planted more than 17,000 trees with more than a 90-percent survival rate. The utility has actively participated in research on the Salt Lake Valley air shed with the University of Utah. "We've accomplished a lot

for a utility our size," Merrill stated proudly.

He hopes that other small utilities might look at Murray City Power and think, "If a little utility in the middle of Utah can accomplish all that, why not us?" ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2005/august/aug054.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug054.htm)

## Colorado rancher

from page 7

### Continued research

The feedstock will be a major factor in determining the system's capacity. In addition to manure, Teague is accepting waste from local breweries and dairies and paunch material from slaughterhouses. As might be expected, different wastes decompose at different rates. Teague noted, "Everything is compared to manure—that's the baseline."

Teague sends waste samples to Hansen who has cooked up "recipes" for the optimum breakdown rate. "Milk and brewery waste

enhance the performance," said Teague.

Researchers from the Colorado State University Agricultural Sciences Department are helping Teague develop rates at which another product, the liquid digestate, could be applied to fields. The slurry enters the digester containing 12 to 15 percent solids, and leaves it with 4 to 6 percent solid content, 90 percent less noxious odors and no pathogens or toxins. The solids go to the compost heap, while the liquid, which contains a little nitrogen and phosphorous, can be applied directly to crops.

A fertilizer that adds moisture to the dry Colorado soil will have a lot of value to local farmers. Having

gone to the trouble of extracting the energy and dry nutrients from so many materials, a resourceful businessman like Gary Teague is not about to let one last product go to waste. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2005/august/aug056.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug056.htm)

# Online workshops walk utilities through renewable issues

The webcast series highlighting the Guidebook to Expanding the Role of Renewables in a Power Supply Portfolio concluded on April 4 with a number of power industry professionals in attendance.

Western co-sponsored the free, six-part series with the American Public Power Association's Demonstration of Energy-Efficient Developments program, the U.S. Department of Energy's GeoPowering the West program and the U.S. DOE Wind Powering America program.

On the first Monday of each month from November to April, industry experts offered downloadable presentations and discussions focusing on the issues covered in the reference guide. "It was evident we needed a mechanism to communicate how to use the final product," said Western Renewable Resource Program Manager Randy Manion. "The webcast series served that purpose wonderfully."

Larry Barrett, who developed the guidebook and led the sessions with co-author Brian Walshe, was impressed with the turnout. According to Barrett, the participation level was at least partly due to the convenience and economy of the webcast format. Instead of directions to a meeting facility, registrants received conference call dial-up instructions and the URL where workshop materials were posted. Connected to the workshop by phone and Internet, participants never had to leave their desks. "Many people just used their lunch hour," said Barrett.

## Agendas differ

About 20 different utilities participated, including many outside Western's service territory. Several participants

joined most or all of the webcasts, while others picked one topic with a specific goal in mind.

Resource Planning Engineer Mark Harris of the Nevada Public Utilities Commission signed up only for the Mar. 7 session, Analyzing Renewable Energy Costs and Risks. He explained, "We wanted to get some ideas for incentive programs that would help more projects get off the ground."

Plumas-Sierra Rural Electric Cooperative is designing its own voluntary green power program and Member Services Representative Jessica Nelson was seeking guidance on pricing. "I appreciated the broad overview of renewable energy program design the series offered," she said.

Some agencies, like Basin Electric Power Cooperative, came to the webcast with several years' experience in developing, purchasing and marketing green power. To Randy Bush, Basin Electric distributed energy coordinator, the webcasts were an opportunity to catch up on the latest happenings in the renewable energy industry. "Attending events like the webcasts keeps us from getting blindsided by looming issues," he said.

## Feedback useful

Each seminar covered a chapter from the guidebook and allowed for questions and discussion among the participants and presenters. Barrett thought that future webcast discussions might be improved by reminding participants to view slides before the session and prepare questions ahead of time. The Public Renewables Partnership made the PowerPoint

slides available on its home page before and after the webcasts.

The accessibility and quality of handouts and speaker presentations drew praise from several participants. "The discussions were easy to page through," noted Basin Electric Member Marketing Coordinator Jeremy Woeste.

"One of the presentations was full of wind technology resources, so I downloaded and saved it," added Bush.

Nelson found the case studies interesting, and expects to use the project planning and public participation strategies in refining Plumas-Sierra's program. As Plumas-Sierra's program evolves, she added, she hoped to see webcasts addressing the same issues in more depth.

Sponsors have taken comments from Nelson and other participants into account in planning future webcasts. "The next webcast series will address wind power technologies," said Manion. "It begins Aug. 11, 2005, and runs the second Thursday of every other month for four months."

Public power providers face unique challenges in making alternative resources part of their power mix. Western and its partners will continue to offer tools like the guidebook and the webcast series to help them reach their goals.

The Guidebook to Expanding the Role of Renewables in a Power Supply Portfolio is available through the APPA product store. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2005/august/aug0510.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug0510.htm)



# Energy Shorts

## Nationwide interconnect rules

The Federal Energy Regulatory Commission released Order No. 2006, "Standardization of Small Generator Interconnection Agreements and Procedures" on May 12, providing consistent nationwide interconnection practices for generators of less than 20 MW.

FERC recognized that the growing market for small distributed powerplants created the need for standard procedures. According to the commission, the rule removes barriers to developing needed infrastructure by reducing interconnection uncertainty, time and costs. Dozens of parties including utilities, small generators, state commission representatives and the National Association of Regulatory Utility Commissioners offered input on the rule.

Under the rule, investor-owned utilities must amend their Order No. 888 open access transmission tariffs to offer non-discriminatory, standardized interconnection service for small generators. FERC's Small Generator Interconnection Procedure sets forth specific steps to study the effects a proposed interconnection might have on a system. The rule also outlines contractual provisions for interconnections and defines who should pay for necessary transmission system upgrades through the Small Generator Interconnect Agreement.

The final rule went into effect in July, 60 days after it was published in the Federal Register. Regional transmission organizations and independent system operators have 90 days to comply. The ruling in its entirety can be found at the FERC e-library.

## State programs receive DOE funds

The U.S. Department of Energy is providing 38 states with \$26.5 million in State Energy Program grants for Fiscal Year 2005 to support and encourage state energy-saving and efficiency goals.

States in Western's territory received more than \$8 million of the total \$44 million in SEP grants DOE is distributing this year to every state and U.S. territory, Puerto Rico and the U.S. Virgin Islands. State energy offices manage SEP projects with support from DOE's six regional energy efficiency and renewable energy offices.

Program funds have supported projects such as California's "Energy Saving Traffic Lights"; Illinois' Small Business Smart Energy Program; Indiana's purchase of two compressed natural gas street sweepers; and Kentucky's biodiesel infrastructure program, connecting biodiesel customers with biodiesel distributors across the state.

Every \$1 SEP invests is matched by \$3.54 from state and local govern-

ments and the private sector, and saves the American people \$7.23. The State Energy Program saves an average 41.35 million British thermal units per year, reducing energy bills by \$256 million.

## Colorado's largest wind farm

The Washington County, Colo., Commission recently gave its approval to Charlottesville, Va.-based Greenlight Energy to build the largest wind energy development in the state.

The 200- to 300-MW Akron wind farm could provide enough clean energy to meet the annual needs of up to 90,000 homes. Colorado's renewable portfolio standard, passed by voters in November 2004, was an incentive to develop the project.

Construction on the wind farm could begin as early as 2006, pending completion of a power purchase agreement and remaining development work. Western, Tri-State Generation and Transmission Association and Xcel Energy have transmission facilities near the site in northeastern Colorado. A spokesman for the developer said the location's proximity to transmission lines made it ideal for wind energy development.

The Washington County Economic Development Corporation worked with the Greenlight Energy team to advance the project. The community was very receptive to the

*See ENERGY SHORTS, page 16*

Want to know more?  
Visit [www.wapa.gov/es/pubs/esb/2005/august/aug05es.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug05es.htm)

## Not all pump systems benefit from adjustable speed drive

by Johnny Douglass, P.E.

We often hear that installing an electronic, adjustable-speed drive on a pump system that does not need continuous maximum pump flow will result in big energy savings.

Because speed requires power, maintaining minimum speed with an ASD can result in energy savings if the system generally requires a lower flow rate than the pump is designed to deliver. However, applying an ASD can be tricky or inadvisable when the pump is used for open-loop flow.

### Open-loop pumping

In pumping applications, pressure is usually expressed as “head.” For a given pressure, head is the height of a fluid column that will produce that pressure at the bottom. Head is a convenient unit in lift pump calculations because a large part of their work is lifting fluid to a higher elevation. One psi is equivalent to 2.31 feet of water head.

Static head exists in open-loop flow when fluid is either pumped to a higher elevation or pumped into a manifold that is already pressurized by other pumps. Friction head is the additional pressure rise as flow increases. Closed-loop pumps, such as those serving heat exchangers, encounter only friction head, not static head, because the fluid returns to the initial elevation at the starting point each time it

cycles through the system.

Motors in high-static applications are designed for worst-case conditions, where if the flow is not reduced during operation, the pumps have to cycle on and off. An ASD can eliminate cycling, but the additional power savings are not as significant as they would be in a closed-loop system where the pump does not have to work against static head. If constant speed cycling is used, look for a pump with high efficiency at the expected combination of flow and pressure.

### Match pump to system

Designers match pumps to systems by overlaying their curves. The constant speed pump curve is a graph of head vs flow. It gradually slopes downward to the right, representing decreasing pressure at higher flows. Manufacturers’ pump curves are overlaid with efficiency lines—concentric rings that look like topographic lines. At the center of these lines is the point where the pump uses the least energy to move the fluid.

The system (piping and reservoirs) can be represented by a similar curve that shows the necessary head at pump discharge to achieve a certain flow. The system curve starts at the elevation head and slopes upward to the right, representing increasing pressure required to overcome flow friction. Flow always occurs where the two

curves intersect. The intersection may move when using an ASD because it shifts the whole pump curve down on the pump performance graph.

A challenge with ASD applications in high static head situations is stability. Reduced pump speed results in lower pressures expressed by the entire pump curve sliding downward. On a system with a nearly horizontal curve because of high lift and minimal piping friction, only a small speed decrease will lower the flow, sending the intersection of the pump and system curves far to the left.

That sensitivity can cause wide-ranging cycling or fluctuation in speed and flow as the system “hunts” for equilibrium. For system operation to be stable and efficient with an ASD, the pump should have a steeper downward sloping curve and good efficiency across the range of expected flow variation.

### Magnetic vs. electrical

If variable speed looks like it might work for your needs, compare a mechanical magnetic variable speed drive to an electronic ASD. Both will reduce the pump shaft energy requirement by the same level for the same flow reduction. However, they will not equally reduce the electrical energy input. The electric ASD

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See *TECHNOLOGY SPOTLIGHT*,  
page 16

Want to know more?  
Visit [www.wapa.gov/es/pubs/esb/2005/august/aug05spot.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug05spot.htm)

## Tomorrow's scientists

from page 9

countries,” said Roper. “At more than \$5,000 per unit, the PHPP is in a different category.”

While the university did not get EPA funding for the second phase, it has gained attention for hydrogen sustainability. Student presentations to Utah Clean Cities, a non-profit group that converts city buses to natural gas, and Envision Utah, a sustainable growth partnership, have raised awareness about the environmental benefits of hydrogen.

The project has been an unqualified success from an educational point of view. The high school students impressed the university Chemical Engineering department's academic advisor

with their grasp of the science and ability to explain the technology. The National Science Foundation is now looking at the project as a model for mentoring high school science students.

And AMES parents are very happy with the results. “Maybe even more so than the kids,” Roper admitted. “Their children got to go to Washington, D.C., and meet business, science and government leaders. That's an incredible opportunity.”

The biggest beneficiary of the P3 competition may be renewable energy development. The technological innovations student researchers produced are valuable, but the bigger breakthrough is a new generation of scientists who understand alternative energy and can explain it to others. Or, as Keith Roper put it, “We now have 24 young people with a vision.” ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2005/august/aug058.htm](http://www.wapa.gov/es/pubs/esb/2005/august/aug058.htm)

## Workshop

from page 10

acquired Mikron TH7550 offer more options. These cameras save digital images to a PC memory stick.

### Sponsors needed

The day-long training session stirred interest in future workshops, with one customer suggesting eastern Nebraska as the next location. The vendors liked the format as well—FLIR and Mikron both offered to send represen-

tatives to other workshops in Western's territory.

Western is looking for more utility partners to sponsor IR camera training. Regional Energy Services representatives will coordinate registration, schedule speakers and host the meetings. Utilities are asked to provide meeting space and marketing materials and support for the event.

If your utility is interested in sponsoring a training workshop for infrared cameras, or any other technology, call or email your Energy Services representative. ⚡

Want to know more?

Visit [www.wapa.gov/es/pubs/esb/2005/august/jun059.htm](http://www.wapa.gov/es/pubs/esb/2005/august/jun059.htm)

## School's efficiency

from page 4

Mountain's system. “As far as we know, there haven't been any virus problems this time.”

### Actions have effect

Simple measures and school pride proved to be effective conservation tools. Rocky Mountain reduced its energy use by 9 percent, well within the 200,000-kWh allotment.

The students were enthusiastic about the accomplishment and the teachers were even more excited. “There is some interest in doing it again,” said Swartz.

If Rocky Mountain repeats the wind purchase, Swartz would like to add an attitude survey to see if it raises awareness among students and changes their habits. He said, “The challenge in getting kids to embrace the measures is to show them that their actions have an effect.”

And the students are having an effect, Reeve noted. Although the district actually pays a higher premium for wind energy, the awareness the program raises ultimately saves energy costs freeing more money to put toward education. “By these students working together inside their school, they're actually impacting the entire school district,” said Reeve. ⚡

## Technology spotlight

from page 14

converts electrical energy to drive shaft energy more efficiently below 95 percent output speed, while magnetic drives have their greatest efficiency above 95 percent.

Magnetic drive is preferable for lift pump situations because it requires only minimal speed reduction to substantially reduce flow. Also, it may offer greater stability for a pump and system that both operate with high lift and minimal piping friction—where both curves

are very nearly horizontal.

An ASD will save energy in a closed-loop flow application where the same fluid is circulated over and over—in a heat exchanger, for example. If it is not necessary for the system to always operate at maximum design flow rate, then an ASD is ideal to reduce the flow during light flow requirements.

Make sure you provide your prospective ASD or magnetic drive vendors with your pump and system curves. This will help determine the efficiency and stability for the range in which you will be operating. Be sure to tell them your operating time if your current

constant speed control is based on cycling on and off. Inexpensive battery powered time loggers can be used to actually measure the operating hours over a known span of time. ⚡

## Energy Shorts

from page 13

development, and looks forward to becoming Colorado's leader in clean energy generation.

### Student art contest

The California Energy Commission announced the 16 winners for its 2006 Energy Calendar contest.

The artists are students from public and private schools throughout the state. Their illustrations offer unique and sometimes humorous advice on how to make wise use of energy for a cleaner future. Themes ranged from energy-saving tips such as turning off unneeded lights and appliances and running dryers

and dishwashers during off-peak hours to bringing innovative, cutting-edge technologies to the world marketplace.

A panel of judges selected the winning drawings from 1,400 poster entries received from students in grades three through eight. The number of high-quality entries led judges to award four students with Honorable Mentions, a first in the calendar's 18-year history.

The winning art collection will illustrate the 2006 Energy calendar for children and be featured on Energy Quest, the Commission's education site. ⚡

## Calendar of events

Visit Western's regularly updated Energy Event Calendar for a complete list of seminars, workshops and conferences. <http://www.wapa.gov/es/pubs/esb/2005/august/aug05coe.htm>